The Mobile Economy
Russia & CIS
2019

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with nearly 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

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Executive Summary

Modest growth on the horizon given high market penetration

At the end of 2018, the Commonwealth of Independent States (CIS)[1] was home to 235 million unique mobile subscribers,[2] of which Russia, Ukraine and Uzbekistan together accounted for 80%. The CIS has a high rate of unique mobile subscriber penetration at 81%, though country-level figures range from 60% in Turkmenistan to almost 90% in Russia.

As saturation of the region's addressable market edges closer, future growth will be limited, with less than 9 million new unique subscribers forecast by 2025. Material increases in subscriber numbers will be delivered by underpenetrated markets such as Uzbekistan where there is still scope for growth.

4G migration ongoing as industry edges towards 5G era

Though later than many developed markets, the CIS is now seeing an accelerating shift to mobile broadband. 4G will overtake 2G as a proportion of connections in 2019[3] and will become the region's leading mobile technology in 2021. Greater use of data-intensive services and demand for higher speeds will drive further adoption, with 4G accounting for more than two-thirds of total connections by 2025. Only Belarus and Russia are expected to launch 5G by the end of 2020; networks in the region's other 10 markets will be live by 2025. The CIS will be home to around 54 million 5G connections by 2025, representing an adoption rate of 13%.

Revenue outlook broadly flat, with capex poised to ramp up

Between 2019 and 2025, mobile revenue in the CIS is forecast to remain largely stable. However, market-level analysis paints a more nuanced picture. In certain countries, we expect greater smartphone adoption, 4G upgrades and growing data usage to deliver some revenue uplift. In others, factors such as plateauing subscriber penetration and acute competition could contribute to negative revenue growth, possibly pressing the case for structural change. Over the same period, operators are forecast to invest $39 billion in capex, of which more than 70% will be 5G-specific. Delivering 5G connectivity will increase capital intensity, stretching operators' financial resources.

1. We use the term CIS in this report to refer to the Commonwealth of Independent States, including Russia.
2. Total unique users who have subscribed to mobile services at the end of the period, excluding machine-to-machine (M2M). Subscribers differ from connections such that a unique user can have multiple connections.
3. Excluding licensed cellular IoT

Mobile's significant contribution to jobs and the economy

In 2018, mobile technologies and services generated 4.7% of GDP in the CIS, a contribution of $101 billion of economic value added. In the period to 2023, this figure will increase to $122 billion (5.1% of GDP). The mobile ecosystem supported 620,000 jobs in the CIS in 2018, either through direct employment or indirectly through activity in the wider economy. Mobile also contributes to the funding of the public sector, raising $12 billion in 2018 – mainly via general taxation. 5G technologies are expected to contribute $34 billion to the CIS economy over the next 15 years, impacting key sectors such as manufacturing, utilities and construction.

Regional innovation underpinned by mobile connectivity

The Internet of Things (IoT) is an area where mobile operators can grow their business beyond traditional communications. Industrial IoT connections in the CIS will see strong growth out to 2025, driven by increased interest in smart cities and smart utilities. With IoT revenue set to reach $26 billion in 2025, operators are implementing strategies designed to capture opportunities at the applications, platforms and services layer. Further, operators are seeking to invest or formalise partnerships in the e-commerce market, particularly as smartphone and mobile broadband adoption rates grow. The industry is also exploring potential applications of, and devising solutions based on, artificial intelligence (AI) and blockchain technologies, and injecting greater funds in the start-up ecosystem to protect itself from disruption and diversify revenues.

Policies to support the region's burgeoning digital economy

5G mobile networks offer the potential to underpin a range of solutions for enterprises, in addition to serving the consumer market. However, uncertainty around spectrum access and returns on investment can be significant barriers to releasing value into the digital economy. Policymakers should consider the rollout of 5G a vehicle for driving socioeconomic growth and the transformation of traditional industries. The regulatory framework should foster the mobile industry's development within an environment that is conducive to investment. Launches of 5G networks in other markets indicate that a key factor behind their successful deployment and operation is the creation of a comprehensive national 5G development plan.

Russia & CIS

Unique mobile subscribers

2018

235m

81% PENETRATION RATE (% of population) 83%

CAGR 2018–25 0.5%

244m

2025

SIM connections

Excluding licensed cellular IoT

2018

420m

145% PENETRATION RATE (% of population) 147%

CAGR 2018–25 0.4%

431m

2025

Mobile industry contribution to GDP

4.7% of GDP **$101bn** 2018

5.1% **$122bn** 2023

Operator revenues and investment

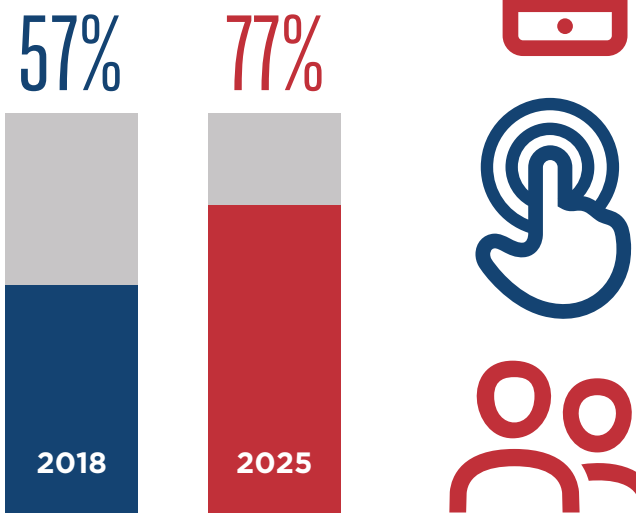
Total revenues

$23.1bn 2018 — 2025 **$24.2bn**

Operator capex of **$38.8 billion** for the period 2019–2025

Smartphone adoption

(as a proportion of total connections)



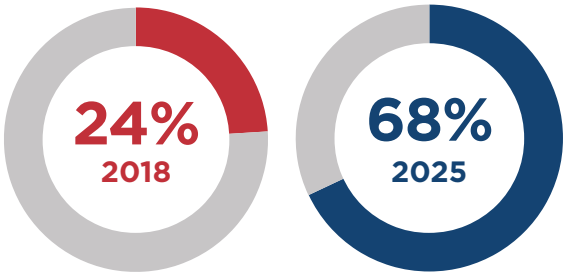
4G connections*

2018
101m

2025
292m

Adoption

(as a proportion of total connections)



Licensed cellular IoT connections

27m 2018

87m 2025

5G connections* in 2025 (13% of total connections) **54m**

*Excluding licensed cellular IoT

Public funding

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)

$12bn

2018

Employment

2018

270,000

Jobs

directly supported by the mobile ecosystem

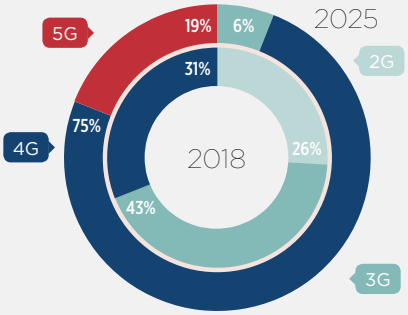
Plus 350,000 indirect jobs

The CIS region

The CIS region: subscriber and technology trends for key markets

Russia

TECHNOLOGY MIX*



SUBSCRIBER PENETRATION

2018 — 2025

90% 91%

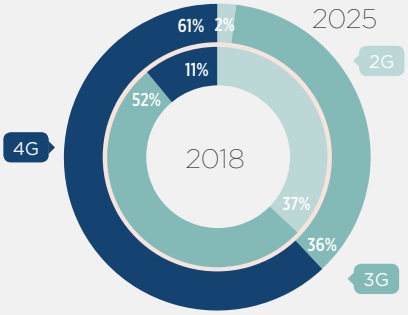
SMARTPHONE ADOPTION

2018 — 2025

62% 79%

Ukraine

TECHNOLOGY MIX*



SUBSCRIBER PENETRATION

2018 — 2025

88% 89%

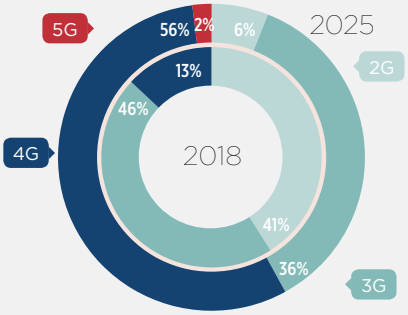
SMARTPHONE ADOPTION

2018 — 2025

60% 82%

Uzbekistan

TECHNOLOGY MIX*



SUBSCRIBER PENETRATION

2018 — 2025

60% 67%

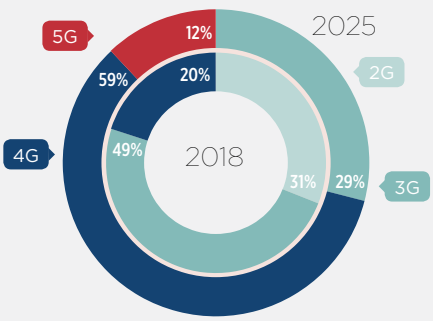
SMARTPHONE ADOPTION

2018 — 2025

45% 74%

Kazakhstan

TECHNOLOGY MIX*



SUBSCRIBER PENETRATION

2018 — 2025

69% 73%

SMARTPHONE ADOPTION

2018 — 2025

54% 73%

*Percentage of connections

01
The mobile market in numbers

1.1
One of the most highly penetrated regions in the world, dominated by Russia

Figure 1

Source: GSMA Intelligence

Unique subscribers will reach 244 million by 2025, though this represents only a marginal increase in market penetration

Millions

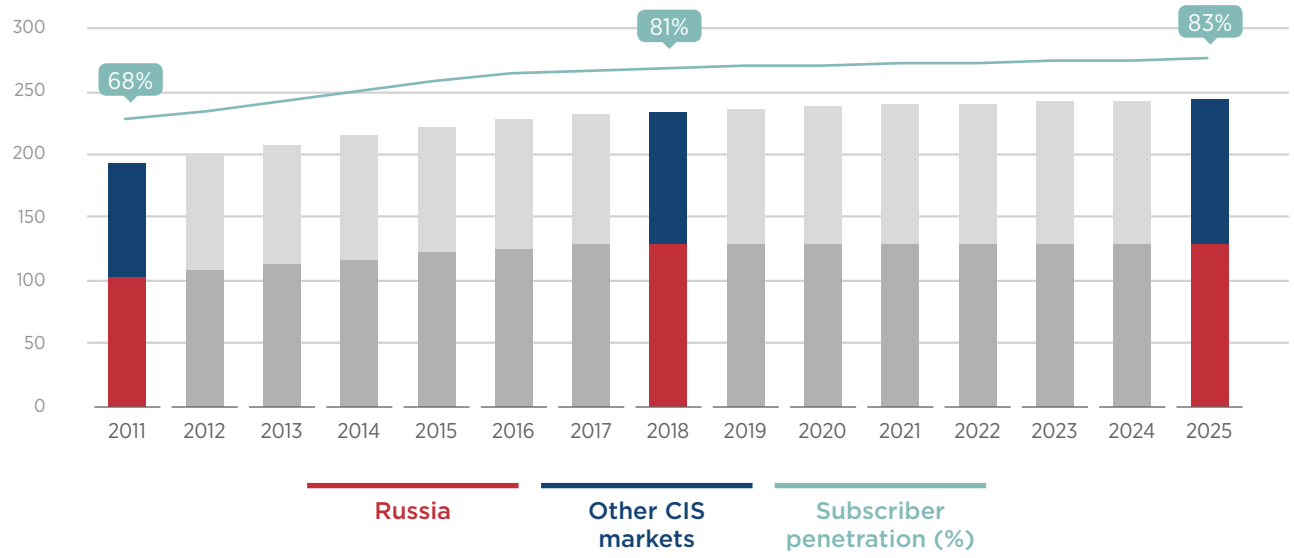


Figure 2

Source: GSMA Intelligence

The CIS is a diverse geography, with headline numbers masking markets at different stages of development

