KIWANJA.NET
MINDFUL SOCIAL CHANGE

MOBILE DATABASE · REPORT

INFORMATION SOCIETY STATISTICAL PROFILES 2009: CIS

Author / organisation	International Telecommunication Union (ITU-D)
Year recorded	2009
Region	Eurasia · Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
Category	Economic, Other
Original source	itu.int
Archive page	kiwanja.net/mobile-database/itu-statistical-profiles-2009-cis/

This document is part of the kiwanja.net Mobile Database, an archive of more than 700 articles, reports and projects on mobile technology for development, collected between 2003 and 2010. It is reproduced here for reference; the original author's rights are retained.

Explore more. Browse the full archive at kiwanja.net/mobile-database.
Looking for support with your own social change work? See kiwanja.net/work-with-me.
Ken Banks offers coaching, mentoring and strategy support.

International Telecommunication Union

Information Society Statistical Profiles 2009

CIS (Commonwealth Independent States)

ITU-D

In preparation for the World Telecommunication Development Conference 2010

International Telecommunication Union

International Telecommunication Union

Information Society Statistical Profiles 2009

CIS (Commonwealth of Independent States)

International Telecommunication Union

Acknowledgements

The *Information Society Statistical Profiles 2009: CIS*, the fourth of a series of regional statistical reports in preparation for the next ITU World Telecommunication Development Conference (WTDC-10), was prepared by the Market Information and Statistics Division within the Telecommunication Development Bureau of ITU. The team included Susan Teltscher (Head of Division), Vanessa Gray, Esperanza Magpantay and Desirée van Welsum. Substantive contributions to the report were made by Veaceslav Sidorenco and Ivan Vallejo, consultants to the ITU. The work was carried out under the overall direction of Mario Maniewicz, Chief, Policies and Strategies, Telecommunication Development Bureau.

Helpful inputs on the final draft were received from Yuri Grin, Deputy Director of the Telecommunication Development Bureau, Fernando Lagrana, Head of the Partnerships, Promotion and Membership Division of the Telecommunication Development Bureau and Orozobek Kaijkov, Head of the ITU area office for the CIS region, Moscow.

The Report includes data sourced from the UNESCO Institute of Statistics and Purchasing Power Parity conversion factors received from the World Bank, which is gratefully acknowledged.

The desktop publishing was carried out by Nathalie Rollet, and the cover was designed by Sarah Roxas. Administrative support was provided by Herawasih Yasandikusuma.

Original language of publication: English.

© 2009 ITU

International Telecommunication Union
Place des Nations
CH-1211 Geneva, Switzerland

Foreword

This report is the fourth of a series of regional statistical profiles on the information society prepared by ITU in 2009, as an input to the regional preparatory meetings (RPMs) for the ITU World Telecommunication Development Conference 2010 (WTDC-10). The fourth RPM – for the CIS region – takes place on 23-25 November 2009 and is hosted by the Government of Belarus.

The CIS region is characterized by large disparities in terms of income levels, geography and size of economies. Russia is not only the largest economy in the region, but also the most advanced when it comes to ICT developments, driven by a strong and growing telecommunication market. Both Russia and Ukraine have impressive mobile penetration levels, high Internet growth rates and a dynamic ICT sector. While the region as a whole has experienced steady ICT development during the past decade, low-income countries, such as Tajikistan and Uzbekistan, are still characterized by limited ICT penetration and moderate ICT growth.

There is a striking difference in the CIS region between the uptake of mobile telephony and other ICT services. In the region as a whole, the number of mobile cellular subscriptions has surpassed the number of inhabitants, reaching 113 per cent at the end of 2008 and placing the region second globally after Europe. However, when it comes to Internet use and fixed and mobile broadband access, the region lags behind others. In particular, fixed and mobile broadband penetration stands at only 4.6 and 0.9 per cent respectively, which is below the world average of 6.0 per cent. A major challenge for the CIS countries therefore is to bring the benefits of Internet and broadband to a larger part of its population.

A closer look at fixed and mobile broadband reveals that in many CIS countries, the market is still dominated by incumbent operators, which have yet to roll-out backbone broadband infrastructure, especially outside the capital cities. Promising developments include the launch of mobile broadband networks and WiMAX deployment in several countries throughout the region, with the potential of bringing high-speed Internet to rural and underserved areas.

This report highlights the latest ICT developments in the CIS region and presents key statistical indicators for each country. The report also features a regional analysis of the ITU ICT Development Index (IDI) and the ICT Price Basket, two ICT benchmarking tools that were launched in March 2009. I am confident that the findings of the report as well as the resulting policy conclusions will provide useful inputs to our members in preparation of the WTDC-10.

Sami Al Basheer Al Morshid
Director
Telecommunication Development Bureau (BDT)
International Telecommunication Union

Table of contents

Acknowledgements ..... **ii**

Foreword ..... **iii**

Chapter 1. Market overview **1**

1.1 Fixed telephony 4

1.2 Mobile telephony 6

1.3 Internet and broadband 11

Chapter 2. A closer look at the development of broadband **17**

2.1 Fixed broadband 18

2.2 Mobile broadband 19

Chapter 3. Benchmarking ICT developments in the CIS **27**

3.1 Regional analysis of the ICT Development Index (IDI) 27

3.2 Regional analysis of the ICT Price Basket 34

Chapter 4. Conclusions and recommendations **43**

References **47**

Annex 1. List of countries in the CIS region **49**

Annex 2. IDI sub-indices (access, use, skills) for CIS countries **51**

IDI access sub-index (2002 and 2007) 51

IDI use sub-index (2002 and 2007) 52

IDI skills sub-index (2002 and 2007) 53

Annex 3. Statistical tables **55**

Introduction 55

List of economies 56

1. Main (fixed) telephone lines 57

2. Mobile cellular subscriptions 58

3. Internet users 60

4. International Internet bandwidth 61

5. Fixed broadband Internet subscribers 62

Technical Notes 63

Chapter 1.

Market overview

Over the past decade, the Commonwealth of Independent States (CIS) region[1] has experienced steady ICT infrastructure development and service uptake (Chart 1.1). Mobile cellular penetration rates stand out in particular, with more mobile cellular subscriptions than inhabitants by the end of 2008. At the same time, fixed telephone line penetration stood at 26 per cent, and 25.4 per cent of the population was using the Internet. Fixed and mobile broadband penetration stood rather low, however, at 4.6 per cent and 0.9 per cent respectively. In absolute terms, this means that by the end of 2008, the CIS was home to 314 million mobile cellular subscriptions, 72 million fixed telephone lines, 69 million Internet users, 12 million fixed broadband subscribers, and 2.4 million mobile broadband subscriptions. In the majority of CIS countries, the different telecommunication services have been formally opened to competition (Table 1.1).

From 2003 to 2008, the numbers of fixed lines, Internet users and mobile cellular subscriptions in the CIS have grown annually twice as fast as in the world

ICT growth in the CIS region was higher than that for the world as whole (Table 1.2), suggesting that the region is catching up. Between 2003 and 2008, annual growth rates of both Internet users and mobile cellular subscriptions in the CIS were close to twice those of the world. Mobile penetration soared from 17.2 per cent in 2003 to 113.4 per cent in 2008. Over the same period, fixed line growth in the region also substantially exceeded that of the world, though its growth was much lower than that of mobile cellular subscriptions and Internet users. Nonetheless, as will be illustrated further below, while ICT annual growth rates in the CIS as a whole are higher than in other regions, many countries are lagging behind.[2]

ICT developments in the CIS, 1998-2008

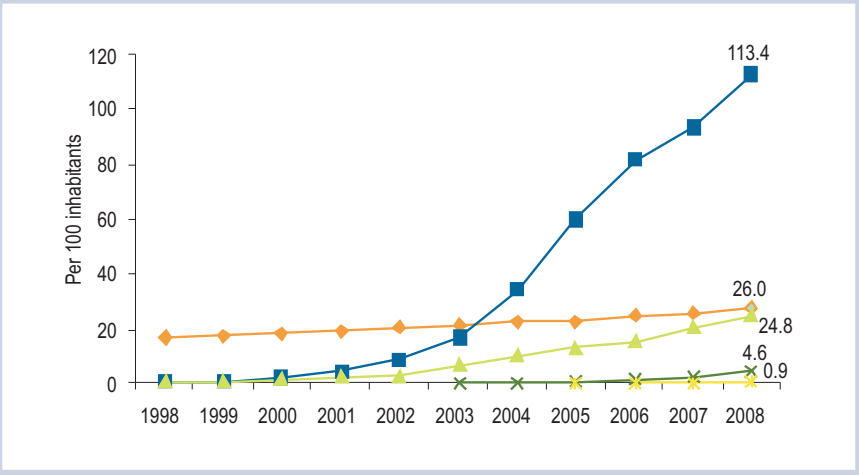


Chart 1.1

Source: ITU World Telecommunication/ICT Indicators database.

