Building a Resilient Digital Economy: Fostering SMEs in Central Asia

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Abbreviations and Acronyms

AAL	Average Annual Loss
APEC	Asia-Pacific Economic Cooperation
AP-IS	Asia-Pacific Information Superhighway
B2B	Business to Business
B2C	Business to Customers
B2G	Business to Government
BCP	Business Continuity Plan
C2C	Customer to Customers
ESCAP	Economic and Social Commission for Asia and the Pacific (United Nations)
Gbps	Gigabits per Second
GDP	Gross Domestic Product
GNI	Gross National Income
ICT	Information and Communications Technology
ITU	International Telecommunication Union
PPP	Purchasing Power Parity
SAARC	South Asian Association for Regional Cooperation
SDG	Sustainable Development Goal
SME	Small and Medium-Sized Enterprise
SMS	Short Message Service
SPECA	Special Programme for the Economies of Central Asia (United Nations)
TASIM	Trans-Eurasian Information Super Highway
UNCTAD	United Nations Conference on Trade and Development
UPS	Uninterruptible Power Supply

1. Introduction

The year 2016 marks the beginning of a journey towards the implementation of the 17 Sustainable Developments Goals (SDGs). Information and communications technology (ICT) has a critical role to play towards the achievement of the SDGs, particularly SDG8 (decent work and economic growth), SDG9 (industry, innovation and infrastructure) and SDG17 (partnerships for the goals), among others. As a sustainable development enabler, broadband-enabled technologies support various critical public goods that can improve the economic and social well-being of populations in both rural and urban areas, noting that countries that harmonize technology investments with broader economic reforms realize digital dividends in the form of faster growth, more jobs, and improved services. Further, with broadband in place, small and medium enterprises (SMEs) can for example offer more innovative mobile and online services, and accelerate the path towards achieving the SDGs. From playing a critical role in modernizing logistics and marketing to developing digital banking solutions for financial inclusion, ICT, in particular broadband technology, has been transforming our society and economy.

Specifically, the digital economy is made up of three main components, defined by Mesenbourg:

1. **E-commerce**: The E-commerce concept refers to goods and services transactions carried out over computer networks including the Internet.
2. **E-business**: This concept not only encompasses e-commerce, but also any online activities carried out by traditional businesses. These activities can include a variety of internal processes such as human resources, inventory operations, finance and risk management.
3. **E-business infrastructure**: This concept is defined as the infrastructure employed to support e-commerce as well as e-business operations. For example, software, telecommunication networks, human capital, routers, computers, hardware and services such as web development are all included in the E-business infrastructure concept if they are used in e-business and e-commerce operations[1].

For all the benefits brought about by a digital economy, noting the caveat of ICT development in hand with economic reforms that promote competitive business environments, increase accountability and upgrade education and skills-development systems to prepare people for the jobs of the future, it has also demonstrated that it is vulnerable to the impacts of natural disasters. When such disasters strike, they can bring about economic impact long after the initial shock of the disaster has passed.

As disasters such as earthquakes demonstrate, economic activities can be stalled and economic vitality stifled. For example, the 2015 earthquake in Nepal has knocked the country off balance with full economic recovery years away due to a number of factors including a dearth of capacity to fully spend the reconstruction funds provided by Nepal's National Reconstruction Authority within the stipulated five-year timeframe. The country's rugged terrain also makes rebuilding critical infrastructure very expensive, and until such is back in place economic activities are delayed due to lack of access and services.

[1] Thomas L. Mesenbourg, "Measuring Electronic Business: Definitions, Underlying Concepts, and Measurement Plans"

In Asia and the Pacific, a region that is prone to a multitude of natural hazards, building resilient ICT infrastructure is a development imperative. This is because ICT supports other critical infrastructure and a wide range of socioeconomic activities. In particular, ICT can support SMEs that are likely to suffer most from disasters as they are often faced with insufficient capacity and resources to recover from the shock. As a source of employment, innovation and services, SMEs are the backbone of economic growth and an engine for inclusive and sustainable development in many developing countries.

Thus, for the purposes of this paper the term resilience, or more specifically "ICT resilience (e-resilience)" should be understood as making ICT infrastructure more durable so that such can better absorb and recover from calamities that can not only bring down transport and energy grids, but cut the digital lifeline to fledgling and established small and medium enterprises. Here it must be stressed that ICT infrastructure should be treated with the same urgency as power grids and transport linkages when such are damaged or destroyed.

This working paper aims to identify and bring to the attention of policy- and decision-makers, the ways to build resilient ICT in the SPECA[2] countries in order to promote an inclusive and sustainable digital economy for the achievement of the SDGs. The paper focuses specifically on SMEs in the SPECA subregion, and the ways to facilitate their integration into the global value chain with improved ICT connectivity, taking into account existing disaster risks in the subregion. It analyses the state of ICT in the SPECA subregion and shows that a significant digital divide exists among SPECA countries. The paper proceeds to identify ICT-based strategies that are adopted in the SPECA subregion, particularly among SMEs, and the way forward in order to manage and reduce the impact of disasters on businesses and governments. The initial draft of this working paper was presented for comments and suggestions at a regional meeting held in Almaty, Kazakhstan, in September 2016.[3]

This paper contributes to the implementation of the Asia-Pacific Information Superhighway (AP-IS)[4] supported by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). The AP-IS initiative aims to promote seamless regional broadband connectivity across the ESCAP member countries through better broadband infrastructure, more efficient Internet traffic and network management, e-resilience, and inclusive broadband, for the ultimate purpose of achieving inclusive and sustainable development in the region.

The paper is structured as follows:

- Section II describes the economic structures as well as the state of ICT in the SPECA subregion.
- Section III presents the role of SMEs in the digital economy in the SPECA subregion.

[2] The United Nations Special Programme for the Economies of Central Asia (SPECA) was launched in 1998 to strengthen subregional cooperation in Central Asia. The countries in the SPECA subregion include Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. In this paper, when Central Asia is mentioned, Afghanistan is included in the description.

[3] ESCAP, **"**Regional Workshop on Resilient ICT Connectivity for the Knowledge Economy, SDGs and the WSIS Goals**"**. Available from http://www.unescap.org/events/regional-workshop-resilient-ict-connectivity-knowledge-economy-sdgs-and-wsis-goals.

[4] ESCAP, "Asia-Pacific Information Superhighway". Available from http://www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway.

- Section IV briefly presents the types of risks affecting the SPECA countries and their economic consequences.
- Section V presents recommendations to enhance ICT resilience among SMEs and facilitate their integration into the global value chain in the SPECA subregion.

It is hoped that this paper will stimulate policy discussions among ICT and disaster management agencies and ministries for concrete actions, and feed into regional cooperation, in particular the implementation of the AP-IS among the SPECA countries.

2. Economic Structure and the State of ICT in the SPECA Subregion

2.1 GDP per Capita, Sector Share and SMEs

SPECA countries differ widely in terms of economic structure, as presented by the data from the World Bank in Table 1.

Table 1. Economic structure in SPECA countries

Country	Agriculture, value added (% of GDP)	Services, value added (% of GDP)	Industry, value added (% of GDP)	GDP per capita, PPP (constant 2011 international $)	Classification of SMEs – employees	SMEs contribution to GDP (%)	Percentage of SMEs among companies	Employment in SMEs (%)
Afghanistan	22.6	55.0	22.4	1,820	<300 employees	50 (2009)	80-90 (2009)	75 (2009)
Azerbaijan	6.8	56.2	37.0	16,695	<125 employees and turnover<AZN 1,250,000	25 (2014)	94 (2014)	43 (2014)
Kazakhstan	5.0	61.8	33.2	24,.353	<250 employees	20 (2014)	90 (2015)	28 (2013)
Kyrgyzstan	15.9	57.1	26.9	3,225	Depends on sector and turnover <200 employees or <50 employees	37 (2015)	*Missing*	19 (2015)
Tajikistan	27.4‡	50.8‡	21.7‡	2,616	<200 for agricultural producers <100 for others	*Missing*	54.7 (2015)	50 (2015)
Uzbekistan	18.3	47.1	34.6	5,642	<100 employees in general, varies according to the industry	56 (2014)	*Missing*	76.5 (2014)

Sources: World Bank, "World Development Indicators", 2016. Available from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicator; and individual country reports. The sources for data on SMEs are given in Appendix V.

Notes: ‡ Data is for year 2013, and the rest of the data is for year 2015.Turkmensitan is not included due to the lack of recent data.

The data on SMEs presents several limitations. Firstly, the definition of SMEs varies from one country to another. The maximum number of employees for a firm to be classified as an SME ranges from 300 (Afghanistan) to 100 (Uzbekistan). Secondly, the informal sector accounts for a significant share of the total number of firms in SPECA countries, which implies that collected data might not reflect the real SMEs' weight in each economy.

Azerbaijan and Kazakhstan are the most advanced economies in the subregion in terms of gross domestic product (GDP) per capita (using purchasing power parity (PPP) rates), which exceeds

USD16,000. In both countries, the agricultural sector's share in total domestic production is low (at 6.8 per cent and 5.0 per cent, respectively). In the relatively low-income countries such as Afghanistan, Kyrgyzstan, Tajikistan and Uzbekistan, the data shows that agriculture plays a major economic role and contributes 22.6 per cent (in Afghanistan) and 27.4 per cent (in Tajikistan) to GDP.

SMEs play an important role in agrarian economies and contribute a higher percentage to GDP. Afghanistan and Tajikistan are the two predominantly agrarian countries of the subregion where SMEs play a major role. In Afghanistan in 2009, 80-90 per cent of the enterprises were classified as SMEs—defined as enterprises with less than 300 employees. Most of these enterprises were rural businesses and contributed to more than 50 per cent of GDP and 75 per cent of employment.[5] In Tajikistan, 54.7 per cent of the firms were classified as SMEs according to the national definition and accounted for about half of total employment in the country.[6] Uzbekistan presents similar structural characteristics. Although only firms with less than 100 employees were classified as SMEs, they accounted for 56 per cent of total GDP and 76.5 per cent of employment in 2014. The share of SMEs in the agricultural sector grew considerably in the Uzbekistani economy in the early 2000s and reached 70 per cent in 2006.[7] Additionally, 98 per cent of the total agricultural GDP was generated by SMEs in 2013.[8]

The contribution of SMEs to GDP in the most advanced economies of the SPECA subregion is low. In both Azerbaijan and Kazakhstan, a majority of the firms are classified as SMEs (94 per cent and 90 per cent, respectively). However the contribution of SMEs to their GDP remains low. In Kazakhstan, which is the most economically-advanced country of the SPECA subregion and where firms with less than 250 employees are classified as SMEs, the SMEs only generated 20 per cent of GDP in 2014. This figure is at odds with the global trend, as the level of development is generally positively correlated with the importance of SMEs in the economy in terms of contribution to GDP and employment.[9] The relatively small contribution of the SME sector to the economy in Azerbaijan and Kazakhstan can be explained by the major role played by big companies in the oil and gas sectors, which accounts for 65.3 per cent of GDP in Azerbaijan in 2015[10] and about 25 per cent of GDP in Kazakhstan.[11]

Official figures may underestimate the real contribution of SMEs to SPECA economies as the informal sector is not taken into account. In most economies in the SPECA subregion, SMEs employ from 19 per cent (Kyrgyzstan) to as high as 76.5 per cent (Uzbekistan) of the labour force, and contribute from 20 per cent (Kazakhstan) to 56 per cent (Uzbekistan) of GDP. However, these figures may

[5] Islamic Republic of Afghanistan, Ministry of Commerce and Industry, 2009.
[6] Regional Environment Center for Central Asia, "Tajikistan: Country Situation Assessment", Working Paper, August 2015. Available from http://prise.odi.org/wp-content/uploads/2015/08/Tajikistan_Country_Situation_Assessment.pdf.
[7] Viktoriya Kan, "Do Initial Conditions Matter? A comparative analysis of SME Development in Russia, Kazakhstan, and Uzbekistan", No. 639, CIS Discussion Paper Series, February 2015.
[8] State Committee of the Republic of Uzbekistan on Statistics, 2013.
[9] World Economic Forum, "Redefining the Emerging Market Opportunity: Driving Growth through Financial Services Innovation", 2012. Available from http://documents.bcg.com/REMO_2012_complete_for_WEB.PDF.
[10] Reuters, "Azerbaijan sees 1.8 pct GDP growth in 2016, bases budget on $50 oil price", 20 October 2015. Available from http://www.reuters.com/article/azerbaijan-budget-idUSL8N12K1IO20151020.
[11] Rabobank, "Country Report Kazakhstan", 24 June 2015. Available from https://economics.rabobank.com/publications/2015/june/country-report-kazakhstan/.

underestimate the real contribution of SMEs in the SPECA economies as the informal sector is not taken into account. For example, a study[12] estimated that the informal economy accounted for 31.5 per cent of GDP in Azerbaijan, 33 per cent in Kazakhstan, 26 per cent in Kyrgyzstan, and 32.8 per cent in Tajikistan in 2008. Another study estimated that 46.3 per cent of self-employed men in Kazakhstan and 42.7 per cent of self-employed women worked in the informal sector in 2011.[13] SMEs along with the informal sector play an important role for inclusive development in the subregion.

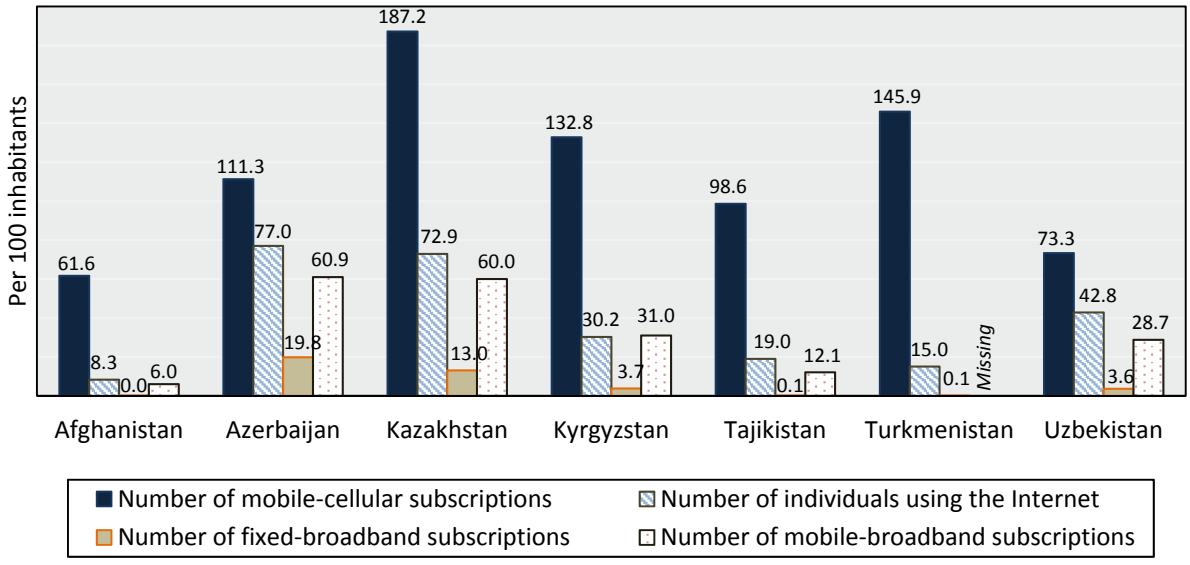
2.2 The State of ICT in the SPECA Subregion

Since 2007, there has been a rapid increase in international bandwidth and expansion of broadband networks in the SPECA countries. However, a significant digital divide remains in the subregion and many countries need to catch up to reap the benefits of the transformative capacity brought about by ICT.

Significant digital divide exists in the SPECA subregion. ICT is a foundation for the digital economy and inclusive development, but a significant digital divide exists not only in the Asia-Pacific region as a whole, but also within the SPECA subregion. The digital divide is particularly pronounced between countries in Central Asia. The two most developed economies in the subregion in terms of real GDP per capita, namely Azerbaijan and Kazakhstan, exhibit the highest number of Internet users and number of fixed-broadband subscriptions per 100 inhabitants, as shown in Figure 1. In comparison, Afghanistan, Tajikistan and Turkmenistan, have the lowest share of Internet users and number of fixed-broadband subscriptions per 100 inhabitants. In 2015, the share of Internet users in Azerbaijan was 77 per cent as compared to only 8.3 per cent in Afghanistan, highlighting the digital divide in the SPECA subregion. Afghanistan, Tajikistan and Turkmenistan are characterized by the lowest number of fixed-broadband subscriptions per 100 inhabitants in the ESCAP region.[14] The three countries are also at the bottom in Asia-Pacific ranking for mobile broadband subscriptions per 100 inhabitants.

[12] Yasser Abdih and Leandro Medina, "Measuring the Informal Economy in the Caucasus and Central Asia", International Monetary Fund Working Paper, May 2015. Available from https://www.imf.org/external/pubs/ft/wp/2013/wp13137.pdf.
[13] Altay Mussurov and Reza Arabsheibani, "Informal self-employment in Kazakhstan", *IZA Journal of Labor & Development*, vol. 4, no. 9 (December 2015).
[14] ESCAP, *State of ICT in Asia and the Pacific 2016: Uncovering the Widening Broadband Divide* (Bangkok, 2016). Available from http://www.unescap.org/resources/state-ict-asia-and-pacific-2016-uncovering-widening-broadband-divide.

