



Country Diagnostics

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Azerbaijan: Country Digital Development Overview

Asian Development Bank

This report was prepared by Seok Yoon, senior public management specialist (e-governance), Sustainable Development and Climate Change Department, and Michael Minges and Andre Kwitowski, consultants. The views and opinions expressed in this report are those of the authors and do not represent the official views of ADB. Comments on the report can be emailed to Seok Yoon at syoon@adb.org.

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ABBREVIATIONS

2G	– second generation
3G	– third generation
4G	– fourth generation
ABAD	– ASAN Support to Family Business
ADB	– Asian Development Bank
ADSL	– asymmetric digital subscriber line
ECDL	– European Computer Driving License
EGIS	– Electronic Government Information System
GDP	– gross domestic product
GSM	– global system for mobile
ICT	– information and communications technology
ISP	– internet service provider
LTE	– long-term evolution
Mbps	– megabits per second
MTCHT	– Ministry of Transport, Communications and High Technology
SAPSSI	– State Agency for Public Service and Social Innovations under the President of the Republic of Azerbaijan
SCPI	– State Committee on Property Issues
SMEDA	– Small and Medium Business Development Agency
SMEs	– small and medium-sized enterprises
TVET	– technical and vocational education and training
UNESCO	– United Nations Education, Scientific and Cultural Organization

I. INTRODUCTION

1. Information and communication technology (ICT) is expected to play a leading role in diversifying the economy of Azerbaijan and reducing its reliance on hydrocarbons, current goals of the Government of Azerbaijan. The national development plan, Azerbaijan 2020, envisions creating a high-income economy by reaching a per capita income of \$13,000.¹ ICT is viewed as essential to the plan, given its cross-cutting scope of economic diversification and transitioning the nation to a knowledge society. This report reflects status ICT sector as of September 2018 and legislative status as of December 2018.

A. Country Context

2. Geographically located at the crossroads of Europe and Asia, Azerbaijan is an upper middle-income economy situated in the southeastern Caucasus, stretching for some 800 kilometers from the Black Sea to the Caspian Sea. In 2018, it claimed 9.94 million inhabitants. According to the 2009 census, 92% of the country's population are ethnic Azerbaijanis; Russians are a small proportion at 1%, unlike most former Soviet republics; and various ethnic groups make up the rest.² Those in rural areas account for almost half of the population (47%), a ratio that has remained unchanged over the last decade. Baku, on the Caspian Sea, is the capital, as well as the largest city in the Caucasus, with 2.3 million inhabitants.

3. Azerbaijan has significant oil resources, which are the main engine of the economy. Growth has been strong, with gross domestic product (GDP) tripling between 2003 and 2011, making the economy the largest in the south Caucasus. However, the fall in oil prices in 2014 disrupted the economy, including a significant devaluation of the Azerbaijan manat.

4. Today, the country is focused on the development of its ICT sector. The government aims to turn the country into an ICT hub for the Caucasus, a goal reinforced by the State Program on the Implementation of the National Strategy for the Development of Information Society in Azerbaijan for 2016-2020,³ a decree signed by the President declaring 2013 the year of ICT in Azerbaijan; and an action plan consisting of 52 measures toward this goal. In addition, the Strategic Roadmap for Development of Telecommunications and Information Technologies in Azerbaijan Republic has been under implementation since 2016.⁴

B. ADB Country Strategy Priorities

5. Azerbaijan joined the Asian Development Bank (ADB) in 1999. ADB has since approved \$4.61 billion in loans, guarantees, grants, and technical assistance to the country.⁵ ADB's engagement in Azerbaijan is guided by its country partnership strategy, 2014–2018, which aims to help diversify Azerbaijan's economy, foster new economic opportunities, promote inclusive growth, and reduce disparities between urban and rural areas.⁶ The country operations business plan, 2018–2020 is aligned with the government's Strategic Roadmap on the National Economy and Main Economic Sectors, adopted in December 2016 by supporting the response to

¹ Government of Azerbaijan. 2012. Azerbaijan 2020: Look into the Future Concept of Development. Baku.

² State Statistical Committee of the Republic of Azerbaijan. 2009. Azerbaijan Census 2009. Baku.

³ <http://www.e-qanun.az/framework/33717>

⁴ Government of Azerbaijan. 2016. Strategic Roadmap for Development of Telecommunications and Information Technologies in Azerbaijan Republic. Baku.

⁵ ADB. 2017. Azerbaijan: Fact Sheet. <https://www.adb.org/sites/default/files/publication/27752/aze-2017.pdf>

⁶ ADB. 2014. Country Partnership Strategy: Azerbaijan, 2014–2018. Manila.

macroeconomic and financial challenges and efforts to diversify the national economy and promote sustainable, non-oil economic growth.⁷

C. Objective of Report

6. This Overview was prepared to adequately respond to the Government of Azerbaijan's priority on the development of ICT sector as a driver of economic diversification during the implementation of ADB's next Country Partnership Strategy for Azerbaijan (CPS 2019–2023).⁸ The brief is also guided by ADB's initiative to mainstream digital technologies in its operations^{9 10} The report draws on consultations undertaken in Baku from 18-20 September 2018.

II. AZERBAIJAN E-READINESS

7. The ICT legal and regulatory environment, and the availability, quality, and demand for ICT infrastructure and services in Azerbaijan (i.e., e-readiness), are reviewed in this section. Understanding a country's e-readiness is essential for gauging its capacity to successfully absorb digital interventions across different economic sectors.

A. Policy, Regulatory, and Market Dimensions

8. In terms of policy, a strategic ICT road map was approved by the President in December 2016. It outlines 3 key strategies and 10 priorities, with achievement targeted for 2020 (Table 1). The cost of implementing the road map has been budgeted at AZN585 million (\$344 million), with funding sources identified as the government, private sector (including foreign investment), and bilateral and multilateral partners. Implementation will be critical to address shortcomings in the sector that are constraining development of the digital economy.

Table 1: Strategic Roadmap for Telecommunications and Information Technologies in Azerbaijan Republic

Strategic Target	Priorities
1. Improve governance structures, and strengthen ICT	1.1. Establish an independent regulatory body 1.2. Liberalize the telecommunication market 1.3. Increase mobile infrastructure investments
2. Increase productivity and operational efficiency of the business environment	2.1. Extend digital payments 2.2. Extend technology-based operations in business environment 2.3. Upgrade technology education with the involvement of businesses 2.4. Improve the electronic systems of government institutions 2.5. Increase knowledge and skills in the ICT sector, and apply ICT in education system
3. Digitize government and social environment	3.1. Improve the information systems of government institutions 3.2. Create an end-to-end integrated e-health infrastructure

Source: Government of Azerbaijan. 2016. *Strategic Roadmap for Development of Telecommunications and Information Technologies in Azerbaijan Republic*. Baku.

⁷ ADB. 2017. Country Operations Business Plan: Azerbaijan, 2018–2020. Manila; and Government of Azerbaijan. 2016. Strategic Roadmap on the National Economy and Main Economic Sectors. Baku.

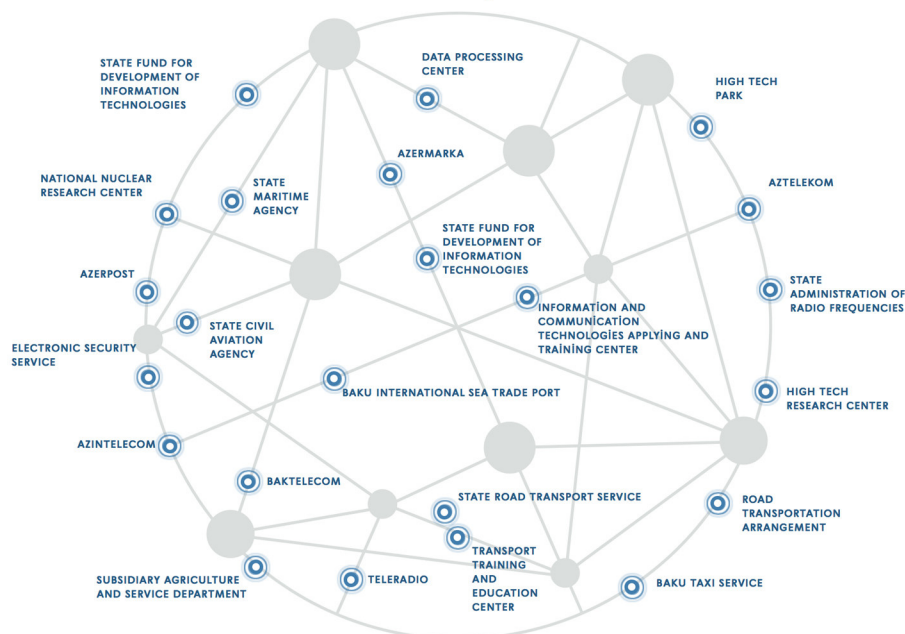
⁸ Strategic Roadmap for Development of Telecommunications and Information Technologies in Azerbaijan Republic adopted in December 2016.

⁹ ADB. 2014. Promoting Information and Communication Technology in ADB Operations: <https://www.adb.org/sites/default/files/publication/42673/promoting-ict-adb-operations.pdf>

¹⁰ Similar briefs have been prepared for Indonesia, Kyrgyz Republic, Mongolia, Sri Lanka, and Tajikistan

9. The agency responsible for both ICT policy and regulation is the Ministry of Transport, Communication and High Technologies (MTCHT).¹¹ Its remit is broad, covering telecommunication, information technology, and postal services, as well as transport and oversight over several telecommunication operators (Figure). While the MTCHT is the main government authority for ICT, frequency allocation, tariff approval, and anti-trust monitoring are carried out by other government agencies.

Figure 1: Organizations under the Ministry of Transport, Communication and High Technologies



Source: Government of Azerbaijan, Ministry of Transport, Communication and High Technologies.
<http://www.mincom.gov.az/en/>

10. Many countries and areas have created an independent regulator for their ICT sectors to establish regulations and to license operators. An independent regulator is especially critical when state-owned telecommunication operators exist to ensure equal treatment among all players. Azerbaijan's strategic ICT road map calls for the creation of such a sector regulator, as an independent agency. Indeed, the current lack of a regulator in Azerbaijan is affecting dynamism, innovation, and investment in the sector.¹²

11. The government could also consider privatizing the state-owned enterprises in the telecommunication sector, which would add greater transparency and likely generate additional investment and innovation.