Table 1.1

Competition in telecommunication services in the CIS, 2009

Country	Local services	Domes-tic fixed long-dist.	Intern. fixed long-dist	WLL	Data	DSL	Cable Modem	VSAT	Leased lines	Fixed wire-less broad-band
Armenia	C	C	C	-	C	C	-	-	-	-
Azerbaijan	C	C	C	-	C	C	-	-	-	-
Belarus	M	M	M	-	-	-	-	-	-	-
Georgia	C	C	C	-	C	C	-	-	-	-
Kazakhstan	C	C	C	-	C	C	-	C	-	C
Kyrgyzstan	C	C	C	C	C	C	-	C	-	C
Moldova	C	C	C	C	C	C	C	C	C	C
Russia	C	C	C	C	C	-	-	C	-	C
Tajikistan	C	C	C	-	C	-	-	-	-	C
Turkmenistan	M	M	M	-	-	-	-	M	-	M
Ukraine	C	C	C	C	C	-	-	C	-	-
Uzbekistan	-	-	-	-	-	-	-	-	-	-

Country	Mobile cellular	Paging	Cable TV	Fixed sat	Mobile sat	GMPCS	IMT 2000	Internet	Interna-tional gateways
Armenia	C	-	-	C	C	-	-	C	-
Azerbaijan	C	-	C	C	C	-	-	C	C
Belarus	C	-	-	-	-	-	-	C	M
Georgia	C	-	-	-	-	-	-	C	C
Kazakhstan	C	-	C	C	C	-	-	C	C
Kyrgyzstan	C	-	C	C	C	-	-	C	C
Moldova	C	-	C	C	C	C	C	C	C
Russia	C	-	C	C	C	-	C	C	C
Tajikistan	C	-	-	C	C	-	-	C	-
Turkmenistan	C	-	-	-	-	-	-	M	M
Ukraine	C	-	C	C	C	-	-	C	C
Uzbekistan	-	-	-	-	-	-	-	-	-

Note: "C" refers to competition, "M" refers to monopoly. Services with two operators are classified as competitive.
"-" means that data are not available or services are not provided, e.g. paging.
Source: ITU from National Administrations.

Table 1.2

ICT growth in the CIS and in the world, 2003-2008

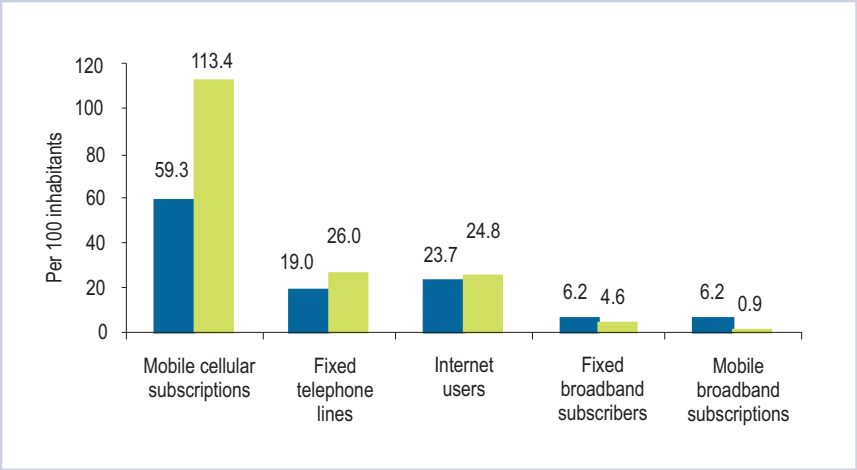
	Compound Annual Growth Rate (CAGR, %)		
	Fixed telephone lines	Mobile cellular subscriptions	Internet users
CIS	4.3	45.6	30.6
World	2.2	23.1	15.1

Source: ITU World Telecommunication/ICT Indicators database.

ICT diffusion levels in the CIS are compared with those in the world in 2008 in Chart 1.2. It shows that mobile cellular subscriptions, fixed telephone lines and Internet user penetration in the CIS are higher than for the world as a whole, while fixed and mobile broadband penetration rates are much lower.

ICT uptake in the CIS and in the world, 2008

Chart 1.2



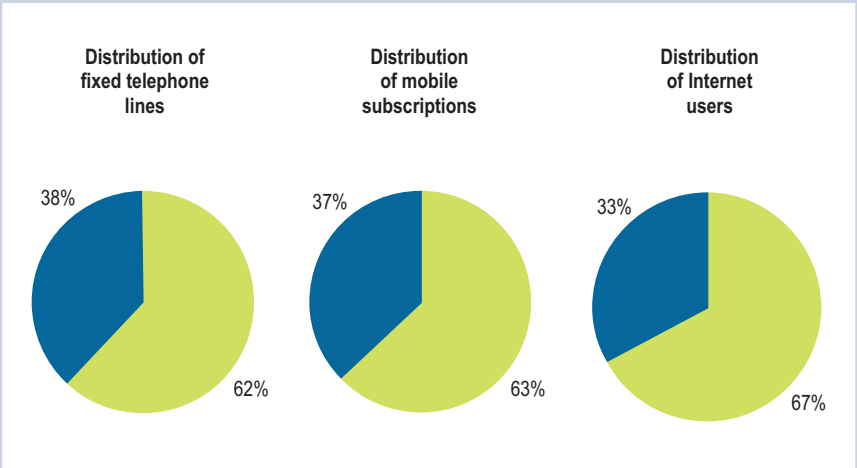
Source: ITU World Telecommunication/ICT Indicators database.

Russia significantly differs from the rest of the CIS countries in terms of its geographic, demographic and economic characteristics. There has been active investment in network infrastructure, and mobile phone penetration has risen dramatically in recent years.[3] Russia now boasts the fourth-largest mobile market in the world, behind China, India and the United States. The market has grown rapidly since the start of the decade, from just under 3.3 million subscriptions (2000) to 200 million (2008). Russia is not only the largest economy of the CIS region, but also one of its most diverse and rapidly developing telecommunication and information technology markets (Chart 1.3). Growth of telecommunications and Internet services in Russia has been stimulated by higher disposable incomes, improved political and economic stability,

Russia now boasts the fourth-largest mobile market in the world, after China, India and the United States

ICT in Russia and the rest of the CIS, 2008

Chart 1.3



Source: ITU World Telecommunication/ICT Indicators database.

and rising foreign investment. Mobile communications, new generation services and IP telephony have also experienced strong annual growth in recent years.

In spite of strong growth in ICT diffusion in recent years, a major challenge for the CIS region remains to ensure continued ICT development, and to make the benefits of ICTs, especially of Internet and broadband, available to a larger part of its population.

1.1 Fixed telephony

Contrary to Europe and the Americas region, in the CIS fixed line penetration keeps growing

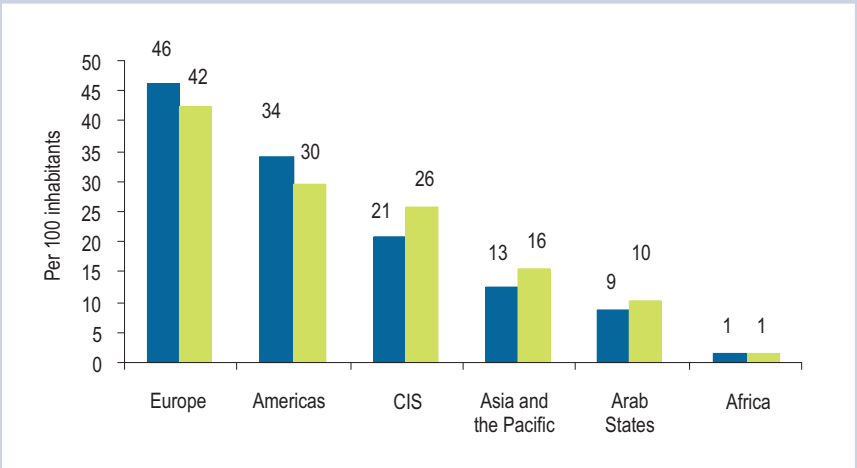
In 2003, there were some 58.2 million fixed telephone lines in the CIS, which corresponded to a penetration rate of 20.9 per cent; by the end of 2008, the number of lines had increased to 72 million, reaching a penetration rate of 26 per cent (Chart 1.4). In contrast to developments in Europe and the Americas,[4] fixed telecom penetration rates are growing steadily in the CIS. The level of digitization of the fixed telephone network is equally increasing, and by 2008, over 75 of the installed, and over 90 per cent of the used fixed telephone network were digital (Table 1.3).

By the beginning of 2009, the fixed-line (and mobile) telephony markets in a number of the most developed CIS countries, like Belarus, Russia and Ukraine, had reached a certain degree of maturity. Growth of the fixed-line telephony sector was relatively stable in 2008.[5] Recent investments in fixed network infrastructure includes fiber, Next-Generation-Networks (NGN) and fixed wireless, which are increasing with a rapid take-up of broadband services. One effect of the current economic crisis could be a slow-down of demand for telephone services. CIS telecommunication operators are therefore shifting their attention to the development of broadband infrastructure and services.[6] The following section takes a closer look at the situation of the fixed line market in selected CIS countries.

