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ADB Working Paper Series

**INFRASTRUCTURE IN
CENTRAL ASIA AND CAUCASIA**

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Abstract

Without realizing the importance of soft infrastructure, hard infrastructure cannot ensure a significant impact on sustained economic development. Unfortunately, Central Asia and Caucasasia regions have continued to rely on a physical development model that has resulted in generating revenue but has failed to embed a sustained growth pattern in these countries. This paper highlights where Central Asia and Caucasasia regions stand in terms of physical and soft infrastructure. A gradual improvement in physical infrastructure is observed, however, the infrastructure development pattern is uneven. Tajikistan and the Kyrgyz Republic are catching up with the rest of the region. The utilization of infrastructure depends on regional infrastructure connectivity which shows gradual improvement but still faces challenges, for example, mandatory transloading, corruption and inappropriate practices, containerization availability, and multi-transport mode delays. To overcome infrastructure development and connectivity challenges, massive infrastructure investment is required but is currently quite low. To tap infrastructure financing, appropriate financing strategies like developing public–private partnerships, attracting foreign direct investment, and exploring the possibility of the bond market are required. To improve the infrastructure development landscape, and resolve infrastructure connectivity and financing issues, the region requires an appropriate institutional and regulatory environment.

Keywords: infrastructure, transportation infrastructure, roles of government

JEL Classification: O180, R420, H110

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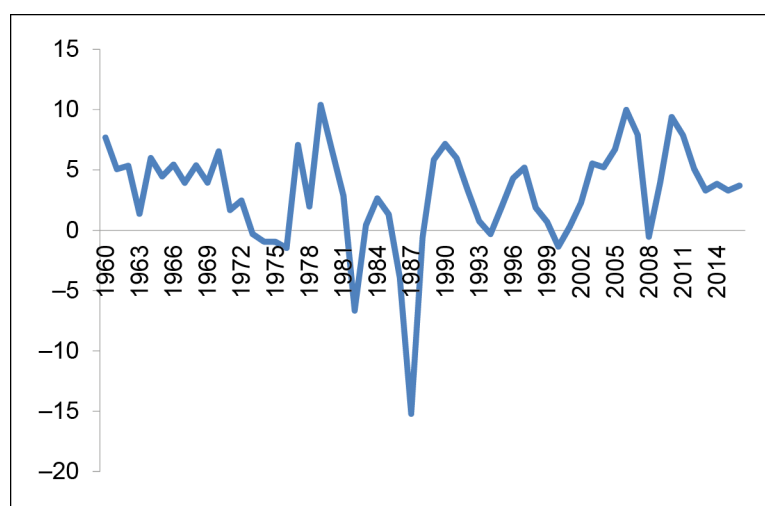
1. INTRODUCTION

The role of infrastructure¹ in economic development and the growth of the economy is paramount. Infrastructure not only makes a significant impact on economic development, but infrastructure development eventually supports economic growth, trade, and investment. Conversely, infrastructure deficiency creates bottlenecks to economic development, growth, trade, and investment. However, physical infrastructure alone cannot contribute to the economic development of an economy, unless accompanied by soft² infrastructure. “History offers much evidence of the impacts of transformational infrastructure successes and failures” (McCartney 2018). Three examples, which are not directly related to the Central Asian economies (landlocked economies), serve to demonstrate the importance of soft infrastructure along with physical infrastructure in order to achieve a sustained growth pattern.

The Panama Canal not only reduces the travel time³ between the Atlantic and Pacific Oceans, but it also connects these two oceans to avoid 8,000 miles around the Southern tip of South America. Through this facilitation, the annual shipping traffic has risen exponentially to 815,000 in 2012 from 1,000 in 1914 generating \$2.4 billion in tolls (PIDE Research Brief 2019). Similarly, the development of road networks in Pakistan and dry ports in Central Asia reduces both the time and cost of trade, but unfortunately these developments did not show up in its sustained growth pattern.

If we look (see Figure 1) at GDP per capita growth (%), it does not reflect a sustainable increasing pattern. Unfortunately, the physical infrastructure model was adopted in Panama and less importance is given to improving soft infrastructure to achieve a sustainable development pattern.

Figure 1: GDP Per Capita Growth (%)



Source: World Bank. World Development Indicators 2019.

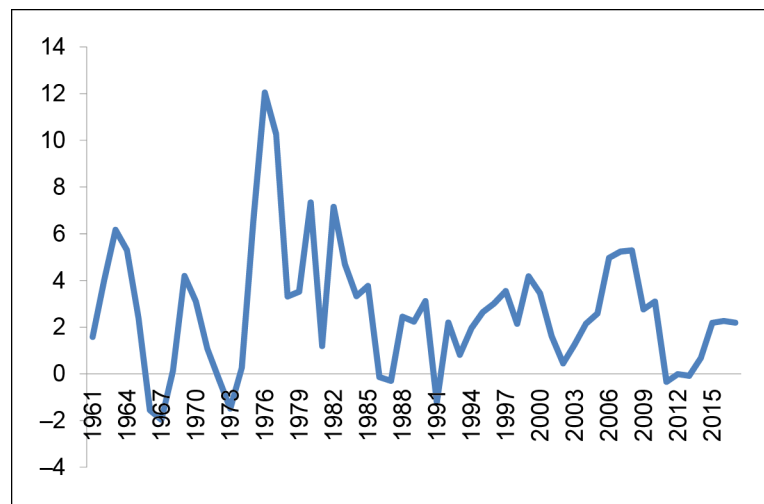
¹ Roads, railways network, energy, water and sanitation, seaports and airports, and telecommunications.

² Rules and regulations that support the facilitation of trade and overall economic development.

³ From 25 hours to 12–15 hours.

Similarly, another humongous project, the Suez Canal, again not only connects the Mediterranean Sea to the Red Sea but it also reduces the distance by 7,000 km by avoiding the South Atlantic and Southern Indian Oceans (PIDE Research Brief 2019). This project also substantially increases shipping traffic generating \$5.4 billion in tolls in 2017–18. Like the Panama Canal, the Suez Canal is not contributing to a sustainable increasing growth pattern (see Figure 2).

Figure 2: Growth Pattern



Source: World Bank. World Development Indicators 2019.

Finally, the Greater Mekong Sub-region⁴ also contributes to a high cost of doing business due to inefficient cross-border procedures; lack of a customs transit system; poor logistic services; and non-tariff measures. With these inadequate measures, the cost of exporting a container of cargo from Cambodia increased \$735 in 2005 to \$795 in 2014 (Nguyen 2016). One of the main reasons along with internal intricacies in economic policies is the need to improve soft infrastructure so that soft infrastructure can combine with physical infrastructure to achieve a sustained growth pattern.

This study not only examines the hard infrastructure⁵ landscape of the Central Asian⁶ and Caucasus economies but will try to highlight the significance of soft infrastructure in order to achieve a sustained development pattern. Soft infrastructure⁷ refers to the efficiency and effectiveness of regulatory indicators that include regulations, transparency, irregular payments, favoritism, and measures to combat corruption (Ismail and Mahyideen 2015). Soft infrastructure improvement brings efficiency to economic activities, and around the world, efficient infrastructure for any country provides enormous opportunities to boost its economic activities. It increases the production capacity and reduces the cost of production. And, it also improves transport connectivity through efficient transport networks and telecommunication. Infrastructure development expands market connectivity and creates efficient markets (reducing time and price

⁴ The People's Republic of China, Viet Nam, the Lao People's Democratic Republic, Myanmar, Thailand, and Cambodia in 1992 by ADB.