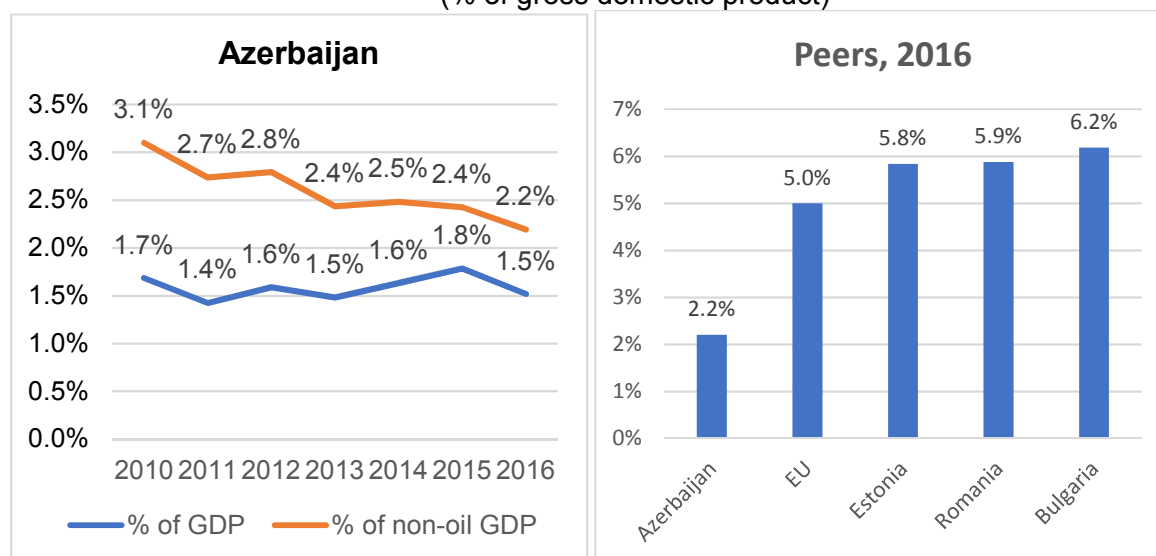
¹¹ Government of Azerbaijan, MTCHT. <http://www.mincom.gov.az/en/>

¹² World Bank. 2014. A Sector Assessment: Accelerating Growth of High-Speed Internet Services in Azerbaijan. Washington, DC.

12. Azerbaijan's ICT sector¹³ generated revenue of AZN 1.038 million (\$610 million) in 2017, or 1.5% of GDP (2.2% of non-oil GDP).¹⁴ Although the sector has grown since 2010, the growth rate has been less than that of the overall economy; consequently, its share of GDP has declined (Figure 2). Telecommunication accounted for 88% of total sector revenue, suggesting that Azerbaijan has yet to exploit its existing hard infrastructure through a vibrant computer and information service industry.

13. Value added of the ICT sector, which includes publishing, broadcasting, telecommunication, and computer and information services, made up 2.2% of GDP, less than its peer countries with available data and significantly smaller than the European Union and members such as Bulgaria and Romania (Figure 2).

Figure 2: Information and Communication Technology Sector
(% of gross domestic product)



EU = European Union, GDP = gross domestic product, ICT = information and communication technology. Source: The State Statistical Committee of the Republic of Azerbaijan (SSC) and Statistical Office of the European Union (Eurostat).

14. The low, stagnant contribution of the ICT sector to GDP and dominance of telecommunication within the ICT sector present a challenge to the government's aspirations for sector revenues to surpass those of oil. Employment in the ICT sector totaled 61,700 persons in 2017, an increase of 11% since 2010. However, the sector accounts for 1.3% of total employment.¹⁵

¹³ The ICT sector is defined in United Nations, Department of Economic and Social Affairs, Statistics Division. 2008. International Standard Industrial Classification of All Economic Activities. Revision 4. New York. https://unstats.un.org/unsd/publication/SeriesM/seriesm_4rev4e.pdf

¹⁴ See State Statistical Committee of the Republic of Azerbaijan. Information and Communications Technologies. Value Added in the ICT Sector. <https://www.azstat.org/MESearch/details?lang=en&type=2&id=444&departament=20>

¹⁵ Number of employed population by statistical Classification of Economic Activities" at: <https://www.azstat.org/MESearch/search?departament=22&lang=en>

B. Access to Information and Communication Technology

1. Fixed Telephones

15. Fixed telephone network services are provided by several operators such as “Aztelekom” LLC, “Baku Telephone Communication (BTC) ” LLC, “Ultel” LLC, “Az-Evro-Tel” LLC, “Delta Telecom LTD” LLC and others.¹⁶ Aztelekom operates throughout the entire country, except for Baku and the Nakhchivan Autonomous Republic (NAR). BTC LLC has installed LTE wireless communication equipment to provide telephony and Internet services in low-income areas through wireless technologies. In NAR “NAXTEL” LLC, founded in 2015, offers mobile communication services.

16. There were 1.5 million fixed telephone lines in operation in 2017, with just under two-thirds of families having a fixed telephone line. Unlike many other countries and areas, fixed telephone lines in Azerbaijan have not declined in number despite growth in mobile and broadband phones. The number of home telephone lines is also an indicator of the potential for household wired broadband access using copper line (i.e., asymmetric digital subscriber line [ADSL]).

2. Mobile Phones

17. Three private companies offer global system for mobile (GSM), third generation (3G), and fourth generation (4G) mobile services: Bakcell is the oldest, dating back to 1994; Azercell, established in 1996; and Azerfon, which launched in 2007 under the Nar mobile brand.¹⁷ Second generation (2G) coverage is ubiquitous, with the leading mobile operator claiming that 99.8% of the population can receive a mobile signal.¹⁸

18. With 10.1 million subscribers at the end of 2017, there are more mobile phone subscriptions than people in Azerbaijan (Figure 3). Subscription-based penetration does not translate into real access, however, due to people having multiple SIM cards, lapsed subscriptions, and machine subscriptions.

19. Access to mobile phones is pervasive; according to the 2017 household budget survey, 99.1% of households have a mobile phone, with a slightly higher penetration in rural (99.6%) than urban (98.8%) homes.¹⁹ Azerbaijan ranked 56 on the International Telecommunication Union's (ITU's) mobile cellular price basket in 2016. The price of a monthly basket of voice calls and text messages was \$8.80, or 2% of per capita income.²⁰

¹⁶ Aztelekom. <https://www.aztelekom.az>; Baktelecom. <https://www.baktelecom.az>, Ultel <https://ultel.3dsecure.az/>; Azeurotel <http://www.azeurotel.com/>; Delta telecom <https://delta-telecom.net/>

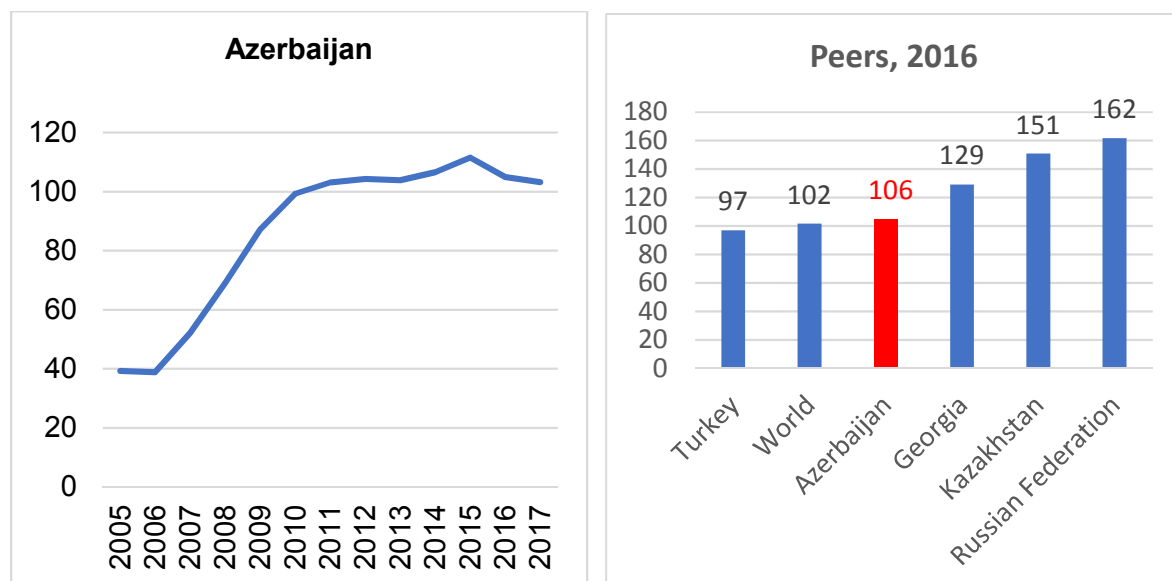
¹⁷ Bakcell. <https://www.bakcell.com>; Azercell. <https://www.azercell.com/az/>; and Nar. <https://www.nar.az/en/>

¹⁸ <https://www.azercell.com/en/company/>

¹⁹ State Statistical Committee of the Republic of Azerbaijan. Budget of Households. https://www.stat.gov.az/source/budget_households/?lang=en

²⁰ International Telecommunications Union. 2017. ICT Prices. Geneva. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/IPB2017_E.pdf

Figure 3: Mobile Phone Subscriptions
(per 100 people)



Sources: The State Statistical Committee of the Republic of Azerbaijan Bank
(https://www.stat.gov.az/source/information_society/?lang=en).
(<https://data.worldbank.org/indicator/IT.CEL.SETS.P2>).

3. Broadband

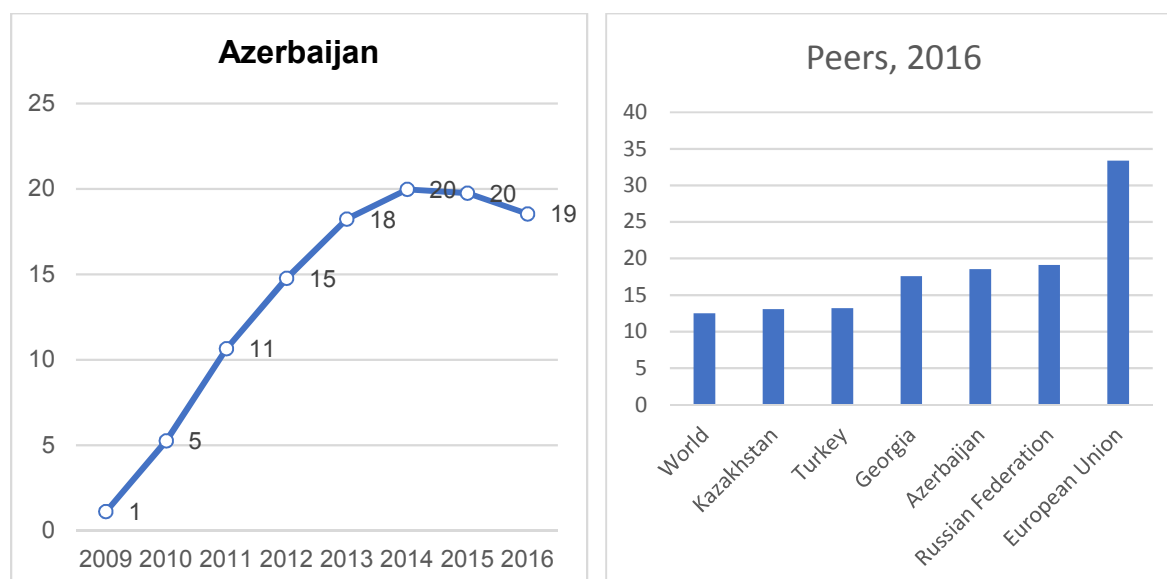
20. Although there are some 40 internet service providers (ISPs) in Azerbaijan, the two fixed-line operators (i.e., Aztelekom LLC and BTC LLC,) control all last-mile wired access to homes, so ISPs need to enter into agreements with them. Aztelekom LLC and BTC LLC also provide internet services using their own ISPs, providing fixed broadband ADSL over their copper-line networks. Both have similar ADSL offerings and have started to offer fiber-optic connections as well. They make up roughly half of the market, with private ISPs serving the other half. The three mobile operators (i.e., Azercell, Azerfon, and Bakcell) provide their subscribers with broadband internet access using 3G and 4G long-term evolution (LTE) technology. There is also a fixed wireless LTE network operated by AzQTel.²¹