Figure 1. ICT adoption indicators in SPECA countries, 2015

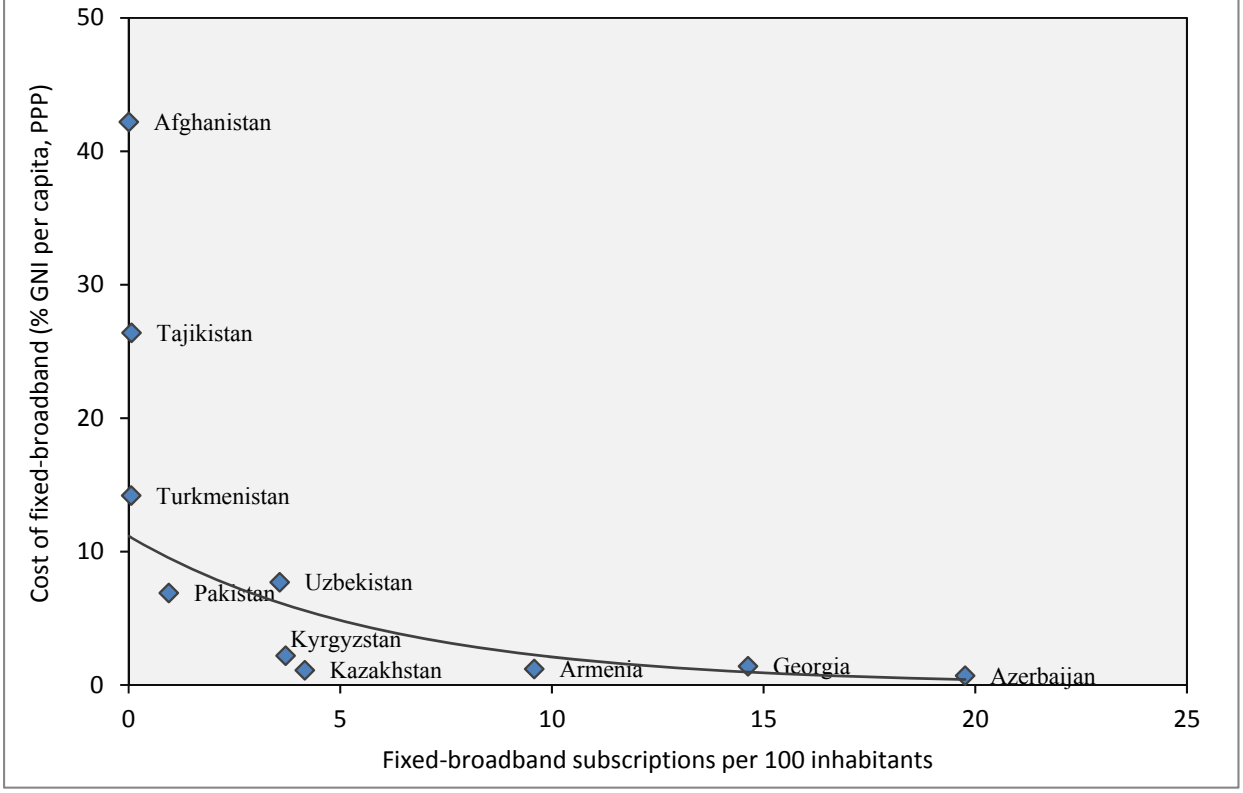


Source: ESCAP, based on International Telecommunication Union (ITU) data, 2016.

The digital divide also exists in the SPECA subregion in terms of affordability. One of the reasons for the digital divide may be the lack of affordability of ICT (see Figure 2). Affordability can be defined as the cost of ICTs (including broadband services and devices) expressed as a proportion of gross national income (GNI) per capita.[15] In ESCAP's classification, services are defined as "expensive" if it is more than 5 per cent of GNI per capita (PPP), and "affordable" if it is less than 2 per cent of GNI per capita (PPP). The cost of fixed-broadband services is around 1 per cent of GNI per capita (PPP) in Kazakhstan and Azerbaijan and is therefore classified as affordable. The cost is 42.2 per cent in Afghanistan, 26.4 per cent in Tajikistan, and 14.2 per cent in Turkmenistan, which is expensive, putting it out of reach of the majority of people in these countries. The cost of fixed-broadband services is expensive in Uzbekistan (7.7 per cent) and moderate in Kyrgyzstan (2.2 per cent). Conversely, mobile-broadband prices are either moderate or affordable in all SPECA countries according to ESCAP's classification. The only exception is Afghanistan, where mobile-broadband cost accounts for 5 per cent of GNI per capita (PPP) and is therefore classified as expensive.

[15] ITU, *Measuring the Information Society Report 2014* (Geneva, 2014). Available from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2014/MIS2014_without_Annex_4.pdf.

Figure 2. Broadband affordability and fixed-broadband subscriptions in the SPECA and neighbouring countries, 2015



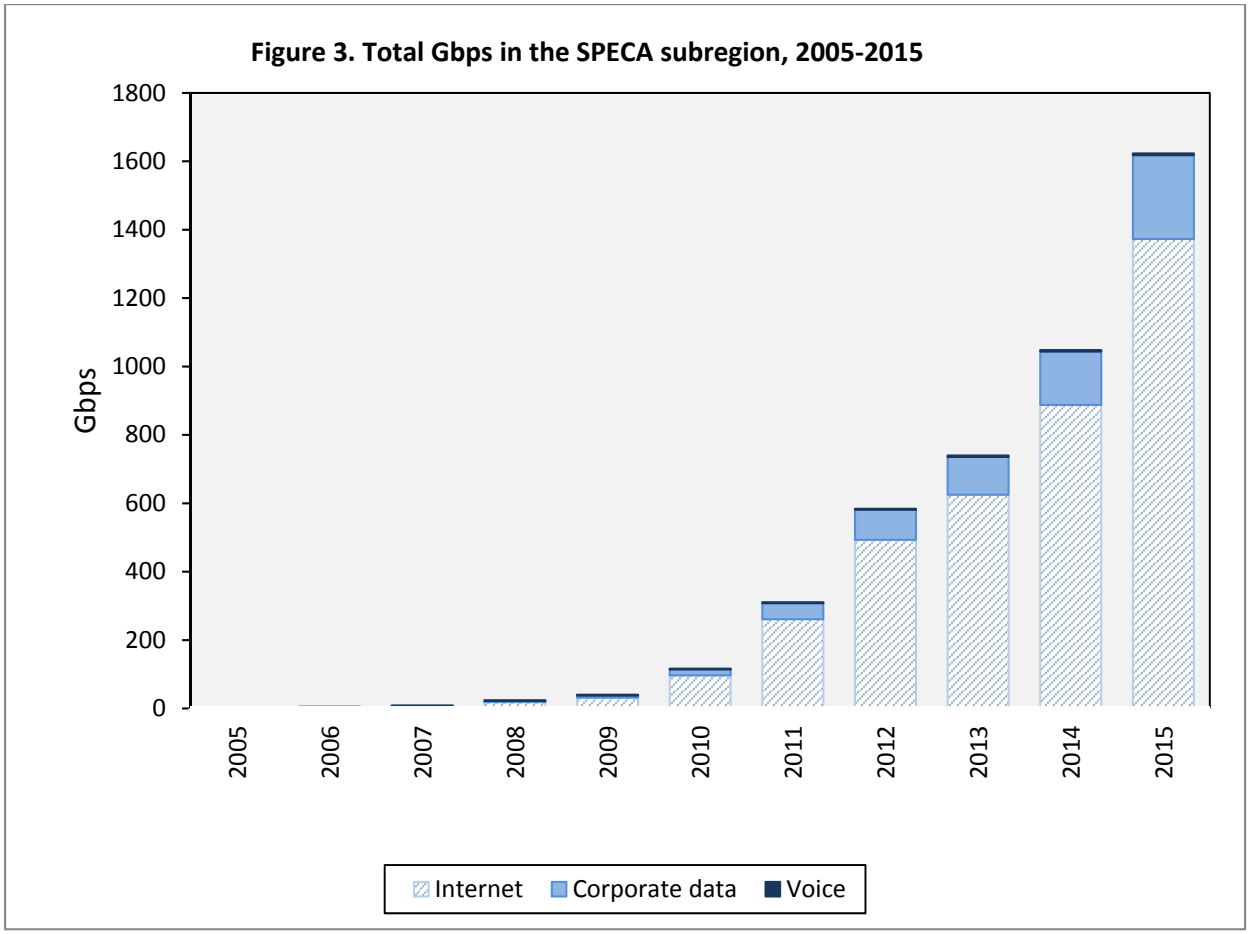
Sources: Cost of fixed broadband and data on fixed-broadband subscriptions from ITU, "World Telecommunication/ICT Indicators Database". Available from http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx; and GNI data from World Bank, "World Development Indicators", 2016. Available from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicator.

Furthermore, significant inequalities in international Internet bandwidth capacity exist in the SPECA subregion. Although the total international Internet bandwidth capacity has increased since 2005 (see Figure 3), considerable inequalities in bandwidth capacity characterize the SPECA subregion (see Table 2). This means that some countries not only lack access to broadband but also high quality broadband services. Azerbaijan and Kazakhstan clearly lead the way in the subregion in terms of total international Internet bandwidth. The total international Internet bandwidth in Azerbaijan and Kazakhstan was 448.8 Gbps and 1,082 Gbps, respectively in 2015.

Table 2. Total international Internet bandwidth in SPECA countries, 2015

Country	Total bandwidth (Gbps)
Afghanistan	24.4
Azerbaijan	448.8
Kazakhstan	1,082
Kyrgyzstan	30.1
Tajikistan	4.5
Turkmenistan	2.4
Uzbekistan	30.7

Source: ESCAP, "Updated Analysis of the Broadband Infrastructure in Asia Pacific", Working Paper, October 2016. Available from http://www.unescap.org/resources/updated-analysis-broadband-infrastructure-asia-pacific.



Source: ESCAP, "Updated Analysis of the Broadband Infrastructure in Asia Pacific", Working Paper, October 2016. Available from http://www.unescap.org/resources/updated-analysis-broadband-infrastructure-asia-pacific.

The rapid increase in the international bandwidth in the SPECA subregion provides an opportunity for building a knowledge-based economy. There has been a dramatic increase in international bandwidth availability and it is expected to continue in the next decade in all the SPECA countries, even among the less economically-advanced economies of the subregion.[16] This provides an opportunity for the creation of an enabling environment for ICT-related innovation and investment, which can facilitate the development of a knowledge-based economy in Central Asia. The knowledge-based economy offers significant business opportunities for SMEs by reducing costs, facilitating innovation, reaching global customers, as well as creating new products and services. The next section examines the relationship between SMEs and the digital economy and the crucial role played by ICT in the SPECA subregion.

3. SMEs in the Digital Economy

SMEs are crucial economic actors in Asia and the Pacific and in the SPECA subregion in particular, as described earlier in this paper. However, SMEs in the Central Asian economies entered the private sector in the early 1990s with limited experience and were concentrated mainly in the retail sector and in services such as tourism, rather than in manufacturing and agriculture.[17] Export products from these countries consist mainly of low value-added commodities. There is, therefore, a need to build the capacity of SMEs to enhance their competitiveness, integrate into global value chains in the manufacturing, agriculture and service sectors, and diversify their economies.[18]

Innovation plays a critical role in enhancing the competitiveness of SMEs by allowing them to quickly respond to a changing business landscape and innovate themselves. For example, in many countries getting sufficient workers with adequate skill sets is proving to be a challenge for supply chain operators, resulting in processes being automated with a higher reliance on ICT.[19] However, in developing countries, where the use of the Internet for e-commerce and information sharing is limited, SMEs fail to capitalize on ICT.[20] The lack of connectivity and access to broadband Internet is one of the reasons that impede SMEs' integration into global value chains. This limits SMEs' capacity to innovate, which in turn affects their competitiveness.

Despite significant constraints faced by SMEs in the SPECA subregion, they have the potential to seize opportunities created by the growth in mobile broadband and increased access to broadband to integrate into the digital economy. Through this integration, businesses can lower their entry costs to reach both domestic and international markets.

[16] ESCAP, "Updated Analysis of the Broadband Infrastructure in Asia Pacific", Working Paper, October 2016. Available from http://www.unescap.org/resources/updated-analysis-broadband-infrastructure-asia-pacific.
[17] Masato Abe and others, *Policy Guidebook for SME Development in Asia and the Pacific* (Bangkok, ESCAP, 2012).
[18] ESCAP, *Globalization of Production and the Competitiveness of Small and Medium-sized Enterprises in Asia and the Pacific: Trends and Prospects*, Studies in Trade and Investment 65 (Bangkok, ESCAP, 2009). Available from http://www.unescap.org/sites/default/files/0%20-%20Full%20Report_28.pdf.
[19] Deborah K. Elms and Patrick Low, eds., *Global Value Chains in a Changing World* (Geneva, World Trade Organization, 2013). Available from https://www.wto.org/english/res_e/booksp_e/aid4tradeglobalvalue13_e.pdf.
[20] Masato Abe and others, *Policy Guidebook for SME Development in Asia and the Pacific* (Bangkok, ESCAP, 2012).

SMEs use the Internet for both internal and external applications. Table 3 presents the Internet use in businesses by size, for ten different usage categories in Azerbaijan and Kazakhstan where data is available. According to the data, SMEs use the Internet not only for communicating via e-mails and telephoning both internally and externally, but also for customer services and getting information about goods and services. Interacting with the government and getting information from the government are two other uses that significantly reduce the role of government intermediaries and therefore improve transparency, accountability and efficiency. In addition, SMEs use the Internet for online banking and other types of financial services.

Table 3. Internet use among businesses, by size, 2013

Source: UNCTAD, "Core indicators on ICT use in business by enterprise size class, annual, 2003-2014". Available from http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=16951.

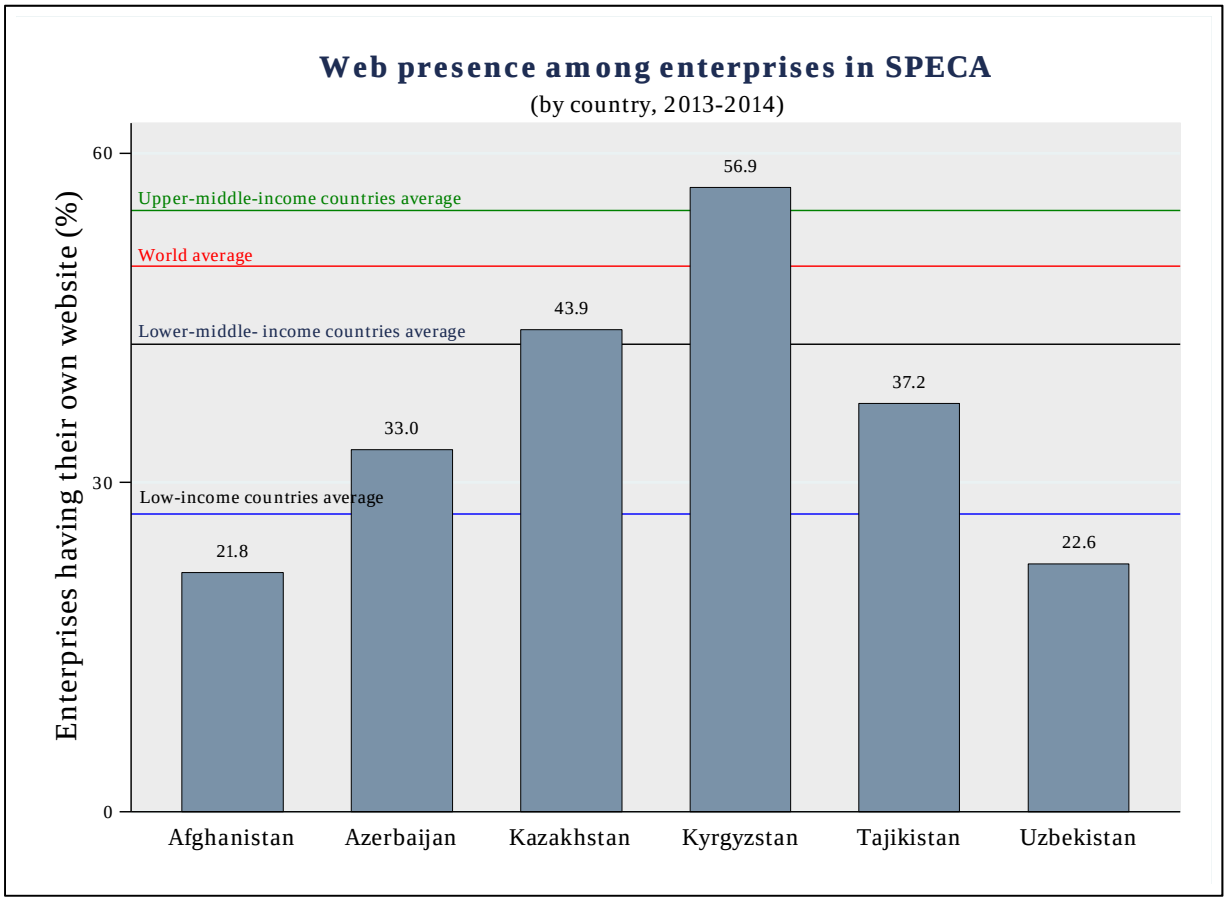
	Azerbaijan			Kazakhstan		
Types of businesses:	Micro	Small	Medium	Micro	Small	Medium
Proportion of businesses (%) using the Internet for:						
Interacting with government organizations	33.0	49.8	84.7	12.5	26.5	26.1
Sending or receiving e-mail	11.8	49.4	73.9	47.6	65.4	51.9
Getting information from government organizations	6.9	29.9	56.5	17.2	34.9	32.8
Internet banking	9.1	50.6	42.5	21.3	39.9	38.8
Instant messaging, bulletin boards	9.0	48.3	29.9	16.7	31.7	29.8
Getting information about goods and services	2.3	13.2	26.1	21.5	35.0	33.0
Providing customer services	2.4	9.2	11.2	6.4	8.7	7.4
Delivering products online	0.4	5.7	5.3	*Missing*	*Missing*	*Missing*
Telephoning over the Internet/VoIP, or using videoconferencing	0.4	4.3	2.5	9.1	12.8	13.2
Accessing other financial services	*Missing*	*Missing*	*Missing*	3.6	10.4	11.8

As a general trend, the percentage of SMEs using different types of Internet-based tools increases with the number of employees in both countries. A small fraction of SMEs engages in online activities related to customer services and less than 5.3 per cent of medium-sized businesses in Kazakhstan deliver products online. Conversely, getting information from the government is the top use for all types of businesses in the two countries. Internet banking is also one of the most important Internet uses across all SMEs. More than 38 per cent of SMEs in Azerbaijan and Kazakhstan use online banking services. Online banking offers many advantages to firms as they can instantly access their accounts, apply for loans, obtain information

about interest rates and make transactions at any time. These advantages reduce waiting and travel time. A number of studies have provided empirical evidence that demonstrates the positive impact of online banking on SMEs' finance.[21]

The most recent data provided by the United Nations Conference on Trade and Development (UNCTAD) on SMEs is limited to the two most developed economies of the subregion—Azerbaijan and Kazakhstan. However, aggregate data for the SPECA region shows extensive use of the Internet by the countries in the SPECA subregion. As Figure 4 illustrates, 37.2 per cent of Tajikistani businesses had a web presence in 2013. This figure is at the same level as the proportion of Azerbaijani and Kazakhstani enterprises having a website. Kyrgyzstan has the highest share of enterprises with websites among the SPECA countries. This share is approximately 10 percentage points[22] above the average for lower-middle income countries for which 2013 data is available. By having a website, companies can advertise their products and engage in e-commerce. The next subsection examines this use in the SPECA subregion and its implications for SMEs.