Most telecommunication services are now open to competition in **Russia**, including the carriage of international voice services. Around 40 licenses have been issued

Chart 1.4

Fixed telephone line penetration by region, 2003 and 2008



Source: ITU World Telecommunication/ICT Indicators database.

Digitization of the fixed telephone network (installed and used capacity)

Table 1.3

Countries	2006				2008			
			Digital				Digital	
	Total capacity (000s)	Total capacity digital (000s)	As % of ins-talled	As % of used	Total capacity (000s)	Total capacity digital (000s)	Dig as % of total	As % of used
Armenia	736.0	335.2	45.5	-	795.5	454.8	57.2	-
Azerbaijan	1'334.2	1'010.3	75.7	-	1'504.9	1'251.2	83.1	-
Belarus	3'675.9	2'300.2	62.6	-	3'945.8	2'866.7	72.7	-
Georgia	-	-	-	-	-	-	-	-
Kazakhstan	3'190.8	2'417.4	75.8	-	3'911.4	3'378.4	86.4	-
Kyrgyzstan	582.3	258.0	44.3	-	721.6	488.9	67.8	-
Moldova	1'024.7	724.4	70.7	-	1'130.9	936.10	82.8	-
Russia	47'691.1	31'351.5	65.7	-	50'775.5	3'8719.0	76.3	-
Tajikistan	394.9	362.2	91.7	-	407.3	382.1	93.8	-
Turkmenistan	537.1	345.8	64.4	-	530.4*	347.9*	65.6*	-
Ukraine	13'379.7	74'466.7	55.8	-	14'039.1	8'126.1	57.9	-
Uzbekistan	2'014.0	1'487.8	73.9	-	2'121.9	1'886.2	88.9	-
Total	**74'560.6**	**48'059.6**	**64.5**	**89.7**	**78'292.1**	**58'837.4**	**75.2**	**90.7**

Note: * Data refer to 2007.
"-" Data not available.
Source: ITU based on National Administrations.

for inter-city and international telephone communications, and eight operators have started to provide such services: Rostelecom, Interregional Transit Telecom, Sovintel, Komstar-OTS, Synterra, Arktel, Equant and TransTeleCom.

The **Armenian** incumbent fixed line operator ArmenTel (Beeline) has announced plans to fully digitize its Public Switched Telephone Network (PSTN) by 2010.[7] In recent years, ArmenTel has invested some USD 200 million to upgrade analogue network exchanges across the country. For example, by April 2009, the digitization rate in the capital city Yerevan had already reached 90 per cent.[8]

In **Kyrgyzstan**, Kyrgyztelecom OJSC dominates the fixed communications market in terms of numbers of subscribers and territorial coverage, as it is the sole operator offering fixed communication services in all regions of the country.[9] At the end of 2007, the user base share of Kyrgyztelecom OJSC was 96 per cent.[10] In spite of some 44 licenses issued, only two other companies (Saima-Telecom CJSC[11] and Winline LLC (Sapatcom)[12]) effectively operate in the national market.

Other privately owned operators serve the cities of Bishkek, Osh, Jalal-Abad and Kara-Balta and their suburban areas, with efforts often directed at the relatively more solvent consumer segments.

Kyrgyztelecom OJSC, Saima Telecom CJSC and WinLine LLC are also using new technologies in their networks (for instance, CDMA-450 wireless local loop, Softswitch and NGN elements), allowing them to provide a wider spectrum of services and making them more efficient in implementing changes, which should increase their subscriber base.

In **Ukraine**, the incumbent Ukrtelecom dominates the fixed line sector, with over ten million fixed lines in service at the end of 2008, although competition is now increasing, for example from Vega.[13] The fixed line sector is still growing, with Ukrtelecom investing in network expansion, although fixed-to-mobile substitution and VoIP is growing moderately. Furthermore, market observers predict that 2009 could herald the end of fixed-line growth in Ukraine before it will enter a period of decline.[14]

The low level of per capita income makes mobile telephony a priority service in countries such as **Turkmenistan**, **Uzbekistan** and **Tajikistan**. Much of the rural population is spread over a large area, reducing the feasibility of investments in fixed lines.[15] In these countries, the development of fixed-line telephony is limited to the major cities and mobile phones become a vital means of communication in the countryside.

From 2003 to 2008, the number of mobile cellular subscriptions increased more than six times in the CIS, a rate twice as high as the global growth rate

In **Uzbekistan**, the conversion to digital exchanges is expected to be completed in 2010, making the country the frontrunner in the region; this development has also contributed to rapid growth of the Uzbek telecommunications market.[16]

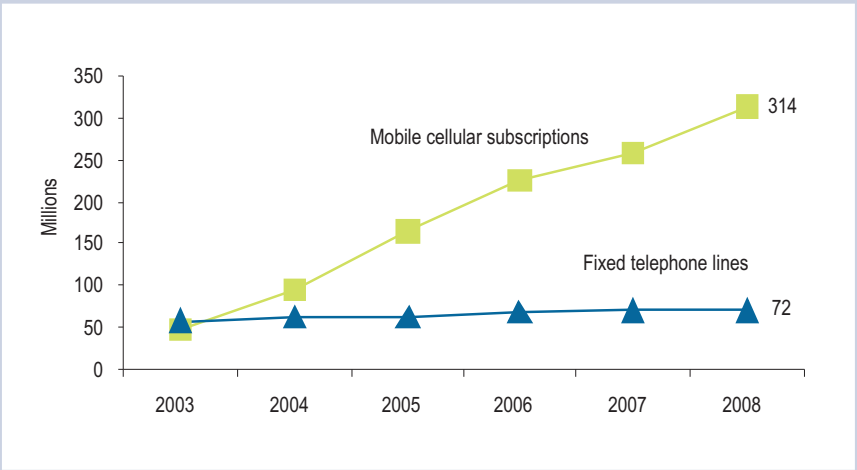
1.2 Mobile telephony

Mobile telephony has undergone impressive growth in the CIS region. The trends analysis clearly shows a shift from fixed to mobile telephony (Chart 1.5). In 2003, the number of mobile cellular subscriptions overtook that of fixed telephone lines and continued to grow remarkably, reaching a total of 314 million subscriptions by the end of 2008. The GSM networks of mobile operators cover most of the national territory in all CIS countries, and mobile telephony is available to the mass market.

Between 2003 and 2008, the number of mobile cellular subscriptions increased more than six times in the CIS, a rate twice as high as the global growth rate (Chart 1.6). This has resulted in a penetration rate higher than the developed country average and much higher than the world average (Chart 1.7). In 2008, the mobile cellular

Chart 1.5

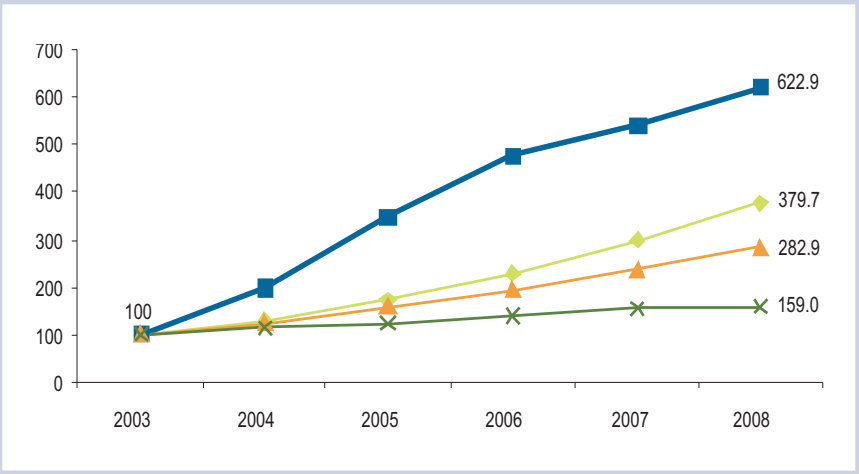
Mobile cellular subscriptions and fixed telephone lines in the CIS, 2003-2008



Source: ITU World Telecommunication/ICT Indicators database.

Mobile cellular growth in the CIS and in the world, 2003-2008

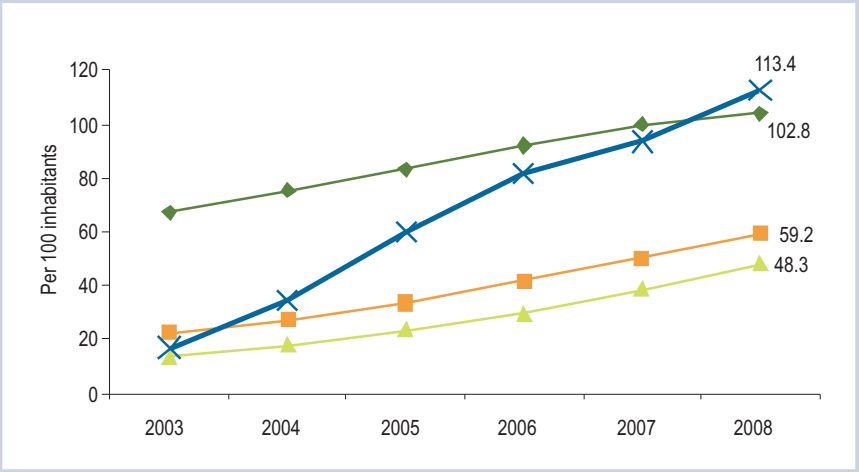
Chart 1.6



Source: ITU World Telecommunication/ICT Indicators database.