21. In 2016, there were 1.8 million fixed broadband subscriptions for a penetration rate of 19. This is a slight decline from the previous year, with subscription growth peaking in 2014 (Figure 4). Despite this, Azerbaijan compares favorably with its peers, although it is significantly behind the average fixed broadband penetration rate in the European Union (Figure 4). According to the Global Competitiveness Index of the World Economic Forum, in 2017-2018 Azerbaijan ranked 34th among 137 countries in the world on number of internet users, leaving behind other CIS countries.²²

²¹ Telrad. 2018. "AzQTel Selects Telrad Networks for Largest Fixed LTE Deployment in Azerbaijan." Press Release, 26 February. <https://www.telrad.com/azqtel-selects-telrad-for-fixed-lte/>

²² <http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf>

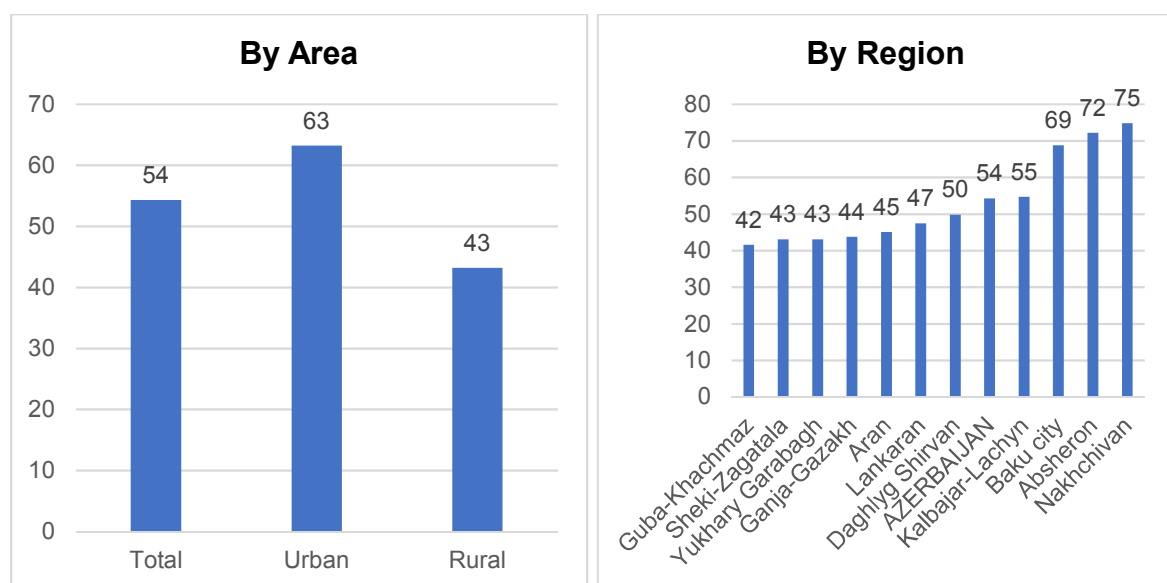
Figure 4: Fixed Broadband Subscribers
(per 100 people)



Source: World Bank. (<https://data.worldbank.org/indicator/IT.NET.BBND.P2?view=chart>).

22. There is a digital divide within Azerbaijan, as evidenced by differences in wired broadband penetration. Indeed, a 20-percentage point gap in household fixed internet penetration exists between urban and rural dwellers; similar gaps exist among the different regions of the country (Figure 5). These gaps are due to shortages of fixed infrastructure and lower levels of digital literacy in rural areas.

Figure 5: Household Access to Fixed Broadband Internet, 2017



Source: The State Statistical Committee of the Republic of Azerbaijan (https://www.stat.gov.az/source/information_society/?lang=en).

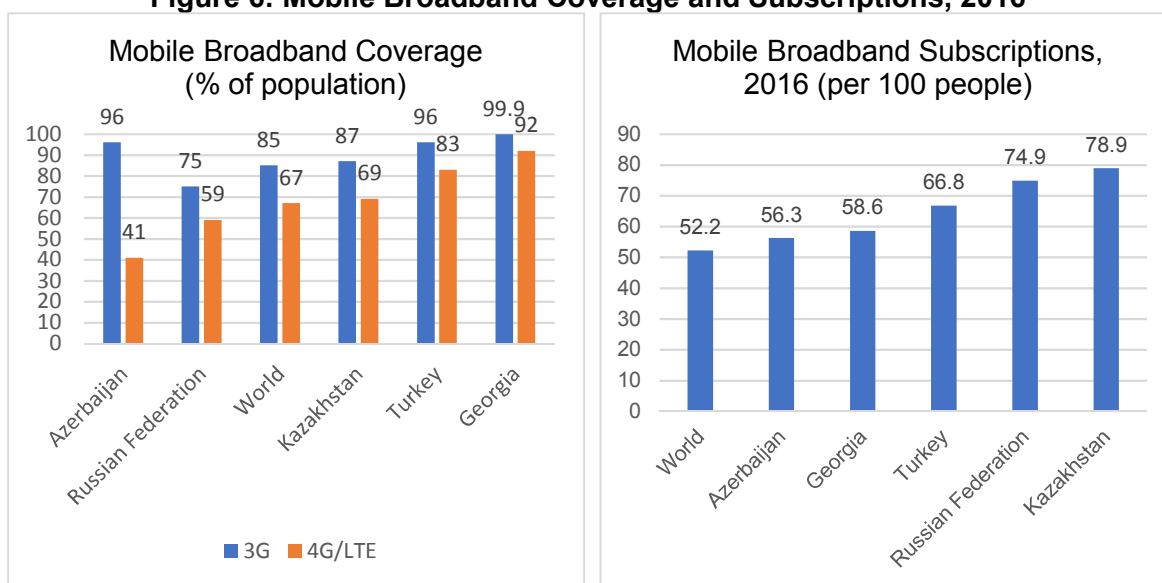
23. The latest mobile broadband technologies are available from all three mobile operators, although coverage is not as high as with narrowband mobile. 3G mobile, launched in 2009, covers

96% of the population. 4G/LTE was deployed in 2015, with coverage reaching around 40% of the population. While coverage is widely available in urban areas, it is limited in rural zones. Moreover, 3G coverage is relatively high, but 4G/LTE coverage is the lowest among its peers and below the world average (Figure 6).

24. One issue is that 4G/LTE is only used on the 1800 MHz frequency. This does not have as wide coverage as lower frequencies and results in higher investment costs in rural regions. The strategic ICT road map thus proposes allocating lower frequencies to expand 4G/LTE coverage.

25. Azerbaijan's mobile broadband penetration was 56.3 in 2016, significantly higher than fixed broadband, partly due to faster speeds and lower prices. Nevertheless, the rate is just above the world average and lower than those of its peers (Figure 6).

Figure 6: Mobile Broadband Coverage and Subscriptions, 2016



3G = third generation, 4G = fourth generation.

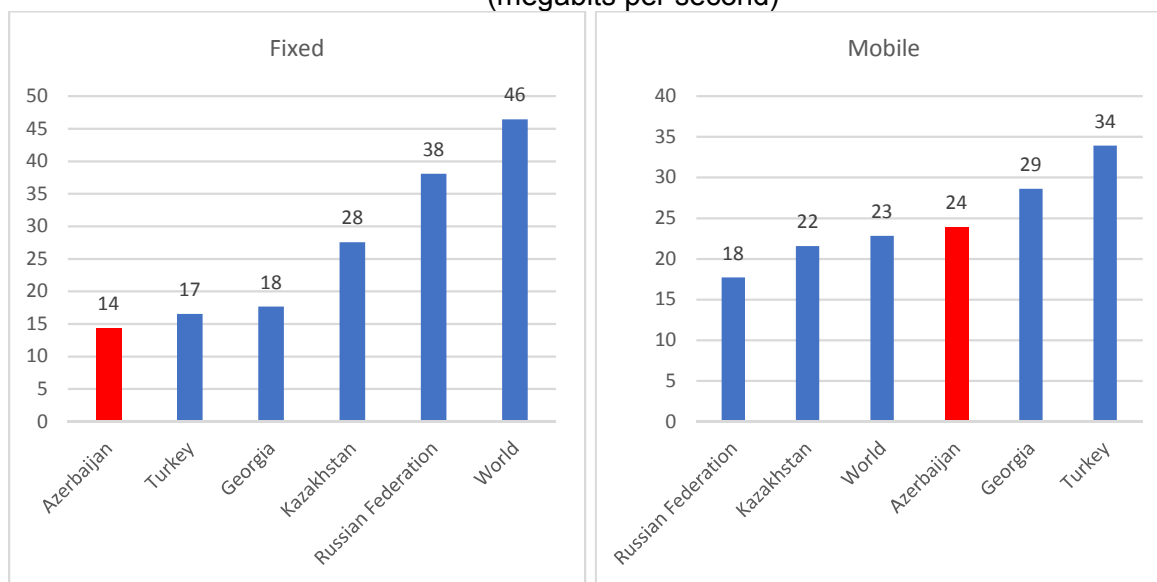
Source: United Nations Global SDG Database (<https://unstats.un.org/sdgs/indicators/database/>) and International Telecommunication Union. 2018. Measuring the Information Society Report. <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>.

26. The price of a monthly fixed broadband basket (with a minimum download speed of 256 kbps) is equivalent to 1.1% of per capita income. Azerbaijan is ranked 61 globally in fixed broadband pricing²³. A mobile broadband package (i.e., at least 1 gigabyte per month) is equivalent to 0.5% of per capita income, with the country having the 43rd cheapest mobile broadband prices in the world. This helps explain why mobile broadband is more popular than fixed.

27. Azerbaijan's average fixed internet download speed was 14 megabits per second (Mbps) in July 2018, well below the world average and those of its peers, with a rank of 98. (Figure 7). Azerbaijan compensates for low fixed speeds with higher mobile ones. The country's high proportion of relatively low-speed copper-wire fixed broadband connections, as well as limited infrastructure competition in fixed broadband, impacts internet speed.