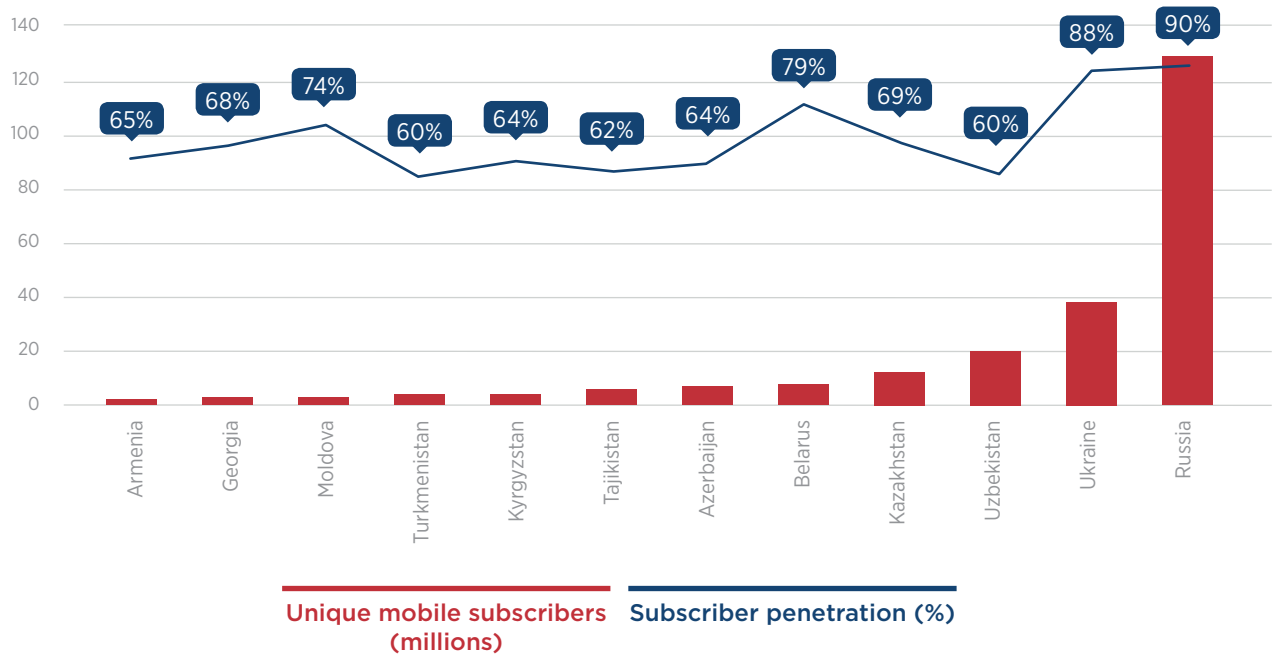
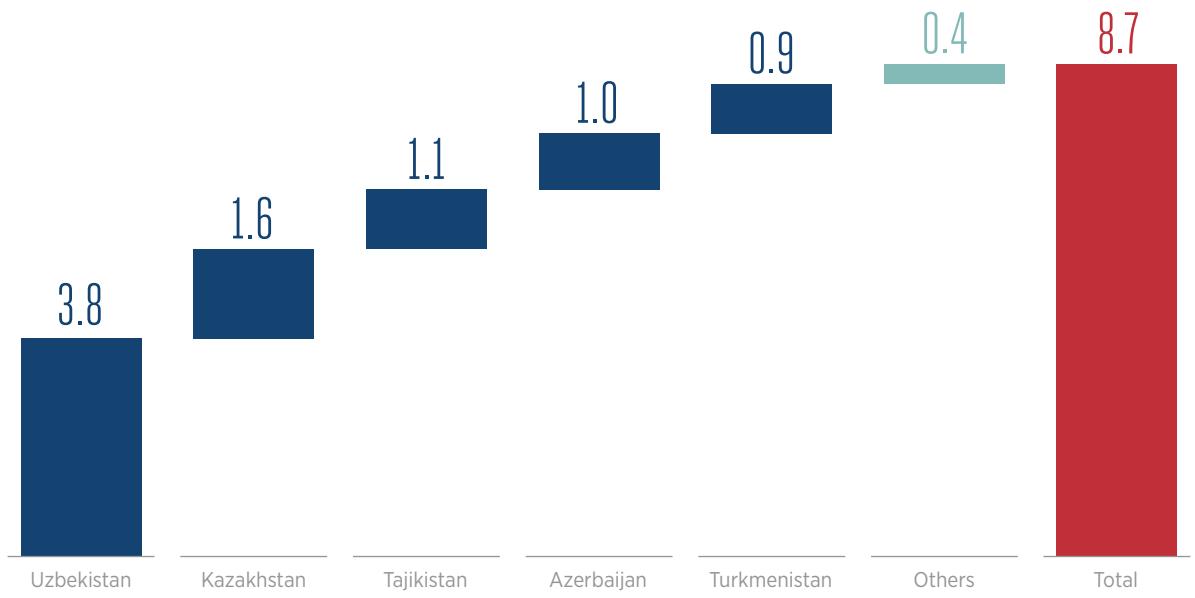


Figure 3 Source: GSMA Intelligence

A significant percentage of net subscriber growth between 2018 and 2025 will come from Uzbekistan, a populous but relatively underpenetrated country

Millions



There were 420 million SIM connections in the CIS at year-end 2018,[4] equivalent to a penetration rate of 145%. The number of connections will reach 431 million in 2025, nudging penetration up by a small amount. Levels of multi-SIM ownership are well above the global average, reflecting strong competition in a largely prepaid market, where 'unlocked' handsets are primarily sourced from independent outlets, with dual-SIM phones particularly common in Russia.

4. Excluding licensed cellular IoT

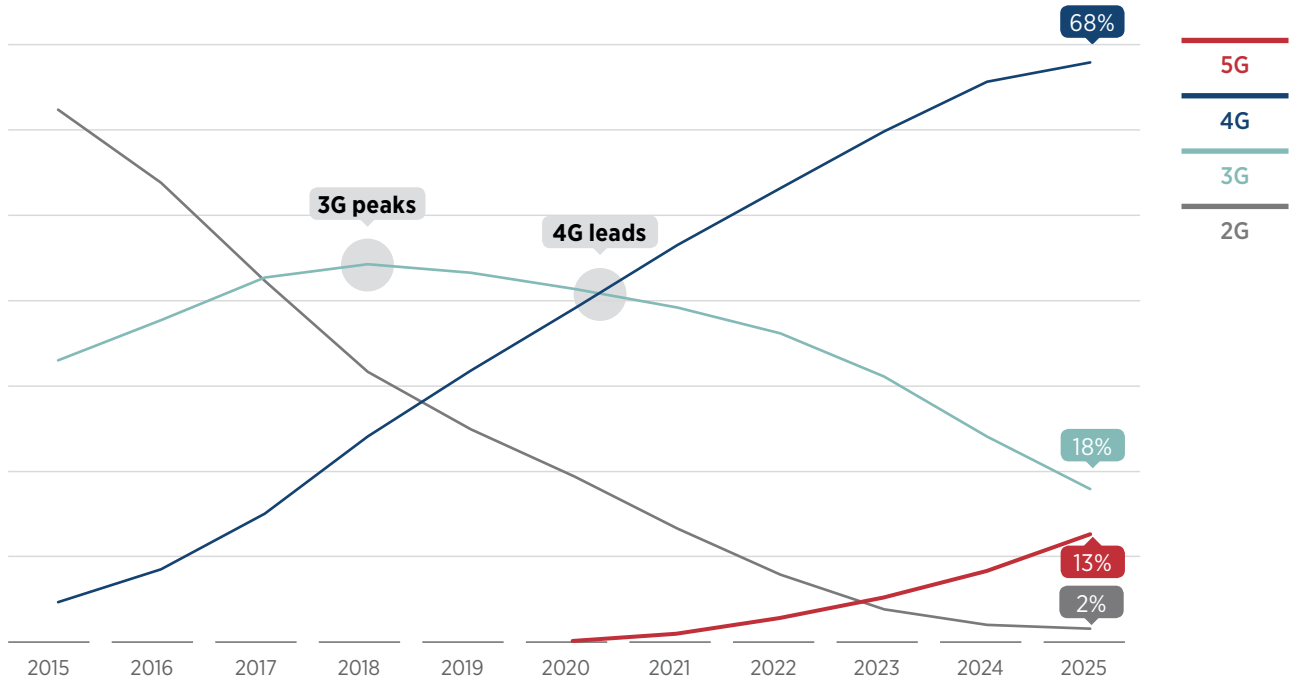
1.2
Later than many global leaders, 4G will soon become the CIS's leading mobile technology

At the end of 2018, 4G accounted for less than a quarter of the region's connections base, compared to 50% in Europe. However, operator investments are now bearing fruit as the region's shift to mobile broadband services accelerates, marked by the total number of 4G connections topping 100 million by year-end 2018.

Figure 4 Source: GSMA Intelligence

Following 3G's peak, 4G is set to take the lead in 2021, reaching 290 million connections by 2025

Percentage of connections (excluding licensed cellular IoT)

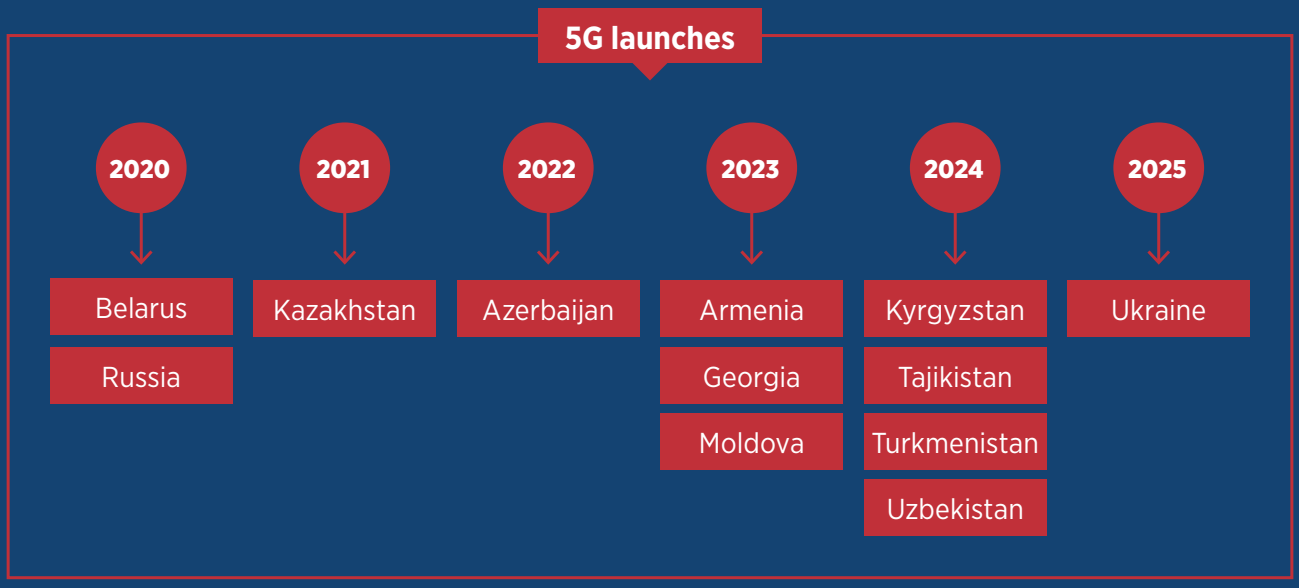


Russia has been the key driver of the migration to 4G, seeing some of the region's first 4G network launches in 2012. The rollout of base stations, spectrum refarming and a greater focus on rural areas expanded 4G coverage to 85% by the end of 2018. 4G network availability and performance remain key competitive dimensions in the Russian market, with the four main operators all launching LTE-Advanced networks in recent years. 4G connections are due to reach 186 million in the country by 2025, over three quarters of total connections.

1.3
The first 5G launches are on the horizon, though take-up will not grow rapidly

Figure 5 Source: GSMA Intelligence

The CIS region will not be at the forefront of 5G's development; certain markets are set to be fast followers



The initial focus of 5G in the CIS is likely to be on enhanced mobile broadband (eMBB) to add capacity in hotspot areas and to offer higher network throughput; 58% of Russian consumers expect 5G to deliver an improvement in data speeds, which operators may use as a marketing differentiator against 4G.[5] With fibre broadband access already a fairly mature market in the likes of Belarus,[6] 5G-based fixed wireless services may find opportunities limited in the short run. Although IoT and enterprise solutions (such as for smart cities, autonomous vehicles and public security systems) are being explored, they will take time to develop.