⁵ Given the limited word requirements, this paper will not discuss its positive economic ramifications.

⁶ Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan.

⁷ Framework for Economic Growth (FEG) defined soft infrastructure as the organization of institutions in such a way as to support innovations and best use of resources to gear up productivity.

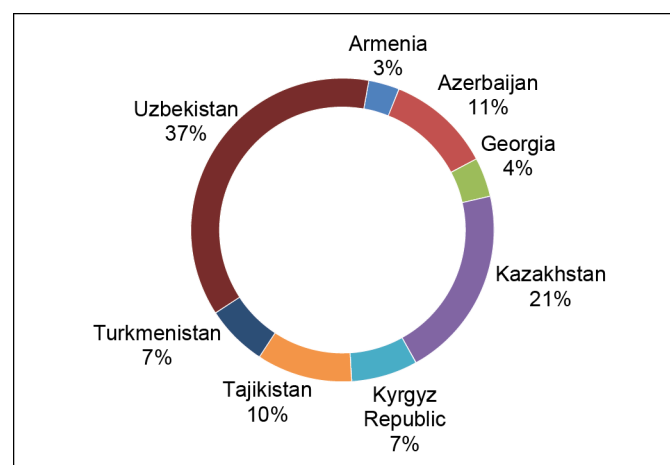
divergence), that eventually generates more jobs. To achieve optimal impact both soft and hard infrastructure are equally important (Kingcombe 2014).

The paper is organized as follows: Section 2 will discuss the economic profile of Central Asia⁸ and the Caucasus to educate the reader on where the Central Asian region is standing economically. Section 3 will build on the infrastructure landscape of the Central Asian economies. Infrastructure connectivity is discussed in section 4. To meet the infrastructure gap, section 5 will discuss infrastructure investment requirements and challenges. Section 6 will shed light on infrastructure investment strategies and possible challenges. Finally, section 7 will conclude and discuss policy recommendations.

2. POPULATION AND ECONOMIC PROFILES OF CENTRAL ASIA

Increasing population is putting unprecedented pressure on natural resources. Fortunately, Central Asian and Caucasian countries' overall population is not stressing natural resources, however, the exploration of natural resources and productive utilization is one of the main challenges of the Central Asian and Caucasian economies. Central Asia and Caucasus are home to 89.12 million people. Its total population is equivalent to 0.95% of the total world population and approximately 48% of the population lives in urban areas. Figure 3 shows the distribution of the population in Central Asian and Caucasus countries. Uzbekistan has the largest populated country in the region with 32.95 million people, and Armenia is the least populated country with 2.95 million people.

Figure 3: Population Share 2018



Source: World Bank. World Development Indicators 2018.

⁸ Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

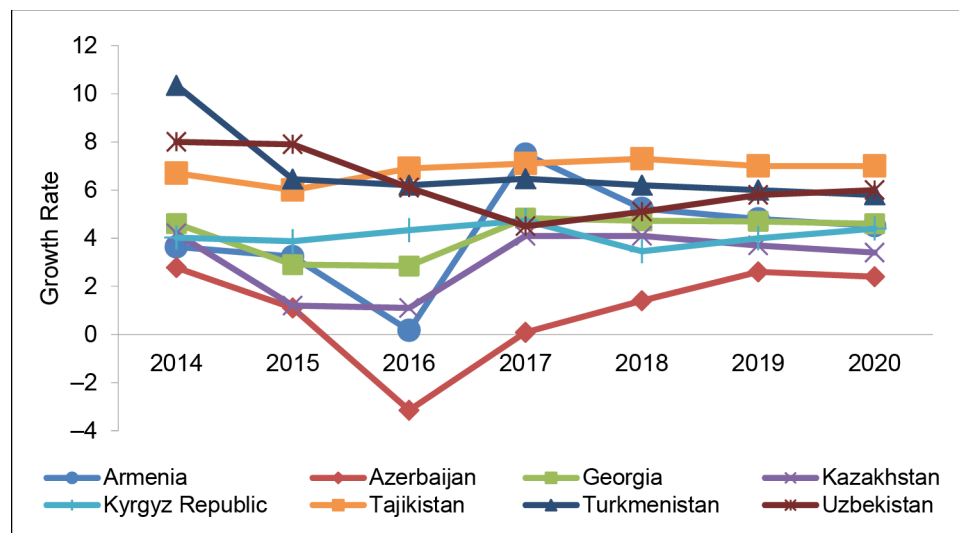
The region is a unique blend of diverse features, economic, political, cultural, and geographical that influence economic growth and have shaped policy through the economic transformation in the last 30 years since independence from the Soviet Union. Central Asia is blessed with natural resources that include gold, crude oil, natural gas, and other metals. Crude oil and natural gas reserves are held by Kazakhstan and Turkmenistan while Armenia, the Kyrgyz Republic, Tajikistan, and Uzbekistan have gold reserves, and Kazakhstan also has the largest uranium reserves.

The region stretches across a vast geographical area and is strategically positioned as a gateway to Europe and Asia and provides many potential opportunities for trade and investment. After independence, Central Asian and Caucasian countries transformed from state-controlled economies to market economies. The economies have embarked on market-oriented reforms that emphasize macroeconomic stabilization, trade openness, and private sector development. The governments in the region are implementing structural reforms to improve competition in the markets; raising the living standard of their people; adopting industrialization; and improving services via public policies and other measures that increase opportunities for the people in the region.

The overall GDP growth rate for these regions was 2.4% in 2016, the lowest GDP reported in the last five years. The average GDP growth rate from 2014 to 2020 was 5.1% to 3.9% in the region because negative GDP growth rate was recorded in 2016 for Azerbaijan. Figure 4 shows that Tajikistan has the highest GDP in the region, Tajikistan's GDP remained more than 7.0% from 2017 to 2020. Whereas Armenia's GDP grew from -3.1% to 2.4% from 2016 to 2020.

Average growth in Central Asia and Caucasasia declined by 2.8 percentage points in 2014–19 from 5.1% to 2.4%. Most of this decline is attributed to the shrinking labor supply that played a key role in declining productivity growth that eventually resulted in low average growth in Central Asia and Caucasasia.

Figure 4: GDP Growth Rate at Constant Price



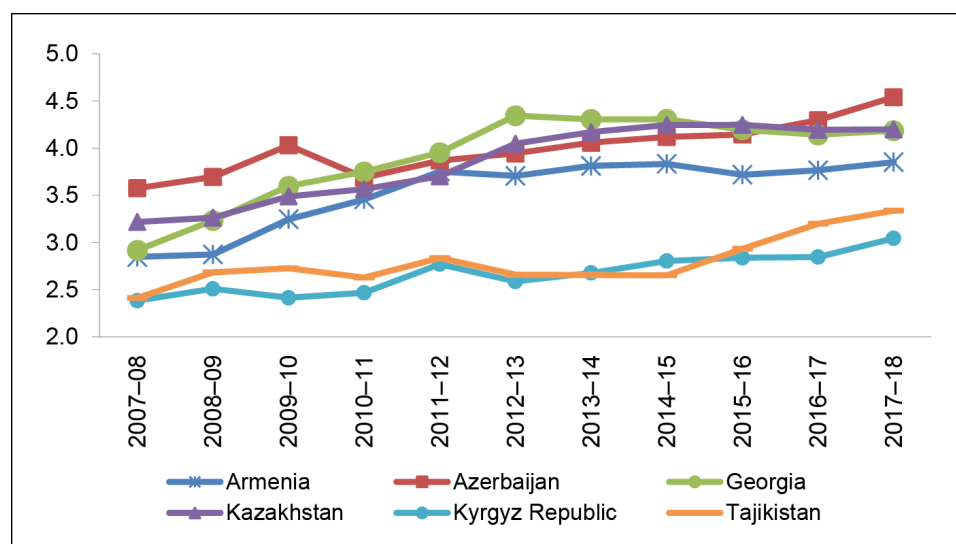
Source: Asian Development Bank (2019).