Mobile cellular subscriptions in the CIS and in the world, 2003-2008

Chart 1.7



Source: ITU World Telecommunication/ICT Indicators database.

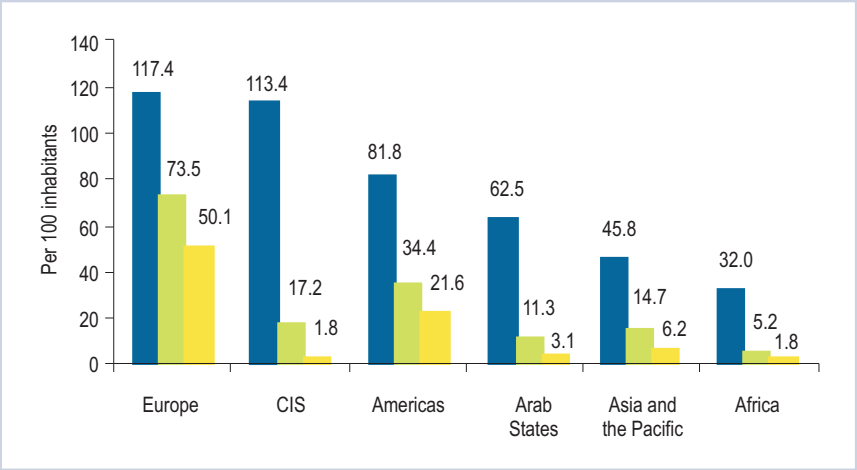
penetration rate in the CIS exceeded that of the Americas, Asia and the Pacific and Africa, but remained slightly below that of Europe (Chart 1.8). This is primarily due to the high growth in Russia and Ukraine, the two largest countries in the region.

The CIS mobile market is attractive, and the entry of Russian mobile operators in the region's markets was facilitated by a shared history between Russia and the CIS countries under the Soviet Union (for example, the strong entrance in the CIS markets by Russian operators such as MTS and VimpelCom).[17]

Some international mobile operators have also entered these markets, as illustrated by the prominent role played by the Swedish operator TeliaSonera. Nonetheless, the CIS

Chart 1.8

Mobile cellular penetration by region



Source: ITU World Telecommunication/ICT Indicators database.

mobile markets mostly revolve around three large mobile operators: MTS, VimpelCom and TeliaSonera.[18] Other important mobile operators include Telenor, market leader in Ukraine under Kyvistar, Orange in Moldova, and Deutsche Telekom in Russia and Ukraine. In October 2008, the third mobile license in Armenia was awarded to Orange.[19] Overall, the region is home to 171 mobile cellular operators (Table 1.4).

In 2008, the number of mobile cellular subscriptions exceeded the number of inhabitants in two CIS countries, namely Russia and Ukraine, while Kazakhstan had a penetration rate of over 90 per cent (Chart 1.9). Mobile penetration is relatively

Table 1.4

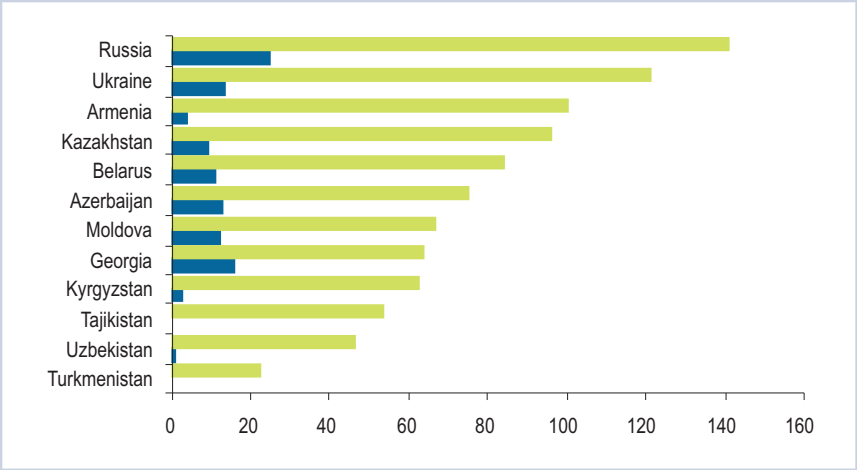
Mobile operators in the CIS, 2009

Country	Mobile Operators	GSM 900 only	GSM 900/1800	NMT 450	IMT MC-450	CDMA 450/ 800/2000	IMT 2000/ UMTS	TDMA
Armenia	3*	-	3	-	-	-	-	-
Azerbaijan	4	-	3	-	-	1	-	-
Belarus	4	-	3	-	-	1	-	-
Georgia	4	-	3	-	-	1	-	-
Kazakhstan	4	-	3	-	-	1	-	-
Kyrgyzstan	8	-	6	-	-	1	1**	1
Moldova	4	-	1	-	-	1	2	-
Russia	121***	25	60	14	95	14	3	-
Tajikistan	9	-	5	-	-	4	1**	-
Turkmenistan	2	-	2	-	-	-	-	-
Ukraine	8	-	4	-	-	3	1	-
Uzbekistan	-	-	-	-	-	-	-	-
TOTAL	**171**	**25**	**93**	**14**	**95**	**27**	**8**	**1**

Note: * In Armenia the third operator will start at the end of 2009.
** The same operator has licenses for provision of services in Tajikistan and Kyrgyzstan
*** In Russia, the column "Mobile operators" reflects the total number of operating companies while other columns refer to the number of licenses for provision of mobile communication services. The same operator may have licenses in several regions within Russia. Only 3 companies are licensed to provide services in the entire country. Besides, 12 companies were licensed to create virtual mobile radiotelephone networks.
"-" Not available.
Source: ITU based on National Administrations.

Mobile penetration rates in CIS countries, 2003 and 2008

Chart 1.9



Source: ITU World Telecommunication/ICT Indicators database.

low in the other CIS economies, but increasing.[20] Turkmenistan is the least advanced market of the region in terms of mobile penetration, reaching only nine per cent by the end of 2008. The Russian mobile market is very dynamic and mobile cellular penetration, as measured by the number of SIM cards, increased from 105.7 per cent in 2006, to 115.1 per cent in 2007, and more than 140 per cent in 2008.

The fastest annual mobile subscription penetration growth in the CIS countries over the past five years is observed in Turkmenistan and Uzbekistan – more than 100 per cent – although penetration rates remain low.

In absolute terms, Russia represents the largest mobile market in the CIS, with the highest net additions of mobile subscriptions during the last five years (Chart 1.10). At the end of February 2009, there were 188 and 169 SIM cards per 100 inhabitants in use in Moscow and St. Petersburg, respectively.

Russia has the largest mobile market in the region, with the highest net additions of mobile subscriptions during the last five years

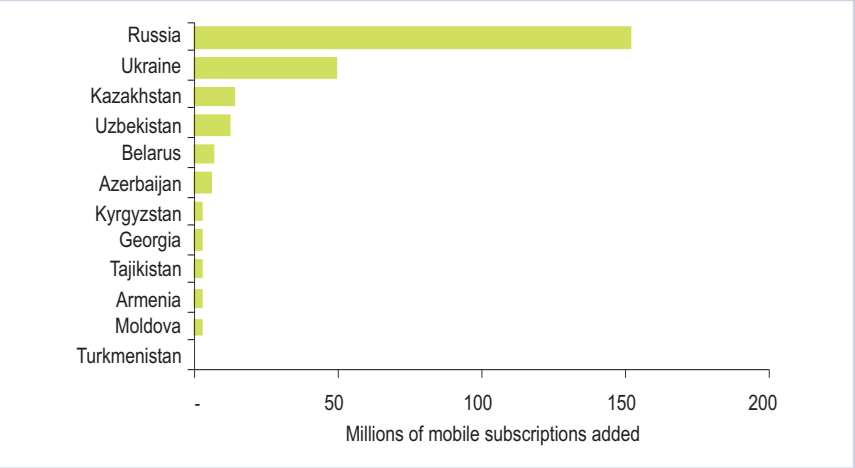
The Russian telecommunications sector has benefited greatly from the high profits generated by mobile telephony. The rapidly growing sector is dominated by three mobile service providers, which together accounted for over 80 per cent of the market at the end of 2008:[21]

- MTS – 34.4 per cent
- VimpelCom – 25.4 per cent
- MegaFon – 23.0 per cent
- others – 17.2 per cent.