5. GSMA Intelligence Consumer Survey 2018
6. FTTH Council Europe – Panorama, IDATE, 2019

Operators are preparing for the 5G era

- **Russian** operator Tele2 has launched a 5G pilot zone in central Moscow in the 28 GHz band in non-standalone (NSA) mode. Though the Ministry of Communications has rejected a series of 3.4-3.8 GHz trial applications, it is expected to assign 4.4-4.99 GHz and millimetre wave (mmWave) spectrum to test 5G later in 2019.
- A number of 5G test zones have now been opened in **Belarus**, allowing firms to test innovative applications of the technology. Meanwhile, in September 2019 a working group comprising operators and government agencies will present its provisional framework for the deployment of 5G across the country.
- **Azerbaijani** operator Azercell has selected Ericsson to modernise its radio access network (RAN) to be 5G-ready over a two-year programme, which will include the supply of services and multi-standard radio equipment nationwide.
- The three largest cities in **Kazakhstan** – Nur-Sultan (formerly Astana), Almaty and Shymkent – will be covered with 5G "in the near future", according to Kazakhtelecom. The operator's three-phase pilot programme is scheduled for the 2019-2021 period and will test 5G use cases, including fixed wireless, eMBB and M2M communications.

Figure 6 Source: GSMA Intelligence

With the majority of launches a few years away, critical mass for 5G in the CIS is still some way off

Millions

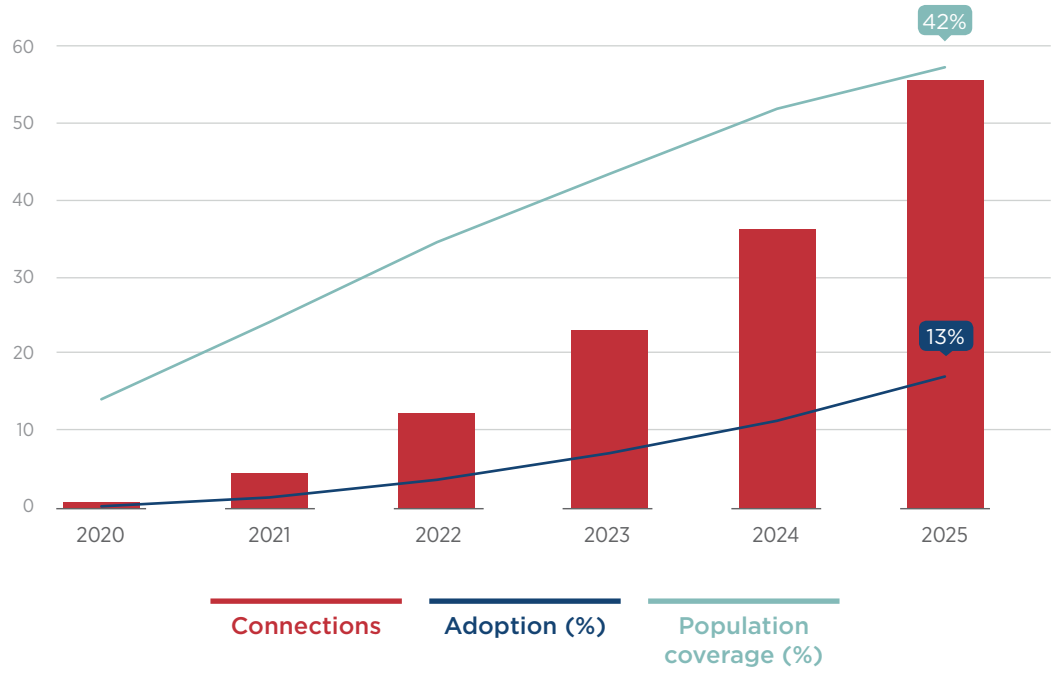


Figure 7

Source: GSMA Intelligence

Russia will lead 5G adoption, with 5G accounting for nearly a fifth of connections in 2025

5G as a share of total connections
(excluding licensed cellular IoT)

1.4
Data demand surges as consumers transition from 'connected' to 'digital'

At the end of 2018, smartphones accounted for 57% of connections in the CIS, compared to 73% in Europe and 83% in Northern America. This reflects issues around affordability and the fact that the region is comprised to varying degrees of majority prepaid markets, with few handset subsidies or financing offers.

Figure 8 Source: GSMA Intelligence

Smartphone connections will exceed 330 million by 2025, with data growth spurred by take-up of more affordable devices

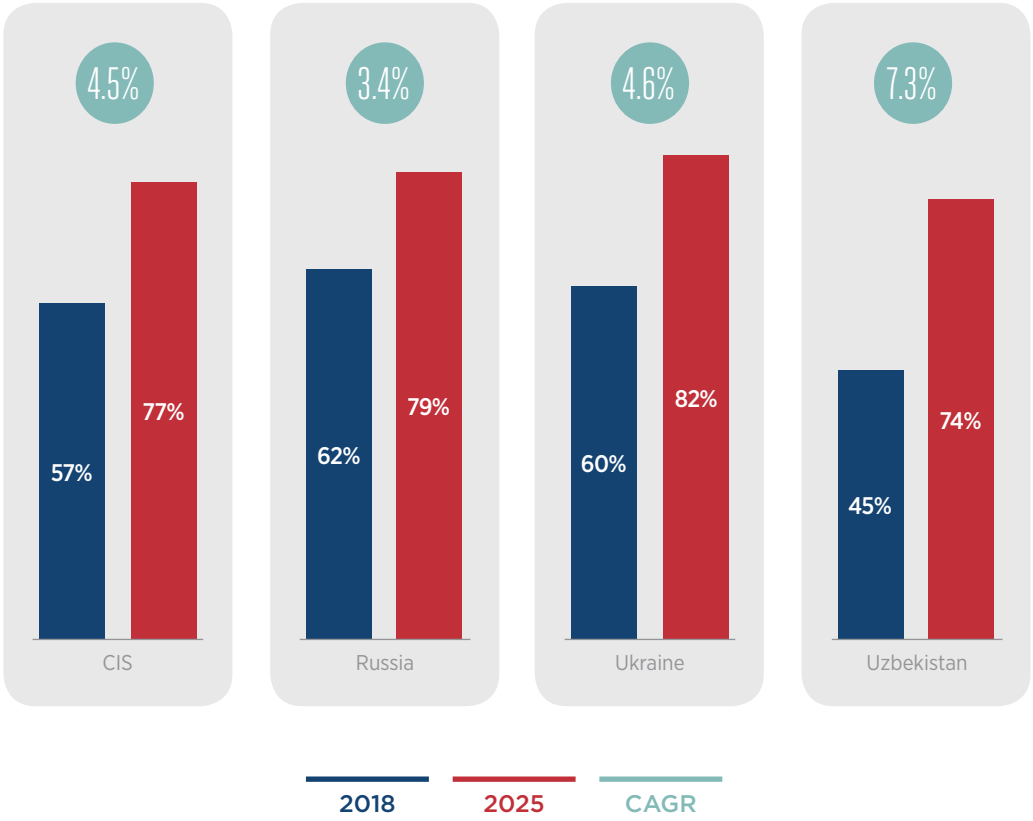


Figure 9 Source: GSMA Intelligence

Intense competition is keeping retail prices low relative to many developed markets, helping expand data volumes

Cost of 5 GB premium basket ($ per month)

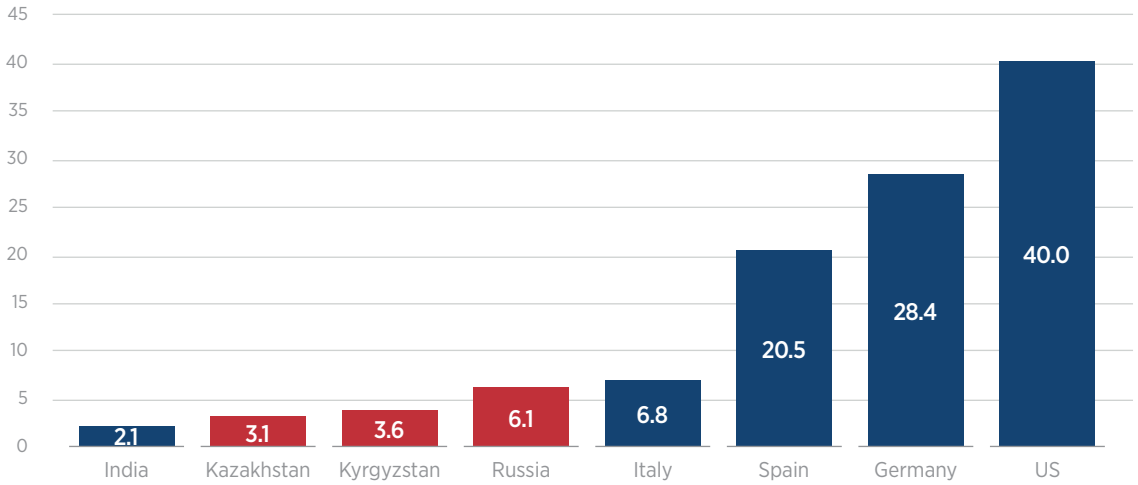
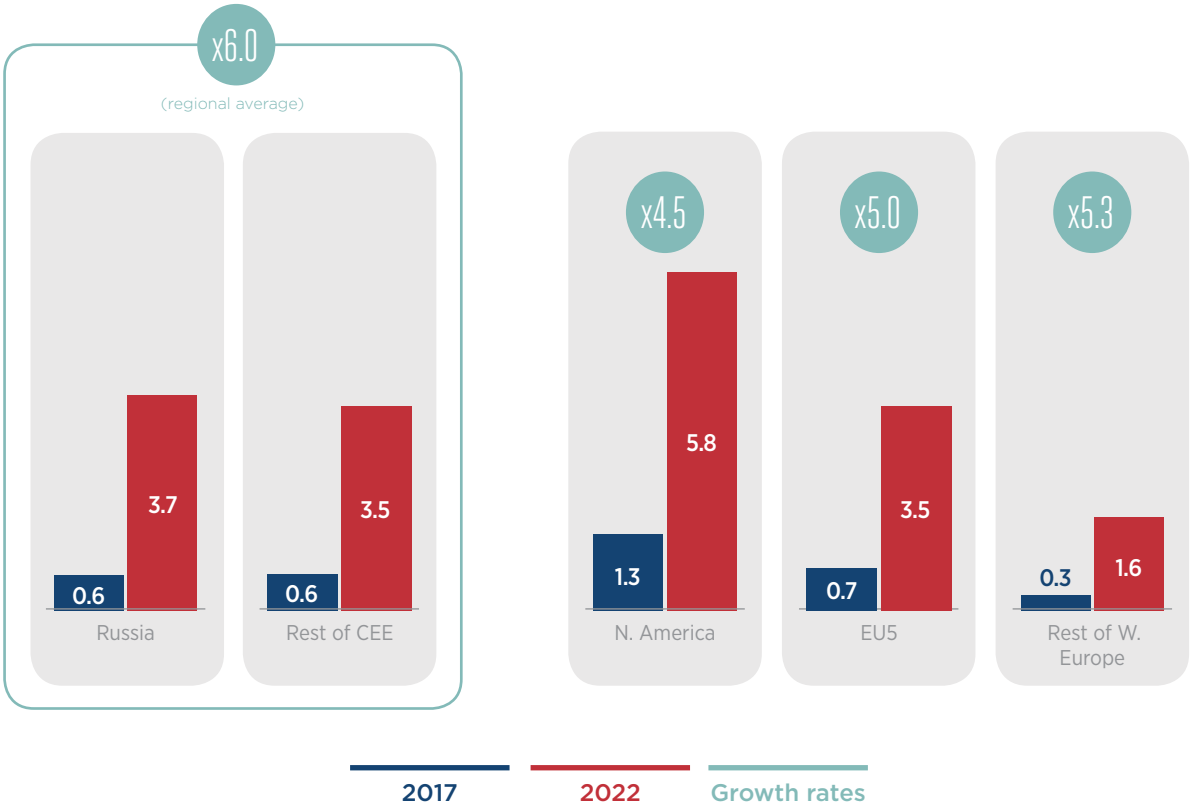


Figure 10 Source: GSMA Intelligence, Cisco VNI 2018[7]

Mobile data traffic in the CIS will grow six-fold between 2017 and 2022

Exabytes per month



7. Rest of CEE = Rest of Central and Eastern Europe. For more information, see https://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html

1.5
A stable revenue outlook for the CIS as the next wave of capital spending begins

Figure 11 Source: GSMA Intelligence

Largely flat revenue forecast for the region between 2019 and 2025 obscures market-level differences

$ billion

- Despite competitive pressures and relatively low pricing, service revenue trends in Russia improved during 2017-18. Beyond 2019, revenue growth is expected to be positive, albeit at a subdued rate of less than 1% on average and below inflation, which is currently holding above the central bank's 4% target.
- In contrast, other CIS markets will see total revenue decline over the 2019-2025 period. Ukraine and Uzbekistan (the second and third largest markets after Russia) are projected to experience falling revenue, with only Azerbaijan and Moldova exhibiting a positive revenue forecast for the coming years.