3. INFRASTRUCTURE LANDSCAPE IN CENTRAL ASIA AND CAUCASIA

Infrastructure⁹ has shown gradual improvement since 2007–08 (see Figure 5). Tajikistan and the Kyrgyz Republic are still catching up with the other countries. Similarly, Armenia is lying in the middle above Tajikistan and the Kyrgyz Republic, but below Azerbaijan, Kazakhstan, and Georgia. The overall infrastructure situation in Azerbaijan, Kazakhstan, and in Georgia is much better than the other mentioned countries. The Global Competitiveness Index (World Economic Forum 2019) illustrated the overall infrastructure ranking figures that reveal the slower development pace in the region. However, the score shows improvement as revealed in Figure 5: The index score for Armenia increased from 2.84 to 3.85 between 2007 and 2018, and all countries in the region showed similar improvement.

These countries have introduced a number of infrastructure development programs. The Belt and Road Initiative (BRI) agreement was signed to boost the pace of development. Infrastructure improvement was established in the region which is providing opportunities to trigger the pace of developmental strategies and fostering high-tech industries, trade, and investment, and has established many important institutions to pool resources toward an export orientation. The research institute in the region is playing a significant role in developing new technology and adopting new priorities towards problem-solving methods. Countries are seeking to increase efficiency in productivity to strengthen economic stability and accelerate the pace of growth. The region is also investing in modern technologies, education, health, and other infrastructure.

Figure 5: Infrastructure Global Competitiveness Index (1–7)



Source: World Economic Forum (2018).

⁹ According to the Global Competitiveness Index: To assess the general infrastructure (e.g., overall infrastructure, transport, telephone, energy) in your country? [1 = extremely underdeveloped; 7 = extensive and efficient by international standards].

Transport Infrastructure

With the exception of Georgia that has a coastline on the Black Sea, the rest of Central Asia and Caucasus regions are landlocked, therefore, transport in the region mainly occurs by road and rail networks.

3.1 Road Infrastructure

In landlocked economies, road and rail networks have an incredible role in enhancing economic activities. Both of these entities connect markets and improve efficiency (reduction in prices). Some of these economies like Azerbaijan have the highest road density¹⁰ in Central Asia. The trunk road network is managed by Azeravtoyol, a semiautonomous state-owned company responsible for construction, rehabilitation, and maintenance. Kazakhstan has the largest geographical area in the region but has a very low road density. The trunk road network falls under the responsibility of the Committee of Roads under the Ministry of Investment and Development. Similarly, different ministries and authorities manage road construction, rehabilitation, and maintenance in the region. The average road density is around 28 km/100 km², which in comparison is much lower than South Asia and other regions like East Asia.

Table 1: Road Infrastructure

General Road Data	AZE	GEO	KAZ	KGZ	TAJ	TKM	UZB
Total roads (km)	59,000	21,800	96,718	34,810	26,767	58,592	18,3724
Trunk road network (km)	19,016	6,824	23,485	18,810	14,067	13,644	42,530
Rural/urban road network (km)	40,000	15,000	73,233	16,000	12,700	44,948	141,194
Land area (km ²)	86,663	69,490	2,699,700	191,800	138,786	469,930	425,400
Road density (km/100 km ²)	68.1	31.4	3.6	18.1	19.3	12.5	43.2

AZE = Azerbaijan, GEO = Georgia, KAZ = Kazakhstan, km = kilometer, km² = square kilometer, KGZ = Kyrgyz Republic, TAJ = Tajikistan, TUR = Turkmenistan, UZB = Uzbekistan.

Source: ADB consultant. 2018. Compendium of Best Practices in Road Asset Management.

3.2 Rail Infrastructure

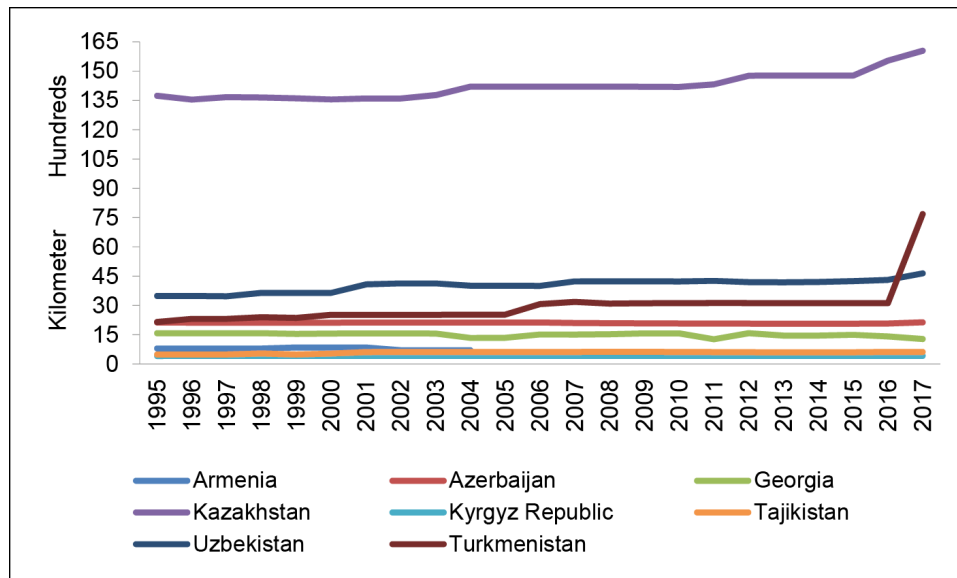
The rail networks are the backbone of any economy, used for the distribution of goods from one place to another and also for passengers' travel. The rail network in Central Asia is extensive, it connects Kazakhstan, Uzbekistan, and Turkmenistan with links to the Kyrgyz Republic and Tajikistan. The rail network connects seaports on the Persian Gulf, the Mediterranean Sea, and the Black Sea. Also, the rail network provides potential transit to East Asia, Southern and Central Europe. In addition, the rail network connects the industrial sector of northern Kazakhstan with the northern border of the region. This mainline provides a junction between Kazakhstan, the European Russian Federation, and the People's Republic of China (PRC) to the northeast of Kazakhstan.