Figure 4. Web presence among enterprises in SPECA countries, 2013-2014



Source: ESCAP based on World Bank, "Enterprise Survey", 2016.

[21] For example, a study by Liang Han found that online banking reduced SMEs' financial difficulties in the United Kingdom. Liang Han, "Bricks vs. clicks: Entrepreneurial online banking behaviour and relationship banking", *International Journal of Entrepreneurial Behaviour & Research*, vol. 14, no. 1 (2008), pp. 47-60.

[22] Authors' calculation.

3.1 Growth Potential of E-commerce in the SPECA Subregion

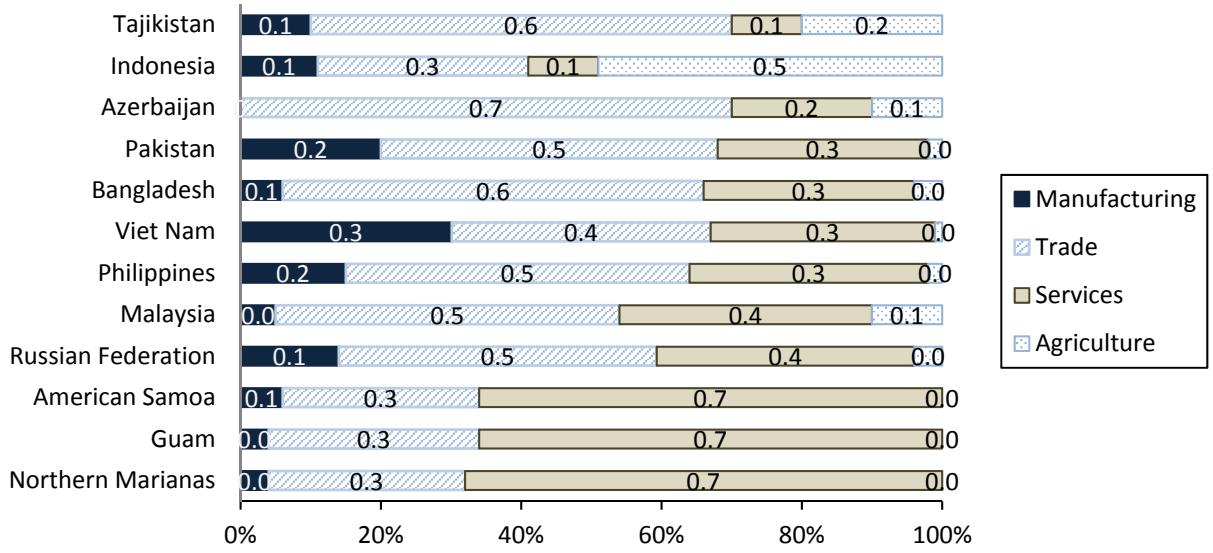
The digital economy is comprised of three components: (1) electronic business; (2) e-business infrastructure; and (3) e-commerce.[23] E-commerce[24] makes a significant contribution in the digital economy. There are various electronic relationships among stakeholders including government, businesses and customers. This may include business-to-business (B2B), business-to-customers (B2C), customer-to-customers (C2C), and business-to-government (B2G).[25]

Engaging in e-commerce generates a number of benefits for SMEs. E-commerce encourages entrepreneurship, business exports, as well as export diversification.[26] Studies show that firms engaged in e-commerce are more likely to export. In Chile, only 18 per cent of offline companies also export, while 100 per cent of online firms selling products on eBay are found to engage in exports. These online companies are found to export to 28 different countries on average, while a typical exporting offline firm sells its products and services in one or two foreign markets.[27] Similar data could be found in all emerging and advanced countries.[28] In general, SMEs characterized by heavy web use are those that have access to a larger market. Heavy web users are found to be significantly more likely to source and sell products and services to partners that are not located in their immediate region.[29] In addition, SMEs stand to significantly benefit from e-commerce platforms as far as trade costs are concerned.

SMEs encounter higher trade costs as a proportion of their yearly expenditures compared to large multinational companies. These trade costs—from transportation costs, and tariff and duties, to other related costs inside the domestic market—impose huge financial burdens on many SMEs, deterring their sustainable access to international markets.[30] SMEs are particularly constrained by their size, and therefore financial resources and capacity, to tap into the global value chains (let alone global markets) and withstand these additional external trade costs. For ESCAP countries, there is evidence that the majority of SMEs are actively participating in the trade and services sectors, and most prominently in Azerbaijan and Tajikistan (see Figure 5). Both of these sectors are directly impacted by trade costs, which affect the ability of these SMEs to tap into the global value chain.

[23] Thomas L. Mesenbourg, "Measuring the Digital Economy", U.S. Bureau of the Census, 2001.
[24] The definition of e-commerce is given in Annex IV.
[25] For more information, see UNCTAD, *Information Economy Report 2015: Unlocking the Potential of E-commerce for Developing Countries* (Geneva, 2015). Available from http://unctad.org/en/PublicationsLibrary/ier2015_en.pdf.
[26] Kati Suominen, "Aid for eTrade: Accelerating the E-commerce Revolution", *International Centre for Trade and Sustainable Development*, 12 March 2015. Available from http://www.ictsd.org/opinion/aid-for-etrade-accelerating-the-e-commerce-revolution.
[27] Ibid.
[28] Ibid.
[29] Ibid.
[30] For ESCAP countries, Pacific developing countries have the highest trade costs (> 230 ad-valorem per cent in 2012) among all ESCAP subregions, partly because of their geographic isolation and also lower trade volume compared to other countries. North Central Asia (> 160 ad-valorem per cent in 2012) and South Asian Association for Regional Cooperation (SAARC) countries (>130 ad-valorem per cent in 2012) follow closely. In the case of Pacific developing countries, the cost of any product exported to these countries will be more than double the market price when it is eventually sold for consumption. The same challenge is being faced by landlocked developing countries in the SAARC subregion.

Figure 5. Sector distribution of micro, small and medium-sized enterprises in selected ESCAP countries



Source: ESCAP based on World Bank, "MSME Indicators", December 2016.

However, there are opportunities offered by ICT connectivity, and in particular, e-commerce, to facilitate and minimize trade costs and barriers on international trade. The potential for e-commerce is greater for SMEs located in geographically isolated small island developing states and landlocked developing countries. For small island developing states, ICT connectivity could help bridge long distances. For landlocked developing countries, e-commerce could help address some unfavourable trade practices offered by neighbouring countries sharing similar borders. In a comparison between online and offline trade, the study found that the effect of distance is considerably smaller in the case of e-commerce due to lower information costs and greater trust.[31] SMEs can now use websites for marketing and e-sales channels, which have allowed them to tap into markets otherwise unreachable due to distance or political systems.[32] A survey of SMEs conducted in the Republic of Korea found that the most important impact of e-commerce is reduced transaction time and faster business processes, lower transaction costs, and ability to reach new customers.[33]

Asia and the Pacific has seen a staggering uptake and growth of online shopping, led by China, where up to a third of total retail sales are expected to be made online by 2019. B2C transactions in Asia and the Pacific hold 28 per cent of the global share,[34] with one third of the volume for international postal deliveries being small packages. This indicates that SMEs with less tradable capacities have great potentials to be able to participate in trade for niche products and services. In 2015, B2C e-commerce (online shopping) constituted on average 7.4 per cent of all retail sales worldwide, with projections to

[31] UNCTAD, *Information Economy Report 2015: Unlocking the Potential of E-commerce for Developing Countries* (Geneva, 2015). Available from http://unctad.org/en/PublicationsLibrary/ier2015_en.pdf.
[32] Ibid.
[33] Ibid.
[34] Ibid.

reach 13 per cent in 2019.[35] Japan, Republic of Korea and Singapore are other major e-commerce markets within the region.

However, the potential for SMEs to use e-commerce for trade can be limited if broadband connectivity is poor. Poor or limited connectivity is a key barrier to e-commerce for many companies. For example, in the Latin America and Caribbean region, 20 per cent of the companies engaged in exports perceive the lack of connectivity as a very significant challenge to cross-border online sales.[36] In the case of Cambodia, a report by UNCTAD[37] noted that low Internet adoption, lack of electronic payments and unreliable postal service are key challenges for e-commerce to develop. In Indonesia, barriers to e-commerce include unreliable payment systems and high trade costs, while in Viet Nam the main challenge is the unreliable electronic payment system. Another significant challenge for many countries is the lack of credible and conducive regulations to facilitate SME development.

E-commerce development and adoption are strongly influenced by the presence and quality of the information infrastructure, in particular fixed-broadband connectivity. Using the 2016 B2C E-commerce Index developed by UNCTAD and data for 137 countries, ESCAP[38] finds that fixed-broadband connectivity is strongly correlated (0.90) with B2C e-commerce (see Figure 6), which implies that enhanced broadband connectivity in the SPECA subregion is very likely to lead to the development and adoption of e-commerce by companies.

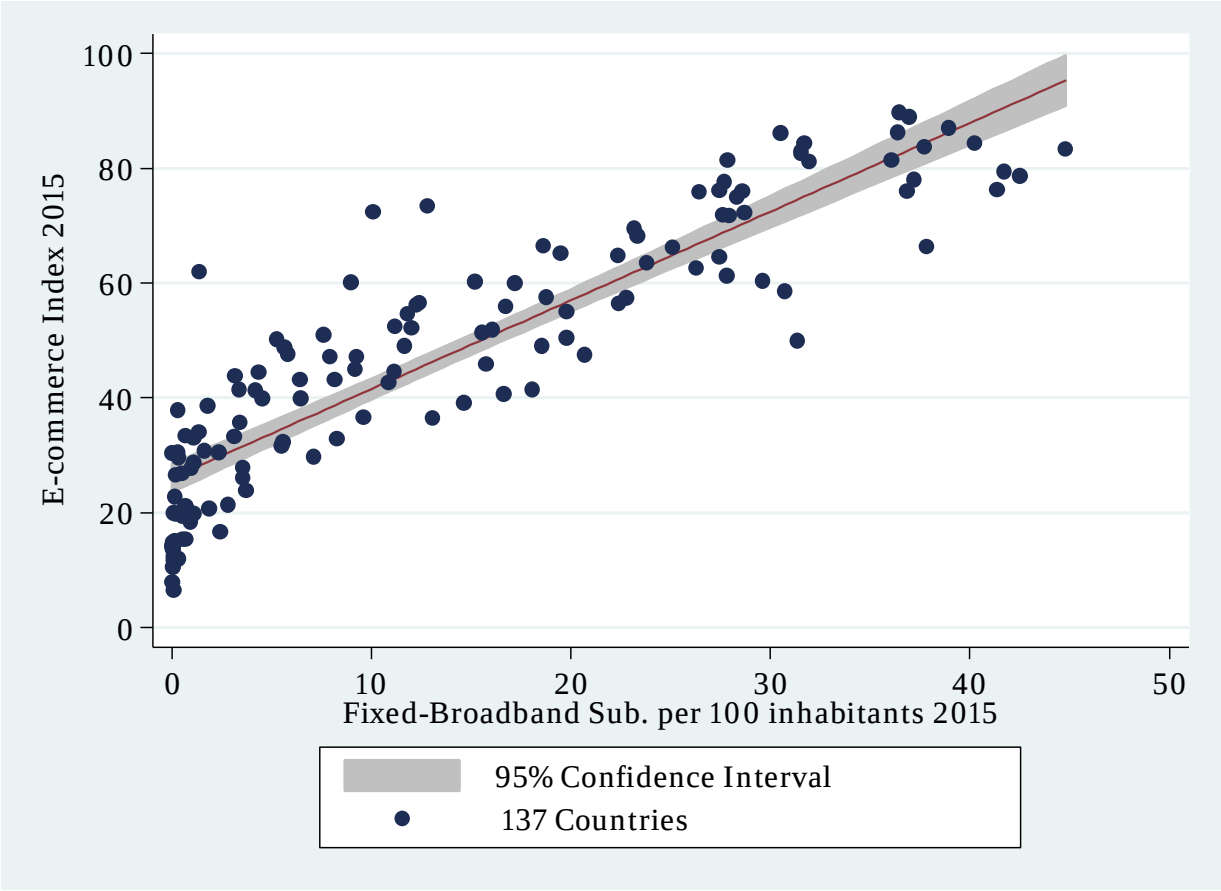
[35] Statista, "E-commerce share of total global retail sales from 2015 to 2020". Available from https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide/.

[36] Kati Suominen, “Accelerating SME Trade in Asia-Pacific: De Minimis Plurilateral”, presentation made at ESCAP, Bangkok, Thailand, 1 December 2016. Available from http://www.unescap.org/sites/default/files/19.%20Session%205-De%20Minimis%20-%20Suominen%20120116.pdf.

[37] UNCTAD, *Information Economy Report 2015: Unlocking the Potential of E-commerce for Developing Countries* (Geneva, 2015). Available from http://unctad.org/en/PublicationsLibrary/ier2015_en.pdf.

[38] ESCAP, "Updated Analysis of the Broadband Infrastructure in Asia Pacific", Working Paper, October 2016. Available from http://www.unescap.org/resources/updated-analysis-broadband-infrastructure-asia-pacific.

Figure 6. Correlation between e-commerce and fixed-broadband subscriptions per 100 inhabitants, 2015



Sources: ESCAP estimates; UNCTAD, "UNCTAD B2C E-commerce Index 2016", UNCTAD Technical Notes on ICT for Development No. 7, April 2016. Available from http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d07_en.pdf; and ITU, "Fixed-Broadband Subscriptions per 100 Inhabitants", 2015.

Many studies substantiate the crucial role played by broadband penetration on e-commerce adoption and development. For example, Rodriguez-Ardura and Meseguer-Artola[39] show that the proportion of consumers having access to broadband Internet is a crucial component of the technological readiness of the market, which in turn impacts e-commerce adoption. Even in countries where the Internet infrastructure is widely deployed, broadband adoption appears to be a crucial explanatory factor for gaps in terms of e-commerce adoption.[40] A study[41] found that companies can create websites to improve their customer experience if broadband is used by a large fraction of the population.

[39] Inma Rodríguez-Ardura and Antoni Meseguer-Artola, "Towards a longitudinal model of e-commerce: Environmental, technological and organisational drivers of B2C adoption", *The Information Society*, vol. 26, no. 3 (2010), pp. 209-227.
[40] Stewart Adam and others, "E-marketing in perspective: A three country comparison of business use of the Internet", *Marketing Intelligence & Planning*, vol. 20, no. 4 (2002), pp. 243-251.
[41] Inma Rodríguez-Ardura, Antoni Meseguer-Artola and Jordi Vilaseca-Requena, "Factors influencing the evolution of electronic commerce: An empirical analysis in a developed market economy", *Journal of Theoretical and Applied Electronic Commerce Research*, vol. 3, no. 2 (August 2008), pp. 18-29.