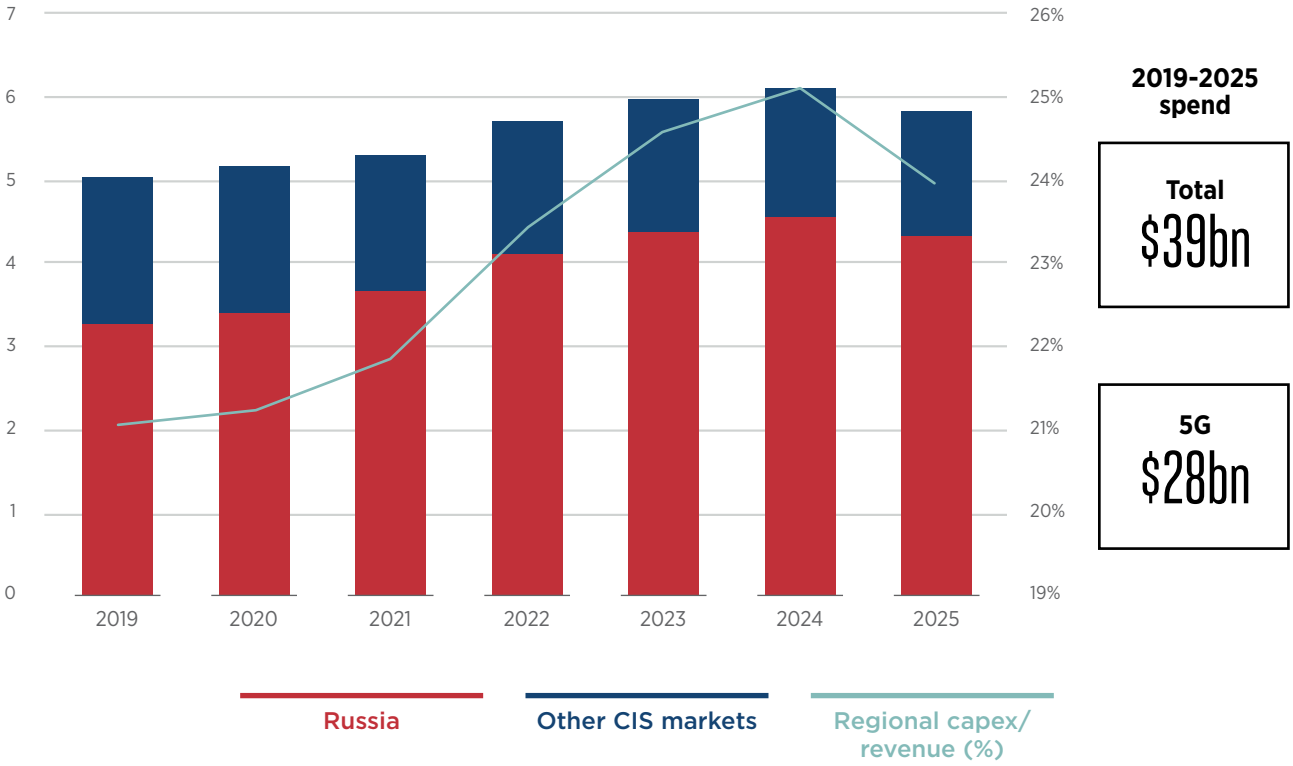
With some of the lowest mobile data prices and ARPU levels globally, the revenue outlook in the CIS is likely to remain modest until operators more effectively monetise strong data traffic growth and cultivate new revenue streams. Leading operators have been active in developing digital platforms and services; however, these have had less impact on top line trends so far than has been the case in markets such as Turkey, while VEON's app was not widely adopted.[8] 5G offers some clear revenue potential, though this is unlikely to be realised in the short term.

8. "VEON: When Transformation Goes Bad", Light Reading, July 2018

Figure 12 Source: GSMA Intelligence

Growing number of 5G launches post-2020 will drive an upturn in aggregate capex levels, with 5G accounting for more than 70% of operator spend to 2025[9]

Capex, $ billion



The Yarovaya law, which came into force in July 2018, will also affect cashflows over the coming years for Russian operators – a factor not reflected in our forecasts. This law obliges telcos to store voice, SMS and data traffic records for up to six months. Operators are investing significant sums in secure storage software and facilities; MegaFon recorded a capex increase of 13.2% in 2018 compared with 2017, citing compliance with the law as a major investment project.[10] Company estimates for the Yarovaya law's financial impact range from RUB40-60 billion ($608-912 million) over a five-year period.

9. 2025 Capex outlook: financing the 5G era, GSMA Intelligence, 2019
10. Other such projects included the accelerated rollout of LTE/LTE-A and VoLTE networks, and the further development of MegaFon's billing platform: https://corp.megafon.com/investors/events/presentations/

02
Mobile driving growth and enabling innovation

2.1
Mobile's contribution to economic growth and jobs

Figure 13 Source: GSMA Intelligence

The mobile ecosystem generated $23 billion of economic value in 2018, with mobile operators accounting for close to 75%

$ billion, % GDP 2018

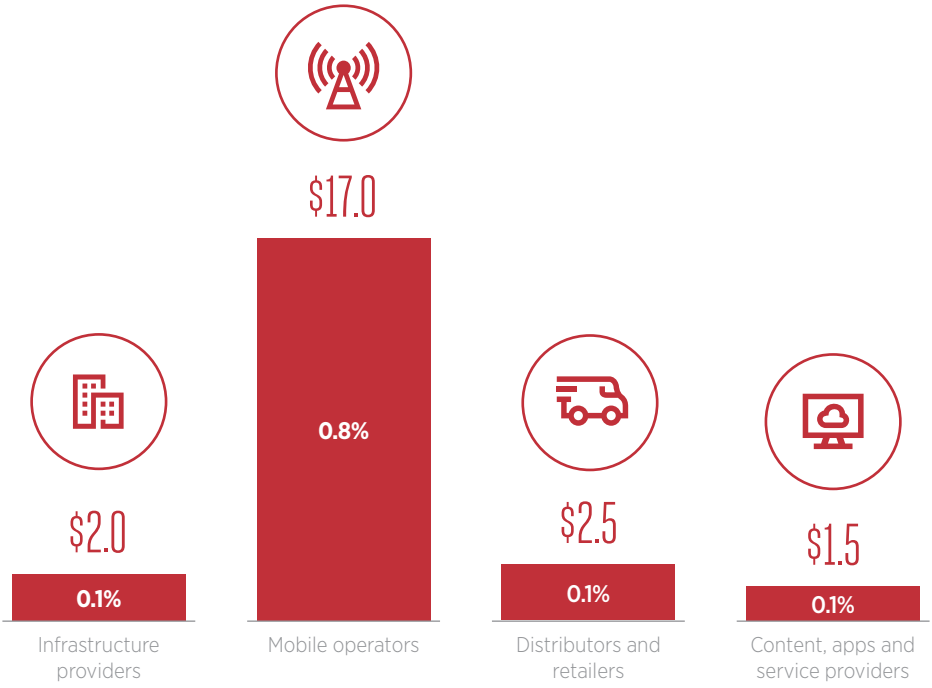


Figure 14 Source: GSMA Intelligence

Additional indirect and productivity benefits bring the total contribution of the mobile industry to $101 billion

$ billion, % GDP 2018

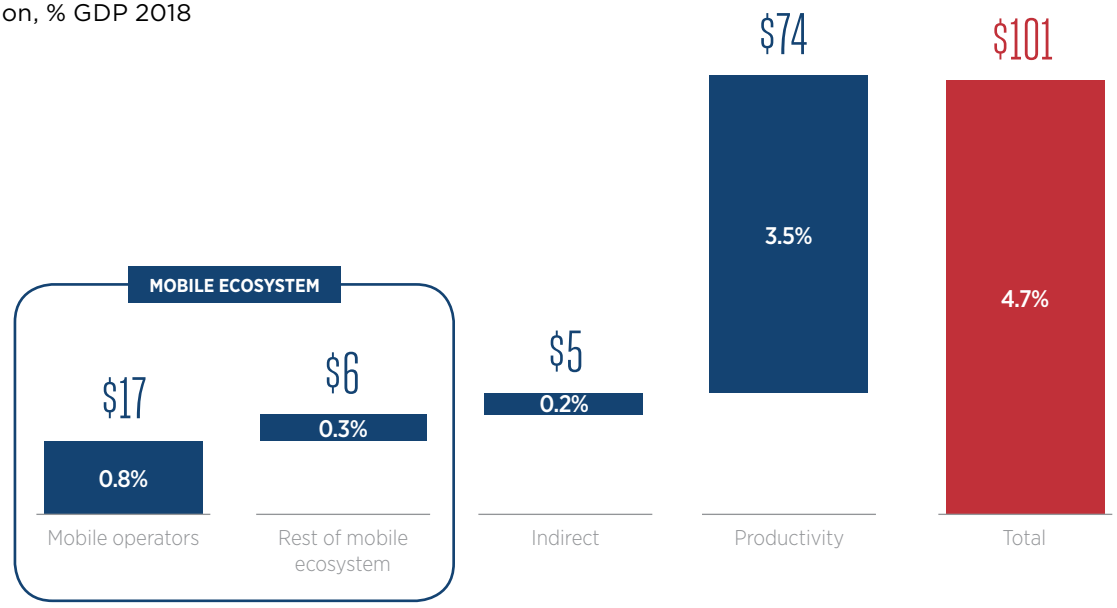
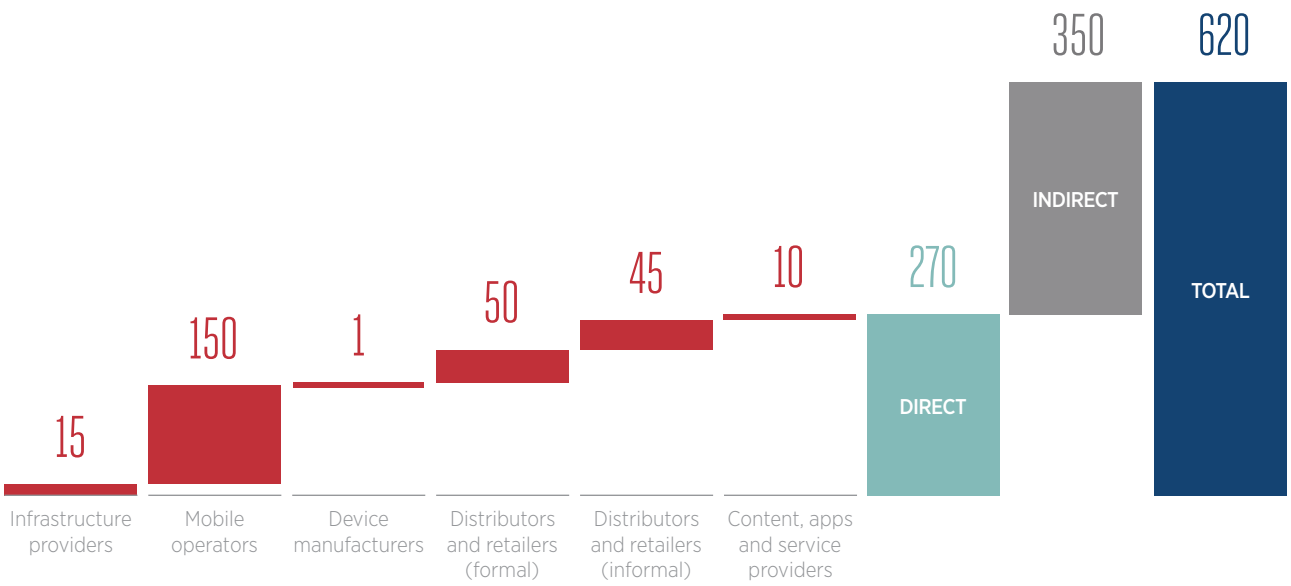


Figure 15 Source: GSMA Intelligence

The mobile ecosystem employs 620,000 people: 270,000 directly and 350,000 through related industries

Jobs (millions)



Note: totals may not add up due to rounding.