²³ International Telecommunication Union. 2018. Measuring the Information Society Report. <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>

Figure 7: Average Internet Download Speed, July 2018
(megabits per second)

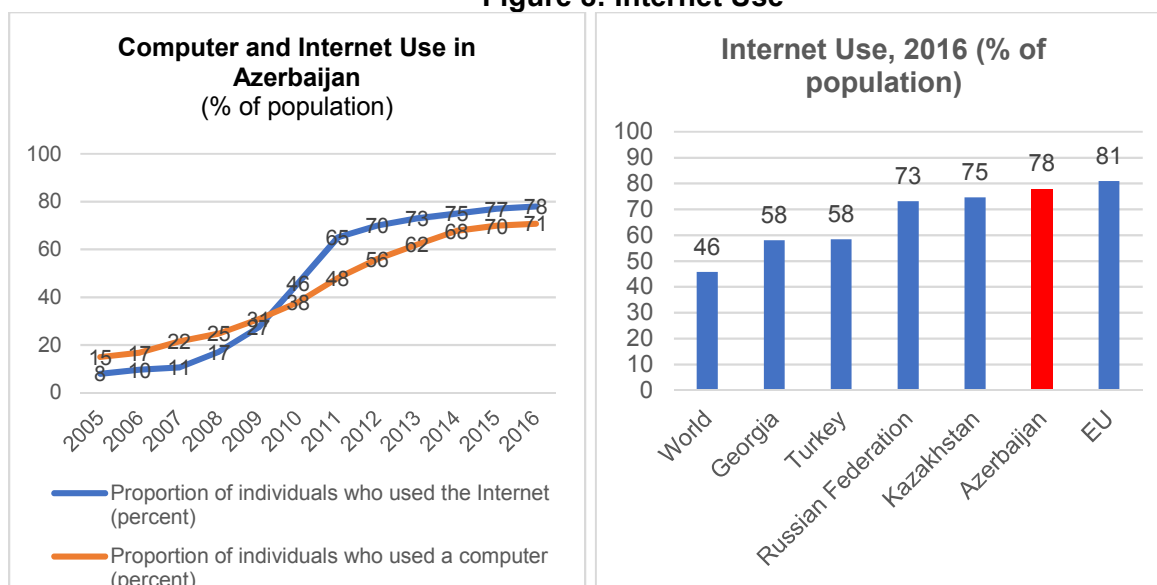


Source: Speedtest. <http://www.speedtest.net/global-index>.

4. Internet Use

28. About 78% of the population in Azerbaijan used the internet in 2016, while 71% used computers (Figure 8). The higher level of internet access suggests some online users are only utilizing mobile phones. Azerbaijan has one of the highest levels of internet access among peer countries (Figure 8). In 2017 the total capacity of "International Internet Channels" in the country was 770,000 Mbit / s, and the capacity of Internet channels was 360,000 Mbit.²⁴

Figure 8: Internet Use



Source: The State Statistical Committee of the Republic of Azerbaijan Bank (https://www.stat.gov.az/source/information_society/?lang=en), and (<https://data.worldbank.org/indicator/IT.NET.USER.ZS>).

²⁴ <https://www.itu.int/en/Pages/default.aspx>

C. Backbone Infrastructure

29. From an internet perspective, Azerbaijan is essentially landlocked. Although it borders water, Azerbaijan is geographically far from the major global undersea fiber systems that traverse the Atlantic and Pacific oceans. Regionally, there are submarine networks in the Black and Mediterranean seas and Persian Gulf that connect to global networks. However, Azerbaijan must still deploy overland fiber cable backbones to access these networks.

30. Only two companies in Azerbaijan are licensed to connect international internet traffic, Delta Telecom and AzerTelecom. Delta Telecom, founded in 2000, handles most of the ISP traffic. Its primary gateways are with the Russian Federation, secondary gateways with Georgia, and a backup gateway via Iran. It also owns a data center and provides hosting services.²⁵

31. AzerTelecom, created in 2008, is 95.0% owned by Azerfon (the mobile carrier), and 2.5% each by BTC and Aztelekom, the facilities-based fixed-line operators. In addition to providing international internet connectivity to local ISPs and transit services to neighboring countries, it also provides domestic backbone connections over its national fiber-optic network.

32. As stated, Azerbaijan's international internet bandwidth links to neighboring countries for passage onto undersea backbones. The country's terrestrial backbones also form part of larger networks passing through the region. It is part of the Trans-Asia–Europe fiber-optic network stretching from Frankfurt to Shanghai, as well as the Europe–Persia Express Gateway running from Frankfurt to Oman.

33. The government has also been promoting a new regional fiber-optic network, the Trans-Eurasian Information Super Highway. This would stretch from Frankfurt to Hong Kong, China and Shanghai, passing through the People's Republic of China, Kazakhstan, Azerbaijan, Georgia, Turkey, and Germany.²⁶

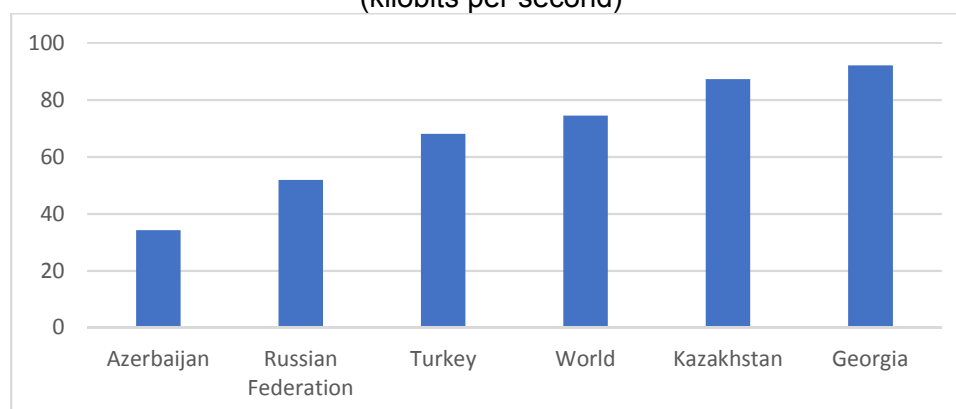
34. Azerbaijan is one of some 70 countries without a neutral internet exchange point, resulting in increased reliance on costlier international bandwidth due to exchanging local traffic abroad, affecting download speeds and latency and the development of local content and government e-services. Presumably, the presence of a duopoly in the internet backbone transmission market negates the need for a neutral internet exchange point.

35. Given that Azerbaijan is far from intercontinental fiber-optic submarine cable systems and has limited wholesale competition, international internet capacity is relatively low. In 2016, there was 34 kilobits of international bandwidth per internet user, the lowest rate of any of its peers and less than half of the world average (Figure 9).

²⁵ Delta Telecom. <https://www.delta-telecom.net/>

²⁶ AzInTelecom. 2017. Paper presented on Trans-Eurasian Information Super Highway (TASIM). Bangkok. 12–13 December. <https://www.unescap.org/sites/default/files/Trans-Eurasian%20Information%20Superhighway%20%28TASIM%29.pdf>

Figure 1: International Internet Bandwidth per Internet User, 2016
(kilobits per second)

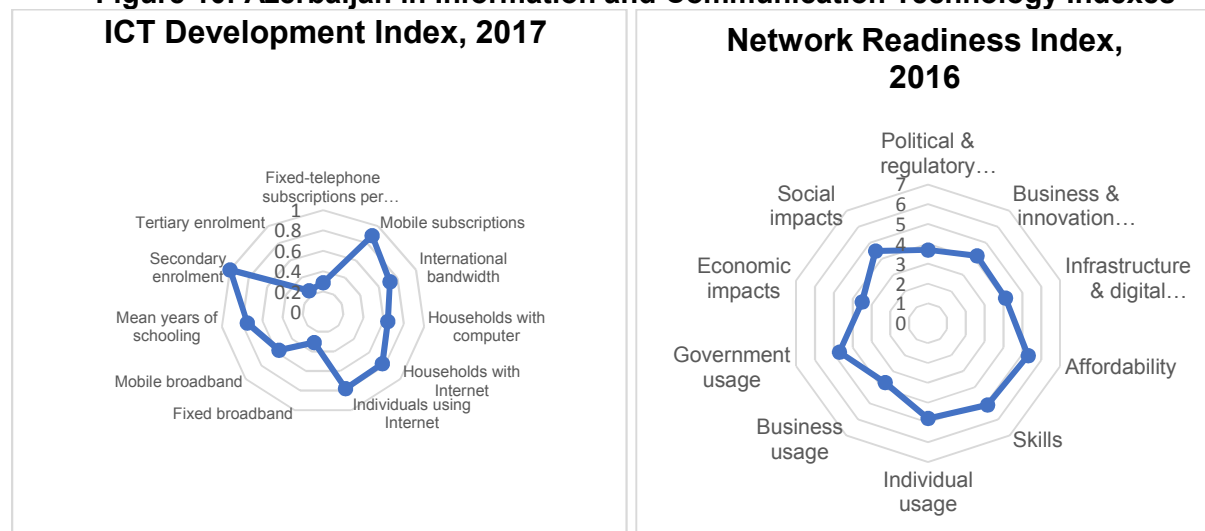


Source: International Telecommunication Union. 2017. *Measuring the Information Society Report*.

D. International Indexes

36. Several institutions compile ICT-related indexes that measure different aspects of a nation's e-readiness. The International Telecommunication Union ICT Development Index consists of a number of infrastructure and education indicators. Azerbaijan ranked 65 in 2017, mainly affected by low levels of wired infrastructure (i.e., fixed telephones and fixed broadband) and tertiary enrollment (Figure 10).²⁷ Another ICT ranking is the World Economic Forum Networked Readiness Index.²⁸ This index consists of 10 pillars, ranging from the legal and business climate to affordability, infrastructure, and usage. It is composed of both hard indicators and opinion surveys. Azerbaijan ranked 53 out of 139 countries in 2016, lagging in government usage and achieving economic impacts from ICT (Figure 10).

Figure 10: Azerbaijan in Information and Communication Technology Indexes



Sources: International Telecommunications Unit. ICT Development Index 2017. <http://www.itu.int/net4/ITU-D/idi/2017/index.html>; and World Economic Forum. Global Information Technology Report. Azerbaijan. <http://reports.weforum.org/global-information-technology-report-2016/economies/#economy=AZE>.

²⁷ International Telecommunications Unit. ICT Development Index 2017. <http://www.itu.int/net4/ITU-D/idi/2017/index.html>

²⁸ World Economic Forum. Global Information Technology Report. Azerbaijan. <http://reports.weforum.org/global-information-technology-report-2016/economies/#economy=AZE>.