SPECA countries generally lag behind other subregions in the adoption of e-commerce. From available data for the most ICT-developed countries in the SPECA subregion, Kazakhstan's B2C e-commerce constituted only 2 per cent of all retails sales in 2015, and 0.05 per cent in Azerbaijan.[42] In 2013, only 1 per cent of all Internet users in Azerbaijan were classified as Internet shoppers. In both countries, consumers preferred foreign online retailers, but local retailers have recently gained market share. [43] The reasons for low adoptions rates are multiple, including comparatively low levels of critically important high-speed broadband Internet access, and insufficient regulatory frameworks to protect both buyers and sellers.[44] UNCTAD's biennial B2C E-commerce Index also identified low shares of individuals with credit cards, secure Internet servers and postal reliability as factors influencing e-commerce adoption, with countries in the SPECA subregion performing relatively poorly in all areas (see Table 4). The table shows that there is scope for considerable improvements in e-commerce indicators in the SPECA subregion.

Van Hoove and Karimov[45] note that due to the low adoption of credit cards, e-commerce sites in the subregion have no alternative but to accept non-electronic payment methods, hindering the convenience associated with online purchases. The authors also note that due to poor reliability of postal services, a number of sites have set up delivery channels of their own, and draw parallel with China's leading e-commerce website, Taobao, which built its own distribution network, enabling an increase in the control over the distribution and a secure payment-on-delivery system. E-commerce is set to grow in Central Asia, once these hurdles are overcome, highlighting the need for affordable, high-speed and resilient Internet and broadband access. Market-research company, yStats.com,[46] predicts that Kazakhstan will maintain a double-digit growth rate in online retail.

[42] yStats.com, "Central Asia and Caucasus B2C E-Commerce Market 2015", 2015. Available from http://myemail.constantcontact.com/Kazakhstan--Azerbaijan--B2C-E-Commerce-markets-with-untapped-potential.html?soid=1102552213913&aid=A6omrBPiJQo.
[43] Ibid.
[44] Alisa DiCaprio and Jeff Procak, "A snapshot of e-commerce in Central Asia", *Asian Development Blog*, 18 January 2016. Available from https://blogs.adb.org/blog/snapshot-e-commerce-central-asia.
[45] Leo Van Hove and Farhod P. Karimov, "The role of risk in e-retailers' adoption of payment methods: Evidence for transition economies", *Electronic Commerce Research*, vol. 16, no. 1 (2016), pp. 27-72.
[46] yStats.com, "Central Asia and Caucasus B2C E-Commerce Market 2015", 2015. Available from http://myemail.constantcontact.com/Kazakhstan--Azerbaijan--B2C-E-Commerce-markets-with-untapped-potential.html?soid=1102552213913&aid=A6omrBPiJQo.

Table 4. B2C e-commerce indicators by country

Country	B2C E-commerce (2015)	Share of individuals using Internet (2014 or latest)	Share of individuals with credit card (15+, 2014 or latest)	Secure Internet servers per 1 million people (normalized, 2014)	UPU postal reliability score (2013- 14)	UNCTAD B2C E-commerce Index value 2015	UNCTAD B2C e-commerce rank 2016 (2014)
Afghanistan	*Missing*	6	1	31	18	14.1	130 (101)
Azerbaijan	0.05% (2015)	61	9	53	79	50.5	50 (*Not available*)
Kazakhstan	2% (2015)	55	11	54	26	36.5	88 (64)
Kyrgyzstan	Missing	28	3	50	14	23.8	109 (*Not available*)
Uzbekistan	Missing	44	1	36	24	26.1	108 (78)

Source: UNCTAD, "UNCTAD B2C E-commerce Index 2016", UNCTAD Technical Notes on ICT for Development No. 7, April 2016. Available from http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d07_en.pdf.

3.2 Emerging ICT Technologies and Usage

The proliferation of innovative technologies has generated new opportunities and usage, and is increasingly proving to be a game changer for businesses and people. Technological advancements such as the "Internet of Things", which enables multitude of devices and appliances to connect over the Internet, have opened up tremendous opportunities for innovations and cutting-edge solutions to some of the most pressing issues. Intelligent things such as drones and autonomous vehicles that use applied artificial intelligence and machine learning to deliver advanced behaviours (such as self-driving) are increasingly recognized as having transformative capacity for businesses.[47] Intelligent applications, such as virtual personal assistants, can make everyday tasks such as prioritizing e-mails simpler and faster.[48] Through cloud computing, firms reduce the cost that they would have otherwise incurred on acquiring software and hardware equipment. They can also pay on-demand for storage services, and prices are tailored to their needs.[49]

The development of superfast broadband via fibre optic networks in the subregion will undoubtedly increase the proportion of SMEs using cloud computing, as other countries are following this trend.[50] Examining SMEs located in a region of the United Kingdom, Lacohee and Phippen report that the introduction of superfast broadband has increased the proportion of businesses carrying out their

[47] Information Management, "Gartners Top 10 Strategic Technology Trends for 2017", 28 October 2016. Available from http://www.information-management.com/gallery/oct-top-reader-pick-top-10-strategic-technology-trends-for-2017-10030046-1.html.
[48] Ibid.
[49] Federico Etro, "The economic impact of cloud computing on business creation, employment and output in Europe", *Review of Business and Economics*, vol. 54, no. 2 (2009), pp. 179-208.
[50] Andy Phippen and Hazel Lacohee, *The Impact of Fibre Connectivity on SMEs: Benefits and Business Opportunities* (Cham, Springer International Publishing AG, 2016).

activities online. This qualitative study shows that communicating with customers, collaborators and suppliers has become easier with video chat applications, and business opportunities have been created through the use of social networks. This has reduced telephony costs and the need to travel. In addition, the use of paper in some office functions has become unnecessary, which has increased efficiency. Overall, businesses have become more flexible and productive. The study also finds that remote working has become the norm after the introduction of superfast broadband.

The growing availability and importance of online labour forces will encourage a significant proportion of SMEs to outsource many tasks on the Internet. It will favour the emergence of individual companies as workers can be hired as independent contractors by international clients through websites offering online labour services. Through Internet-based outsourcing, SMEs have the potential to become more efficient, and therefore competitive, as they have access to a large market of diverse skills, which can be hired on an on-demand basis.[51] Consequently, companies will increasingly depend on ICT to perform everyday tasks.

These technologies can radically reshape companies and provide several benefits such as decreased service costs, improved equipment downtime, increased efficiency gains and higher customer satisfaction. For governments these technologies can be used to create "smarter cities" by improving access to energy, health, transport and education, which support SMEs among others, and create new business opportunities for SMEs. Despite the fact that emerging ICTs and usage will lead to considerable potential economic gains, businesses need to act fast and adopt digital technologies to capture the growing digital market.[52] Building a resilient digital economy requires new types of governance, leadership and behaviours.[53]

SMEs face a number of challenges in their path towards reaping the benefits of the digital economy, one of them being natural disasters. When the Internet is the cornerstone of commerce, Internet disruptions for even a short time can have potentially devastating economic effects on SMEs and the economy overall. Without building the e-resilience of the SPECA subregion to disasters, any potential gains to the economy may be lost overnight. The next section will present the types of disaster risks and their potential impacts in the SPECA subregion.

[51] Vili Lehdonvirta and others, "Online labour markets – leveling the playing field for international service markets?" Paper presented at IPP2014: Crowdsourcing for Politics and Policy Conference, Oxford, United Kingdom, 25-26 September 2014.
[52] Silja Baller, Soumitra Dutta and Bruno Lanvin, eds., *The Global Information Technology Report 2016: Innovating in the Digital Economy* (Geneva, World Economic Forum, 2016). Available from http://www3.weforum.org/docs/GITR2016/GITR_2016_full%20report_final.pdf.
[53] Ibid.

4. The Challenges posed by Disasters in Building a Resilient Digital Economy in the SPECA Subregion

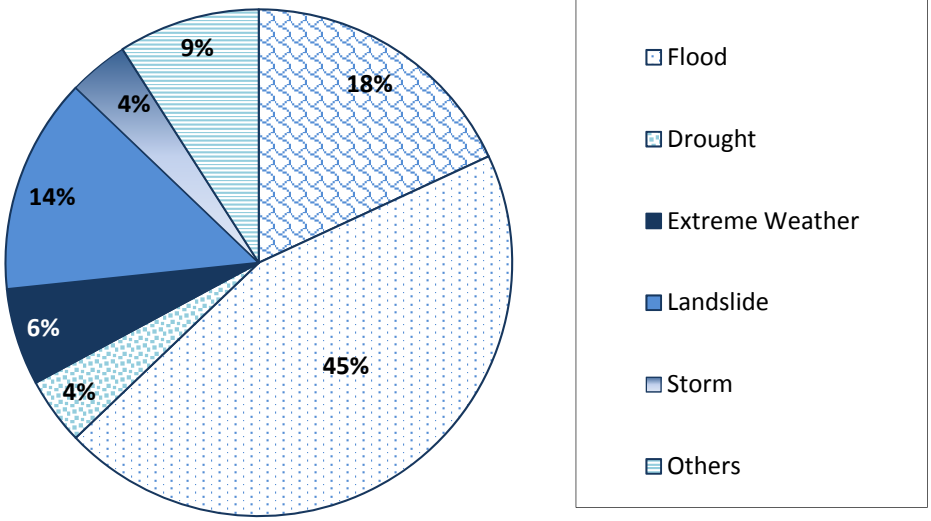
In Central Asia, building resilient ICT is vital to mitigate disaster risks and promote resilient development. The subregion is highly exposed and vulnerable to many disasters such as earthquakes, floods, landslides, mudslides/debris flows, dust and sandstorms and climate-related disasters such as drought and extreme temperatures. It is one of the most seismically active areas in the world with the majority of the population in many countries concentrated within areas of high to very high seismic hazards. In addition, a large portion of SPECA countries' economic activity, including trade, industrial output and services, as well as national governments of all countries except Kazakhstan, are concentrated in the most hazard-prone areas.[54] The high exposure of the population, ICT infrastructure and economic activities to various hazards exacerbates the disaster risks in the SPECA countries. Disasters have the potential to jeopardize developmental gains, and in some cases, when one disaster is followed by another, it can have potentially catastrophic cascading effects.

This substantial exposure to disasters has caused sizeable human and economic losses in the SPECA subregion (see Annex I for a detailed analysis). During the period 2000-2015, the 210 disasters reported caused 10,639 deaths and affected more than 16 million people in the SPECA subregion. Floods were the most frequent disasters, followed by earthquakes and landslides. However, earthquakes represented the highest risk in terms of potential loss of lives and economic damage. Out of the reported disasters during 2000-2015, 45 per cent were floods, 18 per cent were earthquakes, 14 per cent were landslides, 6 per cent were extreme weather events, and 4 per cent were droughts (see Figure 7). During the same period, disasters caused USD 1.9 billion in economic damage.[55] Floods were the costliest disasters, followed by droughts and earthquakes (Figure 8). During 2000-2015, floods were the costliest disasters in Tajikistan (USD 307 million) and Kazakhstan (USD 253 million). In the less developed countries of the SPECA subregion, droughts were the costliest disaster. Azerbaijan was the only developed country where drought was the costliest disasters.

[54] Michael Thurman, "Natural Disaster Risks in Central Asia: A Synthesis", *United Nations Development Programme*, 11 April 2011. Available from http://www.undp.org/content/dam/rbec/docs/Natural-disaster-risks-in-Central-Asia-A-synthesis.pdf.

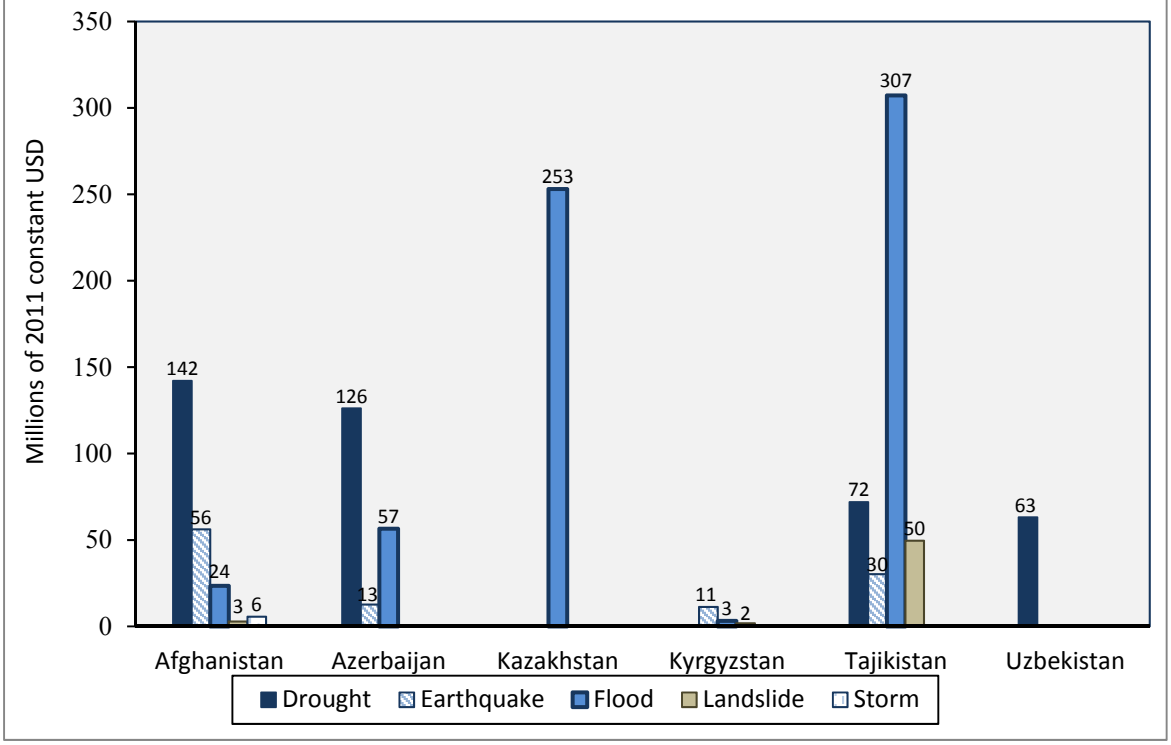
[55] In this paper, "damage" refers to the damage to property, livestock and crops, and "losses" refers to negative impacts in business activities, income generation and increase in the cost of production caused indirectly as a consequence of damage.

Figure 7. Share of disasters in the SPECA subregion by number of occurrences, 2000-2015



Source: ESCAP based on data from Centre for Research on the Epidemiology of Disasters, "EM-DAT: The International Disaster Database", 2015.

Figure 8. Disaster damage in the SPECA subregion, 2000-2015



Source: ESCAP based on data from Centre for Research on the Epidemiology of Disasters, "EM-DAT: The International Disaster Database", 2015.

A large proportion of the population and economic activity is concentrated within areas of high to very high seismic hazard. Earthquake risk is the predominant risk for all countries in the SPECA subregion. Since 2000, 37 major earthquakes that hit the subregion caused huge economic loss. In Tajikistan alone, during the period 2010-2015, the 145 earthquakes registered caused USD 4.7 million in damage.[56] A large number of major cities and population centres have experienced major earthquakes in the past decade. In 1966, Tashkent, the capital of Uzbekistan was devastated by a 7.5 magnitude earthquake and over 300,000 people became temporarily homeless.[57] A catastrophic earthquake hit Ashgabat in 1948 resulting in 110,000-176,000 deaths.[58] A year later, the Khait earthquake occurred in Tajikistan, triggering massive landslides and causing an estimated 12,000 deaths. The largest city in Kazakhstan, Almaty, was severely damaged in the past due to earthquakes between 1887 and 1911, and the capital of Tajikistan, Dushanbe suffered a devastating earthquake in 1907. A major earthquake struck Afghanistan in 1998 and caused an estimated 4,700 deaths.[59]

Experts suggest that in most countries, a majority of the population is concentrated within areas of high or very high seismic hazard. In Kyrgyzstan, the percentage of the population concentrated within high or very high risk areas is 99.9 per cent, in Tajikistan 88.3 per cent, and in Uzbekistan 80.4 per cent. In Turkmenistan 97 per cent and in Kazakhstan 43.6 per cent of the population is within a moderate to very high hazard area.[60]

Moreover, a large portion of these countries' ICT infrastructure and economic activity, including trade, industrial output and services, as well as national governments of all countries (except Kazakhstan), is concentrated in the most hazard-prone areas.[61] A major earthquake in the SPECA subregion can have devastating impacts on the economy. For example, Tajikistan might lose roughly a fifth of its GDP from a major seismic event.[62] It is estimated that due to the increase in population and the low building standards, the damage will be even higher today if earthquakes of past severity were to recur. A study by the United Nations and the World Bank showed that if the earthquake that hit Dushanbe, Tajikistan in 1907 were to recur today, it could cause around 55,000 deaths and over USD 1 billion in economic damage.[63] Moreover, seismic events can lead to secondary disasters including landslides, mudflows and the formation of glacial lakes and outburst floods.