Figure 16 Source: GSMA Intelligence

In 2018, the mobile ecosystem contributed $12 billion to the funding of the public sector through general taxation

$ billion

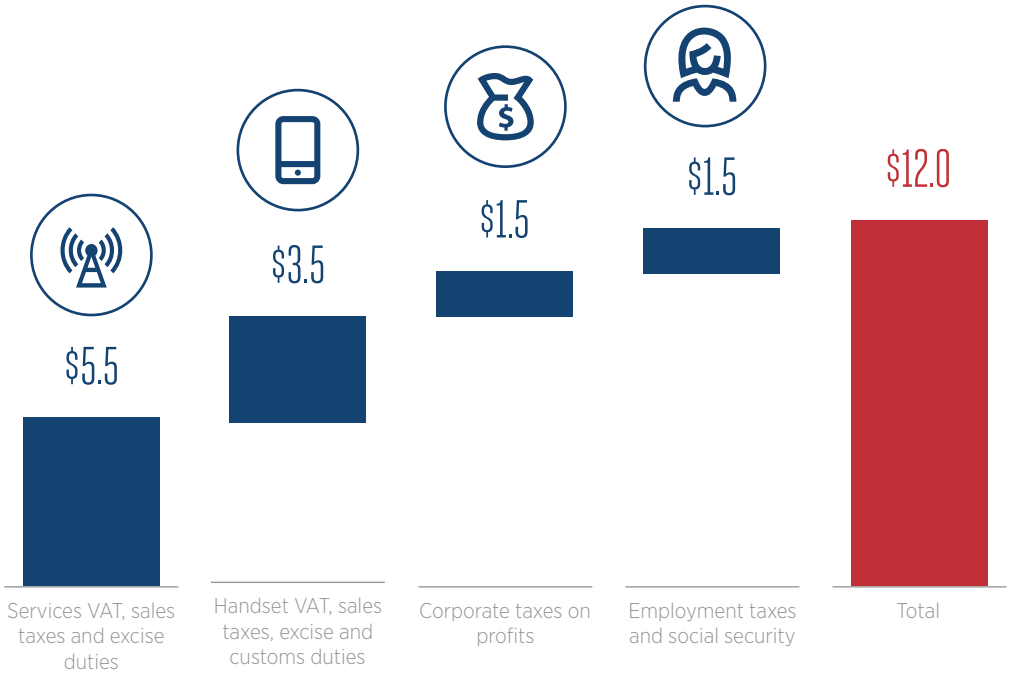


Figure 17 Source: GSMA Intelligence

Driven mostly by productivity gains, the economic contribution of mobile will increase by over $20 billion by 2023

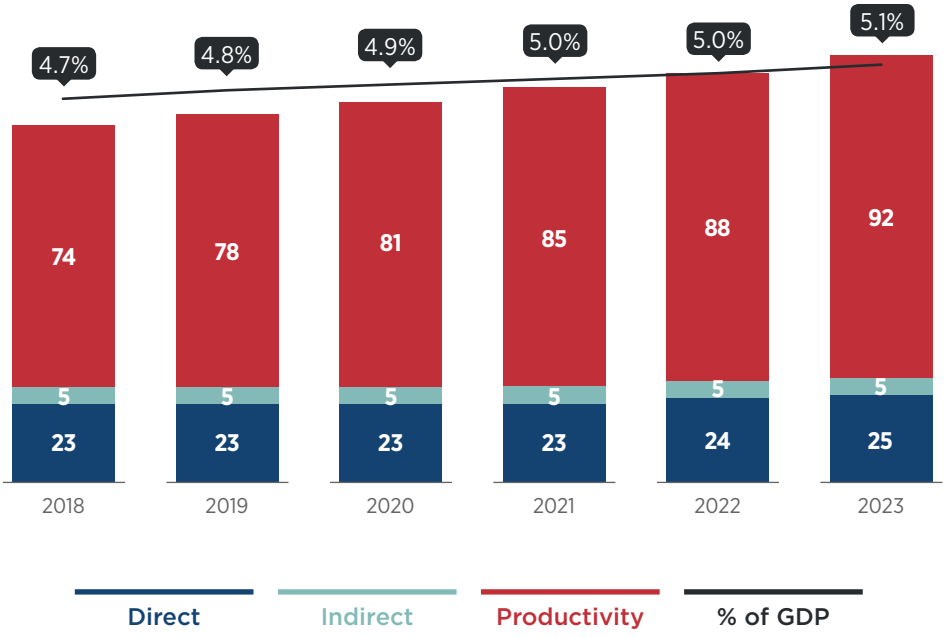
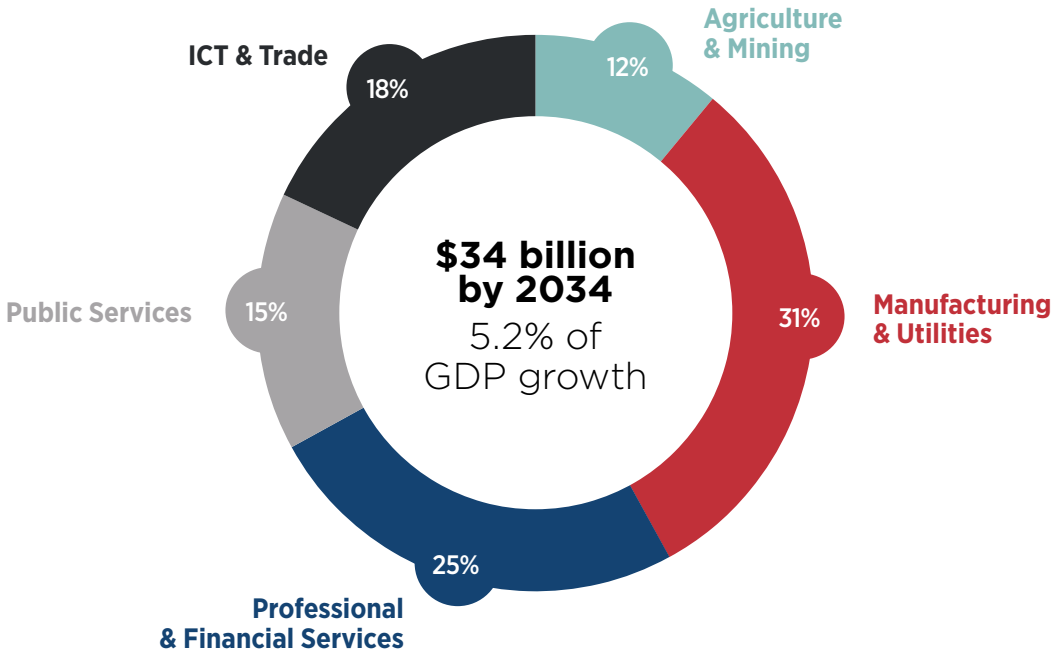


Figure 18 Source: GSMA

5G will contribute $34 billion to the global economy over the next 15 years[11]



11. For more information, see Study on Socio-Economic Benefits of 5G Services Provided in mmWave Bands, GSMA, 2018

2.2
Consumer engagement with mobile services

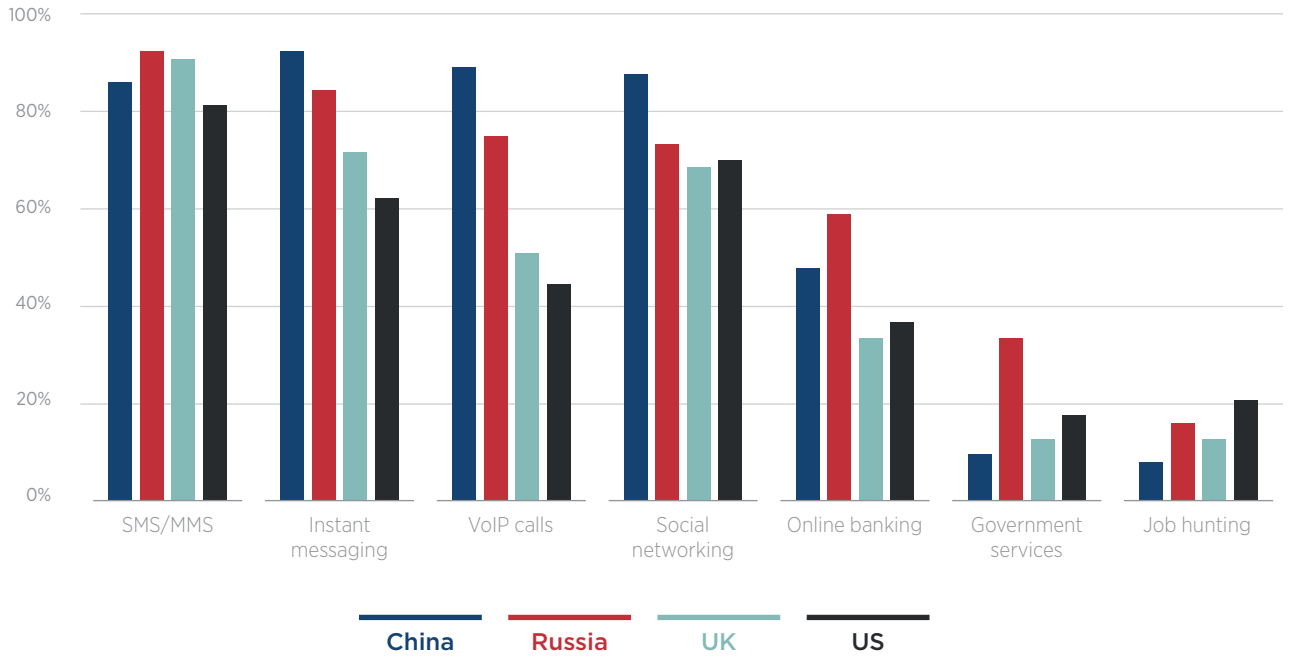
Widening 4G coverage and rising smartphone adoption are fuelling rapid growth in data traffic as consumers across the CIS become increasingly engaged with mobile services. Consumers are using their devices on a more regular basis to access not only internet-based messaging and social media platforms like VK, but also entertainment content (especially video), e-commerce (more often via contactless payment technology) and other digitally delivered services such as healthcare and education. Russia is at the forefront of this transition, scoring highest in the region on both the Consumer and the Content and Services enablers of the GSMA's Mobile Connectivity Index.[12]

Findings from the GSMA Intelligence Consumer Survey 2018[13] show that:

- Of the 34 countries surveyed, Russia has one of the highest monthly engagement scores for sending and receiving **SMS/MMS** messages. Also, a greater proportion of smartphone owners use IP-based apps, including WhatsApp and Telegram, each month compared with developed markets such as the UK and the US.
- Smartphone owners in Russia are relatively highly engaged with **financial services;** 60% use their device to conduct online banking activities at least once per month, often enabled by operators' mobile apps, which provide a platform for a range of services.
- A higher percentage of Russian smartphone users access **e-government** services on a monthly basis compared with some of the leading European markets. Access to public services via the internet is an important driver of digital inclusion, reflected by the Russian government's launch of an online portal in 2009.