Between 2003 and 2008, Ukraine and Kazakhstan also significantly grew in terms of mobile cellular subscriptions. Ukraine increased its number of subscriptions from only about six million to about 56 million and in Kazakhstan – a country with 15 million inhabitants – almost 14 million new subscriptions were added.

Chart 1.10

Countries with the highest net additions of mobile cellular subscriptions in the CIS, 2003-2008



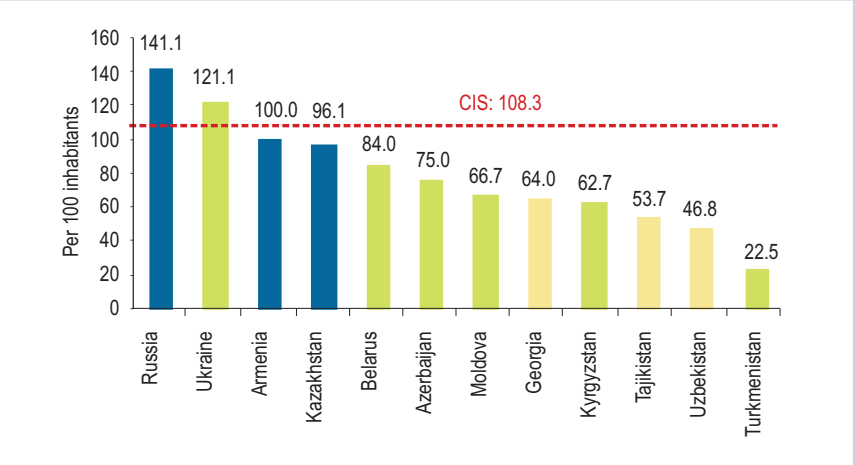
Source: ITU World Telecommunication/ICT Indicators database.

The mobile sector in Ukraine stagnated in 2008, with growth at just 0.8 per cent. This was largely due to MTS Ukraine, which discounted close to 1.9 million inactive SIM cards from its subscriber base, although market leader Kyivstar also reported a net loss of 73'000 subscriptions. Meanwhile, the smallest of the country's four major operators, VimpelCom, saw just 87'000 net additions after shedding 376'000 inactive SIM cards in the final quarter of the year. However, a strong performance from Astelit, which saw close to 2.4 million net additions, underpinned overall growth.[22]

Generally speaking, significant differences in mobile penetration according to income levels[23] can be observed in the CIS region (Chart 1.11). Nonetheless, Ukraine stands

Chart 1.11

Mobile cellular penetration in the CIS by income, 2008



Source: ITU World Telecommunication/ICT Indicators database.

out with higher penetration given its income level, and Turkmenistan with very low penetration compared to its income.

The CIS mobile market is evolving in terms of technology and services offered. For example, MagtiCom, the market leader in Georgia, has introduced offers of HSDPA services, Orange Moldova has launched the iPhone, and data services more generally (Internet browsing in particular) are gaining momentum in many of the CIS markets. Looking ahead, the market is likely to see the diffusion of IMT-2000/3G/3.5G technologies and value added services and the consolidation of large mobile operators in the region, including the expansion in other markets. [24]

1.3 Internet and broadband

Internet user penetration varies considerably among CIS countries, ranging from 1.5 % in Turkmenistan to 32 % in Russia

Internet usage has greatly increased in the CIS region, and together with the mobile cellular market, the Internet market represents an important area of ICT growth and development. By the end of 2008, the region had 70.3 million Internet users, which accounted for four per cent of the world total (Chart 1.12). Between 2003 and 2008, the region added some 50 million Internet users. This increase was mainly driven by Russia and Ukraine (Chart 1.13). In 2008, Internet user penetration in the CIS region overtook that of the world as a whole, approaching 25 per cent (Chart 1.14).

Internet user penetration rates vary considerably among CIS countries, ranging from 1.5 per cent in Turkmenistan to 32 per cent in Russia (Chart 1.15). Countries can broadly be grouped into four categories of Internet user penetration:

1) above 25 per cent - Russia and Belarus
2) 20-25 per cent – Azerbaijan, Georgia, Ukraine[25] and Moldova
3) 15-20 per cent – Kazakhstan, Kyrgyzstan
4) below 15 per cent – Uzbekistan, Tajikistan, Armenia, and Turkmenistan.

Distribution of Internet users, 2008

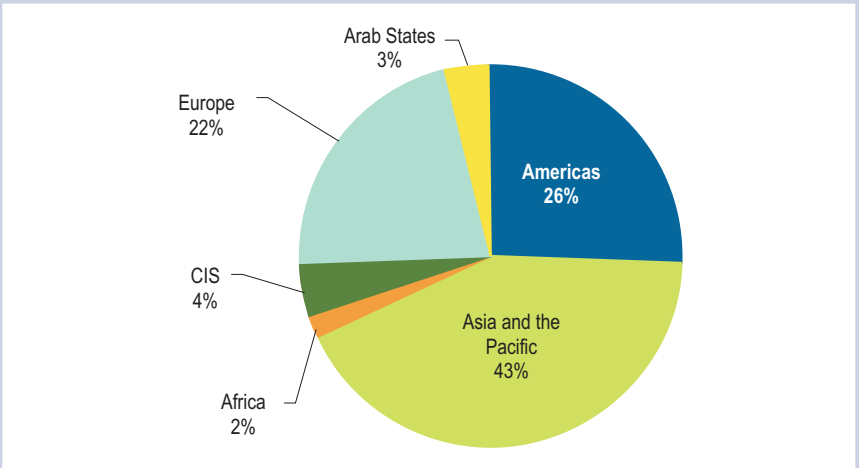
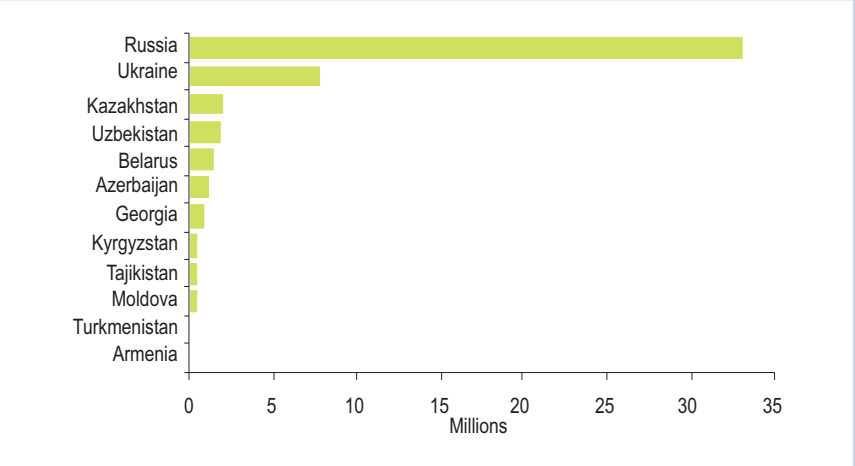


Chart 1.12

Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.13

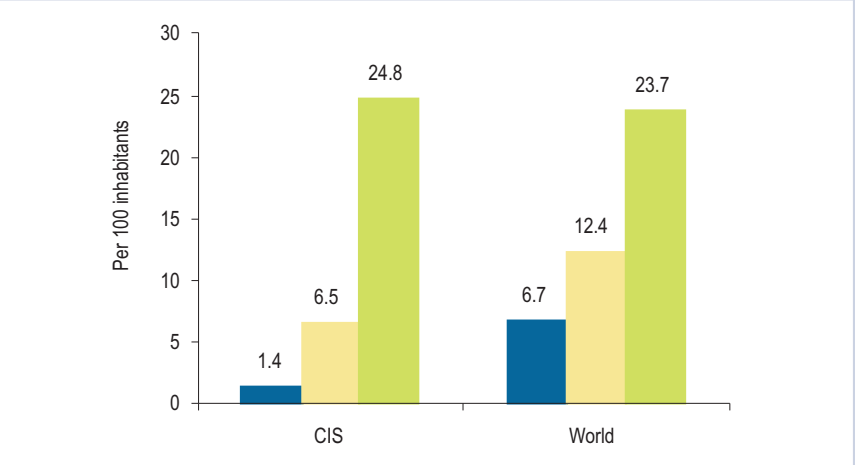
Number of Internet users added, 2003-2008



Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.14

Internet user penetration in the CIS and in the world



Source: ITU World Telecommunication/ICT Indicators database.

Looking at broadband Internet access, in 2003, there were 350'000 fixed broadband Internet subscribers in the CIS. In 2008, this number had increased to 12.2 million – or three per cent of the world's total fixed broadband subscribers. Nearly half of the growth is accounted for by Russia, Ukraine, Kazakhstan and Belarus. Nonetheless, in 2008, the region had less fixed broadband subscribers per 100 inhabitants than the world average and much less than the developed economies (Chart 1.16).