Floods are the most frequent and costliest disaster. In addition to seismic risks, the SPECA subregion suffers from frequent flooding. Floods are more frequent in the mountainous region of Central Asia. For

[56] World Bank, *Kazakhstan – Southeast Europe and Central Asia Catastrophe Risk Insurance Facility* (Washington D.C., 2015).
[57] Johannes F. Linn, "Protection Against Severe Earthquake Risks in Central Asia", *Brookings*, 23 March 2010. Available from https://www.brookings.edu/opinions/protection-against-severe-earthquake-risks-in-central-asia/.
[58] Ibid.
[59] National Centers for Environmental Information, "National Geophysical Data Center / World Data Service: Significant Earthquake Database". Available from https://www.ngdc.noaa.gov/nndc/struts/form?t=101650&s=1&d=1.
[60] Michael Thurman, "Natural Disaster Risks in Central Asia: A Synthesis", *United Nations Development Programme*, 11 April 2011. Available from http://www.undp.org/content/dam/rbec/docs/Natural-disaster-risks-in-Central-Asia-A-synthesis.pdf.
[61] Ibid.
[62] Johannes F. Linn, "Protection Against Severe Earthquake Risks in Central Asia", *Brookings*, 23 March 2010. Available from https://www.brookings.edu/opinions/protection-against-severe-earthquake-risks-in-central-asia/.
[63] Global Facility for Disaster Reduction and Recovery, *Disaster Risk Management Programs for Priority Countries* (Washington D.C., 2009). Available from http://www.unisdr.org/files/14757_6thCGDRMProgramsforPriorityCountrie.pdf.

example, in Tajikistan an average of over 70 flooding events occur every year.[64] The flooding risk is compounded by the fact that agriculture is a major sector in most of the countries, which means that populations tends to live near areas with access to water, such as river basins.[65] Most capital cities in the SPECA subregion are very densely populated, and are located in either medium-risk areas (e.g., Kabul, Astana, Tashkent and Bishkek) or high-risk areas (e.g., Baku). As a consequence, floods pose a serious threat on the economic activity of these cities. Since 2000, floods have caused the highest recorded economic damage and the maximum number of deaths in the SPECA subregion (see matrix in Annex I). In ThinkHazard's classification, a major flooding event will occur with a probability higher than 10 per cent in the next 10 years.[66] According to available records, the rising intensity of rainfall has also led to frequent flash floods and mudflows. It is estimated that 26 per cent of the Kazakhstani territory, which contains a quarter of the country's population, is subject to mudflows.[67]

Disasters combined with other vulnerabilities can result in "compound crisis". Other significant risks include drought and extreme weather events. All countries are subject to medium or high risks of drought, with the exception of Azerbaijan, according to ThinkHazard's classification.[68] In the period 2000-2015 droughts caused substantive damage in the SPECA countries such as Afghanistan, Azerbaijan, Tajikistan and Uzbekistan (see Figure 8). Moreover, drought and extreme weather events particularly affect food production in the SPECA subregion. For example, as a result of the 2008-2009 major drought events, the annual Afghan, Tajikistani and Turkmen wheat production declined by 60.5 per cent, 24.5 per cent and 25 per cent, respectively.[69] In some cases, disasters combined with other vulnerabilities can result in a major crisis. This was experienced in 2007-2008 in Tajikistan and Kyrgyzstan when they faced an unexpected "compound crisis" as a result of hydrological drought and extreme weather combined with vulnerabilities such as rising food prices, macroeconomic uncertainties, issues in energy transmission and lower access to remittances.[70] This resulted in major issues in food security and heating for the majority of households and critical public utilities.

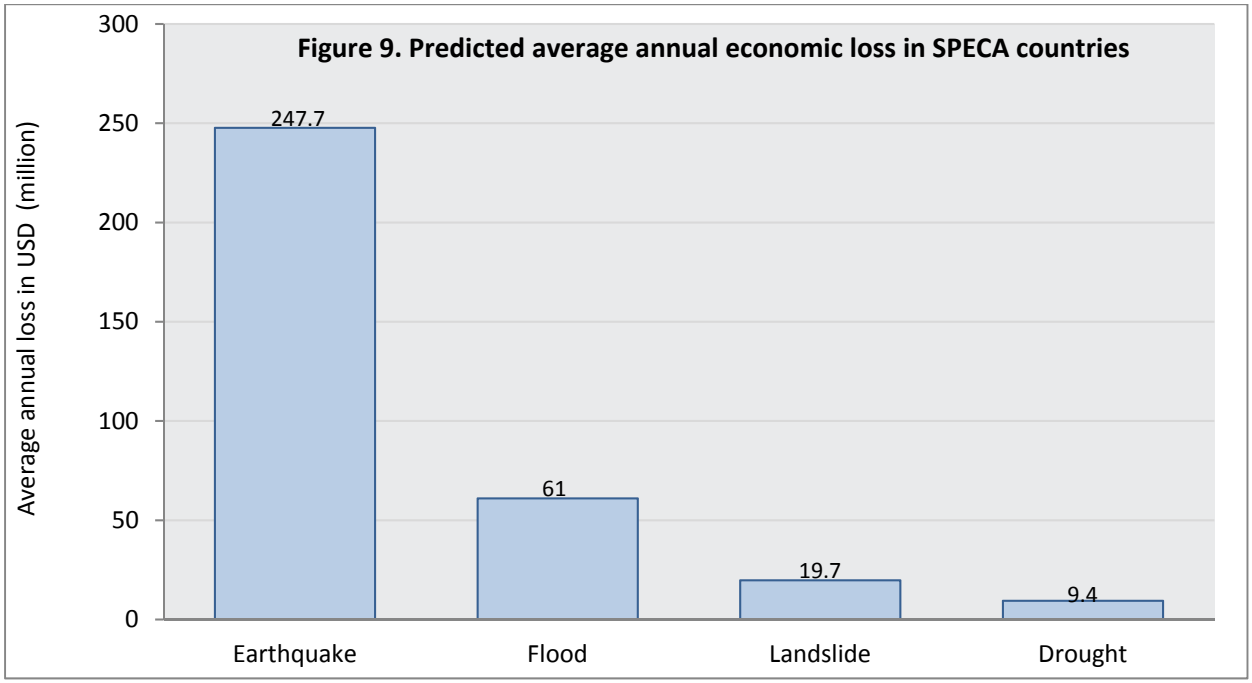
Risk from landslides is high. All countries in the SPECA subregion are classified as high risk for landslides.[71] Landslides are common in the mountainous region of Central Asia. Tajikistan contains around 50,000 landslide sites, of which about 1,200 threaten lives and livelihoods.[72] Landslides caused substantive damage in Tajikistan (USD 42 million) from the period 2000-2015. During the same period, Kyrgyzstan had

[64] Michael Thurman, "Natural Disaster Risks in Central Asia: A Synthesis", *United Nations Development Programme*, 11 April 2011. Available from http://www.undp.org/content/dam/rbec/docs/Natural-disaster-risks-in-Central-Asia-A-synthesis.pdf.
[65] Ibid.
[66] Global Facility for Disaster Reduction and Recovery, "ThinkHazard!" Available from http://thinkhazard.org/.
[67] World Bank, "World Development Indicators", 2016. Available from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicator.
[68] Global Facility for Disaster Reduction and Recovery, "ThinkHazard!" Available from http://thinkhazard.org/.
[69] United States Department of Agriculture, "Commodity Intelligence Report – Middle East & Central Asia: Continued Drought in 2009/10 Threatens Greater Food Grain Shortages", 16 September 2008. Available from http://www.pecad.fas.usda.gov/highlights/2008/09/mideast_cenasia_drought/.
[70] Michael Thurman, "Natural Disaster Risks in Central Asia: A Synthesis", *United Nations Development Programme*, 11 April 2011. Available from http://www.undp.org/content/dam/rbec/docs/Natural-disaster-risks-in-Central-Asia-A-synthesis.pdf.
[71] Global Facility for Disaster Reduction and Recovery, "ThinkHazard!" Available from http://thinkhazard.org/.
[72] Michael Thurman, "Natural Disaster Risks in Central Asia: A Synthesis", *United Nations Development Programme*, 11 April 2011. Available from http://www.undp.org/content/dam/rbec/docs/Natural-disaster-risks-in-Central-Asia-A-synthesis.pdf.

approximately 5,000 landslides, of which 3,500 at various levels of activity were located in the southern part of the country.

Estimating Future Losses

Estimating potential future losses is important for making decisions on investments in disaster risk reduction, SMEs and ICT infrastructure. One way to estimate potential future losses is to consider the average annual loss (AAL).[73] The AAL can provide an indication of the amount of savings a country needs every year to cover the cost of long-term losses from that hazard. A study conducted by the United Nations and the World Bank[74] analysed the projected economic loss in the absence of mitigation efforts in the form of AAL, based on 20 years of data during the period 1988-2007.The study shows that the AAL from earthquakes and floods is very high. As seen in Figure 9, the AAL for earthquake in the SPECA countries (excluding Afghanistan) is as high as USD 247.7 million, followed by USD 61 million for flood. Furthermore, a country-wide analysis shows that in Uzbekistan the AAL from an earthquake is estimated to be as high as USD 89.2 million, in Turkmenistan USD 71.2 million and in Kazakhstan USD 59 million. Similarly, the AAL for floods is USD 41.1 million in Tajikistan. More recent data shows that the predicted AAL for the SPECA subregion from multiple hazards will be as high as USD 2 billion. The predicted AAL from multiple hazards is highest for Kazakhstan at USD 865 million.[75]



[73] AAL is the estimated average loss annualized over a long time period considering the full range of loss scenarios relating to different return periods. United Nations Office for Disaster Risk Reduction, *Global Assessment Report on Disaster Risk Reduction 2015: Annex 1* (Geneva, 2015). Available from http://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/Annex1-GAR_Global_Risk_Assessment_Data_methodology_and_usage.pdf.

[74] Global Facility for Disaster Reduction and Recovery, *Disaster Risk Management Programs for Priority Countries* (Washington D.C., 2009). Available from http://www.unisdr.org/files/14757_6thCGDRMProgramsforPriorityCountrie.pdf.

[75] United Nations Office for Disaster Risk Reduction, *Global Assessment Report on Disaster Risk Reduction 2015: Annex 1* (Geneva, 2015). Available from http://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/Annex1-GAR_Global_Risk_Assessment_Data_methodology_and_usage.pdf.

Source: ESCAP based on calculations from Global Facility for Disaster Reduction and Recovery, *Disaster Risk Management Programs for Priority Countries* (Washington D.C., 2009). Available from http://www.unisdr.org/files/14757_6thCGDRMProgramsforPriorityCountrie.pdf.
Note: Does not include data for Afghanistan.

Disasters can have a significant impact on the private sector's growth and profit particularly among SMEs. According to a study, when an uninsured business loses 10 per cent of its capital, it would need to make a profit of 11 per cent to return to its pre-disaster capital level, and a 50 per cent loss would require a profit of 100 per cent to return to the same level.[76] Investment in disaster risk management is proven to be more cost effective than paying for losses after a disaster.

SMEs are the backbone of the economy and play a key role in economic sustainability and employment generation, as illustrated earlier in this paper. In most countries in the Asia-Pacific region, SMEs employ over half the labour forces and contribute approximately 20-50 per cent to the GDP.[77] SMEs are particularly vulnerable to disasters due to a generally lower capacity to absorb disaster impacts. Yet, they have limited financial resources and limited access to advisory services or risk finance, and hence lack the capacity to invest in disaster risk management.[78] Building resilient ICT infrastructure, particularly for SMEs, can protect the livelihoods of people and help to manage disaster risks.

ICT is a critical tool for growth and business development and needs to be protected from the adverse effects of disasters. ICT is also an essential tool for managing disaster risks. As disasters become more frequent, building e-resilience is a strategic investment that can have substantial payoff in the future

5. Building a Resilient Digital Economy in the SPECA Subregion

ICT is both a tool for disaster risk reduction initiatives and an asset that needs to be protected to avoid business failures and their consequences on people's lives and economy. The following segments examine how SMEs and governments in the SPECA subregion can implement ICT resilience strategies as a foundation for a resilient digital economy in Central Asia. It includes a description of the critical elements needed to build a resilient digital economy, with a focus on SMEs in Central Asia.

5.1 Business Continuity Plan for SMEs in the SPECA Subregion

As the section above has shown, the SPECA subregion is particularly vulnerable to disasters. Despite this vulnerability, business continuity plans (BCPs) among SMEs are lacking in the subregion. For example, less than 2 per cent of the SMEs in Kazakhstan are insured against natural disaster risks.[79] A similar pattern

[76] ESCAP, *Disasters without Borders: Regional Resilience for Sustainable Development* (Bangkok, 2016). Available from http://www.unescap.org/sites/default/files/Full%20Report%20%20%5BLow-Res%5D.pdf.
[77] Ibid.
[78] ADPC, "Asian Business Forum 2016: Risk Reduction and Resilience Building", April 2016. Available from http://www.adpc.net/igo/contents/blogs/ABF2016/download/12Apr/ABRF2016-Technical%20Note%20and%20Agenda%2011%20Apr.pdf.

[79] World Bank, *Kazakhstan – Southeast Europe and Central Asia Catastrophe Risk Insurance Facility* (Washington D.C., 2015).

emerges in the Asia-Pacific region in terms of limited disaster preparedness as 83 per cent of the SMEs surveyed in the Asia-Pacific Economic Cooperation (APEC) economies indicated that they did not have any BCPs.[80] Furthermore, the lack of awareness, information, knowledge and skills among management and employees is perceived by SMEs as a major obstacle for BCP preparation. In addition, 47 per cent of the APEC survey respondents indicated that they were not aware of the existence of BCPs.[81]

These numbers are extremely low considering the high exposure and vulnerability to natural disasters that usually characterizes SMEs. Disasters have a serious impact on SMEs even in more developed countries. In the United States, a quarter of small businesses never recover after a catastrophic event such as a flood or a wildfire according to the Insurance Institute for Business and Home Safety.[82] In addition, natural disasters can cause severe disruptions through value chain mechanisms and linkages. Among the SMEs that ceased their operations in the aftermath of the March 2011 catastrophe in Japan, 90 per cent of them went bankrupt due to indirect damage caused by supply chain and production issues and 88 per cent were located outside the impacted region.[83]

The lack of disaster preparedness for SMEs is attributable to several obstacles such as a lack of awareness among employees and management, a lack of resources, expertise and information about managing disaster risks,[84] and gaps in policy and institutional arrangements. Implementing disaster risk reduction practices may also be perceived as a cost by SMEs, as they may not be aware of their potential beneficial impacts in the long run. SMEs may underestimate the likelihood of disasters, as well as the extent of their consequences, and result in adopting a short-term profit-maximization strategy. Governments and SMEs can adopt different practices to enhance business resilience in the SPECA subregion and overcome these obstacles.

As a first step in building resilient infrastructure and businesses, risk assessment and risk identification should be carried out to minimize disaster risks. Based on the risk assessment, businesses can decide to either limit their exposure to the hazards or not invest in disaster-prone areas.[85]

5.2 ICT Infrastructure Resilience

Due to the highly interconnected nature of modern economies and their reliance on the ICT infrastructure, it is critical to ensure that the ICT infrastructure is redundant, reliable and resilient. However, in the SPECA region an analysis of the transmission map of fibre optic cables shows that these cables in many countries are exposed to seismic, flood and landslide risks. This means that disasters such as earthquake and

[80] Asian Disaster Reduction Center, "BCP Status of the SMEs in the Asia-Pacific Region 2012", 2012. Available from http://www.adrc.asia/publications/bcp/survey_2012.pdf.
[81] Ibid.
[82] Organisation for Economic Co-operation and Development, *Financial Management of Flood Risk* (2016). Available from http://www.oecd.org/daf/fin/insurance/Financial-Management-of-Flood-Risk.pdf.
[83] Wei-Sen Li, "Experience of APEC in Disaster Management: Importance of BCP", in *Disaster Management and Private Sectors: Challenges and Potentials*, Takako Izumi and Rajib Shaw, eds. (Springer Japan, 2015).
[84] Asian Disaster Reduction Center, "BCP Status of the SMEs in the Asia-Pacific Region 2012", 2012. Available from http://www.adrc.asia/publications/bcp/survey_2012.pdf.
[85] Asian Disaster Preparedness Center, ESCAP and R3ADY Asia-Pacific, "Resilient Business for Resilient Nations and Communities", 2015. Available from http://www.unescap.org/sites/default/files/2015-kpf6Jv-ADPC-Resilient.Business.FRNC_pdf.

landslide can sever the optical fibres causing massive disruptions to communication networks and subsequently business operations. This can further exacerbate and compound the impact of disasters.

To ensure e-resilience against external shocks, infrastructure redundancy and reliability are essential in the SPECA subregion. In the 2015 Internet outage in Azerbaijan, 78 per cent of the Internet connectivity in the country was lost after a fire affected the data centre of the country's main Internet service provider. Similar types of Internet outages can lead to major disruptions of SME services and operations, impacting e-payment systems and other mission-critical applications. The above-mentioned incident is attributable to the limited number of network routes developed to access the Internet, resulting in limited redundancy and resilience. Table 5 shows a classification of countries according to the level of risks of Internet disconnection in 2014.

Table 5. Risk of Internet disconnection, 2014

High risk	Moderate risk	Low risk
-Turkmenistan	-Azerbaijan	-Afghanistan
-Uzbekistan	-Tajikistan	-Kazakhstan
	-Kyrgyzstan	

Source: Oracle Dyn, "Syria, Venezuela, Ukraine: Internet Under Fire", 26 February 2014. Available from http://research.dyn.com/2014/02/internetunderfire/.

Turkmenistan and Uzbekistan were classified as being at high risk of Internet disconnection, as these two countries had only one or two service providers linking the country to the Internet. Azerbaijan, Tajikistan and Kyrgyzstan were exposed to moderate risk of Internet disconnection as these countries had between three to ten service providers linking the country to the Internet. Only Afghanistan and Kazakhstan were in the low-risk category, and no country in the SPECA subregion was classified as resistant to Internet disconnection.[86]

In order to avoid Internet outages such as the incident in Azerbaijan in 2015, more emphasis could be placed on network redundancy and diversification in the development of the ICT infrastructure. Some current and future infrastructure projects in the SPECA subregion could help address this challenge. The fibre optic cable from Azerbaijan and Turkmenistan through the Caspian Sea and the Trans-Eurasian Information Super Highway (TASIM) project initiated by Azerbaijan will increase resilience by offering redundancy in terrestrial links, as promoted in the AP-IS.[87] E-resilience is one of the four pillars of the AP-IS initiative.