Figure 6 shows the extent of the Kazakhstan railway network that connects the PRC in East Asia, the European Russian Federation to the north of Kazakhstan, and the Kyrgyz Republic to the south of Kazakhstan. The total length of the Kazakhstan railways was 16,040.3 kilometers in 2017, it grew 12.9% over a decade. The Kyrgyz Republic has a limited rail network but it is important due to its connectivity with the PRC to the east, through Bishkek with Kazakhstan, and through Tashkent

¹⁰ Road length per unit of area.

with Uzbekistan and Tajikistan, respectively. Interestingly, the railway length in Turkmenistan doubled from 3,181 kilometers in 2007 to 7,680 kilometers in 2017.

Figure 6: Railway Length



Source: World Bank. World Development Indicators 2018.

Table 2 shows data on the ten-year change for goods, transport, and passenger transport.

In Armenia goods transport by train has more than doubled, but passenger train travel has decreased by 8.2% from 2007 to 2017. Tajikistan and Uzbekistan show a significant increase in the last 10 years for transporting both goods and passengers by train.

Table 2: Railways for Goods and Passengers

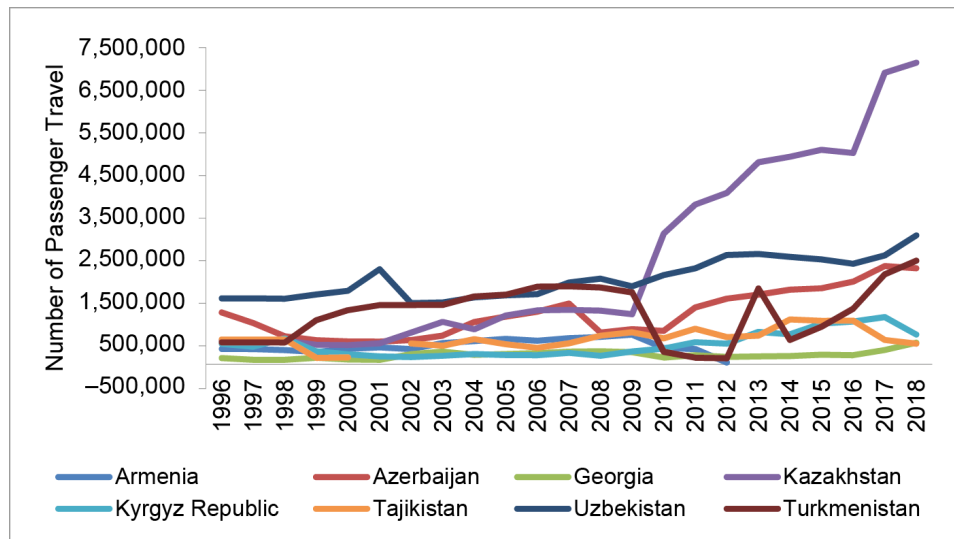
	Goods Transported			Passengers Carried		
	2007 (million ton/km)	2017 (million ton/km)	Change %	2007 (million ton/km)	2017 (million ton/km)	Change %
Armenia	340	689	102.78	27	24.8	-8.14
Azerbaijan	10,374	4,633	-55.34			
Georgia	6,928	2,963	-57.23			
Kazakhstan	200,752	206,258	2.742	14,314	19,241	34.42
Kyrgyz Republic	848	935	10.14			
Tajikistan	1,274	165	-87.05			
Uzbekistan	21,594	22,940	6.23	2,264	4,294	89.66
Turkmenistan	10,973	13,327	21.45	1,286	1,811	40.82

Source: World Bank. World Development Indicators 2018.

3.3 Air Infrastructure

Air transport is one of the safest means of transportation and has potential benefits to generate jobs and inject billions of dollars into Central Asian and Caucasian economies. It reduces the distance around the globe and helps to create a feasible environment for business. Air transport has an extensive economic impact; direct, indirect, and induced impacts.

Figure 7: Number of Passengers Traveling by Air Transport



Source: World Bank. World Development Indicators 2018.

Like other regions, Central Asian and Caucasian countries also heavily depend on air transport. Figure 7 shows the number of passengers that travel by air transport; the overall number of passengers traveling in the region has increased over time. Kazakhstan's passenger movement has increased by 82% from 2008 to 2018 and reached 7.1 million passengers in 2018. Similarly, Armenia has also increased the number of passenger movements.

Table 3: Air Transport Infrastructure, Transport, and Service Quality

	Quality of Air Transport Infrastructure 2017–18		Air Transport 2018–19		Airport Connectivity 2018–19		Efficiency of Air Transport Services 2018–19	
	Rank	Value (1–7)	Rank	Score	Rank	Score	Rank	Score
Armenia	52	4.8	86	46.7	93	33.2	67	60.2
Azerbaijan	24	5.6	53	60.6	79	41.9	12	79.3
Georgia	69	4.3	82	48.4	81	40.6	86	56.2
Kazakhstan	90	4.0	75	50.7	72	46.4	89	54.9
Kyrgyz Republic	120	3.1	124	31.7	104	30.0	133	33.4
Tajikistan	70	4.3	105	40.8	121	23.8	76	57.9

Note: GCI Rank: It posits the quality of infrastructure out of total countries (141). GCI Value (1–7): 1 = extremely underdeveloped; 7 = extensive and efficient by international standards. Total GCI score is 100, a score closer to 100 shows higher competitiveness.

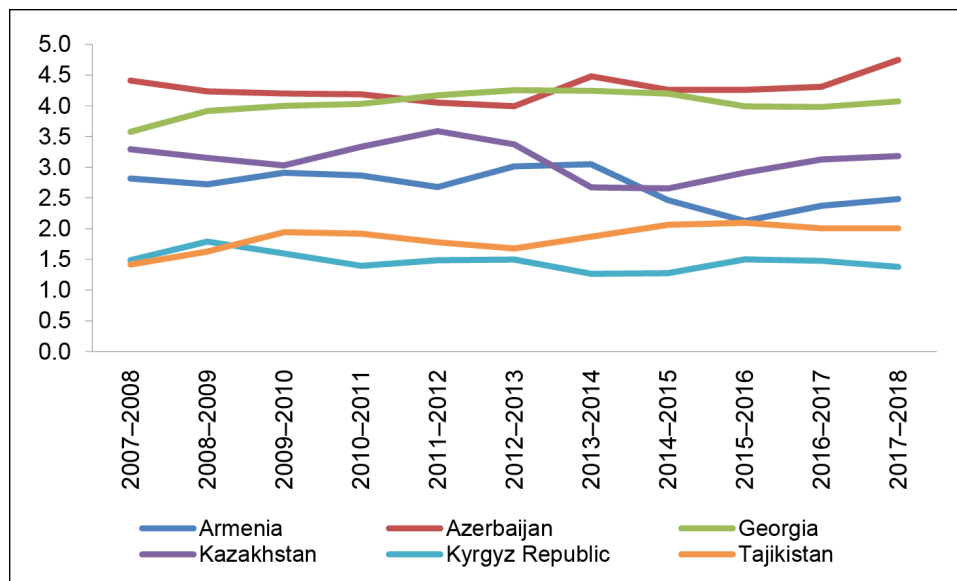
Source: World Economic Forum (2019).

Central Asian and Caucasian countries' air transport infrastructure is categorized in Table 3: Azerbaijan has the finest quality of air transport infrastructure (24/144) followed by Georgia (69/144) and Tajikistan (70/144). The air transport connectivity is below average (score of 50), the regional air connectivity average value of 36 is also not acceptable if we compare with other advanced regions (East Asia, EU). Similarly, the air transport efficiency is relatively on a par with emerging economies but still less than the advanced regions as mentioned.