Internet users in the CIS, 2008

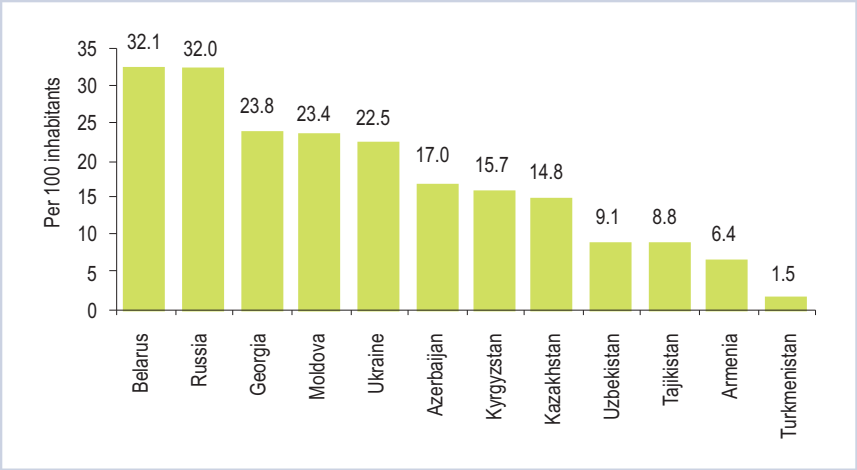


Chart 1.15

Source: ITU World Telecommunication/ICT Indicators database.

Fixed broadband in the CIS and in the world, 2000-2008

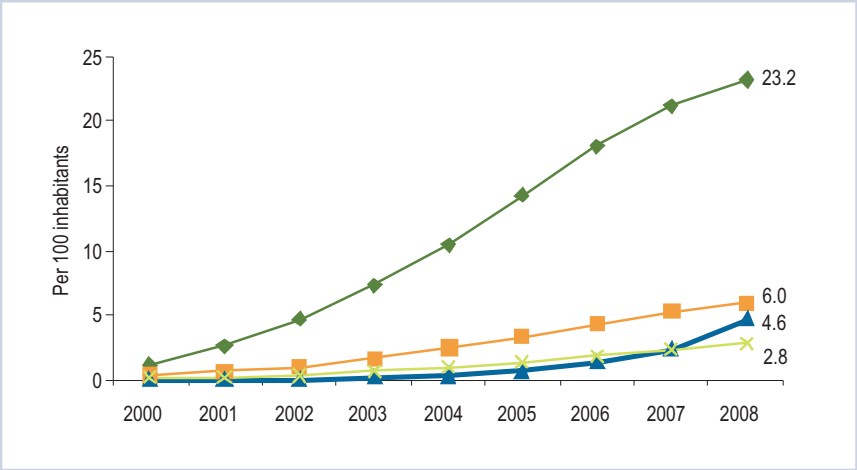


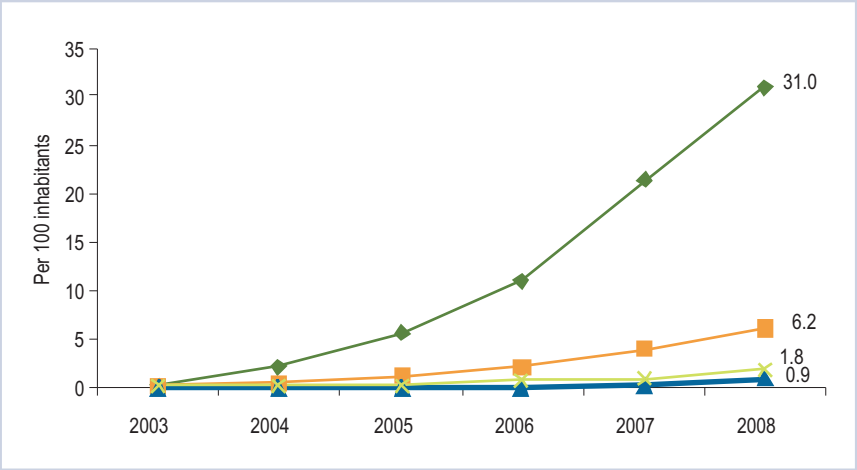
Chart 1.16

Source: ITU World Telecommunication/ICT Indicators database.

The evolution of mobile broadband penetration in the region is at its very early stage compared with advanced economies (Chart 1.17), highlighting a great potential for future growth. More details on fixed and mobile broadband services development in the CIS are presented in Chapter 2.

Chart 1.17

Mobile broadband in the CIS and in the world, 2003-2008



Source: ITU World Telecommunication/ICT Indicators database.

In Russia, there is an important digital divide between the capital cities and other regions of the country when it comes to Internet access, speed and price

In Russia, a substantial digital divide can be observed among the major cities across the country's regions. For example, the average speed of Internet access in Moscow and St.-Petersburg is about seven Mbps, compared to around 410 kbps in other large cities. This divide affects the price policies of Internet providers, with the cost of Internet services in regional cities largely exceeding that in Moscow and St.-Petersburg.[26] According to speedtest.net,[27] in 2009, Moldova ranks in the 10th place worldwide in terms of download speed (with an average of 9.23 Mbps), and in the 12th place in terms of upload speed (with an average of 3.49 Mbps). Overall, some Eastern European and Asian countries attain the highest scores.[28] Russia is positioned in 14th and 7th place for download and upload speeds, respectively.

Levels of international Internet bandwidth are relatively low in most CIS countries

Levels of international Internet bandwidth are also relatively low in most CIS countries (Chart 1.18). In 2008, the CIS region as a whole had around 128 Gbps of international bandwidth. This corresponds to 2'152 bits per Internet user, compared to the developing countries with 3'162 bits per Internet user and developed countries with 29'530 bits per user.

Finally, the proportion of households with computers in CIS countries where data are available is presented in Chart 1.19. Belarus has the highest level of household computer penetration (28.5 per cent), whereas penetration in the low-income CIS countries is below 4 per cent. All countries have household computer penetration levels that are below the world average of approximately 34.3 per cent.

International Internet bandwidth in CIS countries, 2008

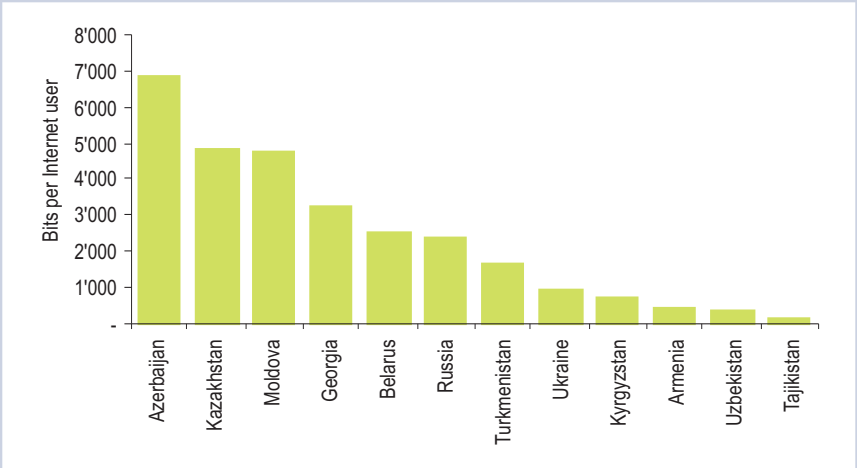


Chart 1.18

Source: ITU World Telecommunication/ICT Indicators database.

Proportion of households with computer, selected CIS countries, 2008

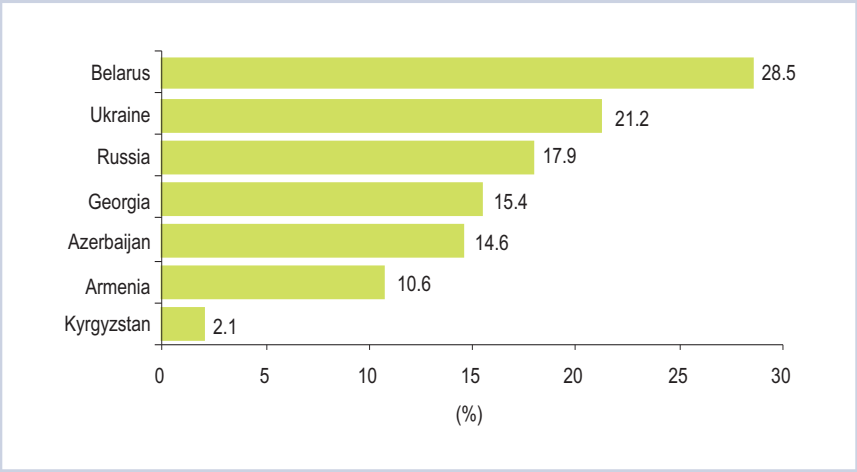


Chart 1.19

Note: Armenia, Georgia, Kyrgyzstan, Russia, and Uzbekistan are estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Endnotes

1 Until 2009, the CIS region included the following countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. Georgia exited the Commonwealth on August 18, 2009 but is included in this report as it is still served by ITU Area Office based in Moscow, Russia.