[86] Oracle Dyn, "Syria, Venezuela, Ukraine: Internet Under Fire", 26 February 2014. Available from http://research.dyn.com/2014/02/internetunderfire/.

[87] ESCAP, "Asia-Pacific Information Superhighway". Available from http://www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway.

5.3 Legal, Regulatory and Policy Implications

The 2015 Internet outage in Azerbaijan illustrates the need for an enabling ICT policy and regulatory framework. This can be achieved if governments create and impose minimum standards on critical ICT infrastructure. Examples of requirements on data centre service providers could include the need for temperature and smoke monitoring, conduct of location risk assessment, building of structural resistance to disasters, and ensuring the availability of redundant power sources and adequate equipment protection. Currently, only three data centres in the SPECA subregion (one in Azerbaijan and two in Kazakhstan, including the National Bank of Kazakhstan's backup centre) have obtained Tier III certification from the Uptime Institute.[88] These data centres are very new. The data centre owned by the Azerbaijani Ministry of ICT run by AzInTelecom, as well the new data centre run by Kazakhtelecom located in Pavlodar, which is the biggest data centre in Central Asia, were respectively certified in 2016 and 2013. This demonstrates that government authorities and state-owned companies take data centre robustness seriously. Certifications from think tanks such as Uptime Institute and industry associations could serve as a basis for defining regulatory standards for new data centres.

Legal and regulatory requirements could be imposed on network providers to ensure that base stations are located away from potential hazards and in protected and easy-to-access places in order to connect portable generators for example, and therefore avoid power restoration problems. The presence of permanent onsite gensets could also contribute to base stations resilience to disasters,[89] and appropriate rules and regulations could encourage this practice.

More generally, critical infrastructure such as roads, ICT and electricity supply are highly interdependent and governments have to ensure reliable services of all of them as the operations of these infrastructures influence each other when a disaster strikes.[90] For example, if an electricity outage occurs due to a disaster, roads will be critical to supply diesel for local power generation units to avoid communication network outages. Robust roads would also facilitate the deployment of cell on wheels/cell on trucks to restore communication if base stations are out of service.[91]

An enabling policy environment, especially in the ICT sector, will be crucial as it can contribute to the elimination of information failures for SMEs by facilitating the access to technological information, which allows firms to start new profitable economic activities or to diversify. As far as the demand side is concerned, a good regulatory environment is necessary to help increase confidence among the trading community in the case of e-commerce solutions.[92]

[88] See Uptime Institute, "Uptime Institute Tier Certifications". Available from https://uptimeinstitute.com/TierCertification/.
[89] Alexis Kwasinski, "Lessons from field damage assessments about communication networks power supply and infrastructure performance during natural disasters with a focus on Hurricane Sandy", paper presented at the FCC Workshop on Network Resiliency, 2013.
[90] S.M. Rinaldi, "Modeling and simulating critical infrastructures and their interdependencies", in *Proceedings of the 37th Annual Hawaii International Conference on System Sciences*, 2004.
[91] Ibid.
[92] Ibid.

Industrial policies will also be needed in order to address coordination failures inherent to investments required to undertake large-scale projects, such as connectivity infrastructure aiming at ensuring redundancy.[93] Improving the business environment by filling the gaps in the regulatory framework is essential for enhancing SME competitiveness. The provision of public utilities, which can include a knowledge infrastructure or uninterrupted access to electricity, will contribute to promotion of a favourable business environment in the SPECA subregion.

5.4 Training and Information about Good Practices

In addition to regulations, governments can help to enhance individual companies' resilience to disasters by providing information about good practices to protect ICT assets, and encourage and train SMEs to adopt these solutions before a disaster strikes.

Informing SMEs about the consequences of disasters on the value chain and their operations may encourage them to adopt BCPs. Informing and training SMEs could be achieved by using chambers of commerce and industrial associations as a link between government agencies and individual firms. Information and training could include solutions to maintain energy supply and use backup services. However, the importance of the informal sector in some countries of the SPECA subregion suggests that informal training takes on particular importance for SMEs.

The SMEs survey in APEC shows that customers' requirement is the third main motivation for BCP implementation among SMEs.[94] If customers, as well as other stakeholders such as credit institutions, shareholders and parent companies, are aware and informed about disaster risk reduction practices and the extent of bankruptcy risks posed by disasters on SMEs such as data losses, they may urge SMEs to adopt BCPs.

5.5 Building E-Resilience in SMEs: Micro-Level Practices

Given the need for enhanced e-resilience in the SPECA subregion, there are several areas of focus the governments, SMEs and other stakeholders can take into consideration. It is not an exhaustive to-do list, but aims to raise awareness on the need to initiate actions that can make a difference.

Backing Up Data

SMEs, like other organizations and entities, create and manage mission-critical data and information to operate on a daily basis. If they are lost to disasters, it is hard to reconstruct and recollect them, and will have significant negative impact on the sustainability of the companies. Earthquakes can lead to the physical destruction of companies' data centres, hardware and networks, which can lead to severe data losses. Fires, which are likely collateral effects induced by earthquakes, affect drives and hard disk through the heat and smoke particles they generate.[95]

[93] UNCTAD, *Information Economy Report 2015: Unlocking the Potential of E-commerce for Developing Countries* (Geneva, 2015). Available from http://unctad.org/en/PublicationsLibrary/ier2015_en.pdf.
[94] Asian Disaster Reduction Center, "BCP Status of the SMEs in the Asia-Pacific Region 2012", 2012. Available from http://www.adrc.asia/publications/bcp/survey_2012.pdf.
[95] See Respond to Disaster, "IT Disaster Recovery". Available from http://respondtodisaster.org/it-disaster-recovery.htm.

In order to mitigate these negative impacts, SMEs can either save their data on external drives or create an offsite backup by using cloud technology. The latter solution is preferable as copies are not stored on site, and are therefore less likely to be affected by the same disasters as those impacting the onsite firm's ICT systems. For example, several Japanese municipalities lost their data as well as backups after the 2011 earthquake as the tapes were not adequately protected and were located in the same geographical location.[96] With cloud-based storage, the data can be safely stored by the provider in a different region, country or continent.

Data backup services and training are available to enhance e-resilience in several SPECA countries. These services are sometimes available in local languages. For example, in Azerbaijan, Delta Telecom provides data centre services for local organizations. In Kazakhstan, Kazakhtelecom provides similar services. Data backup providers price their services depending on customers' needs. In other words, SMEs can have access to affordable options tailored to their needs in terms of storage capacity, and obtain information as well as training from the suppliers.

The widespread implementation of data backup practices might be hindered by a lack of awareness about potential disaster risks, as well as the risks of operational disruptions and possible bankruptcy. The concerned governments, chambers of commerce and professional associations could raise awareness among SMEs. Another limitation inherent to cloud-based solutions is the inaccessibility of data when network connections are disrupted during disasters,[97] but this limitation is less significant than the loss of data.

Maintaining Power Supply

Another element is the consistent power supply. To maintain or restore power, SMEs in the SPECA subregion could be equipped with autonomous power supply technologies, voltage stabilizers, inverters, network filters and batteries. Inverters are used with batteries as part of uninterruptible power supply (UPS). UPS technology is used to provide emergency and near instantaneous power if the main source of electricity is unavailable in order to protect telecommunications equipment, data centres and computers.

While the importance of ensuring constant power supply is widely recognized, it may not be practiced consistently among SMEs. Firstly, as in the case with data backup, SMEs need to be aware that maintaining energy supply is a crucial prerequisite to protecting ICT assets. Secondly, when acquired and installed, power backup equipment needs to be adequately protected. As Kwasinski[98] reports, they can be damaged by floods if located in basements or lower floors. Watertight doors or placing generators on higher floors can help protect equipment from floods. In addition, firms must find solutions to refuel their generators regularly in order to avoid engine fuel starvation. For example, having adequate fuel reserves ensures that

[96] Mihoko Sakurai and Jiro Kokuryo, "Data backup dilemma: Case studies from the Great East Japan Earthquake", in *2016 – Proceedings of the 17th Annual International Conference on Digital Government Research – Internet Plus Government: New Opportunities to Solve Public Problems*, 2016.
[97] Ibid.
[98] Alexis Kwasinski, "Lessons from field damage assessments about communication networks power supply and infrastructure performance during natural disasters with a focus on Hurricane Sandy", paper presented at the FCC Workshop on Network Resiliency, 2013.

generators can function in the longer run. Firms can also have replacement generators/batteries to meet this requirement. These are particularly critical to SMEs providing ICT services and support.

Web Applications for Disaster Risk Management

While various software tools and resources are available for disaster risk management, SMEs do not always have the necessary financial and human resources to purchase and implement the packages, and set up the necessary infrastructure and facilities. In this context, web applications may not only make business sense, but also ensure continuity in business operations during disasters.

In the same way as SMS-based systems, web applications can help disseminate early warnings and alerts, and conduct a risk assessment, as shown by the Catastrophe Risk Insurance Facility project. As part of the project, the World Bank aims to develop and encourage the use of CatMonitor—an online disaster risk management tool for SMEs—in Kazakhstan.[99] It is already available in Serbia, Macedonia and Albania in their native languages. This tool enables an assessment of individual buildings' vulnerability to earthquake and flood hazards, based on the buildings' characteristics and location. In addition, hazard maps are available with historical events for each region via CatMonitor.

Tools such as risk and hazard maps are generally readily available via web applications. For example, Thinkhazard!, which has been created and developed by the Global Facility for Disaster Reduction and Recovery, provides such maps at the provincial level for floods, earthquakes, droughts and landslides for all countries in the SPECA subregion. These maps can be very useful for disaster risk assessment and can help businesses plan and prioritize risk reduction measures that address the most severe and relevant risks first.

The level of feasibility for web applications is high in countries where the Internet is affordable and the coverage is good, which is not necessarily the case in some SPECA countries as demonstrated in the sections above. In addition, some existing web applications such as Thinkhazard! are only available in English, which may limit their widespread use among SMEs in the subregion.

[99] World Bank, "World Development Indicators", 2016. Available from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicator.

5.6 E-Resilience and Future ICT Applications

Building E-resilience is crucially needed in the region, as the economy will be increasingly dependent on the following ICT uses in the future:

Digital Remittances

Remittances play a major economic role in many SPECA countries. Tajikistan was ranked second in the Eastern Europe and Central Asia region in terms of total remittances in 2013 (USD 4.1 billion). Of the 17 countries of Eastern Europe and Central Asia, two SPECA countries have the highest share of remittances relative to GDP, namely Tajikistan (48 per cent) and Kyrgyzstan (31 per cent). Both countries are among the top five countries that receive the highest ratio of remittances to GDP in the world.[100] The development of online remittances could lead to significant cost savings and additional income in the SPECA subregion. Paypal research[101] estimates that people sending remittances via online system such as Xoom/Paypal incur a 3.93 per cent fee of the amount they send, while according to the World Bank, the fee is 7.45 per cent of the amount when sent through traditional channels. This lower transaction cost induced by digital technology is attributable to several factors, such as the fact that it takes only a few seconds to complete a digital payment and that a large proportion of the world's population uses mobile phones (70 per cent by 2020).[102] Other factors that contribute to the low cost of digital remittances include increased transparency since users directly know the cost they will be charged, and ease of use as it takes only a few steps to send the money.[103]

Online Markets via the eBay Model

Lendle and Olarraega[104] argue that online markets, such as eBay, can considerably lower fixed entry costs when firms try to access foreign markets. This is shown in a study,[105] which demonstrates that offline export costs are significantly higher than online export costs. Smaller firms tend to benefit the most from online markets, as they can access global markets due to the low entry costs. In the case of the United States, another study[106] shows that firms exporting via eBay are on average significantly smaller than those

[100] World Bank, "World Development Indicators", 2016. Available from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicator.
[101] PayPal.Inc-US, "Digital Remittances: Enhancing Financial Health for Families around the World". Available from https://www.paypalobjects.com/digitalassets/c/website/marketing/global/shared/global/media-resources/documents/digital-remittances.pdf.
[102] Rhiannon Williams, "7 in 10 of World's population using smart phones by 2020," *The Telegraph*, 3 June 2015. Available from http://www.telegraph.co.uk/technology/mobile-phones/11646593/7-in-10-of-worlds-population-using-smartphones-by-2020.html.
[103] PayPal.Inc-US, "Digital Remittances: Enhancing Financial Health for Families around the World". Available from https://www.paypalobjects.com/digitalassets/c/website/marketing/global/shared/global/media-resources/documents/digital-remittances.pdf.
[104] Andreas Lendle and Marcelo Olarreaga, "Can Online Markets Make Trade More Inclusive?" Inter-American Development Bank Discussion Paper No. IDB-DP-349, March 2014. Available from https://publications.iadb.org/bitstream/handle/11319/6507/Can%20Online%20Markets%20Make%20Trade%20More%20Inclusive.pdf?sequence=1.
[105] Andreas Lendle and others, "eBay's Anatomy", *Economics Letters*, vol. 121, no. 1 (2013), pp. 115-120.
[106] Andreas Lendle and others, "There Goes Gravity: How Ebay Reduces Trade Costs", June 2013. Available from http://www.value-chains.org/dyn/bds/docs/851/How_eBay_reduces_trade_costs.pdf.

exporting via offline channels. The online export model could positively impact SMEs in Central Asia as the region is characterized by particularly high trade costs.[107]

E-Payments

At the macro-level, e-payment systems can have a positive impact on economic activity. Holding cash encourages the informal economy,[108] which restricts the effectiveness of monetary policy. Besides, the cost of holding cash for transaction is high due the large number of intermediaries along the value chain such as banks, traders and corporations. Holding cash also encourages robbery and thefts according to Armey and others.[109] E-payments can overcome these challenges. Cashless payment options can spur consumption,[110] facilitate transactions, and therefore increase operational efficiency as well as vendors' revenues. They also positively impact economic growth in the long run according to Tee and Hong.[111] In the SPECA subregion where a significant proportion of firms are in the informal sector, it could encourage them to consider switching to the formal economy due to the advantages offered by e-payment systems and other incentives.

Cloud Computing

Various cloud computing services and support are available to ensure continuity of business operations, including financial and human resource management, banking, customer relationship management, procurement, logistics and project management, among other business functions. Even if computer facilities are affected by disasters, necessary data and applications might be made available remotely, provided that networks are intact.

In addition to enhancing e-resilience, cloud computing can spur economic development through its positive impact on companies. By acquiring cloud computing solutions, firms no longer incur costs associated with software and hardware equipment acquisition. Rather, services are paid on-demand via cloud computing.[112] For example, Amazon, which is one of the first cloud service providers, offers solutions to businesses via its online platform. The services include data storage, resizable computer capacity, business analytics services, database management services and e-mails, among others. By using data for the European Union and performing a statistical simulation, Etro[113] shows that cloud computing can generate the creation of several thousands of new SMEs and positively impacts economic growth in the European Union. Similarly, cloud computing could facilitate the acquisition of ICT assets by SMEs located

[107] Alisa DiCaprio and Jeff Procak, "A snapshot of e-commerce in Central Asia", *Asian Development Blog*, 18 January 2016. Available from https://blogs.adb.org/blog/snapshot-e-commerce-central-asia.
[108] Central Bank of Nigeria, "Further Clarifications on Cash-Less Lagos Project". Available from https://www.cbn.gov.ng/out/2011/pressrelease/gvd/CASHLESS%20LAGOS%20BRIEF%20FOR%20WEBSITE%20revised2.pdf.
[109] Natalie J. Webb, Laura E. Armey and Jonathan Lipow, "The impact of electronic financial payments on crime", *Information Economics and Policy*, vol. 29 (2014), pp. 46-57.
[110] M. Zandi, V. Singh and J. Irving, "The impact of inequality on economic growth on economic growth", *Moody's anal.* (2013), pp. 1-16
[111] Hock-Han Tee and Hway-Boon Ong, "Cashless payment and economic growth", *Financial Innovation*, vol. 2, no. 4 (2016). Available from http://jfin-swufe.springeropen.com/articles/10.1186/s40854-016-0023-z.
[112] Federico Etro, "The economic impact of cloud computing on business creation, employment and output in Europe", *Review of Business and Economics*, vol. 54, no. 2 (2009), pp. 179-208.
[113] Ibid.

in the SPECA subregion, resulting in greater demand for ICT services and products, and subsequently more investments in ICT networks.

Online Labour Markets

Online labour markets can boost employment and income generation in the SPECA subregion. An increasing number of companies directly hire online workers from distant markets, via online labour websites. They offer significant advantages to both workers and firms. For workers, online markets dramatically increase the number of job opportunities, especially in low-income countries that are often characterized by a limited number of offline jobs for skilled people. Workers can enjoy more flexibility as the work is usually contract-based. In addition, online job markets increase the likelihood of match between demand and supply, as well as between the needs of recruiters and that of the workers, while lowering search costs for employers.[114] Through online labour markets, firms have access to a large pool of workers with a large variety of skills, expertise and languages.[115] However, rules and regulatory challenges remain to be addressed.[116] Over the past few years, the digitalization of labour markets has rapidly grown in terms of transactions and participants,[117] creating an opportunity in the SPECA subregion. A large number of Russian-speaking workers could be hired online by the Commonwealth of Independent States companies and beyond.