Figure 19 Source: GSMA Intelligence

Percentage of smartphone users engaging with certain use cases each month



12. https://www.mobileconnectivityindex.com/
13. The annual survey measures the level of engagement among smartphone and non-smartphone owners across 26 use cases and services in 10 categories. 36,000 people surveyed in total: 1,000 respondents aged over 18 years old in 32 surveyed countries, plus 2,000 in each of China and India.

Consumer behaviour continues to evolve, as mobile devices get smarter, digital services grow richer and societies become more connected. In the CIS, today's *digital* consumers will likely become tomorrow's *augmented* customers in the 5G era; they will increasingly adopt emerging technologies such as immersive reality; smart homes solutions; and new services, including drone delivery and autonomous cars. While this presents an opportunity for mobile operators, the challenge remains to balance network investment and the monetisation of rising data traffic.

2.3
Mobile facilitating and driving innovation across the region

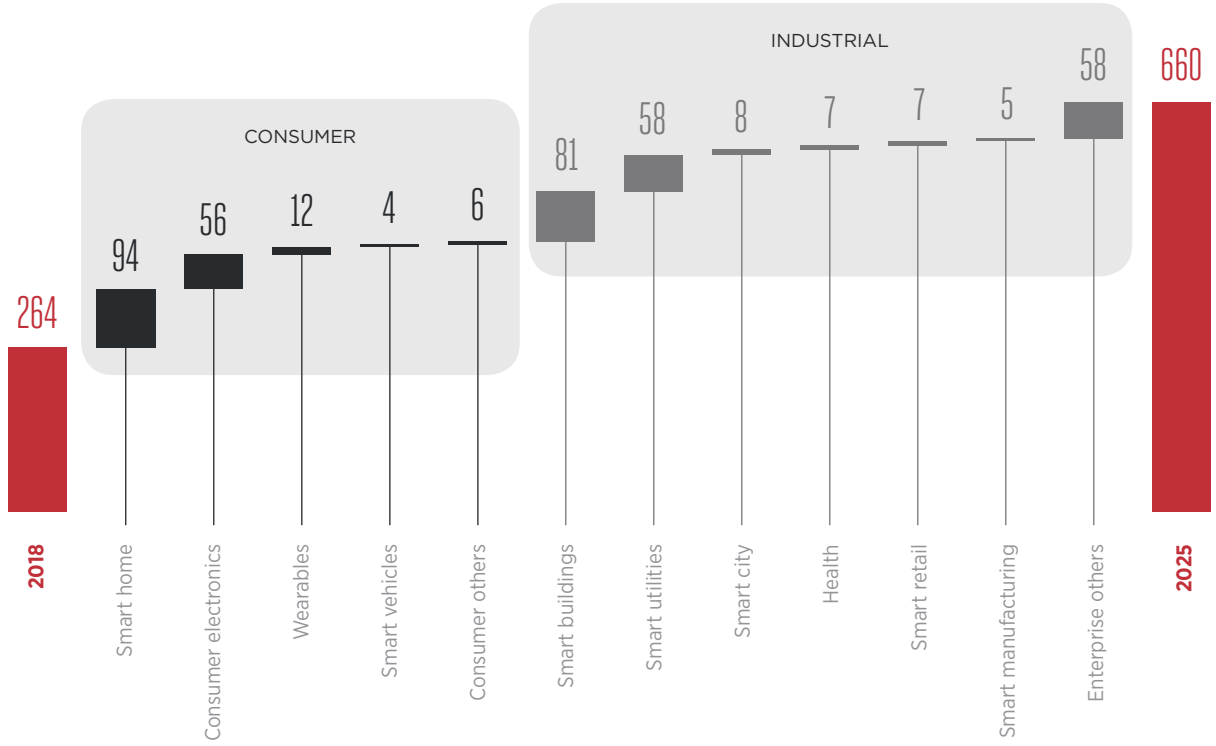
IoT: connections, applications and revenue

Internet of Things (IoT) is an area where CIS operators can grow their business beyond mobile communications, while also delivering productivity gains worth 0.2% of regional GDP.[14] While consumer IoT accounted for 66% of IoT connections[15] at year-end 2018, the biggest increase is expected in industrial IoT;[16] this will reach 48% of total connections by 2025, supported by narrowband IoT (NB-IoT) deployments. For example, MTS and MegaFon have rolled out Russia-wide NB-IoT networks, while A1 (formerly Velcom) and Kyivstar have deployed networks based on the same technology in Belarus and Ukraine, respectively.

Figure 20 Source: GSMA Intelligence

400 million new IoT connections by 2025; smart homes and smart buildings the two key growth areas

Million



14. The contribution of IoT to economic growth: Modelling the impact on business productivity, GSMA Intelligence, 2019
15. IoT connections include cellular and non-cellular connections. IoT connections are IP-enabled devices capable of two-way data transmission (excluding passive sensors and RFID tags). The definition includes connections using multiple communication methods such as cellular, short range and others. It excludes PCs, desktops, tablets, laptops, e-readers and smartphones.
16. IoT: the next wave of connectivity and services, GSMA Intelligence, 2018

Out to 2025, smart buildings and smart utilities will be the two greatest drivers of industrial IoT:

- **Smart buildings** connections will grow due to the vast number of devices and assets that businesses can connect within their premises, including lighting, heating, ventilation and air conditioning systems, and security. At the St. Petersburg International Economic Forum in June 2019, MTS and Ericsson signed an agreement with the President of the Republic of Tatarstan to test a range of smart building solutions in the technology-park-turned-city Innopolis.
- One factor behind the growth of connections for **smart utilities** is government initiatives such as the technical standards and federal law implemented by the Russian Ministry of Energy, which rewards improvement in energy efficiency. In addition, the region has seen a number of projects related to smart meters, including MegaFon's NB-IoT-based solution named 'Smart Utilities' launched in June 2019 and Beeline Kazakhstan's use of its NB-IoT network to deploy smart meters for KazTransGaz in the city of Kostanay.

There has been increased focus on **smart cities** in the region. The Smart Moscow 2030 strategy sets priorities, goals and objectives for the governance and development of a thriving digital economy in Moscow, leveraging emerging digital technologies for sustainable enhancement of citizens' living standards and favourable conditions for entrepreneurship.[17] Meanwhile, Kazakhtelecom and Uzbektelecom are collaborating on projects in their respective countries, while Huawei is supporting the Azerbaijani government to implement a Smart City project in Baku, beginning with the build-out of a public Wi-Fi network.

With the expected growth in connections over the coming years, IoT revenue[18] in the CIS will increase at a compound annual growth rate (CAGR) of 22% between 2018 and 2025 to reach almost $26 billion.[19] Mobile operators have been employing different strategies to capture a larger share of the IoT revenue opportunity and move beyond offering connectivity only:

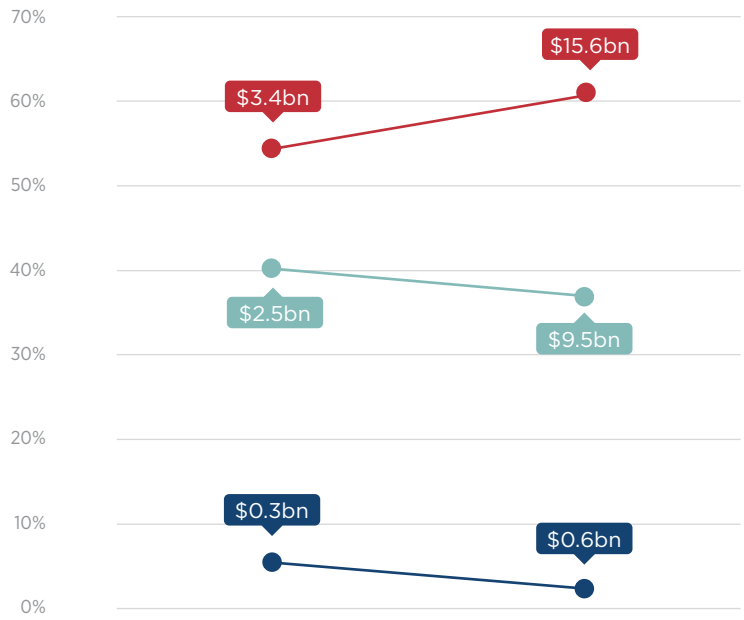
- In 2018, Velcom (now A1) in Belarus announced the launch of its smart home solution, providing the management of devices, lighting and temperature through a mobile app.
- In Russia, MegaFon has introduced a tariff for managing devices working on its NB-IoT network. The tariff also includes access to a M2M monitoring platform, enabling customers, regardless of location, to manage the network of IoT devices, removing the risk of exceeding data traffic limits.
- MTS, Nokia and NVision have established an IoT platform that combines existing IoT technology standards to ensure a wider offering of services to clients, with the aim of boosting the Russian economy through improved business efficiencies.

17. Moscow 'Smart City – 2030' A brief version, Moscow Mayor, 2018
18. For GSMA Intelligence, IoT revenue excludes device and module chipset revenue but includes revenue associated with provision of connectivity, applications, platforms and services, and professional services.
19. IoT: the $1 trillion revenue opportunity, GSMA Intelligence, 2018

Figure 21 Source: GSMA Intelligence

Connectivity will be commoditised; value generation lies elsewhere

% total IoT revenue



Applications, platforms and services (which includes cloud storage, data analytics and security) is the key growth area of IoT

Professional services (encompassing systems integration, consulting and managed services) will increase in share, fuelled by the continued digitisation of industries

Connectivity will commoditise and decline in share, making it difficult for operators to compete on the data pipe alone

The e-commerce market and fintech

Across the CIS, an increasing number of consumers are engaging with digital retail, expanding cross-border trade and presenting challenges to the bricks-and-mortar store model. The Russian e-commerce market alone is estimated to be worth RUB1,040 billion ($16 billion) in 2018, having seen considerable growth in recent years.[20] Digital identity and mobile technology are contributing to the transformation of traditional commerce; 45% of smartphone owners in Russia now use their device to order and/or purchase goods online each month.[21]

However, research suggests that e-commerce currently accounts for only 3% of all purchases in Russia. Hence, with good mobile internet penetration and smartphone adoption there is clear scope for growth. E-commerce projects are receiving substantial funding from both private and public backers, and the trend is likely to continue as the gold rush to create 'Russia's Amazon' persists and competition intensifies.

For example, in March 2019, (Beeline parent) VEON bought out partner Alfa Bank to take outright ownership of Russian financial services provider National Service Company. The transaction provides VEON with complete control over online and mobile payment brand RuRu, which allows users to perform a range of financial services online or through handsets, including P2P payments, retail transactions, mobile top-up and paying for transport in parts of Russia.

By 2023, Morgan Stanley forecasts that the country's 'e-tailers' will invest over $1 billion in their websites, warehouses and logistics. As supply increases and order frequency rises, the total Russian e-commerce market is predicted to grow to RUB3,491 billion ($53 billion) by that time.

Russia currently lacks a dominant e-commerce platform, while foreign companies such as Amazon often prefer to import goods to consumers rather than set up operation within the country's borders.