2 See also http://www.itu.int/ITU-D/connect/cis/figures.html.

3 See EBRD (2008). http://ebrd.com/country/sector/law/telecoms/assess/index.htm.

4 See: "America loses its landlines". http://www.economist.com/displaystory.cfm?story_id=14214847 and ITU (2009d).

5 See also http://www.ictrussia.com/index.php?item=2.

6 See http://www.pmrpublications.com/free_articles/Broadband-to-drive-development-of-CIS-telecoms-markets-in-2009-and-2010-_-July-2009.shtml.

7 See http://www.telegeography.com/cu/article.php?article_id=28580.

8 See http://www.telegeography.com/cu/article.php?article_id=28580.

9 See http://www.kt.kg.

10 See http://www.nas.kg.

11 See http://www.saimanet.kg.

12 See http://www.sapatcom.kg.

13 See http://www.officialwire.com/main.php?action=posted_news&rid=12851&catid=318. In 2005-2006 SCM Group expanded its presence on the communications market by acquiring "Farlep" and "Optima Telecom" Groups, which provide fixed line communications services. Since 15 October 2008, the Farlep Optima group provides services under the single umbrella brand Vega. http://www.scm.com.ua/en/publish/category/7928.

14 See http://www.developingtelecoms.com/central-eastern-europe/ukraine-worst-recession-worst-risk-rating-fixed-line-is-incumbent-dominated-by-the-incumbent-ukrtelecom.html.

15 See also http://www.pmrpublications.com/free_articles/Broadband-to-drive-development-of-CIS-telecoms-markets-in-2009-and-2010-_-July-2009.shtml.

16 See http://www.cn-c114.net/577/a426323.html.

17 See http://www.iba-it-group.com/docs/it_europa_cis_sme.pdf.

18 See more details: http://www.iba-it-group.com/docs/it_europa_cis_sme.pdf.

19 See http://telecom.arka.am/eng/analytics/2008/11/24/279.html.

20 For example, Moldova's mobile cellular penetration is 66.7%, Azerbaijan's 75.0%, Belarus' 84.%, and Kazakhstan's 96.1%.

21 According to ACM Consulting: http://www.amobile.ru/info/opsos/abonents/russia.htm.

22 See http://www.developingtelecoms.com/central-eastern-europe/ukraine-worst-recession-worst-risk-rating-fixed-line-is-incumbent-dominated-by-the-incumbent-ukrtelecom.html.

23 See http://siteresources.worldbank.org/DATASTATISTICS/Resources/CLASS.XLS.

24 See http://www.iba-it-group.com/docs/it_europa_cis_sme.pdf.

25 For more information about Internet users in Ukraine in 2008, see bigmirnet report: http://reklamist.com.ua/uploads/2008/11/uanet_global_report_102008.pdf.

26 See http://reklamist.com.ua/8998/.

27 See http://www.speedtest.net/global.php.

28 See http://it.moldova.org/tag/moldtelecom-0-eng.html.

Chapter 2.

A closer look at the development of broadband

As shown in the previous chapter, by the end of 2008, the CIS region had reached 4.6 per cent fixed broadband penetration and 0.9 per cent mobile broadband penetration. The region thus has a long way to go to bridge the broadband divide and to catch up with neighbouring Europe, where both fixed and mobile penetration levels stand at over 20 per cent.

With 4.5 % fixed broadband penetration and 0.8 % mobile broadband penetration, the region has to make an effort in bridging the broadband divide and trying to catch up with the European levels of over 20 %

The current low broadband penetration levels in the CIS present an important potential for growth in the provision and uptake of broadband services. With such market opportunities for operators, the Internet Service Provider (ISP) market has become attractive to fixed-line carriers, alternative ISPs and Cable Television (CaTV) operators, along with mobile telephony providers. While the first group of operators is developing Digital Subscriber Line (DSL) and Ethernet-based or coaxial cable technologies, the mobile phone companies are investing in IMT-2000/3G[1] networks to provide high-speed Internet access services. New business opportunities and the interest of large telecommunication operators in the region's ISP market are expected to change its landscape over the next few years by introducing a higher degree of (inter- and intra-modal) competition, reducing prices and offering users more choices. While market dynamics and consumer demand play an important role, there are a number of regulatory steps that governments can take to further encourage and accelerate this process.

The emergence of new competitors and a strong demand for high-speed Internet services have been forcing incumbents to rethink their broadband strategies

While incumbent operators have been resisting the regional push and demand for broadband services, the region is entering a turning point. As deregulation in the region's ISP markets is increasingly taking effect, and as new competitors and a strong demand for high-speed Internet services are emerging, incumbent operators are forced to re-think their broadband strategies. Despite concerns over the threat to traditional data and voice service revenue streams and investment in legacy networks, expanding and rolling out new broadband access infrastructure is the only way to face growing competition.

The limited availability of fixed-line infrastructure across the CIS countries, and the sometimes limited availability of frequency spectrum, has also encouraged leading operators across the region to deploy WiMAX to cater to residential and business needs for voice and high-speed data services.[2] The Eastern European market is one of the fastest moving WiMAX markets, with wireline infrastructure being built at the same time. Russian operators and investors are heavily involved in regional deployments, both in their home market and in neighbouring countries.

2.1 Fixed broadband

In all CIS countries, except Russia, fixed broadband penetration levels are below five per cent (Chart 2.1). Russia has achieved 6.6 per cent, which is just above the world average of 6.2 per cent.

A number of countries with less than one per cent fixed broadband penetration, including Armenia, Azerbaijan, Kyrgyzstan and Uzbekistan, have started to implement the important competitive safeguard of Local Loop Unbundling (LLU)[3] to help satisfy the high demand for broadband services. Whereas Kazakhstan has seen significant growth (over 100 per cent) of the incumbent's broadband subscriber base during 2008 *without* the competitive safeguard of LLU, the lack of meaningful competition in the fixed broadband market, according to the European Bank for Reconstruction and Development, "*leaves significant unsatisfied demand and stifled innovation*"[4] in the country. Effective and sound regulation is key to ensuring competition and long-term development of the market. In the Ukraine, for example, the incumbent Ukrtelecom effectively retains the monopoly over the fixed line backbone infrastructure and does not allow alternative operators to use its infrastructure. While the government is in the process of liberalizing this market segment, there is currently no legislation in place and operators find themselves in a state of uncertainty.[5]

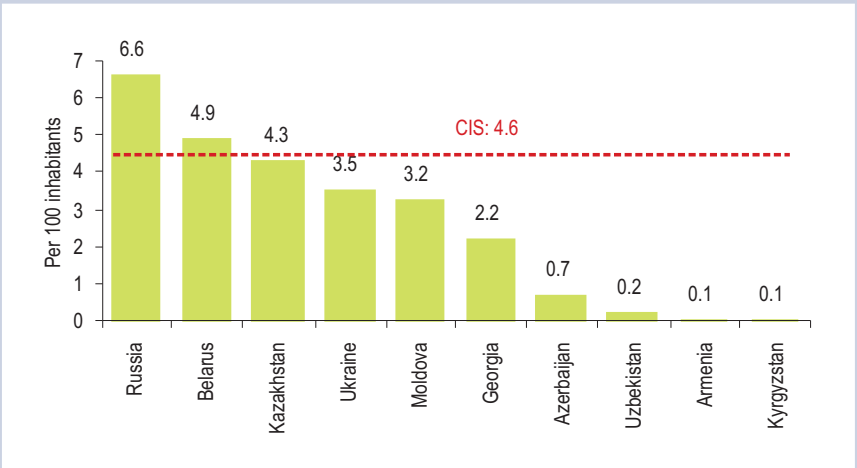
Countries with less than 1 % fixed broadband penetration include Armenia, Azerbaijan, Kyrgyzstan and Uzbekistan

In Kyrgyzstan, where data services have been liberalized for some time, a key challenge to developing broadband services is the lack of infrastructure, especially outside the capital, Bishkek. Increasingly, alternative operators are building their own infrastructure and Kyrgyztelecom, the national telecommunication operator, only has about 30 per cent of all fixed broadband subscribers, with three larger and several smaller service providers in the market.

The CIS region has three main fixed broadband access modes: Digital Subscriber Line (DSL), cable modem and fibre access. While DSL is the dominant access technology,

Chart 2.1

Fixed broadband subscribers in the CIS, 2008



Note: Data on fixed broadband subscribers for Tajikistan and Turkmenistan were not available.
Source: ITU World Telecommunication/ICT Indicators database.

both cable and FTTx[6] (fibre-to-the-x) have started to emerge as serious broadband platforms and competitive technologies, mainly in large cities. FTTx has found itself competing with the copper loop as technology continues to extend the capability and capacity of the more traditional technology. Its adoption and penetration rates vary considerably from market to market.