3.4 Ports

Both sea and dry ports are important for economic activity in coastal areas where they bring important benefits to the economy. Ports provide multiple employment opportunities and mobilize a social function. Seaways and ports transport a huge quantity of goods between countries at the very cheapest price as compared to any other source. Industries require a safe and cheap means of exporting final goods and importing raw materials.

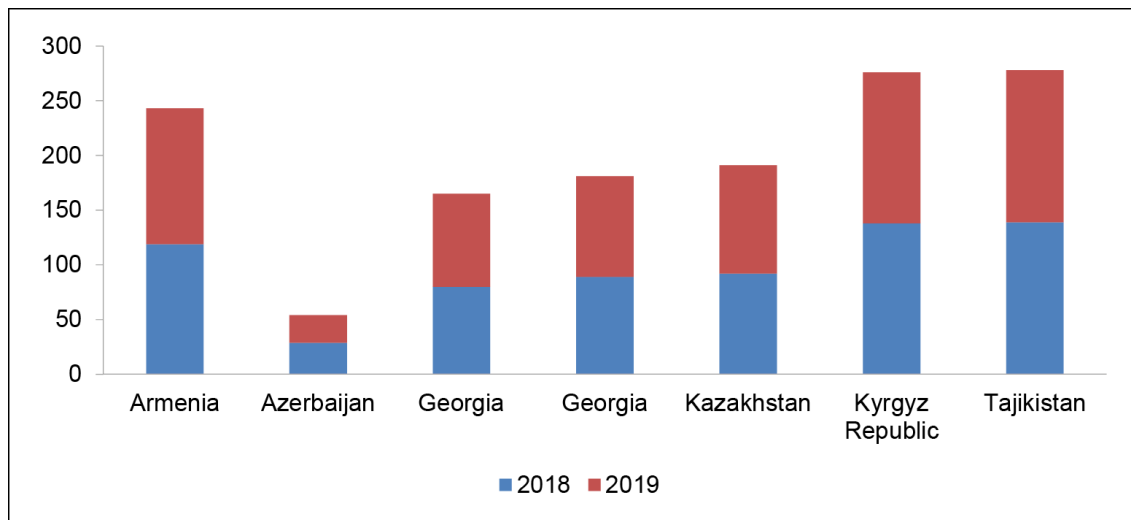
Figure 8: Quality of Port Infrastructure (1–7)



Source: World Economic Forum (2018).

Figure 8 shows the quality of port infrastructure rated 1 to 7.¹¹ Azerbaijan and Georgia have the finest quality of infrastructure in the region while Tajikistan and the Kyrgyz Republic have undeveloped infrastructure. Figure 9 indicates the international ranking for the ports; the overall ranking of port infrastructure is low except Azerbaijan which ranked 29 in 2018 and 25 in 2019.

¹¹ [1 = extremely underdeveloped; 7 = extensive and efficient by international standards].

Figure 9: Quality of Port Infrastructure

Source: World Economic Forum (2019).

3.5 Water and Sanitation

Water quality indicators are measured by the Global Competitiveness Index (GCI) in terms of infrastructure, reliability of water supply, and exposure to unsafe drinking water. Water infrastructure and quality in Central Asia is ranked in Table 4. Armenia has ranked 49/144 countries in the world and scored 84.18 points out of a potential 100. The Kyrgyz Republic has the lowest water infrastructure in the region ranked 85/144 and a score of 67.22/100. Similarly, Armenia has ranked 59/144 and 34/144 for the reliability of water supply and exposure to unsafe drinking water respectively in the region. Whereas Armenia and Azerbaijan score 98.85/100 and 69.50/100 for the reliability of water supply and exposure to unsafe drinking water.

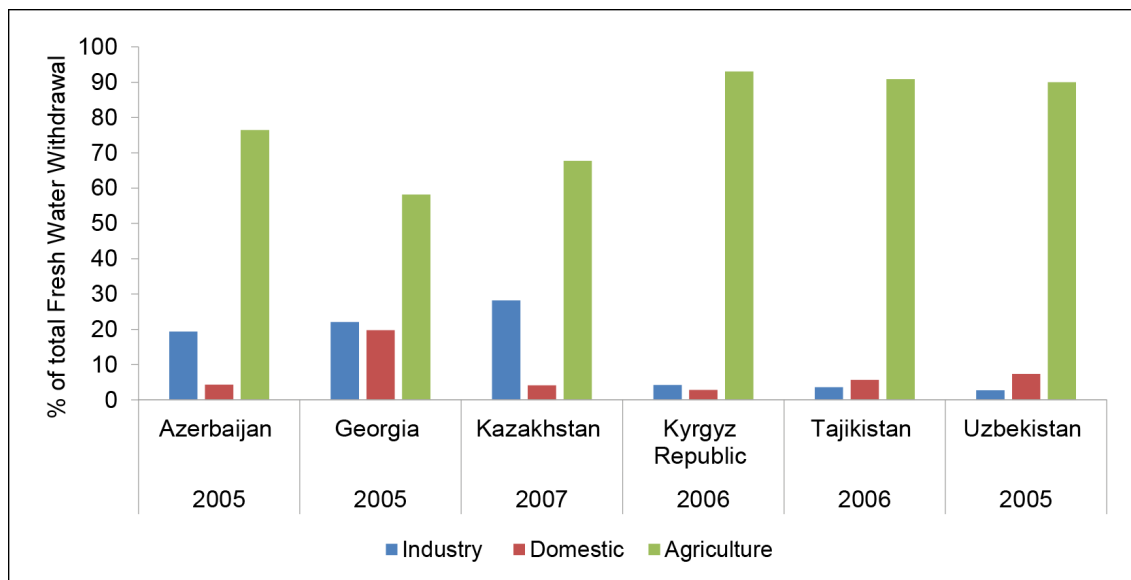
Table 4: Water Infrastructure Indicators

	Water Infrastructure 2018–19		Reliability of Water Supply 2018–19		Exposure to Unsafe Drinking Water 2018–19	
	Rank	Score	Rank	Score	Rank	Score
Armenia	49	84.17	59	69.50	34	98.85
Azerbaijan	56	80.81	58	70.08	60	91.53
Georgia	58	79.78	63	67.51	58	92.06
Kazakhstan	68	76.54	78	61.28	59	91.80
Kyrgyz Republic	85	67.22	110	48.47	70	85.98
Tajikistan	80	70.10	75	62.23	85	77.96

Source: World Economic Forum (2019).

Figure 10 depicts the annual percentage of water withdrawn for residential, agricultural, and industrial use. The highest water consumption is by the agriculture sector in the region as shown (see Figure 10). Residential consumption is quite low compared with that of the industry and agriculture sectors. Georgia consumes around 20% of total water for residential use whereas the Kyrgyz Republic uses less than 5% of total water consumption.