E. Observations

37. Despite ongoing government efforts to diversify the economy by boosting the ICT sector, Azerbaijan's ICT sector accounts for a relatively low level of value added and is dominated by the telecommunication industry. Computer and information services that leverage the current huge investment in infrastructure constitute just 7% of the ICT sector, compared to over 50% in countries with growing digital economies. Efforts are needed to diversify the ICT sector by instead strengthening the computer services industry and its capacity to develop software, mobile apps, and e-commerce platforms.

38. High internet penetration is not translating into impactful use, as evidenced by the country's low rankings on the Network Readiness Index Usage and Impact subindexes. One reason for limited impact is the low level of digital literacy among the public and small and medium-sized enterprises (SMEs). Instead, top consumer uses of the internet are viewing videos, e-mail, searches, and social media.²⁹

39. Although internet use is high, and prices are low, coverage of the latest mobile technologies is only mainly available in urban areas, and most fixed broadband access is over traditional copper lines rather than fiber optic. This results in low speeds, particularly in rural areas, inhibiting the ability to use some apps effectively.

40. The government's strategic ICT road map aims to ameliorate key challenges facing ICT development in the country (e.g., creation of a sector regulator, allocation of a low-frequency spectrum for 4G/LTE, and more competition in the backbone market). Implementation of the road map, however, will require significant human and financial resources and political will to see through changes for which there is likely to be some resistance.

III. SECTOR ABSORPTION

41. This section describes use of ICT across different sectors of the economy, identifying existing systems in each sector and highlighting key challenges to incorporating ICT. Azerbaijan's strategic ICT road map identifies digital priorities in sectors such as business, education, and health. Additionally, strategic road maps have been prepared for other sectors including agriculture, education, and SMEs, and feature digital interventions.

A. Agriculture

42. Agriculture in Azerbaijan is fragmented into some 1 million small farms, with an average farm holding of 1.60 hectares usually divided into four or five land plots of 0.30 hectare.³⁰ It employs 37% of the working population but contributed only about 5.6% to the GDP in 2017.³¹ The sector has substantial potential to meet growing domestic demand and export possibilities with assorted fruits, vegetables, and dairy products.

43. Two digital activities are covered in the strategic agriculture road map.³² One calls for creating an online portal with information about local products and producers to promote the "Made in Azerbaijan" brand. A second uses the internet, social media, and mobile phones to

²⁹ Alexa. Top Sites in Azerbaijan. <https://www.alexa.com/topsites/countries/AZ>

³⁰ A. Kwitowski. 2018. Land Consolidation in Central and Eastern Europe—A Wish, a Must, or a Luxury? Paper presented at the 10th International LANDNET Workshop. Skopje, Macedonia. 19–21 June. https://www.unece.org/fileadmin/DAM/hlm/Meetings/2018/06_18-21/Presentations/7.2.pdf

³¹ World Bank. Data. Employment in Agriculture. <https://data.worldbank.org/indicator/sl.agr.empl.zs> (accessed 2 December 2018).

³² Government of Azerbaijan. 2016. *Strategic Roadmap for the Production and Processing of Agricultural Products in the Republic of Azerbaijan*. Baku.

provide relevant agriculture information to farmers. Indeed, digital technologies figure prominently in the strategic agriculture road map, given the potential of such tools to boost productivity and to enhance rural welfare. The Government of Azerbaijan is keen to develop e-agriculture, including using big and open data, creating online public services for rural areas, incubating agritech start-ups, and encouraging digital literacy for farmers and rural e-commerce.

44. These principles are to be incorporated in “smart villages,” which feature three components: (i) an e-agriculture online platform accessed via the internet providing livelihood information (e.g., on the weather, soil quality, pest control, training, public services, and health) for precision digital farming; (ii) an agriculture business online platform for e-commerce, trade, and supply-chain management; and (iii) an e-learning platform for training farmers and agriculture SMEs. Sustainability of these smart villages would be more likely through collaboration with the private sector, academia, and international partners.

45. To improve the productivity of farming and economy of scale in agriculture, the government must also decide how to solve existing land fragmentation challenges that hamper the efficiency and modernization of agriculture production. Digital technology will play an important role with respect to land registration records in rural areas.³³

46. Food safety is also important for boosting agriculture and public trust. Proof of food safety is also increasingly required for agriculture exports. Accordingly, the Food Safety Agency has been established, and digital technology will play a major role in its activities. Sensors will be used to track food and animals from farm to table, and a paperless system (i.e., tablets) will be implemented to record information throughout the entire supply chain. Further, an online portal is to be developed integrating information from different agencies to track food production and to monitor food security.

B. Business

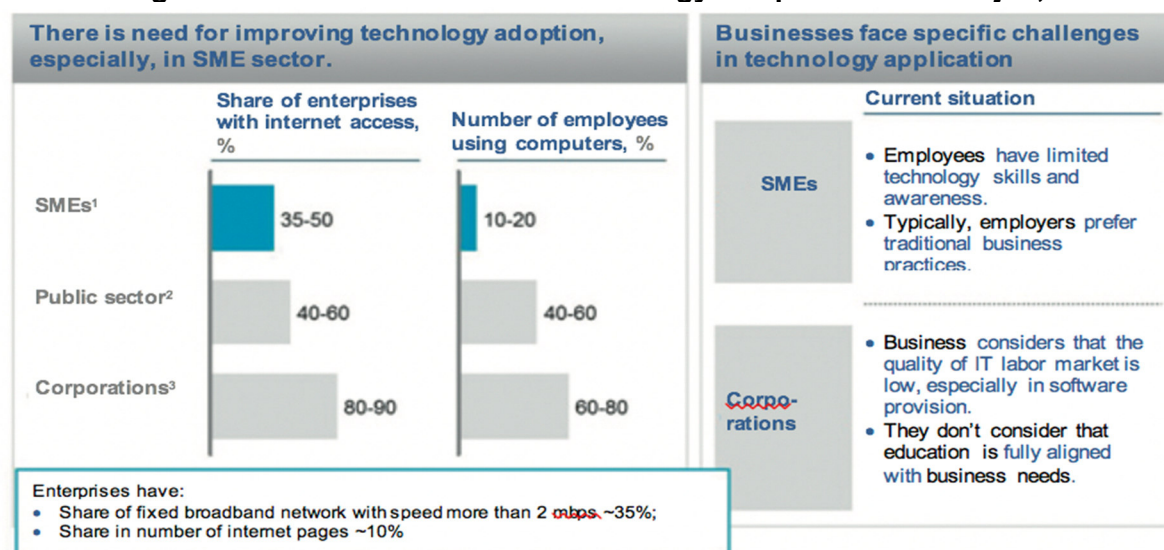
47. ICT use in businesses is generally low (Figure 11), particularly among SMEs. Only 30%–50% of SMEs used the internet in 2015, due to limited skills and awareness and preference for traditional practices. Indeed, data from the State Statistical Committee found just 12% of firms had a website in 2017.³⁴ One factor is the high cost of registering an .az domain at \$255 per year.³⁵

³³ The experience of Georgia is relevant in this area, as it has been pioneering the use of blockchain technology for land registration. See Agenda.GE. 2018. Georgia to Use Smart Contracts in Real Estate Registrations. <http://agenda.ge/en/news/2018/396>

³⁴ State Statistical Committee of the Republic of Azerbaijan. Information and Communication Technologies. Value Added in ICT Sector <https://www.azstat.org/MESearch/details>

³⁵ Marcaria.com. Domain Registration in Azerbaijan. https://www.marcaria.com/ws/en/register/domains/bulk-domain-registration-az?curr=eur&gclid=EAlalQobChMImaSN3Kqu3QIVDeh3Ch3qUAWLEAAYASAAEgKCM_D_BwE

Figure 11: Status of Business Technology Adoption in Azerbaijan, 2015



Notes:

1. Production, water supply, trade, construction, real estate, entertainment, and other activities.

2. Education and public administration.

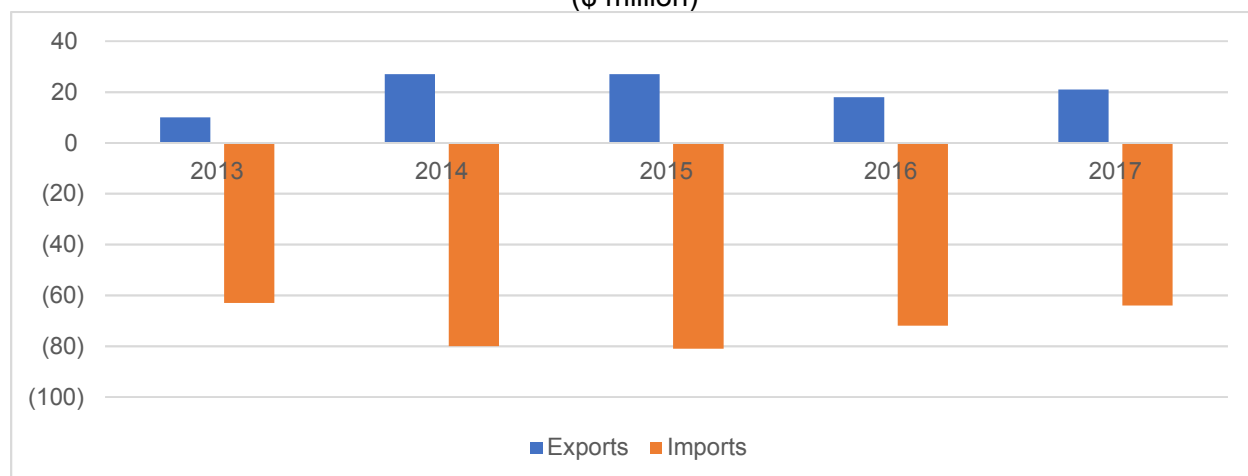
3. Financial services, information, and communication.

Source: Government of Azerbaijan. 2016. *Strategic Roadmap for Development of Telecommunications and Information Technologies in Azerbaijan Republic*.

48. The High Tech Park, established by a presidential decree in 2012, consists of 50 hectares on Pirallahi Island, a district of Baku city, and reports to the MTCHT. Its mission is to help foster a high-tech economy by providing a business-friendly environment with state-of-the-art facilities, economic incentives, and business services. However, today, it is perceived more as an industrial park, so the number of established computer services companies locating there is low. Also, in 2015 the resident company at Mingachevir High Tech Park started production of computers, tablets and other electronic devices.

49. Another indicator of the limited software sector in the country is trade statistics. Azerbaijan runs a notable balance-of-payments deficit in computer and information services (Figure 12), highlighting the constraints in domestic capacity to develop ICT applications.

Figure 12: Trade in Computer and Information Services, Azerbaijan
(\$ million)



(-) = negative.

Source: World Trade Organization Statistics Database (<http://stat.wto.org/Home/WSDBHome.aspx>).