20. Russia eCommerce: Last but not least, Morgan Stanley, 2018
21. GSMA Intelligence Consumer Survey 2018

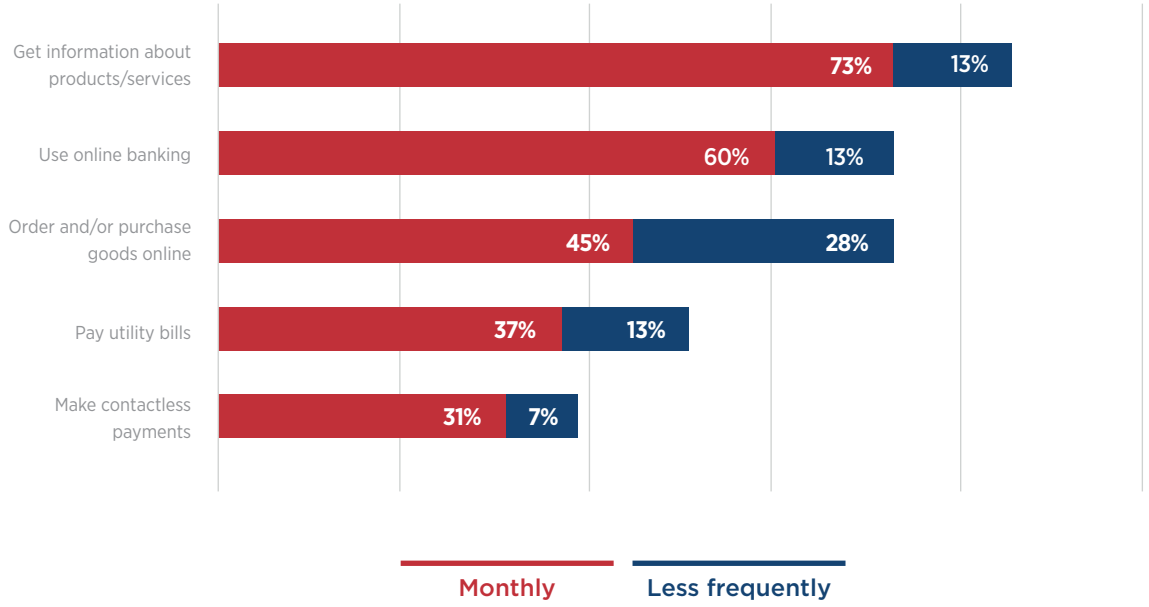
China's Alibaba has now partnered with MegaFon, the Russian Direct Investment Fund (RDIF) and Mail.Ru to launch AliExpress Russia, putting it in direct competition with domestic e-commerce company Yandex, which itself launched a $1 billion joint venture with state-run Sberbank to create an online retail platform. Over the next decade, joint ventures could become the pillars of Russian e-commerce as players look to gain scale, drive down key painpoints (e.g. fulfilment costs) and improve delivery times to satisfy growing consumer demand.

Figure 22 Source: GSMA Intelligence

Digital commerce in Russia

Percentage of smartphone owners

How frequently do you do each of the following on a mobile phone?



Relatedly, the fintech sector is also enjoying steady growth: Russia sits third in a ranking of the top 27 fintech markets globally,[22] while the central bank has established the FinTech Association to investigate and explore potential blockchain solutions, identification technologies and payment system frameworks. Consumer awareness of fintech services (e.g. to transfer money) is high, creating an opportunity for operators to capitalise on their position in the value chain.[23]

Several of the CIS's mobile operators have already made their first forays into digital banking and top-up services, and have demonstrated appetite for further expanding their role:

- Russian operator MegaFon, Gasprombank, Rostec and USM Holdings have formed a new company named MF Technologies, with the aim of creating digital technologies designed to modernise the operations of companies across a number of sectors. The firm's first objective is to drive forward efforts to create a "financial digital platform" in Russia to act as the basis for the development of digital banking and other corporate services.
- In Ukraine, Wirecard has become a payment partner of Kyivstar on the VEON platform, with its real-time processing solutions for airtime top-up enabling customers to upload and update their mobile payment accounts on the go.

Moving forward, the digitisation of financial services will continue as the penetration of internet-enabled devices grows, consumer preferences and regulation evolve, and the adoption of mobile broadband increases.

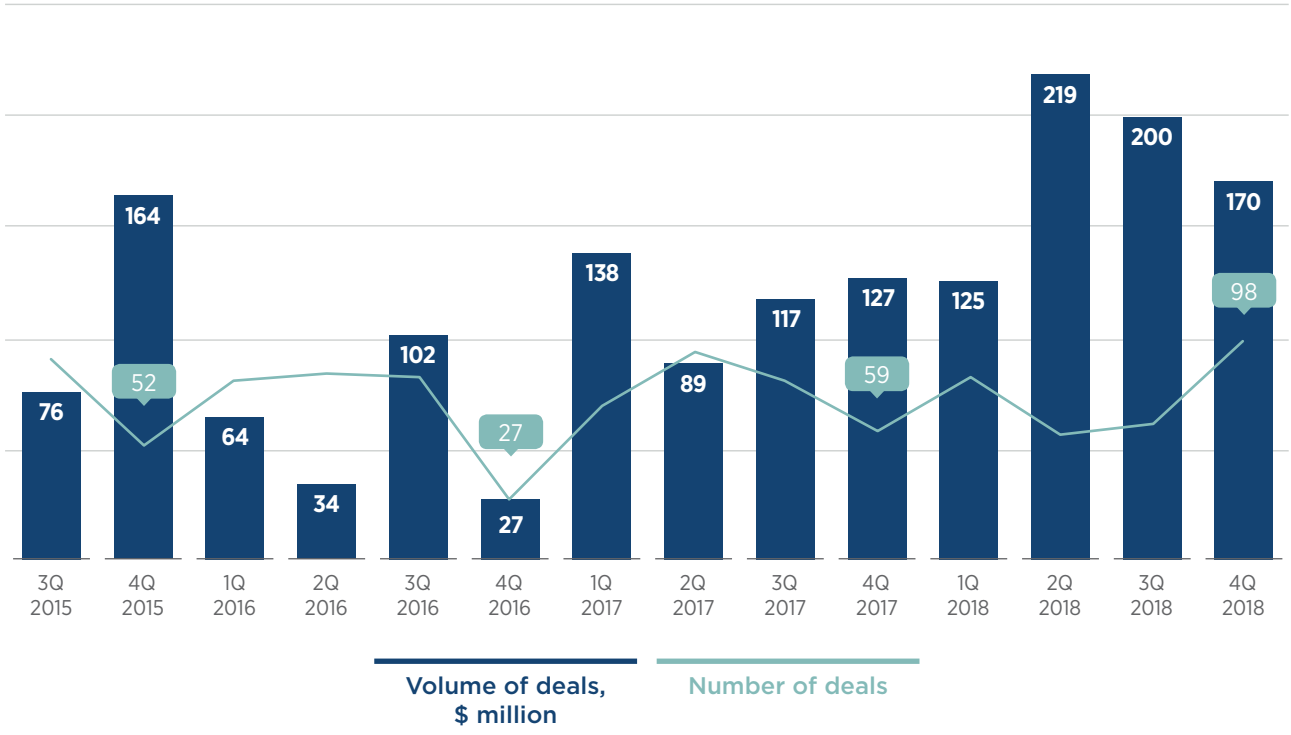
22. Global FinTech Adoption Index 2019, EY, 2019
23. EY notes that the rate of consumer awareness in Russia may be connected to foreign sanctions imposed on major banks, which have raised the profile of alternative providers for services such as in remittances and foreign exchange.

Investment in the start-up ecosystem

The spirit of innovation is becoming more evident across the CIS: in 2018, private firms in Russia invested $714 million in start-ups and maturing tech companies in 299 deals.[24]

Figure 23 Source: Dsight

Value of investment in Russia in 2018 grew 52% on the previous year



24. Venture Russia 2018: Results, Dsight, 2019

The government has been similarly active in supporting research and development in the tech sector, for example through the Russia-China Investment Fund (RCIF). This initiative targets projects that advance bilateral economic cooperation between the two countries, and will invest at least 70% of its $2 billion capital in Russia and CIS countries, and up to 30% in China.

In addition, telco venture-capital (VC) activity is on the rise as certain operators look to accelerate grassroots innovation and steel themselves against disruption:

- Following acquisitions of cloud solutions, online ticketing and e-sports firms, in April 2019, MTS set up a RUB1 billion ($15 million) fund to invest in early-stage start-ups across Russia and neighbouring markets. Separately, these are reports that MTS is considering the RUB20 billion ($304 million) acquisition of the online television provider ivi, which could be a valuable addition to its newly launched MTS Media service.[25]
- Between 28 July and 3 August 2019, Beeline held the fourth annual Sevan Start-up Summit in Armenia. The event provides the platform for fledgling firms to meet and socialise with financiers and entrepreneurs, as well as the opportunity to compete for a $100,000 investment prize.

Several cities in the region are now home to tech hubs or parks, providing start-ups with business support and access to critical resources. Launched in 2010, Skolkovo is a high-tech business area located west of Moscow, where the government is seeking to catalyse innovation across Russia through subsidies for start-ups and tax breaks for multinationals. Having established itself as a preeminent location for talent outsourcing, Ukraine is now seeing the emergence of various IT and software start-ups, contributing to an estimated industry export value of $3.6 billion in 2017.[26] Petcube, a Wi-Fi camera to remotely connect owners and pets, has raised over $14 million in VC funding, while Lviv's Innovation District IT Park has received $160 million, allowing it to provide 14,000 workplaces alongside a hotel, tech labs, nurseries and restaurants. In 2018, the Kazakhstan government launched the Astana Hub, an accelerator for tech and IT start-ups, which will see KZT67 billion ($174 million) of investment by 2022.

Nevertheless, empowering the CIS's digital economy will require policymakers to address certain structural issues. SMEs in Russia account for just 20% of GDP and nearly 25% of employment, compared with 58% and 67%, respectively, in the EU.[27] Further, the World Bank's Ease of Doing Business Index indicates that several markets, including Tajikistan, Uzbekistan and Kyrgyzstan, have work to do to establish a more business-friendly climate.[28] Economic legacies from the Soviet era could also cause a lag on the growth and distribution of the digital economy, creating significant wage inequality. To ensure more uniform and sustainable growth of the ICT across the CIS, policymakers must encourage greater entrepreneurial engagement from their citizens, while also identifying funding and introducing measures to support new businesses.

25. "Mobile operator MTS mulling buying 'the Russian Netflix,' online cinema provider ivi", IntelliNews, April 2019
26. "Tech entrepreneurs see Ukraine as future IT leader", FT, September 2018
27. "Government to Restart Support for Russia's Small Business", Russia Business Today, May 2018
28. Doing Business 2019: Training for Reform, The World Bank, 2018

Emerging tech: beyond connectivity

Mobile operators in the CIS increasingly need to evolve in order to mitigate the challenges facing traditional telecoms services. Several emerging technologies will form the foundations of the new digital economy, shaping the cyber landscape, while presenting opportunities and areas of investment for operators in the near to medium term.

Big data

In October 2018, a collective of organisations, including MegaFon, Yandex, Sberbank and Mail.Ru, founded an industry association, the aim of which is to create common principles and standards of processing, storage, transfer and use of big data in Russia. The group has subsequently announced that by the end of 2019 it intends to propose a self-regulating code of ethics for the use of data by Russian companies.

Utilising real-time mobile analytics to aid the rescue of missing persons

When a person goes missing, speedy action is essential to ensure their safe recovery. By working with the non-profit volunteer organisation LizaAlert, Megafon is offering a smart solution to quickly alert individuals ready to assist active search-and-rescue efforts in Russia. Megafon has developed an algorithm that harnesses its network data to contact via SMS/MMS those of its 80 million mobile subscribers most likely to have information relevant to the missing person without revealing any customer's personal information to third parties. In the first six months post-launch, Megafon's algorithm was used for more than 250 searches in 38 regions of Russia, generating valuable information to aid search-and-rescue teams.[29]

#BD4SG

At MWC19 Barcelona, Kcell presented practical applications for the use big data for smart cities in Kazakhstan. By acting as a source and aggregator of different types of anonymous inputs, including socio-demographic and public transport data, Kcell considers cities can be made safer and more comfortable to live in.

29. For more information on the GSMA's Big Data for Social Good (BD4SG) initiative, see https://www.gsma.com/betterfuture/bd4sg

Blockchain

In the CIS, the mobile industry is gaining a better understanding of the potential of blockchain. Operators are exploring how they could use the technology to develop differentiated services that guarantee transparency, security and real-time transactions:

- Kazakhtelecom is assessing the possible application of blockchain in the private sector, in government and across the wider economy, as well as joining the national industry group on the development of blockchain and crypto-technologies.
- Having partnered with Sberbank, Russia's largest bank, to use blockchain to issue RUB750 million ($11.4 million) of commercial bonds via smart contracts, MTS is collaborating with Orange to test how blockchain can be used to validate inter-operator wholesale billing and charging processes for mobile roaming.

Russia, in particular, has ambitions to be a global pioneer in blockchain, which is reflected by state-sponsored work to develop a national cryptocurrency (the 'CryptoRuble') based on the technology. The country is already a leading innovator in this space, with public bodies and private companies increasingly experimenting with blockchain.