6. Conclusion

ICT is an essential development enabler and at the same time, it is a growth sector. It spurs economic growth through e-commerce for example, improves institutions, and enhances government efficiencies and effectiveness via e-government. These technologies also constitute an invaluable tool for companies in advertising, marketing and financial transactions, as well as in internal and external communication.

ICT, however, does not exist in a vacuum. It is an economic asset vulnerable to external shocks such as natural disasters. Due to the multiple roles ICT plays in socioeconomic development, it is critical that the ICT networks and facilities are up and running regardless of external shocks. While creating added values in the public and private sectors, it is also considered an essential tool for disaster risk management.

The countries in Central Asia are highly exposed and vulnerable to disasters, which continue to wreak havoc in the subregion and cause substantial economic and human losses. The countries in the subregion are affected in different ways by disasters, depending on their economic structure. The less economically-developed countries in the subregion are agrarian economies with an agricultural sector accounting for a

[114] Ajay Agrawal and others, "Digitization and the Contract Labor Market: A Research Agenda", September 2013. Available from https://gps.ucsd.edu/_files/faculty/lyons/lyons_research_092013.pdf.
[115] Vili Lehdonvirta and others, "Online labour markets – leveling the playing field for international service markets?" Paper presented at IPP2014: Crowdsourcing for Politics and Policy Conference, Oxford, United Kingdom, 25-26 September 2014.
[116] Niels Beerepoot and Bart Lambregts, "Competition in online job marketplaces: Towards a global labour market for outsourcing services?" *Global Networks*, vol. 15, no. 2 (March 2014), pp. 236-255.
[117] Ajay Agrawal and others, "Digitization and the Contract Labor Market: A Research Agenda", September 2013. Available from https://gps.ucsd.edu/_files/faculty/lyons/lyons_research_092013.pdf.

high share of their GDP and a large SMEs sector, which renders them particularly vulnerable to climate-related events such as droughts and extreme weather events.

The subregion is also perennially affected by rapid-onset disasters such as earthquakes and floods. Earthquake poses one of the major risks in the SPECA countries, with major cities in the subregion having experienced catastrophic earthquakes in the past decade. In more economically-developed countries such as Azerbaijan and Kazakhstan, disasters may cause higher economic damage due to their more developed infrastructure. There is an urgent need to plan and build resilient ICT infrastructure to mitigate disaster risks and losses.

At the micro level among SMEs, ICT presents opportunities and challenges in the subregion. There are emerging services, platforms and technologies that could open up new business opportunities and cost savings, while reaching new markets and developing new services and products. However, SMEs in the subregion might not be fully aware of how disruptions to ICT services due to natural disasters could impact their operations and sustainability, and how to mitigate such risks.

At the macro level, ICT resilience to disasters can be reinforced by providing information about best practices to enterprises, creating and imposing legal and normative standards, ensuring that ICT and complementary infrastructures are robust and creating redundancy in terrestrial networks. Current and future projects such as TASIM and AP-IS, as well as the recent Tier III data centres will undoubtedly contribute to ICT resilience in the SPECA subregion by taking into account disaster risks.

The AP-IS is designed around four pillars: (1) developing physical ICT infrastructure; (2) improving Internet traffic and network management; (3) enhancing e-resilience; and (4) promoting digital inclusion. The AP-IS initiative can help develop the physical infrastructure, boost the ICT sector, lower the cost of doing business for SMEs by facilitating administrative procedures through e-solutions, and at the same time enhance e-resilience.

The lack of physical infrastructure is often cited as one of the main obstacles to foreign direct investment inflows, which in turn inhibits technological absorption capacity.[118] In particular, the lack of ICT infrastructure disproportionately impacts SMEs relative to large companies according to a United Nations study.[119] ICT infrastructure is a crucial requirement to the deployment of ICT solutions, facilitating trade such as mobile business, which could be extremely beneficial to SMEs located in transition economies.[120] AP-IS would therefore significantly contribute to SME development in the SPECA subregion in addition to enhancing e-resilience.

[118] UNCTAD, “UNCTAD B2C E-commerce Index 2016", UNCTAD Technical Notes on ICT for Development No. 7, April 2016. Available from http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d07_en.pdf.
[119] United Nations Centre for Trade Facilitation and Electronic Business, “Mobile Business”, 2012. Available from http://www.unece.org/fileadmin/DAM/cefact/publica/ece_trade_399-MobileBusinessBrochureE.pdf.
[120] Ibid.

Annex I. Disaster Matrix

			Disaster type						
			Drought	Earthquake	Extreme weather	Flood	Landslide	Storm	Epidemic
Countries	Afghanistan	*Number of occurrences*	4	17	5	57	13	5	15
		Deaths	37	1,453	1,710	2,146	700	415	3508
		Affected	6,510,000	94,230	370,502‡	388,864	327,896	22,656†	216732
		Injured	*	59,817	250‡	825*	187‡‡	5†	*n/a*
		Damage	142,063‡	56.15*	12.33*	23,514‡	2,823†	5,615†	*n/a*
		Risk	High	High		High	High	Low	
	Azerbaijan	*Number of occurrences*	1	3	1	3	1	*n/a*	*n/a*
		Deaths	*n/a*	31	5	3	11	*n/a*	*n/a*
		Affected	*n/a*	18,194	*	105,000	*	*n/a*	*n/a*
		Injured	*n/a*	650	*	*	*	*n/a*	*n/a*
		Damage	126,163	12,616†	*	65,511†	*	*n/a*	*n/a*
		Risk	Low	High		High	High	No data	
	Kazakhstan	*Number of occurrences*	*n/a*	1	2	10	1	*n/a*	1
		Deaths	*n/a*	3	3	54	48	*n/a*	*n/a*
		Affected	*n/a*	36,000	5000†	104,676	*	*n/a*	114
		Injured	*n/a*	626	12	709‡‡	*	*n/a*	*n/a*
		Damage	*n/a*	*	*	253,100*	*	*n/a*	*n/a*
		Risk	High	High		High	High	Very Low	
	Kyrgyzstan	*Number of occurrences*	1	5	2	3	6	2	1
		Deaths	*n/a*	74	27	3	87	4	*n/a*
		Affected	2,000,000	26,490	*	11,845‡	8,986‡‡	9,075	141
		Injured	*n/a*	142	*	*	20‡	*	*n/a*
		Damage	*n/a*	11,293†	*	3,200‡	1,822†	*	*n/a*
		Risk	Medium	High		High	High	Very Low	
	Tajikistan	*Number of occurrences*	2	10	3	20	8	1	2
		Deaths	*n/a*	21	1	184	66	*n/a*	21
		Affected	3,800,000	46,787	2,002,500	480,934	21,464‡‡	830	712
		Injured	*n/a*	86	*n/a*	351	23‡‡	*n/a*	*n/a*
		Damage	71,913†	30,208‡‡	874,404†	307,325*	49,576‡‡	289	*n/a*
		Risk	Medium	High		High	High	Very Low	
	Turkmenistan	*Number of occurrences*	*n/a*	1	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Deaths	*n/a*	11	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Affected	*n/a*	*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Injured	*n/a*	*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Damage	*n/a*	*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Risk	High	High		High	High	Very Low	
	Uzbekistan	*Number of occurrences*	1	1	*n/a*	1	*n/a*	*n/a*	*n/a*
		Deaths	*n/a*	13	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Affected	600,000	86	*n/a*	1,500	*n/a*	*n/a*	*n/a*
		Injured	*n/a*	*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Damage	63,081	*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
		Risk	High	High		High	High	Very Low	

Notes:

Aggregate data from 2000 to 2015, damages are expressed in thousands of constant USD (base 2011).

† data available for only one of the events

‡ data available for only two of the events

‡‡ data available for only three of the events

**missing data*

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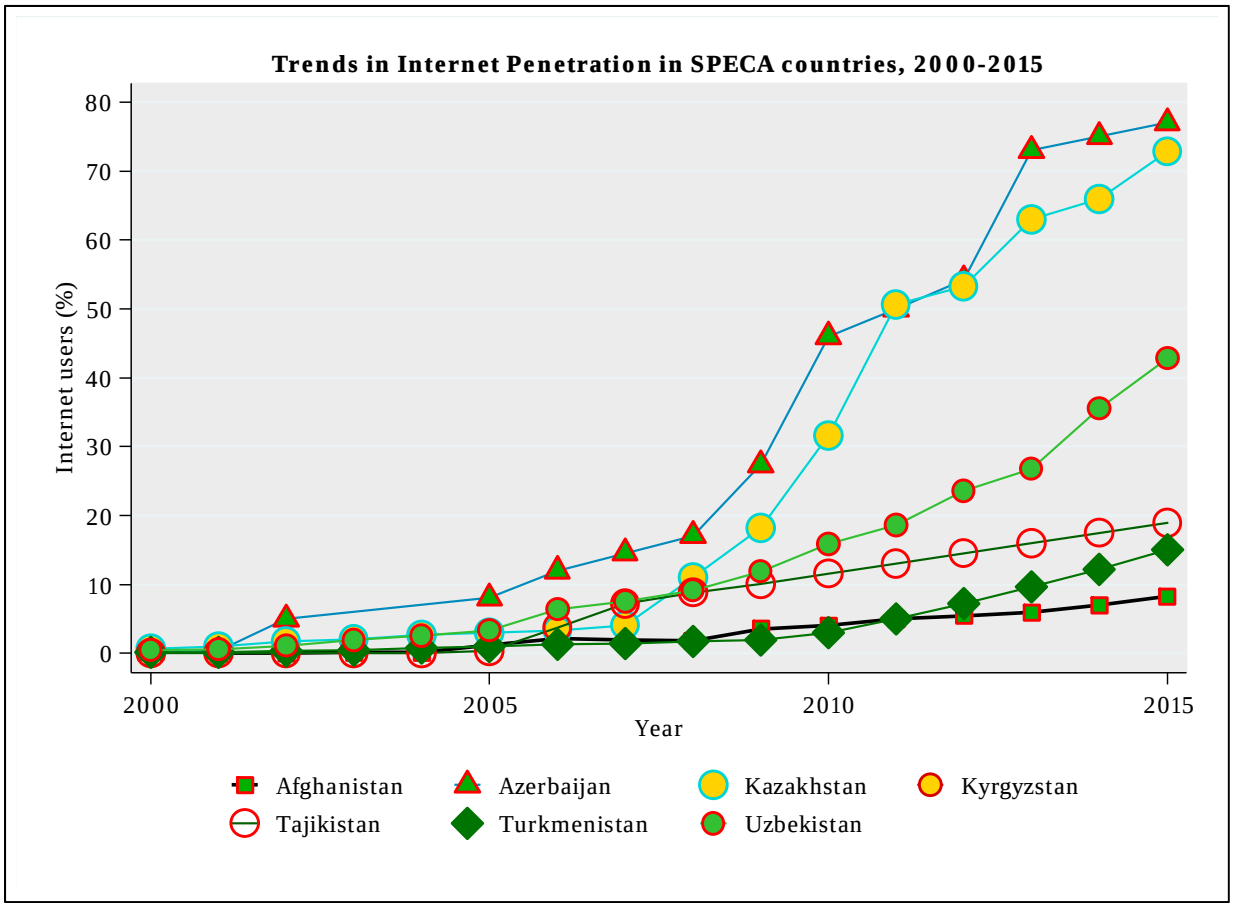
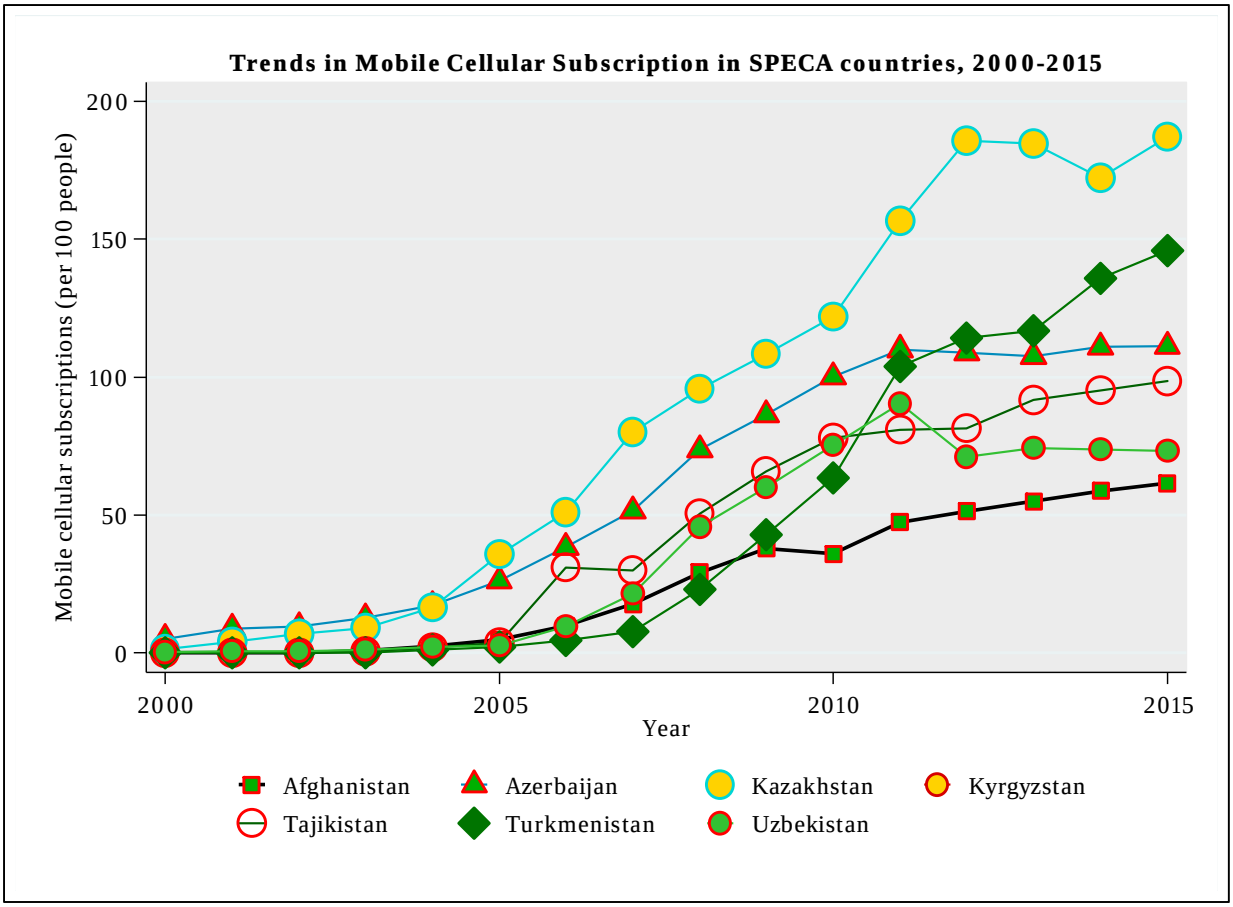
- D. Guha-Sapir, R. Below, Ph. Hoyois - EM-DAT: International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium
- thinkhazard.org. (2016, June 15). ThinkHazard! Retrieved June 15, 2016, from thinkhazard.org: http://www.thinkhazard.org/report

Annex II. Trends in ICT Adoption in SPECA Countries



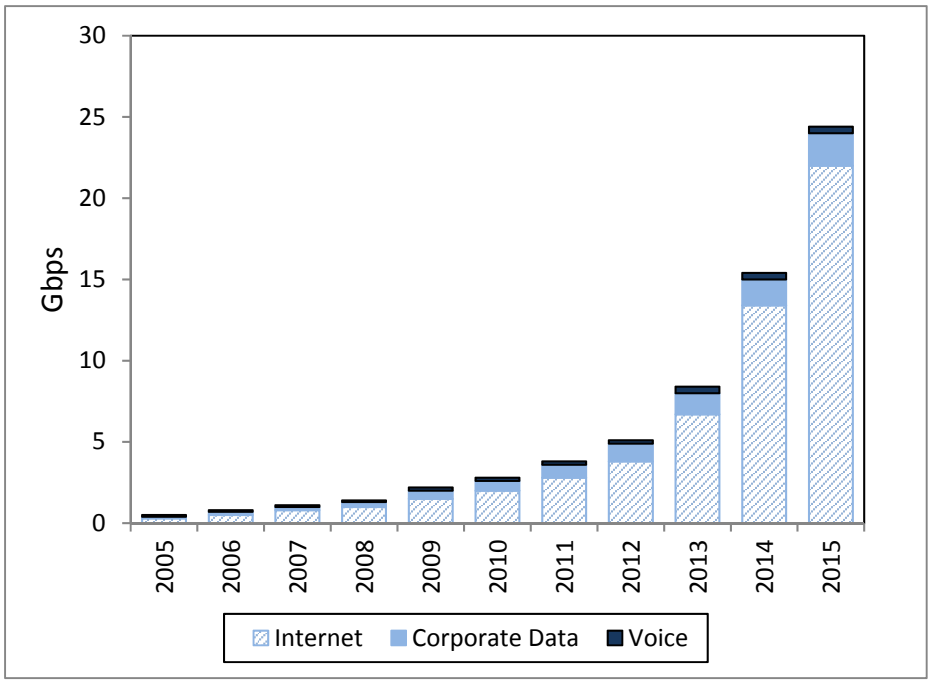
Source: ESCAP, based on ITU date, 2016.