50. Azerbaijan's tech start-up scene has been assisted by universities that have incubators, mainly for social entrepreneurs. Some telecommunication operators also have start-up labs aimed at entrepreneurs developing mobile applications.³⁶ Further, there have been a number of start-up events, including those conducted by international organizers (e.g., Seedstars)³⁷ and universities (e.g., the Massachusetts Institute of Technology), which have offered mentoring.³⁸ In addition, the annual Azerbaijan International Telecommunications, Innovations and High Technologies Exhibition and Conference, known as Bakutel, allows start-ups to pitch ideas to an international audience.³⁹ SAPSSI launched in November 2018 InnoLand, which features a "fab lab," co-working space, incubator, research and development center, and tech academy.

51. While several government initiatives aim to help SMEs incorporate ICT, none are aimed at developing SMEs in the ICT sector. The ASAN Support to Family Business (ABAD) initiative, run by ASAN xidmət (SAPSSI), does help SMEs involved in agriculture and handicrafts to become more productive through an incubation scheme. Likewise, the new Small and Medium Business Development Agency (SMEDA), launched in June 2018, aims to ease business procedures for SMEs through some digital initiatives, including training in ICT and creating a business-business portal. Government also aims to support startups engaged in innovative activities through tax incentives.⁴⁰

52. Another challenge that start-ups and SMEs face in Azerbaijan is access to credit; access to finance was cited as the biggest obstacle for enterprises according to a 2013 World Bank survey.⁴¹ In Azerbaijan, banks are reluctant to lend to enterprises perceived to be high risk.

53. The State Fund for the Development of Information Technologies, administered by the MTCHT, provides capital (mainly seed funding) to start-ups. Also, SME Development Funds under SMEDA will be providing guarantees for SMEs to facilitate access to finance. SMEs, however, often need more flexible financing options in terms of funding size and type depending on their growth stage. Globally, funding for high-growth start-ups often comes from angel investments and venture capital, but these types of funding are virtually nonexistent in Azerbaijan.

54. E-commerce also remains underdeveloped in the country. Just 5% of the population purchased something online in 2017, a very low rate compared the world average of 24% (Figure 13). Retail e-commerce in 2016 made only 0.04% of GDP (Figure 13) and, though it almost doubled between 2016 and 2017 from AZN 25,6 million (\$ 15 million) to AZN 46 million (\$ 27 million)⁴², it was still low comparing to the world average and neighboring countries. Azerbaijan ranks 68 out of 144 countries on the B2C e-Commerce Index, due to low penetration of e-payments, including credit and debit cards, a shortage of domestic online shops, underdeveloped

³⁶ Bakcell. 2018. Bakcell. Young Developers Have Learned the Basics of Project Management at App Lab. 18 July. https://www.bakcell.com/en/07/2018/young_developers_have_learned_the_basics_of_project_management_at_appLab

³⁷ Seedstars. Seedstars Baku 2017. 3 May. <https://www.seedstarsworld.com/event/seedstars-baku-2017>

³⁸ MIT International Science and Technology Initiatives, Global Startup Labs. Azerbaijan Summer 2018. <http://gsl.mit.edu/program/azerbaijan-summer-2018/>

³⁹ A. Kerimova. 2017. Bakutel. Bakutel Exhibition Is the Opportunity for Start-ups to Present Their Ideas and Projects. 11 December. <https://bakutel.az/en-opennews/6371.41.html>

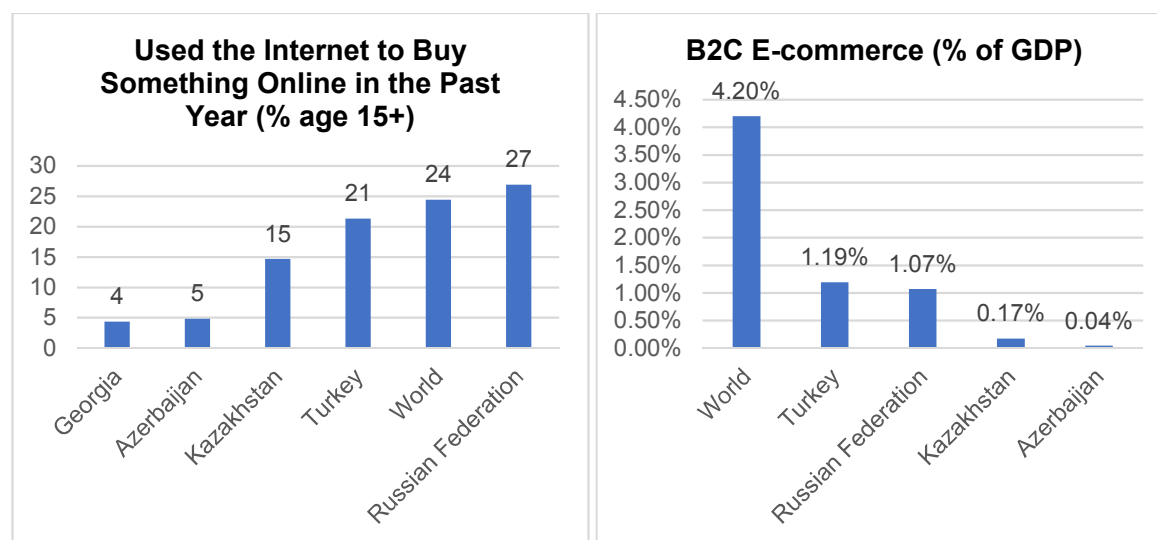
⁴⁰ Law on Amendment to Tax code from 30 November 2018

⁴¹ World Bank Group. 2013. Enterprise Surveys. Azerbaijan. <http://www.enterprisesurveys.org/data/exploreeconomies/2013/azerbaijan>

⁴² Government of Azerbaijan, MTCHT. 2018. News. The Current State and Prospects for Development of Electronic Commerce in Azerbaijan Were Discussed. 11 July. <http://www.mincom.gov.az/en/view/news/354/the-current-state-and-prospects-for-development-of-electronic-commerce-in-azerbaijan-were-discussed>.

logistics, lack of trust by both buyers and sellers, and low digital literacy of people in general.⁴³ Another barrier is the high transaction fees associated with international credit card payment networks. Understanding the problem, Government included Development of e-commerce as one of the priorities of State Program on Digital Payment Expansions in 2018-2020.⁴⁴

Figure 13: E-Commerce in Azerbaijan, 2016



Source: World Bank. 2017. Global Index Database 2017. Washington, DC. <https://globalindex.worldbank.org/>; and United Nations Conference on Trade and Development E-Commerce database.

C. Education

55. The Bureau on ICT for Education under the Ministry of Education is the focal point for school informatization. Provision of ICT to secondary schools has been the emphasis of various government initiatives for the past decade, including supplying computers to schools, developing e-textbooks, providing internet access, and training teachers on ICT use.

56. Majority of general education institutions are connected to the internet through the Azerbaijan Educational Network (AzEduNet), covering around 85% of students and 75% of teachers. Unconnected schools are in remote rural areas where mobile broadband technologies must be used for internet access. Some learning materials are also available online, including 96 % of textbooks, interactive tests, and video lessons. Some 20,000 laptops, as well as electronic boards and projects, have also been provided through a bilateral accord with the People's Republic of China. Connectivity in the tertiary segment is high, with most of the country's 48 universities having fiber-optic links to the internet.

57. While primary and secondary enrollment rates are high, tertiary enrollment rates, although rising, are comparatively low. Almost 150,000 students were enrolled at the undergraduate level during the 2017/18 academic year. In 2016, Azerbaijan's tertiary education enrollment ratio was 27%, compared to 52% in Georgia and 46% in Kazakhstan.⁴⁵

⁴³ United Nations Conference on Trade and Development. 2017. UNCTAD B2C E-Commerce Index 2017. <https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1882>

⁴⁴ <http://e-qanun.az/framework/34254>

⁴⁵ World Bank. Data. School Enrollment, Tertiary (% Gross). (accessed 2 December 2018). <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=AZ-GE-KZ>.

58. Over 24 universities in Azerbaijan offer degrees related to ICT. Enrollment in these programs rose sharply in academic year 2017/18 to 2,466 persons. Some 6,600 students are pursuing studies in this field, and around 1,300 graduate each year.

59. Technical and vocational education and training (TVET) has historically been underfunded and perceived as underperforming. There were 113 TVET institutions operating in academic year 2016/17 (including 3 training centers for teachers) with 23,703 students⁴⁶; enrollment increased 27% from the previous academic year. Most students are on government scholarships. In the past, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has assisted in adapting TVET in Azerbaijan to be more responsive to a modern economy, including developing textbooks on ICT. Currently EU provides technical assistance to Azerbaijan to support development of TVET including in the ICT related fields. There are a few well equipped TVET institutions providing education in ICT related fields, but in majority of TVET institutions the level of ICT infrastructure remains low, resulting in, for example, computer classes with no computers. There is a strategic TVET road map that calls for improved collaboration with the private sector, better trained teachers, and promotion of entrepreneurship in the curriculum. Funding for these initiatives, however, is problematic. New law on TVET was adopted in April 2018.

60. Azerbaijan has been using the European Computer Driving License (ECDL) as certification of ICT skills. The courses have been translated to Azeri and are offered in various locations, including universities.⁴⁷ Azerbaijan has also received European Union support for establishing ECDL test centers throughout the country.⁴⁸ Lithuania's Information Technologies Institute is a subcontractor for development of ECDL testing services in Azerbaijan.⁴⁹

61. Despite such emphasis on developing ICT skills to boost employment prospects, the youth unemployment rate was 13% in 2016, above the national unemployment average. Young people (i.e., ages 15–29 years) make up 46% of all unemployed persons, although 65% of them have had higher or technical vocational education. The employment rate of higher education ICT graduates within 1 year of leaving school is 43%.⁵⁰

62. The causes of the high youth unemployment are twofold. First, there is a skills mismatch, with many graduates lacking the desired technical skills. Second, Azerbaijan's ICT sector is underdeveloped, with computer and information services accounting for only a small share. Consequently, there are fewer jobs available in this area. An additional problem is significant brain drain among those who have ICT skills. This drain flows in two directions, from the public to the private sector, and from Azerbaijan to overseas.

63. The skills mismatch reflects antiquated training that fails to meet the needs of the business sector. Due to limited business involvement in educational planning, in most cases, courses do not meet the requirements of the modern business environment. Textbook teaching and memorization are also emphasized, rather than developing job-specific skills. TVET curriculums are only reviewed every 5 years.

⁴⁶ Network of VET institutions were gradually optimized and brought down to 82 (as of January 2019)

⁴⁷ Azerbaijan University. 2017. News Archive. Azerbaijan University Received Accredited Test Center Status of ECDL. 7 November. <http://au.edu.az/en/material/318/azerbaycan-universiteti-ecdli-in-akkreditasiya-olunmus-test-merkezi-statusunu-alib>;
<http://www.unpan.org/DPADM/EGovernment/KnowledgeBaseofEGovernmentPractices/tabid/828/ctl/StudyView/mid/2148/CaseStudyID/71/language/en-US/Default.aspx>

⁴⁸ Fundacja Rozwoju Systemu Edukacji. 2012. ECDL National Operator and Test Centers in Azerbaijan. <http://www.tempus.org.pl/tempus.org.pl/node/500.html>

⁴⁹ ECDL Lithuania. About Information Technologies Institute. <http://www.ecdl.lt/english/>

⁵⁰ World Bank. 2016. IT Sector and IT Skills in Azerbaijan: Challenges and Opportunities. Washington, DC.