Figure 10: Freshwater Withdrawal for Agriculture, Industry, and Domestic



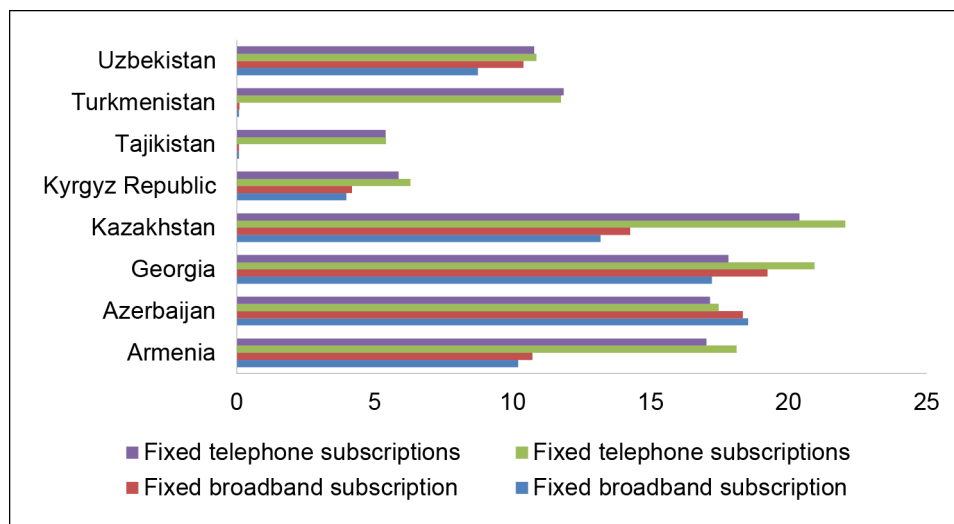
Source: World Bank. World Development Indicators 2019.

3.6 Telecommunications

The telecommunication sector has undergone many changes over the last fifty years since the countries started developing telecommunication technologies. The telecommunication sector is an important focus as it is essential for economic infrastructure. A huge number of changes have taken place in the telecommunication industry over the last two decades with the emergence of the internet, broadband, and many electronic devices with software applications.

3.6.1 Fixed Telephone and Broadband

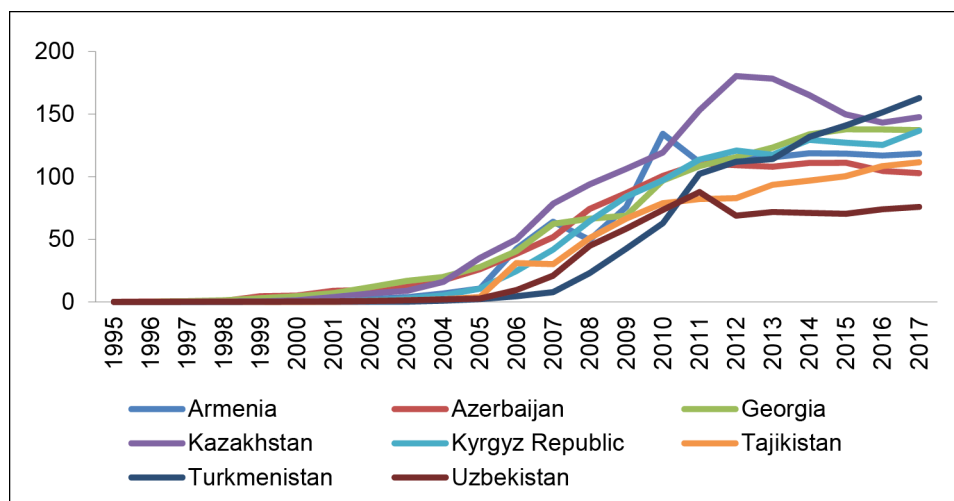
Figure 11 shows the fixed telephone line and broadband as per 100 subscribers in Central Asia and Caucasus. Kazakhstan has the largest number of fixed telephone subscribers (20 out of 100 people, total subscribers 3,686,600) followed by Georgia, Azerbaijan, and Armenia while lowest fixed telephone line subscribers in the region. Whereas Georgia and Azerbaijan have the highest number of broadband subscribers that is 19 and 18 respectively per 100 people in the region.

Figure 11: Fixed Telephone and Broadband

Source: World Bank. World Development Indicators 2019.

3.6.1 Mobile Phone Users

The significance of mobile phone penetration has increased multiple times. Figure 12 shows mobile phone trends in Central Asia and Caucasus. Kazakhstan and Turkmenistan have a larger number of mobile phone users while the Kyrgyz Republic has the lowest number of users.

Figure 12: Number of Mobile Phone Users (Per 100 People)

Source: World Bank. World Development Indicators 2019.

3.7 Energy

The energy sector plays a significant role in economic growth and raising living standards. The region is blessed with many natural resources to produce energy. Table 5 shows natural gas has a larger share in electricity production except in the Kyrgyz Republic and Tajikistan. Kazakhstan produces 71.65% of electricity from coal, while the Kyrgyz Republic electricity production from hydropower is 85.2%, while Tajikistan has

most utilized its hydrological resources for electricity production. Moreover, Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan are crude oil and natural gas exporting countries while Kazakhstan also has large coal deposits. Tajikistan, the Kyrgyz Republic, and Georgia are rich in hydro resources.

Table 5: Electricity Production, Source, and Access

	Electricity Production (kWh billion)	Sources of Electricity Production						Access to Electricity
		Coal	Natural Gas	Crude Oil	Hydro- power	Renewable Sources	Nuclear Power	% of Total Population
Armenia	7	0	35	0	28	0.1	31	100
Azerbaijan	23	0	86	6	6	0.4	0	100
Georgia	10	0	22	0	78	0	0	100
Kazakhstan	95	71	18	1	8	0.2	0	100
Kyrgyz Republic	14	13	1	0.3	85	0	0	100
Tajikistan	17	1	0	0	98	0	0	99.7
Turkmenistan	18	0	100	0	0	0	0	100
Uzbekistan	54	4	75	0.3	20	0	0	100

Source: World Bank. World Development Indicators 2015. <http://wdi.worldbank.org/table/3.7>.

World Development Indicators (WDI 2019) show the abundance of electricity production in the region. For electricity infrastructure, Kazakhstan and Georgia rank 19 and 36 out of 144 countries by GCI, and all the countries in the region score 90+ for electricity infrastructure. Similar to other countries in the world, the central Asian countries are faced with the challenges of electricity transmission and distribution loss and are ranked from 19 for Kazakhstan to 115 for the Kyrgyz Republic. Electricity prices are below cost and electrification rate is ranked 2 for all central Asian countries except the Kyrgyz Republic.

Table 6: Electricity Infrastructure, Rate, and Quality

	Electricity Infrastructure		Electric Power Transmission and Distribution Losses		Electrification Rate		Quality of Electricity Supply	
	Rank (2019)	Score (2019)	Rank (2019)	Score (2019)	Rank (2019)	Score (2019)	Rank (2018)	Value (1–7) 2018
Armenia	63	96.3	71	92.6	2	100	77	4.8
Azerbaijan	54	97.0	59	94.0	2	100	50	5.5
Georgia	36	98.5	36	97.1	2	100	68	5.0
Kazakhstan	19	99.4	19	98.9	2	100	82	4.6
Kyrgyz Republic	94	91.8	115	83.5	68	99.9	102	3.6
Tajikistan	90	93.1	107	86.2	2	100	100	3.7

Source: World Economic Forum (2019).