Source: ESCAP, based on ITU date, 2016.

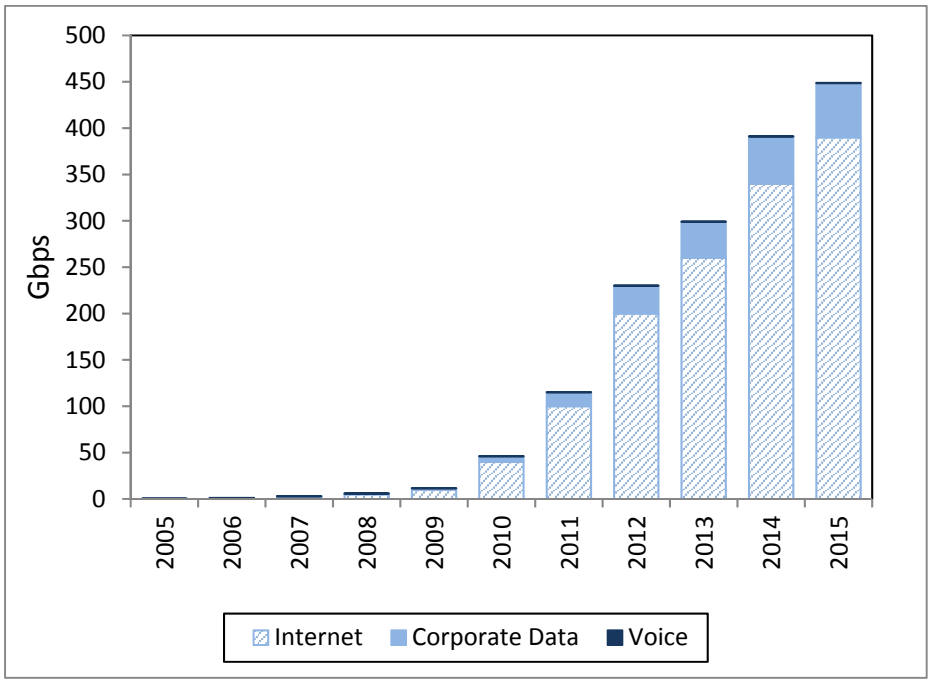
Annex III. Historical International Bandwidth (Gbps), by Country

Afghanistan



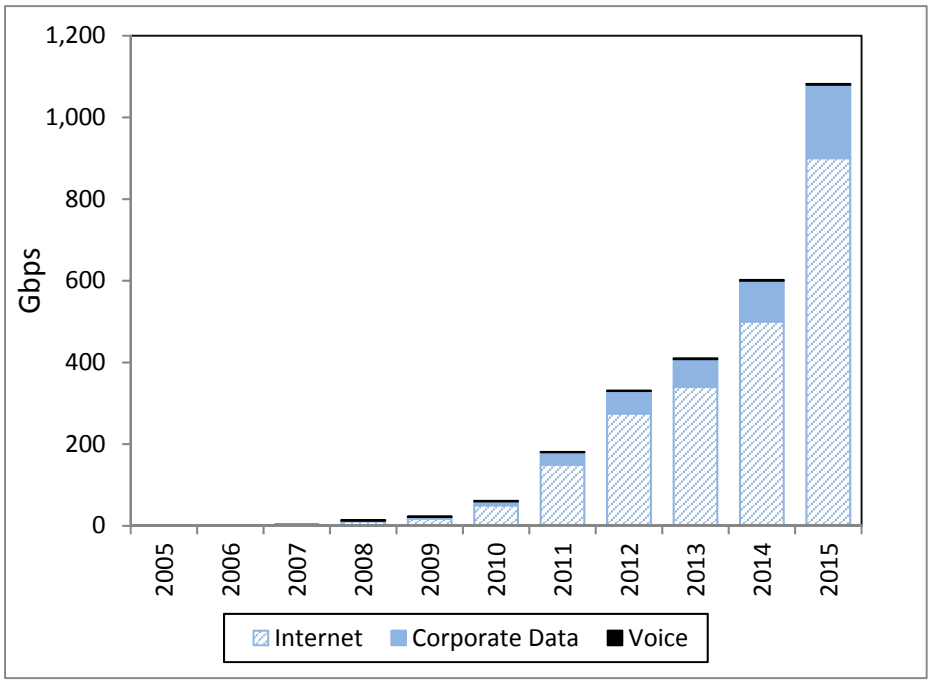
Source: ESCAP, 2016

Azerbaijan



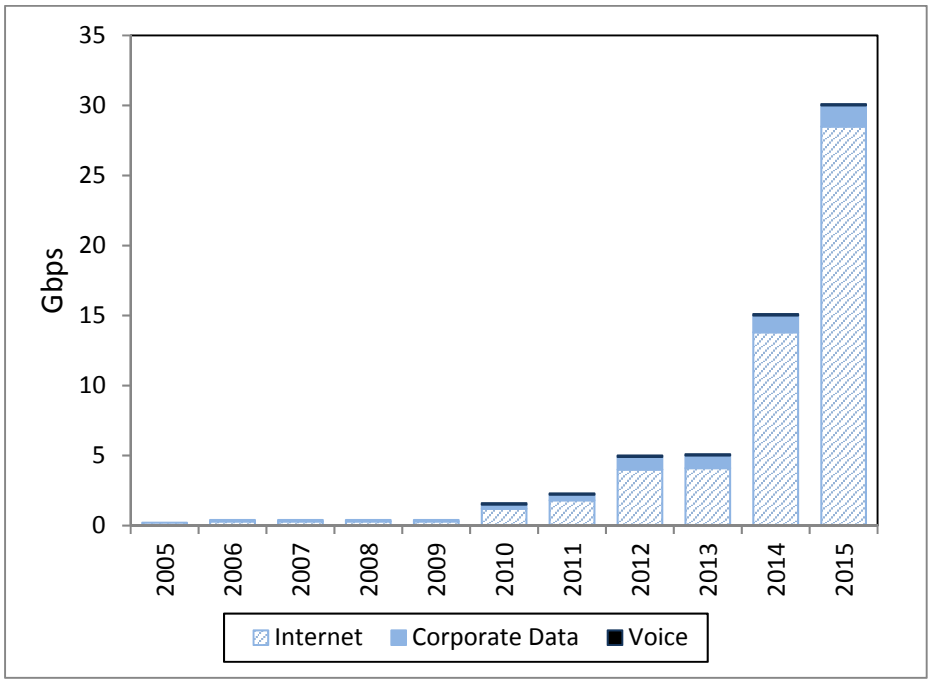
Source: ESCAP, 2016

Kazakhstan



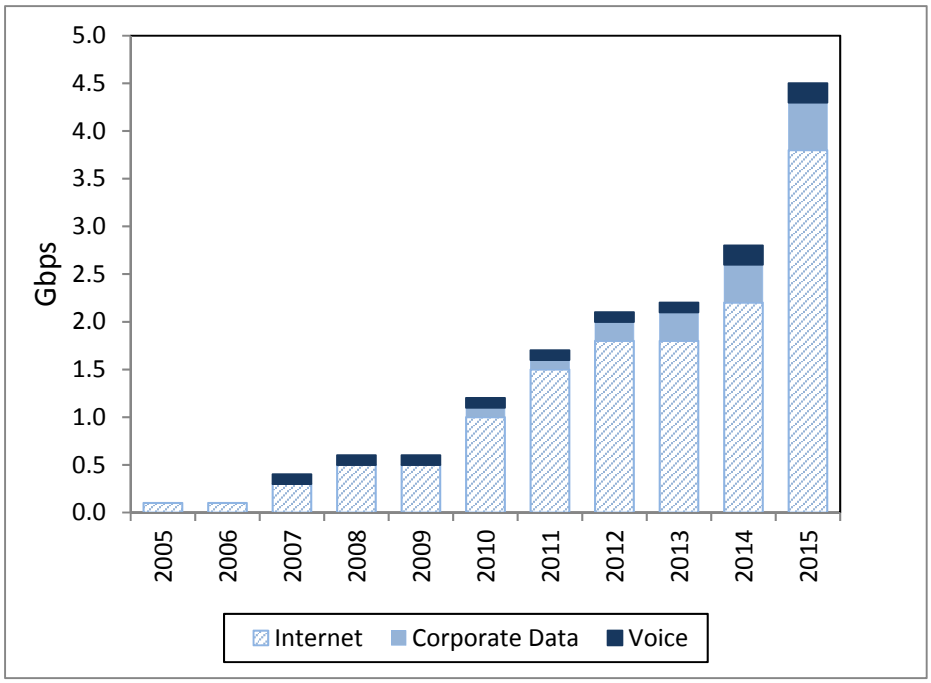
Source: ESCAP, 2016

Kyrgyzstan



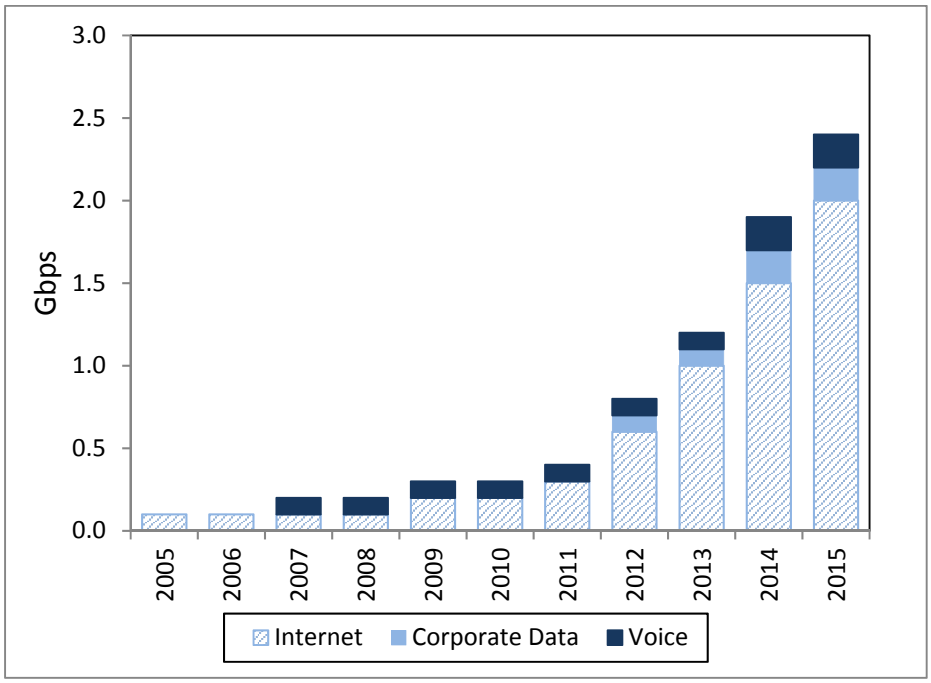
Source: ESCAP, 2016

Tajikistan



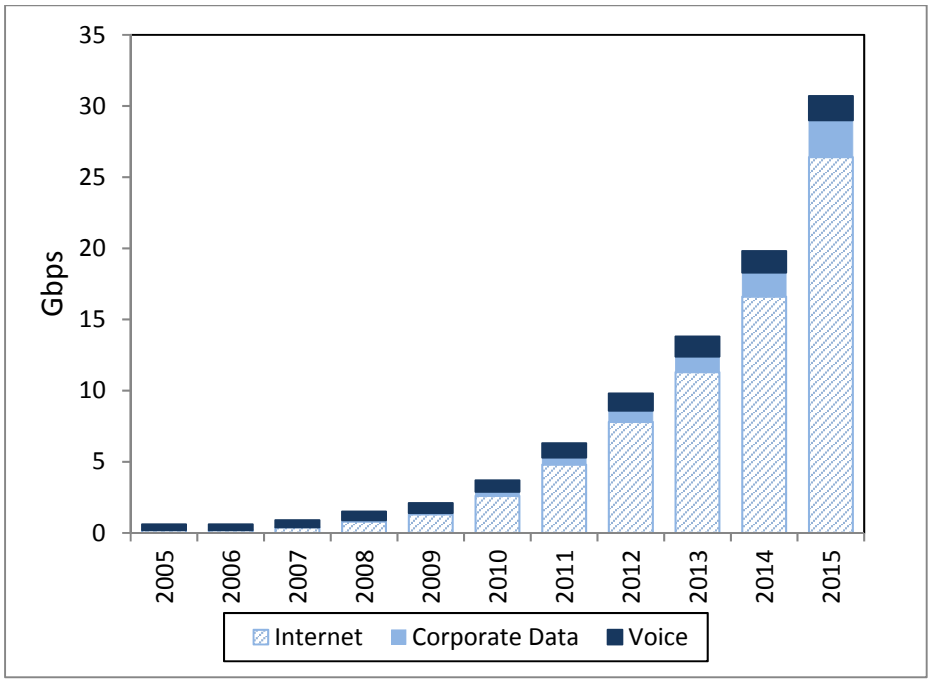
Source: ESCAP, 2016

Turkmenistan



Source: ESCAP, 2016

Uzbekistan



Source: ESCAP, 2016

Annex IV. Definitions

Fixed-broadband subscriptions	"Subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s.[121]"
Active mobile-broadband subscriptions	"The sum of standard mobile broadband and dedicated mobile-broadband subscriptions to the public Internet. It covers actual subscribers, not potential subscribers, even though the latter may have broadband enabled-handsets.[122]"
Individual using the Internet	"An individual who have used the Internet from any location in the last three months. The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer—it may also be by mobile telephone, tablet, PDA, games machine, digital TV, etc.). Access can be via a fixed or mobile network.[123]"
Individual using a mobile cellular telephone	"An individual who have used a mobile telephone in the last three months. A mobile (cellular) telephone refers to a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems and technologies such as IMT-2000 (3G) and IMT-Advanced. Users of both postpaid subscriptions and prepaid accounts are included.[124]"
E-commerce	"The sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organizations. To be included are orders made over the web, extranet or electronic data interchange. The type is defined by the method of placing the order. To be excluded are orders made by telephone calls, facsimile or manually typed e-mail.[125]"

[121] ITU, "Definitions of World Telecommunication/ICT Indicators", 2010. Available from http://www.itu.int/en/ITUD/Statistics/Documents/publications/handbook/2010/TelecomICT_Indicators_Definition_March2010_for_web_E.pdf.

[122] Ibid.

[123] ITU, *Measuring the Information Society Report 2014* (Geneva, 2014). Available from https://www.itu.int/en/ITUD/Statistics/Documents/publications/mis2014/MIS2014_without_Annex_4.pdf.

[124] Ibid.

[125] UNCTAD, *Information Economy Report 2015: Unlocking the Potential of E-commerce for Developing Countries* (Geneva, 2015). Available from http://unctad.org/en/PublicationsLibrary/ier2015_en.pdf.

Annex V. Sources for Table 1

Country	Classification of SMEs – Employees	SMEs Contribution to GDP	Percentage of SMEs Among Companies	Employment in SMEs
Afghanistan	Ministry of Commerce and Industry of the Islamic Republic of Afghanistan, "Afghanistan SME Development Strategy", 2009.	Ministry of Commerce and Industry of the Islamic Republic of Afghanistan, "Afghanistan SME Development Strategy", 2009.	Ministry of Commerce and Industry of the Islamic Republic of Afghanistan, "Afghanistan SME Development Strategy", 2009.	Ministry of Commerce and Industry of the Islamic Republic of Afghanistan, "Afghanistan SME Development Strategy", 2009.
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Kyrgyzstan	Asian Development Bank, *Private Sector Assessment Update: The Kyrgyz Republic* (Mandaluyong City, 2013). Available from https://www.adb.org/sites/default/files/institutional-document/34056/files/kyrgyz-republic-private-sector-assessment-update.pdf.	World Bank, "Kyrgyz Republic: Snapshot", 2015.	*Missing*	World Bank, "Kyrgyz Republic: Snapshot", 2015.
Tajikistan	Ministry of Economic Development of the Russian Federation, "The main directions of the state policy in the sphere of small and medium-sized enterprises: Tajikistan", 2014. Available from http://www.ved.gov.ru/rus_export/partners_search/torg_exp/?action=showproduct&id=4422.	*Missing*	Ministry of Economic Development of the Russian Federation, "The main directions of the state policy in the sphere of small and medium-sized enterprises: Tajikistan", 2014. Available from http://www.ved.gov.ru/rus_export/partners_search/torg_exp/?action	Regional Environment Center for Central Asia, "Tajikistan: Country Situation Assessment", Working Paper, August 2015. Available from http://prise.odi.org/wp-content/uploads/2015/08/Tajikistan_Country_Situation_Assessment.pdf.

			=showproduct&id=4422.	
Uzbekistan	Asian Development Bank, *Private Sector Assessment Update: The Kyrgyz Republic* (Mandaluyong City, 2013). Available from https://www.adb.org/sites/default/files/institutional-document/34056/files/kyrgyz-republic-private-sector-assessment-update.pdf.	Embassy of Uzbekistan to the United States, "Promoting the export potential of small and medium businesses in Uzbekistan", 14 December 2015. Available from http://uzbekistan.org/press-uzbekistan/archive/4870/.	*Missing*	Embassy of Uzbekistan to the United States, "Promoting the export potential of small and medium businesses in Uzbekistan", 14 December 2015. Available from http://uzbekistan.org/press-uzbekistan/archive/4870/.