64. Cognizant of the importance of digital skills for the information economy, Azerbaijan's strategic ICT road map plans converting schools to "e-schools" (e.g., electronic books, electronic seminars, open-access educational materials, distance learning, website based exams, etc.), creating ongoing ICT courses for teachers to stay abreast of the rapid evolution of digital technologies, and improving the evaluation of ICT skills of graduates and teachers. In addition, greater availability of digital technology in schools, and IT application for teaching (e.g., e-books, multimedia-assisted courses, and online courses and exams) will be emphasized as part of development of a digital education concept. Ministry of education has already started working in that direction through introduction of new formats of teaching and capacity building of teachers.

D. Health

65. The strategic ICT road map calls for creating an end-to-end, integrated e-health infrastructure to increase service quality, lower costs, and boost availability of health care services. Projects involve standardized electronic medical records and digital prescriptions. The MTCHT has been assisting the Ministry of Health with funding for incubating start-ups that aim to develop medical applications (e.g., MedTech).

E. Financial Inclusion

66. Although growing, the level of financial inclusion in the country is low, particularly considering Azerbaijan's relatively high per capita income (Table 1). Just less than one-third of the population has a bank account, and only one-quarter has a debit card, many of which are social insurance and salary cards.⁵¹ Mobile money is rarely used due to limits on the amount of a transaction and other restrictions. Just 5% of the population made an online purchase in 2017. The low penetration of credit cards, mobile money, and e-wallets are undoubtedly holding back the development of the country's digital economy. Some tendency for improvement is being observed during the last year: the share of cashless payments increased from 12.7 % in first 11 months of 2017 to 17.7% in the same period of 2018. The volume of e-trade within the country increased 2.8 times between 2017 and 2018. Government intention to increase the level of financial inclusion and expansion of cashless payment is reflected in the Strategic Road Map on Financial Services Development in the Republic of Azerbaijan⁵² and the State Program on Digital Payment Expansion in 2018-2020.⁵³

Table 2: Financial Inclusion
(% age 15+ years)

	2011	2014	2017
Account ownership	15	29	29
Credit card ownership	3	9	5
Debit card ownership	10	16	25
Financial institution account ownership	15	29	29
Mobile money account ownership
Made or received digital payments in the past year	...	18	25
Used the internet to buy something online in the past year	5

... = data not available.

Source: World Bank Global Findex Database (<https://globalfindex.worldbank.org>).

⁵¹ ADBI. 2018. Working Paper Series No. 842: Financial Inclusion, Financial Literacy, and Financial Education in Azerbaijan. Tokyo. <https://www.adb.org/sites/default/files/publication/421611/adbi-wp842.pdf>

⁵² <http://e-qanun.az/framework/34254>

⁵³ <http://e-qanun.az/framework/40164>

67. With the Law on Digital Electronic Signature passed in 2004, e-signatures in Azerbaijan must be certified by an organization approved by the MTCHT. Challenges, however, have arisen with certification given the low level of e-commerce and digital payments. Interest in innovative financial technologies, such as blockchain and cryptocurrencies, also appears low.⁵⁴ At the same time, digital identification have been introduced based on SIM cards, which is gaining traction for verifying users who are accessing online government services.

68. Although not as high as other Commonwealth of Independent States, remittances are nevertheless significant in Azerbaijan. Inflows totaled \$1 billion in 2017, up sharply from 2016 but around half the figure of 2012.⁵⁵ This is largely due to exchange-rate fluctuations involving money sent from the Russian Federation. Outflows are less but still stood at \$740 million in 2017. Like inflows, remittance outflows dropped in US dollar terms due to the depreciation of the Azerbaijan manat. Digital technology, such as mobile money and online payments, can help reduce remittance transaction costs.

69. An ADB study found low levels of financial inclusion, literacy, and education in the country.⁵⁶ It recommended liberalizing the sector, developing needed regulations, promoting innovation, using digital payments for widening financial inclusion including mobile money and greater use of credit and debit cards, and developing a venture capital market.

70. The government has included developing digital payments as a priority in its strategic ICT road map. Steps proposed include making the legal and regulatory framework more conducive to digital payments, including granting licenses to mobile operators; integrating bank accounts to the national e-payment platform for online payments; promoting the use of online and mobile banking by eliminating transaction fees for payment of government services; extending the use of electronic and mobile signatures in payment systems; and creating greater public awareness of the benefits of digital payments.

F. Public Sector Management

1. Information and Communication Technology Infrastructure

71. **Data center and network.** Currently, all government agencies manage and operate their own computer systems at their own facilities. Some government agencies with suitable ICT capacity, such as the Ministry of Finance, have no critical issues in handling their own systems, but many government agencies do have difficulties in dealing with highly sophisticated technical matters including cybersecurity, disaster recovery, and network management. The strategic ICT road map proposes actions to leverage a common public administration data center using a government cloud (i.e., gcloud) to reduce duplication and to increase efficiency for maintaining ICT infrastructure. Similarly, a government-wide network could help expand public e-services to rural and remote areas where various public institutions could share broadband internet capacity. Government understands importance of accelerating transition to digital government and takes relevant actions in that direction such as launch of Data Center with international certificates, set

⁵⁴ Blockchain World Events. 2018. Blockchain and Bitcoin Conference Baku Cancelled due to the Low Interest Showed by the Mark. 31 August. <https://azerbaijan.bc.events/en/article/blockchain-bitcoin-conference-baku-otmenyaetsya-iz-za-nizkoy-zainteresovannosti-rinka-91935>

⁵⁵ World Bank. 2017. Migration and Remittances Data. <http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data> (accessed 2 December 2018).

⁵⁶ ADBI. 2018. Working Paper Series No. 842: Financial Inclusion, Financial Literacy, and Financial Education in Azerbaijan. Tokyo <https://www.adb.org/sites/default/files/publication/421611/adbi-wp842.pdf>

up of E-Government Implementation Group, establishment of E-Government Development Center under SAPSSI⁵⁷, creation of Registry of Public Information Resources, Systems and Electronic Services and sectoral (Utilities, Social, Agrarian) integrated information subsystems under EGIS.⁵⁸

72. **Cybersecurity.** Given the growing number of ICT systems in governments, cybersecurity is a key concern. To safeguard computer networks across the Government of Azerbaijan, a computer emergency response team⁵⁹ has been created under the Special State Protection Service to respond to information security incidents. There is also an Electronic Security Service under MTCHT which acts as a certification body.⁶⁰ A cybersecurity strategy is also under preparation, and the MTCHT intends to implement a cyberoperations center for real-time monitoring of threats.

73. **National spatial data infrastructure.** National spatial data infrastructure plays an important role in government infrastructure, focusing mainly on digital maps and geographic information systems. In Azerbaijan, various government and private organizations are dealing individually with collecting, storing, processing, and maintaining spatial data, resulting in duplication of resources. Some initiatives have been aimed at developing an integrated spatial database for multiple purposes, but these have been unsuccessful due to weak coordination and unclear allocation of responsibilities among the governmental stakeholders.

74. Recently, it has been decided⁶¹ that the ASAN Service and State Committee on Property Issues (SCPI) will be responsible for the development of the national spatial data infrastructure. Overall coordination for providing a digital service via a government e-portal will be the responsibility of ASAN xidmət, while the SCPI, as the main operator, will be responsible for existing and future spatial databases.

75. If successfully applied and implemented, the national spatial data infrastructure will lead, in the long term, to significant cost savings in state spending on spatial data as well as nationwide standardization and sharing of spatial data products. If these data are shared, the private sector and start-ups will also have an opportunity to offer geolocation apps for target groups (e.g., governments, individuals, and companies) as experienced in developed countries.

2. Public Services and Applications

76. **Integrated public e-services.** The government has been providing public services through the ASAN one-stop shop since 2012.⁶² Some 315 services by 11 government agencies as well as by private companies and businesses are available through 15 ASAN centers throughout the country managed by ASAN xidmət, convenient for the public. Some of the services are moving online, there are also mobile services available. ASAN is implemented in partnership with the private sector, which develops the software and earns revenue from transaction fees. ASAN won a United Nations Public Service Award in 2015 for delivery of public services.⁶³ Also,

⁵⁷ <http://digital.gov.az/en>

⁵⁸ <https://www.e-gov.az/en/content/read/12>

⁵⁹ Special State Protection Service, Special Communication and Information Security State Agency. <https://cert.gov.az/>

⁶⁰ www.cert.az

⁶¹ Decree of the President of the Republic of Azerbaijan No 448 dated December 28, 2018 "On Approval of Rules for the Development and Integration of National Spatial Information"

⁶² ASAN xidmət. <http://www.asan.gov.az/en>

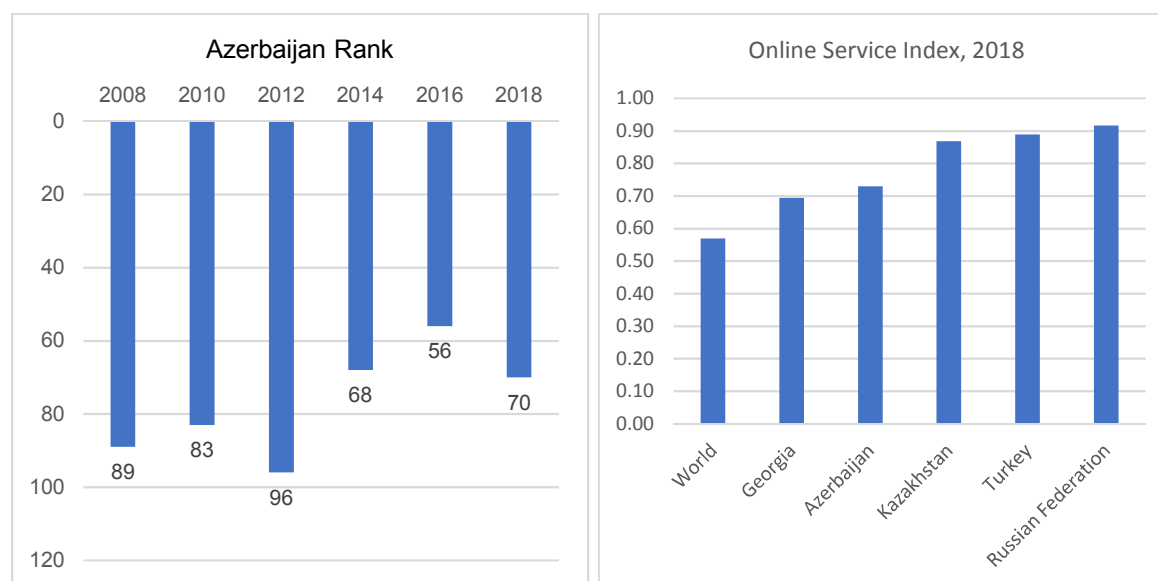
⁶³ Regional Hub of Civil Service in Astana (ACSH) and United Nations Development Programme. 2016. One-Stop-Shop Public Service Delivery Model: The Case of Azerbaijan. Astana: UN House. <http://www.astanacivilservicehub.org/category/library#>

SMEDA will be providing around 100 public (G2B) and 1000 private (B2B) services to SMEs through its Small and medium Business Houses.