4. CONNECTIVITY IN CENTRAL ASIA AND CAUCASIA

The infrastructure landscape is less beneficial if it is not adequately connected. The Central Asia Regional Economic Cooperation (CAREC)¹² Program has identified six corridors (see Table 7 and Figure 13) in Central Asia to enhance developmental activities through greater economic cooperation and stronger trade integration. These corridors are intended to connect the countries across the region and offer unique opportunities for growth in global markets. It is important to see the prevailing situation of these corridors' connectivity situation in terms of deliverability. For the CAREC member countries¹³ an empirical tool¹⁴ is designed to evaluate and monitor the corridors' performance. The CAREC Performance Measurement (CPMM) report considers four indicators¹⁵ to evaluate and monitor the corridors' performance and efficiency in the member countries (ADB 2019).

In 2019, the time taken at border crossing points (BCPs) remains unchanged for road transport, but we have seen an improvement (time shortened by 11.3%) for rail transport as compared to 2018. Unfortunately, the costs incurred to clear BCPs increased for both road and rail transport. In addition, a reduction is shown for travel along a corridor by both road and rail transport, however, travel time along the corridor remains slower as compared to 2018.

Still CAREC corridors for both road and rail transport are facing enormous challenges (mandatory transloading, corruption and inappropriate practices, containerization availability, and multi-transport mode delays) to ensure productive trade corridors. To overcome these challenges, the possible solutions are: the CAREC region requires improvements in infrastructure at BCPs, adoption of cost-effective procedures at BCPs, and conceptualization and implementation of bilateral and multilateral agreements.

Table 7: Central Asia Regional Cooperation Corridors

Corridor	Corridor Name	Connectivity
1	Europe–East Asia	Kazakhstan, the Kyrgyz Republic, and XUAR
2	Mediterranean–East Asia	Afghanistan, Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan, and XUAR
3	Russian Federation–Middle East and South Asia	Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan
4	Russian Federation–East Asia	IMAR, Mongolia, and XUAR
5	East Asia–Middle East and South Asia	Afghanistan, the Kyrgyz Republic, Pakistan, Tajikistan, and XUAR
6	Europe–the Middle East and South Asia	Afghanistan, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan

Source: ADB (2014).

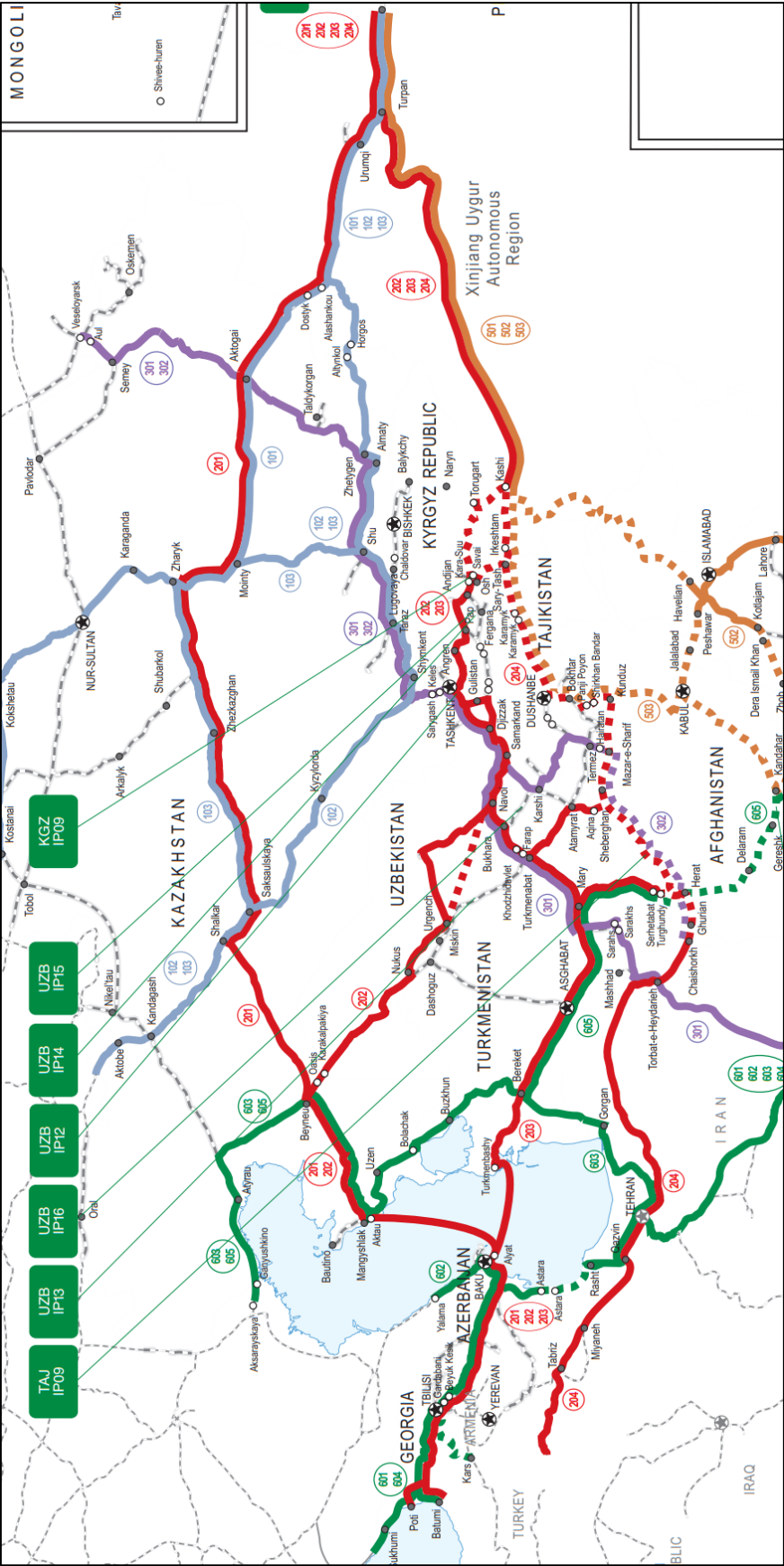
¹² The Asia Development Bank (ADB) established the Central Asia Regional Economic Cooperation (CAREC) in 1997

¹³ Afghanistan, Azerbaijan, the People's Republic of China (PRC), Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan

¹⁴ Corridor Performance Measurement and Monitoring (CPMM)

¹⁵ (i) time taken to clear a border-crossing point (BCP); (ii) cost incurred at a BCP; (iii) cost incurred to travel a corridor sector; and (iv) speed to travel along CAREC corridors.

Figure 13: Central Asia Rail Corridors

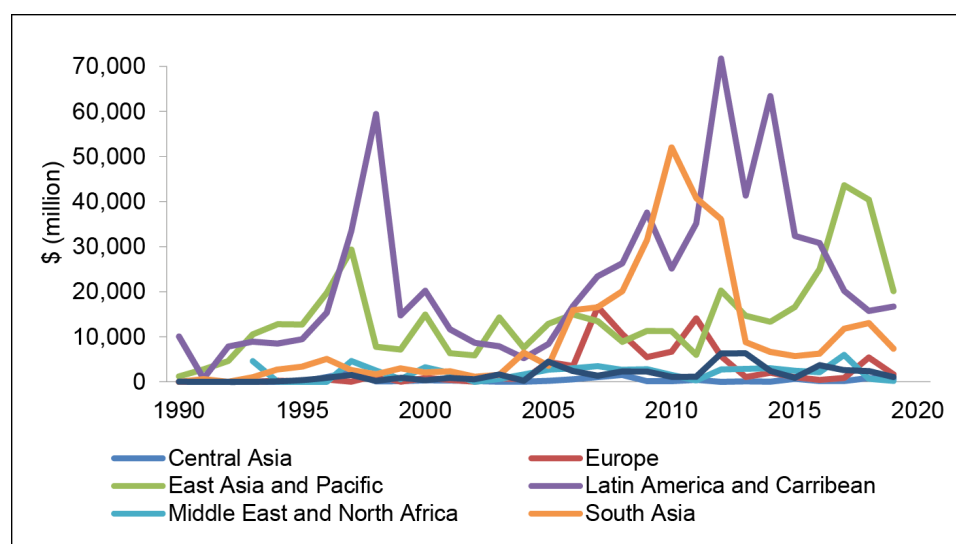


Source: ADB (2014) and CAREC Secretariat. https://www.carecprogram.org/?page_id=20.