The Russian Ministry of Transport has signed a memorandum of understanding with Maersk, which will enable the implementation of blockchain-based TradeLens in the country. TradeLens will first launch a pilot in St. Petersburg, which will see the city's ports join an ecosystem of more than 100 companies and organisations already using the platform to digitise container documentation flows in the global supply chain. However, it has been reported that Sberbank has decided to wind down its participation in Masterchain, a bank blockchain project backed by Russia's central bank, considering the system inefficient, insecure and slow.[30]

AI

Though the global AI industry is currently dominated by the big Chinese and US internet ecosystem players, there is an increasing focus on, and investment in, AI across the CIS.

In May 2019, the RDIF announced that it had raised $2 billion from foreign investors (including "large sovereign funds and global corporations from the Middle East and Asia") to support domestic companies developing AI. The technology is at a nascent stage in Russia today, though the funds raised will now be used to support a range of projects, including facial recognition start-up VisionLabs.

Leading telcos in the region are also stepping up their efforts with respect to AI, considering applications to various business areas, including customer care and network automation:

- Since 2017, MTS has been exploring the use of AI in driving efficiency, improving and digitising customer service, and reducing headcount. As part of this agenda, the operator has established an AI research group (within its Innovation Centre), which brings together experts to devise solutions for industries such as health and legal, and to develop a virtual assistant to support communication with MTS customers.
- Meanwhile, rival MegaFon and vendor NEC have completed a live field test in the Urals to gauge how AI can be used to manage network traffic and undertake proactive maintenance.

30. 'Disappointed' by Central Bank Blockchain, Russia's Largest Bank Eyes Alternatives, CoinDesk, July 2019

03
Policies influencing the future of mobile

The current decade has seen a widening build-out of mobile broadband networks and increasing uptake of 3G and then 4G services across the CIS. Yet, with slowing subscriber growth, intense price competition and a modest revenue outlook, operators are looking to generate cost efficiencies to help handle rising data traffic, as well as innovative business models and adjacent markets to unearth new income streams.

5G mobile networks offer the potential to underpin a range of solutions for enterprises, in addition to serving the consumer market. However, uncertainty around spectrum access and returns on investment can hamper the release of value into the digital economy. Policymakers should consider the deployment of 5G networks not just a technical advancement for the telecoms sector, but as a basis for driving socio-economic growth and the transformation of traditional industries. The regulatory framework for mobile should shift from controlling and supervising the industry to fostering its development within an environment that is conducive to investment. Launches of 5G networks in other markets indicate that a key factor behind their successful deployment and operation is the creation of a comprehensive national 5G development plan.

3.1 Spectrum for 5G

As mobile broadband adoption and data traffic continue to rise, and as a growing number of 'things' become connected, demand for more bandwidth, faster speeds and improved coverage can only be met by increasing the volume of spectrum assigned to mobile operators. Some CIS operators, however, have voiced concerns that spectrum earmarked for 5G remains out of reach, putting at risk the region's digital vision and the potential of IoT. In certain markets, powerful incumbents, including television broadcasters, space agencies, state bodies and the military, are looking to tie up bands slated for 5G, which could scupper momentum as operators work towards commercial network deployments.

New harmonised spectrum needs to be right in terms of amount and type, and provided under the right conditions. It must also be made available in a timely manner, on a technology-neutral basis and within three key ranges:

- **Sub-1 GHz:** With government users in the 800 and 900 MHz bands in many CIS markets, the 700 MHz band is the most viable for both wide area and deeper indoor coverage of mobile services, even after taking into account cross-border coordination and re-planning of broadcasting networks. The band has been used for LTE in Uzbekistan since 2010, while Kyrgyzstan is exploring the allocation of 700 MHz to mobile having completed its digital switchover.[31]
- **1-6 GHz:** Regulators should release 80–100 MHz of contiguous spectrum per operator within bands such as the 3.4–3.8 GHz range to help alleviate network congestion in major cities, while also minimising the costs of site densification. In some countries, including Russia, the historical use of this spectrum by the FSS makes sharing with 5G challenging, creating a risk of delay to 5G rollout. The proposed alternative spectrum in the 4.4-4.99 GHz range is not commonly allocated for 5G worldwide and will not enable a significant ecosystem for the Russian market in the near future; it should be considered only as complementary to the 3.4-3.8 GHz band.
- **Above 6 GHz:** The 26 GHz and 40 GHz bands are the most promising of the WRC-19 bands for 5G network rollouts, and are already gaining traction around the world for mobile broadband services. The 26 GHz band is adjacent to the 28 GHz band, allowing wide harmonisation, low handset complexity, economies of scale and early equipment availability. The 28 GHz band will be used for 5G in many countries, for example Kazakhstan, with such implementation done outside of the WRC-19 process under an existing mobile allocation.

31. 5G Implementation in Europe and CIS: Outcome Report of the ITU Regional Seminar, ITU, 2018

To that end, the full socioeconomic impact of 5G in the CIS will be heavily dependent on access to millimetre wave (mmWave) spectrum. Assigning around 1 GHz per operator will play a key role in meeting the demand for many enhanced mobile data services through ultra-high speeds and low latencies. mmWave-enabled 5G can automate activities to help address labour shortage issues present in multiple verticals in the CIS, as well as providing the connectivity necessary for data-intensive healthcare solutions such as virtual reality training and remote surgery.[32] In fact, the GSMA estimates that 5G enabled with the high capacity of mmWave is expected to deliver $6.7 billion in GDP in 2034 and $1.4 billion in tax revenue in the region.[33]

As well as making sufficient spectrum available, regulators should also reassess the spectrum pricing and annual spectrum fee approaches, specifically for new, wider bands above 3 GHz. Positively, the Russian government has issued a draft decision changing the methodology for the calculation of levies on spectrum use, including a revision of the ratios used for determining fees for 5G frequencies. An appropriate pricing policy will support the 5G investment efforts of mobile operators and should be implemented in all CIS markets without delay.

Benefits of a long-term spectrum roadmap

Governments can maximise the social gains from national resources by developing a transparent and comprehensive spectrum roadmap built on inclusive dialogue between relevant stakeholders. This is also important for ensuring sufficient spectrum is available to meet the requirements driven by changing technology and demand.

Mobile operators' business plans are intrinsically linked to the availability of spectrum and the conditions under which it is made available, while the complexity and cost of decisions to acquire spectrum mean they should be provided with as much notice as possible of forthcoming assignment processes, especially in the case of spectrum renewals.

Many CIS countries have published national strategies in recent years, including the Digital Agenda of Armenia 2030 and Belarus's Decree on the Development of the Digital Economy; however, they have not set out an auction pipeline for 5G-usable spectrum. Notably, Russia released its Digital Economy national programme in 2017 that included a 5G roadmap, but it has yet to develop a clear spectrum assignment plan.[34]

A holistic roadmap that outlines the government's strategy for the release and renewal of spectrum reduces uncertainty by allowing operators to assess the long-term value of their infrastructure investments and more accurately value spectrum lots at auction. These factors will protect against an asymmetry of information, reduce risk and encourage CIS operators to develop business cases and make positive capex decisions.

32. The WRC series: Regional Spotlights: Impact of mmWave 5G, GSMA, 2019
33. The WRC series: Study on Socio-Economic Benefits of 5G Services Provided in mmWave Bands, GSMA, 2018
34. The 5G Ecosystem: Risks & Opportunities For DoD, Defense Innovation Board, 2019

3.2 Infrastructure rollout regulation

Wireless emissions standards

Notwithstanding the need to provide a safe and healthy environment for all citizens, the existing wireless radiation allowances in many CIS countries are based on studies and practices that date back decades. In Russia, exposure limits for the 300 MHz to 3 GHz range are set according to "hygienic-epidemiological standards", which are more stringent than those in the EU.[35] After several studies, many countries around the world have adopted electro-magnetic emission limits based on international guidance (e.g. from the World Health Organization), which are significantly higher than those in most CIS markets.

The spectrum bands that will be employed in providing 5G services, including mmWave, are covered by the same international safety guidelines that protect all members of the public and the environment. Even as the installation of small cells makes the density of mobile network sites in cities greater, there is currently no evidence of any risk to health.[36]

However, the existing requirements inherited from the USSR could make it more difficult to deploy cost-effective 5G networks even if the problems of spectrum availability are resolved. In order to enable the use of modern antenna systems (such as massive MIMO), regulators should consider revising radiofrequency exposure rules towards the higher allowances based on international safety guidelines – for instance those determined by the International Commission on Non-Ionising Radiation Protection (ICNIRP). As the region moves into the 5G era, there is also an important role for national authorities to communicate accurate and reliable information, and combat unverified misunderstandings or falsehoods.

Deployment procedures and provisions

Rapid and efficient 5G rollout will require new approaches from regulators. Strict regulations and procedures historically used by many CIS countries during the deployments of 2G, 3G and 4G networks will become significant constraints on 5G's development. The rapid pace of progress requires operators to roll out and repurpose networks faster using network automation.

Meeting the demands of 5G services will necessitate new investment, as well as requiring that operators take on significant business risks. Building infrastructure, deploying equipment and manipulating equipment parameters on a day-to-day basis with permission-based authorisation has become too time-consuming and diverts substantial resources to tasks not related to overall network quality.

Policymakers should identify mechanisms to streamline the administrative procedures regulating the construction and deployment of 5G networks, including: non-discriminatory, simplified access to federal and municipal infrastructure facilities; connection to municipal or transport energy infrastructure; and facilitating permissions and standard processes. A move from permission-based authorisation to notification procedures for certain infrastructure such as small cells might provide appropriate conditions for operators to speed up 5G development, providing a head start in terms of overall competitiveness of the economy.

35. Comparison of international policies on electromagnetic fields (power frequency and radiofrequency fields), National Institute for Public Health and the Environment, 2018
36. Safety of 5G Mobile Networks, GSMA, 2019

3.3
Security and privacy online

Empowering the CIS's digital economy depends on more than solving spectrum and network deployment issues. According to InfoWatch, Russia accounted for 270 breaches of confidential information in 2018, second only to the US.[37] As the number of data leaks globally grows year-on-year, the level of security provided by the telecoms industry is under greater scrutiny. In Russia, for instance, conversations continue around the registration of every mobile device by its International Mobile Equipment Identity (IMEI) to deter crime.

5G standards outline a security architecture that offers controls surpassing those of previous generations, yet the threat posed by cyberattacks is only increasing as the industry diversifies its services. With so many more connected devices and objects, the 'attack surface' will broaden and, in turn, heighten the need for virtualisation and machine learning.

Legislation covering personal or IoT data should be balanced to address the need to protect sensitive information but also facilitate entrepreneurship and trade, and enable new innovative services based on the use of big data. For example, the movement of subscribers across a city recorded by mobile networks can be a crucial input for the design of smart transport systems. In addition, a regulatory framework that creates a cross-border area of trust in the CIS can have a positive impact on the movement of goods, services, data and capital, without violating citizens' rights.[38]

However, strict legislation may prohibit the collection and exchange of certain information even if it could have socioeconomic benefits. Further, where such legislation is introduced, it should cover not only mobile operators but also other ICT players involved in data collection and exchange so as not to create distortions between telcos and other stakeholders. Across the region, there is a need for governments, private actors and mobile operators to devise a common legal framework that is designed with privacy and security protections to gain citizens' trust, and ensures that data flows and cross-border trade are not unduly impaired or compromised. By championing appropriate safeguards, operators in the CIS can navigate the changing security threat landscape and support the advancement of the region's digital economy as it moves into the 5G era.

For further recommendations relating to policy issues relevant to the CIS region, see the following:

- 5G in Russia: a local and global view on the way forward[39]
- The Mobile Economy Russia & CIS 2018.[40]

37. A Study on Global Data Leaks in 2018, InfoWatch Analytics Center, 2019
38. The EAEU 2025 Digital Agenda: Prospects and Recommendations, The World Bank, 2018
39. 5G in Russia: a local and global view on the way forward, GSMA Intelligence, 2019
40. The Mobile Economy Russia & CIS 2018, 2018

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