77. According to the United Nations e-Government Development Index, an indicator of the depth and functionality of public e-services, Azerbaijan ranked 70 out of 193 economies in 2018 (Figure 14).⁶⁴ Improvement was steady between 2012 and 2016, with Azerbaijan rising from 96 to 56. However, between 2016 and 2018, the country dropped 14 positions. Although Azerbaijan's score rose from 0.6274 to 0.6574, it did not rise as much as other countries.

78. Comparing just the Online Service Index, Azerbaijan is above the global average but some distance behind peers such as Kazakhstan, the Russian Federation, and Turkey (Figure 14). The ranking is likely to progress over the coming years given that improving the ICT systems of government institutions is a priority under the strategic ICT road map.

Figure 14: United Nations E-Government Development Index



Source: United Nations. UN E-Government Knowledgebase. UN E-Governance Survey 2018. <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018>.

79. **Public financial management.** The Ministry of Finance has developed adequate financial information systems. Work continues to integrate the systems to synchronize with registries maintained by other ministries⁶⁵ It will be expedient to continue strengthening of the public debt management information system and public expenditure and fiscal management information system. Going forward, business process reorganization is also needed to streamline software systems to make them more robust and scalable.

80. **Cross-border trade facilitation.** The State Customs Committee has done much work on a single window supporting online trade declarations.⁶⁶ In addition, the Ministry of Taxes has an

⁶⁴ United Nations. UN E-Government Knowledgebase. UN E-Governance Survey 2018.

<https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018>

⁶⁵ ADB under the Improving Governance and Public-Sector Efficiency Program (IGPSEP) supported this area. ADB. 2017. Report and Recommendation of the President to the Board of Directors: Improving Governance and Public Sector Efficiency Program in the Republic of Azerbaijan. Manila

⁶⁶ Government of Azerbaijan, Customs Service. <http://customs.gov.az/en/>

online business registration facility on its website.⁶⁷ The Ministry of Economy is also creating a one-stop licensing and business permit portal. To implement Article 1 (Publication and Availability of Information) and Article 2 (Prior Publication and Consultation) of the 2017 World Trade Organization Trade Facilitation Agreement, the ministry must develop an online portal with different sections for the public and businesses. Apart from this requirement, to utilize Azerbaijan's geographical advantage as a trade hub in the region, the country needs to develop an enabling environment for e-commerce and cross-border e-commerce including e-commerce law, tax incentives, e-payment infrastructure, warehouse logistics, national single windows, and customs automation for cross-border trade.

81. **Land administration.** A well-functioning land administration system is important for ensuring the legal security of land and real estate ownership. It is a critical factor for economic development due to the growing real estate market, enabling mortgages as collateral, stimulating investments, and creating jobs in real estate. Additionally, for the government, land administration levies property taxes transparently and facilitates spatial planning and monitoring.

82. During the Soviet era, land and property were owned by the state; therefore, there were no land administration databases. After the collapse of Soviet Union, Azerbaijan implemented quick land reform accompanied by a rapid, but not always accurate, land registration process resulting in poor cadastral maps and property titles of limited legal value. Recently, a World Bank project has assisted with land and property registration, including digital integration with other stakeholders (e.g., notaries and tax offices) and creation of new digital maps. Today, these land administration services are the responsibility of the SCPI, as is the collection and updating of land registration, spatial data, and registration and privatization of state property.

83. Many activities proposed during the World Bank Project are to be completed shortly, especially on the integration of the ICT system with e-government services.

G. Urban Sector

84. In Baku, there are some areas where ICT is currently contributing to the security and well-being of the city's residents. A municipal Wi-Fi network was launched in March 2017, a free service being progressively expanded throughout the city.⁶⁸ There is also a traffic management system that links traffic lights to a central system and CCTV monitoring.⁶⁹ A basic smartphone app, Residents Info, is available for residents in the historical district of Icheri Sheher, providing location-specific information and services (e.g., information about neighborhood roadworks, nearest bicycle-sharing stations, and cultural events).⁷⁰

85. However, there does not appear to be an integrated approach combining traffic, weather, energy, and sensors with public safety information that is monitored on a real-time basis, forming the basis of a smart city.⁷¹

⁶⁷ Government of Azerbaijan, Ministry of Taxes.

<http://www.taxes.gov.az/modul.php?name=birpencere&bolme=registration>

⁶⁸ R. Shirinov. 2017. Here's How to Get Free WiFi in Baku. *AzerNews*. 29 March 2017

<https://www.azernews.az/nation/110716.html>

⁶⁹ Glosec. Baku Smart City. <http://glosecgroup.com/projects/baku-smart-city/>

⁷⁰ A. Ismayilov. 2017. Implementation of Smart City Infrastructure in Historical Centers of Cities. Paper presented at the Smart Towns Central and Eastern Europe Conference. Ljubljana, Slovenia. 29–30 November.

<http://www.smarttowns.eu/wp-content/uploads/2017/11/Implementation-of-Smart-city-infrastructure-in-historical-centres-of-cities.pdf>

⁷¹ Baku, and other cities in Azerbaijan might consider being affiliated with the ADB's Future Cities Program which aims to provide integrated planning and project design for digital projects for selected cities. ADB. 2018. *Technical Assistance Completion Report: Establishing the Future Cities Program in the Asia and Pacific Region*. Manila. <https://www.adb.org/projects/49053-001/main>

IV. CONCLUSIONS

86. ICT infrastructure has expanded in Azerbaijan, and internet use among the population is relatively high. However, the country is inadequately exploiting its levels of infrastructure and internet use to achieve desired outcomes, notably as outlined in its strategic ICT road map. Consequently, ICT is not yet having the anticipated cross-cutting effect needed to trigger the anticipated economic transformation. Improvements in several key areas would result in more productive application and use of ICTs. These areas are highlighted below.

A. E-Government

87. Azerbaijan progressed in facilitating public access to government services through the ASAN xidmət. Currently, 450 e-services being provided through e-government portal. To continue this mission, SAPSSI intends to intensify work related to (i) establishing an e-Government Academy; (ii) establishing an e-Government Research Center; (iii) capacity building and knowledge sharing on e-Government; and iv) development e-Government infrastructure (implementation of gcloud).

88. Given the remarkable progress of the ASAN xidmət, it could be replicated in other countries in the region as well. It will be important to facilitate the transfer of ASAN xidmət experience to other countries and promote ASAN xidmət as a model for integrated public e-service in Asia and the Pacific through regional knowledge partnership programs as it has already been done in Afghanistan by establishing Asan Khedmat service there⁷².

B. Digital Micro, Small, and Medium-Sized Enterprises

89. Micro and SMEs, particularly those that base their competitiveness on technology and innovative business models, can be the main driving force in transforming the country's economy from resource- to knowledge-based. Programs from multiple agencies currently or are planned to support micro and SMEs through financing, training, and incubation. However, these efforts are ineffectively coordinated; better harmonization under a single agency is needed. Worldwide experience also shows that entrepreneurship and innovation are enhanced through strong collaboration with academia and industry in a favorable policy environment. Support could thus be considered for strengthening and building a conducive ecosystem for innovative and tech-driven micro and SMEs together with individual support programs.

C. Education

90. TVET can be a key instrument in developing specialized support skills for the digital economy. Developing basic expertise in areas such as computer networking, database management, and coding can be taught through TVET, as in other countries. To do this in Azerbaijan, TVET must acquire modern ICT facilities, perhaps by partnering with global firms offering industry-recognized programs (e.g., Cisco, Oracle, and Microsoft) and training instructors to offer the courses.

91. Support for technological research in higher education would also accelerate absorption and transfer of digital technologies to the country. Universities could collaborate with the private sector by customizing curricula to meet modern business needs, incubating start-ups, and supporting innovative businesses. A cooperative system could be developed among universities, the Ministry of Education, other relevant government agencies, and employers to identify skills in

⁷² <http://www.asan.gov.af/Eng/EventDetail.aspx?ID=26275>

high demand and to thus adapt programs in universities to produce the necessary skills and talents.

D. E-Agriculture

92. Digital technologies are viewed as critical for revitalizing the agriculture sector and increasing productivity, innovation, and rural welfare. In this regard, it might be useful to conduct:

- (i) comprehensive sector development support covering market infrastructure development for agriculture businesses; application of digital technologies (e.g., mobile money, e-payments, big data, and precision farming) to improve financial inclusion in rural areas, availability of insurance for agriculture enterprises, and efficiency of agriculture production; and modernization of agriculture science and education to better absorb and to apply digital technology; and
- (ii) knowledge forums to share examples of best practices in applying digital technology to food safety as well as conceptualization of systems for integrating different sources of data into a platform for analyzing food security and an online learning portal for food safety aimed at diverse audiences (i.e., Food Safety Agency staff, the public, and businesses).

E. Cross-Border E-Commerce

93. E-commerce continues to grow around the world, and cross-border e-commerce is developing even faster. Yet utilization of e-commerce is currently low in Azerbaijan, and the economic environment is unfavorable for e-commerce development. An appropriate ecosystem is required to develop e-commerce, featuring e-commerce laws protecting consumers, appropriate taxes for e-commerce transactions, affordable internet, e-payments, and logistics. It will be important to facilitate discussions on cross-border e-commerce among relevant government agencies, building on knowledge partnerships with international organizations that have experience in the area; e-commerce companies, including e-payment and fintech companies; and bilateral donors.

94. Support is also envisioned for related government trade facilitation activities such as a national single-trade window, an integrated business portal in compliance with the free trade agreement, and an online website of relevant trade information.

F. Enabling Environment for the Digital Economy

95. While the government considers ICT critical for diversification, efforts to foster a digital economy have not been successful due to few challenges constraining development of an enabling environment. To address these challenges, it will be important to work on:

- (i) fostering a regulatory environment for the telecommunication sector (i.e., setting up an independent regulatory body);
- (ii) expanding a national broadband network through private sector participation, beginning with creation of a comprehensive national broadband plan;
- (iii) building e-government infrastructure, including gcloud, enterprise architecture for government systems, and cybersecurity;
- (iv) developing e-payments covering widened financial inclusion, and facilitating online payments;
- (v) digitizing and standardizing documents; and
- (vi) encouraging digital literacy for the general public.