5. INFRASTRUCTURE INVESTMENT REQUIREMENTS

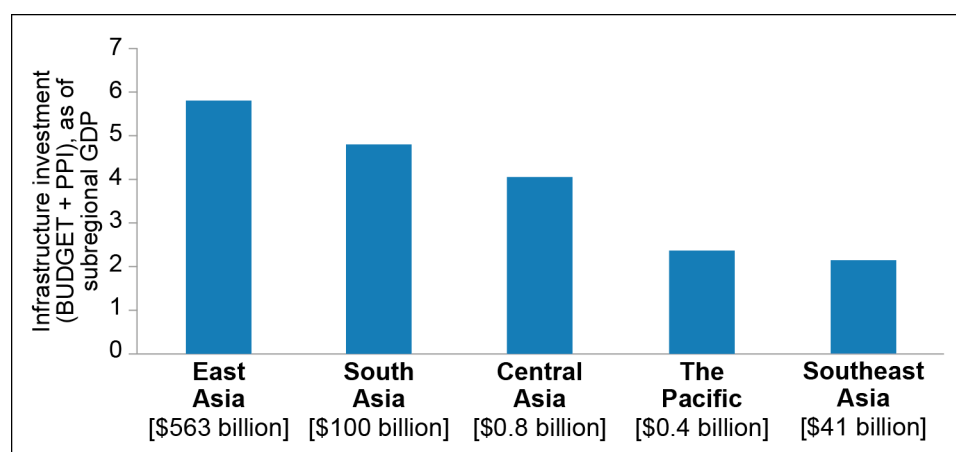
It is well established that the Central Asian and Caucasian regions are lagging substantially behind in financing their infrastructure needs. A substantial amount of financing, \$26 trillion for 2016–2030 or \$1.7 trillion per year, is required to sustain growth and improve people's livelihoods (Ziyodullo Parpiev). In terms of the percentage of GDP this equates to 7.8 %. Figure 14 below shows total investment commitments by the region. The Central Asia and Caucasasia regions' commitments are substantially low. For both regions the peak investment years were 2006 and 2011 with approximately \$19 billion and \$14 billion, respectively. For the remaining years, we can see a declining trend for investment commitments. In 2019, this value is \$1 billion approximately, which is much lower than the \$1.7 trillion a year requirement.

Figure 14: Total Investments by Region



Source: World Bank. Private Participation in Infrastructure 2019.

Figure 15: Infrastructure Investments as a Share of GDP, 2011



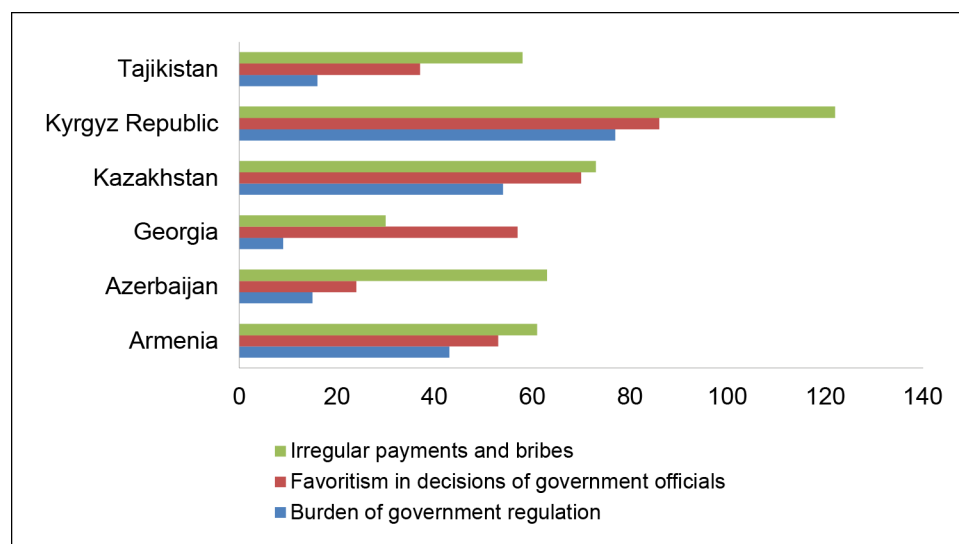
Source: Parpiev, Z. (2018) at the joint CAREC Institute, Beijing National Accounting Institute, and ADB Institute Research Inception Conference 21–22 June, Beijing.

If we disaggregate the data, one can clearly see Central Asia infrastructure total investment in 2011 is only \$0.8 billion. East and South Asia are dominating with \$563 billion and \$100 billion respectively. In addition, Figure 15¹⁶ shows infrastructure investment as a share of GDP in Central Asian economies is \$0.8 billion which again requires investment strategies to finance investment infrastructure.

6. INVESTMENT STRATEGIES TO FINANCE INFRASTRUCTURE INVESTMENT AND CHALLENGES

To chalk out infrastructure investment strategies, the world is relying on exploring both traditional sources of finances (mostly from development expenditure, financing assistance, government guarantees, tax exemptions or reductions), and non-traditional sources of finance like attracting foreign direct investment (FDI), tapping the international bond market, and following the conducive public–private partnership (PPP) model. All of these investment strategies are helping out to some extent to finance infrastructure investment, but these opportunities have rarely delivered due to over-regulation, favoritism in government decisions, and irregular payment and bribes. Figure 16 clearly demonstrates that the regulatory environment could be one of the reasons for not providing an appropriate business environment to attract FDI, tapping the international bond market, and not appropriately delivering on PPP to finance infrastructure.

Figure 16: Regulatory Environment



Source: World Economic Forum (2018).

¹⁶ Once this version is submitted, and by the time we get comments and suggestions, will update to current available data.

7. CONCLUSION

Central Asia and Caucasus region requires the combination of soft infrastructure with physical infrastructure to achieve a sustained growth pattern. The overall infrastructure landscape in these economies is progressing, however, this region needs substantive measures to scale up infrastructure development. Along with infrastructure development, regional connectivity barriers need to be scaled down so that inter, intra and outside region potential trade can be expanded. Exploration of trade potential requires not only sustained infrastructure development but an appropriate infrastructure connectivity.

To overcome the challenges to infrastructure development, both traditional and non-traditional sources need to be exploited. However, having a sustainable infrastructure financing mechanism is a real challenge for these economies. To develop both traditional and non-traditional infrastructure mechanisms it is essential to improve the institutional and regulatory environment across Central Asia and Caucasus.

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