One reason that FTTx is spreading quickly to many large cities in the CIS region is the limited availability of DSL and cable networks, which are particularly prevalent in Europe and other developed regions. Where copper networks are not deployed, countries can move directly to the most advanced technologies. By installing FTTx, combined with Local Area Networks, end-users are able to benefit from very high connection speeds (up to 100 Mbps). As in other regions in the world, fixed broadband is predominantly being deployed in urban areas. In Ukraine, for example, the highest concentration of broadband is found in Kiev, the capital. Here, fixed broadband penetration stood at over 35 per cent (2008), compared to only 3.5 per cent nationally.[7]

In big cities in the region, cable and FTTx have started to emerge as serious broadband platforms

With incumbents limiting their investments in broadband infrastructure, alternative operators are finding ways to offer services, often through cable networks. In Ukraine's capital the cable TV operator Volya Cable today provides broadband access to over 220'000 people, compared to only 60'000 connected by the incumbent, Ukrtelecom.[8] In Belarus, at the beginning of this year, Minsk-based cable operator Cosmos TV catered to over 40'000 fixed broadband subscribers, almost ten per cent of the country's total.[9]

In Russia, the region's largest fixed broadband market with over ten million subscribers at the beginning of 2009, efforts are underway to connect more areas. While Internet use, and especially broadband Internet, has largely been concentrated in Moscow and in St. Petersburg, regional fixed operators are increasingly expanding to cover other cities as well as rural areas. Increased competition between traditional fixed line operators, mobile operators and broadcasting companies is expected to expand coverage of broadband services, lower prices and offer more user applications, including IPTV, VoIP and triple-play services.[10]

3G mobile networks have been launched in many CIS countries, including Armenia, Moldova, Russia, Ukraine and Uzbekistan

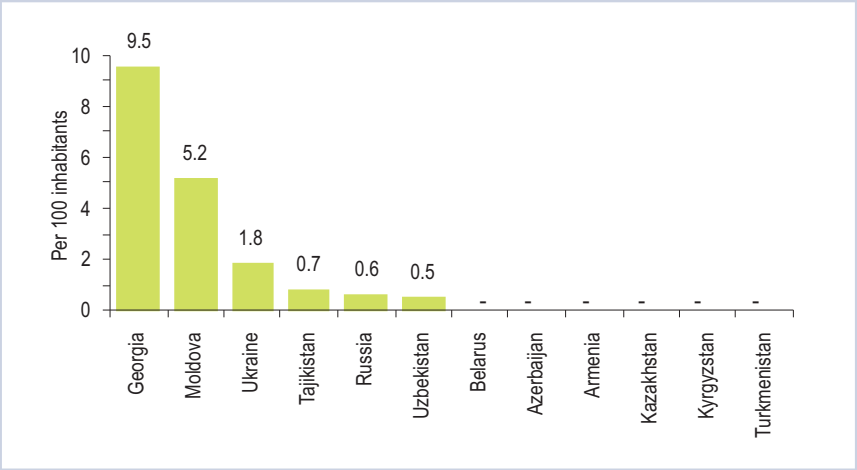
2.2 Mobile broadband

The potential of mobile broadband (often referred to as IMT-2000/3G) technologies to address the broadband Internet divide is widely recognized.[11] Given the relatively low penetration of fixed broadband and the lack of fixed network infrastructure in the CIS region, mobile technologies seem particularly interesting for increasing the region's Internet uptake. Since there are still methodological problems distinguishing subscriptions from actual users, the mobile broadband subscriptions numbers need to be put in perspective. In particular, data on mobile broadband subscriptions today refer to the potential of the mobile network, rather than indicating how many people are actually using the mobile network for data applications, including to browse the Internet.

Preparatory processes for the licensing of IMT-2000/3G networks have started in almost all CIS countries. By the end of 2008, two thirds of the CIS countries, including Armenia, Moldova, Russia, Ukraine and Uzbekistan, had launched IMT-2000/3G networks with the ability to provide mobile broadband speeds[12] (see Table 2.1).

Chart 2.2

Mobile broadband subscriptions in the CIS countries, 2008



Source: ITU World Telecommunication/ICT Indicators database.

Kazakhstan and Belarus are planning to finalize tenders for IMT-2000/3G licenses in 2009. One of the major challenges facing a number of countries, such as Russia, Belarus and Kazakhstan, is the difficulty of reallocating frequencies previously reserved for defense purposes and liberating these for commercial use. Another problem that many mobile operators are facing is the need to rent backbone data transmission channels from state telecommunication operators (which are often monopolies).

While the CIS region still has relatively few mobile broadband subscriptions and penetration rates remain low, growth rates in those countries that have commercially launched 3G services, are strong. At the same time, the number of operators offering mobile broadband services is increasing, competition is growing and pan-regional operators, especially from Russia, are emerging. Those countries that have not yet licensed 3G networks, are expected to do so in the near future. The following takes a brief look at the situation in each CIS country.

In April 2009, Russia's Mobile TeleSystems (MTS) announced the commercial launch of the first 3G network in Armenia

In April 2009, the first 3G network was launched in **Armenia** by Russia's largest Mobile Network Operator, Mobile TeleSystems (MTS). It currently provides coverage in three major cities: Yerevan, Gyumri and Vanadzor, with plans to expand to other cities later in the year. With this launch, MTS increased its 3G operations to three countries (it also operates in Russia and Uzbekistan).[13]

The Ministry of Communications and Information Technologies of **Azerbaijan** is expected to allocate frequencies for 3G services at the end of 2009. All three GSM operators in Azerbaijan – Azercell, Bakcell and Azerfon (Nar Mobile) – are expected to apply for a license.[14]

Belarus first tested 3G mobile broadband services in 2006, when Velcom and MTS launched their test network. The commercial launch of high-speed mobile networks is expected to take off before the end of 2009, according to information from

IMT-2000/3G developments in CIS countries

Table 2.1

Country	Operator, brand name(s)	Year of launch	3G technology family	Notes
Armenia	ArmenTel (Russia's VimpleCom Armenian subsidiary)	-		A 3G license was received in 2007, covering the 1920-1935 MHz and 2110-2125 MHz bands
	VivaCell (K-Telecom) (Russia's Mobile TeleSystems - MTS)	2009	UMTS/HSPA	Commercial launch
Azerbaijan	Aztelecom	2005	CDMA	
	Azercell	-		Application for 3G frequencies allocation is under way
	Bakcell	-		Application for 3G frequencies allocation is under way
	Azerfon (Nar Mobile)	-		Application for 3G frequencies allocation is under way
Belarus	BelCel (Belarussian Cellular), Dialog	2003	EV-DO (IMT-MC-450)	4500 subscriptions, covers territory having 69.6 % population
	BeST, life:) (Turkcell)	-	UMTS	Permission for 3G frequencies allocation received in July 2009
	MTS	-	UMTS	Application for 3G frequencies allocation is under way
	Velcom	2009	EV-DO Rev.1x EV-DO Rev.A	Tested in 2006; launched in 2009 with 3.1 Mbps. Velcom plans to apply for a tender for UMTS license in September 2009
Georgia	Geocell (TeliaSonera)	2008	HSDPA (3.5G)	
	MagtiCom	2005/ 2009	UMTS/HSDPA (3.5G)	
Kazakhstan	Kazakhtelecom	2009	CDMA	
	GSM Kazakhstan (K'Cell and Activ)	-		Waiting for license.
	Kar-Tel (Beeline)	-		Waiting for license.
	Mobile Telecom Service (neo)	-		Waiting for license.
	AlTel (Dalacom, Pathword)	-	CDMA	
Kyrgyzstan	AkTel (FONEX)	2003	CDMA-2000	
	SoTel (nexi)	2007	CDMA-2000	
	Winline (Sapatcom)	2008	CDMA-2000	
	Sky Mobile (Bitel)			
	Katel			3G license received in 2007
	BiMoKom (MegaCom)			
Moldova	Unite	2007	CDMA-2000	
	Orange	2008	3G+	
	Moldcell	2008	3.5G	
	Eventis Mobile	-	-	
Russia	Sky Link	2002	CDMA	
	MTS	2008	UMTS/HSPA	3G license received in 2007 femtocells in buildings
	Vimpelcom (Beeline)	2008	UMTS/HSPA	3G license received in 2007
	MegaFon	2008	UMTS/HSPA	3G license received in 2007
Tajikistan	TK Mobile	2005	CDMA	
	M-Teco	2005	CDMA	
	Telecom Inc	2005	CDMA	
	Tochiktelecom	2005	CDMA	
	Tacom (Beeline)	2006 2007	CDMA UMTS	
	Indigo Tajikistan (TeliaSonera)	2005	UMTS	
	Babilon Mobile	2006	UMTS/HSDPA (3.5G)	
	Babilon-T	N/A	N/A	
	TT-Mobile (MLT – Mobile Lines of Tajikistan)	N/A	UMTS	
	Somocom	2006	UMTS	
Turkmenistan	MTS-Turkmenistan (formerly Barash Communications Technologies - BCTI)	-	-	EDGE only. Plans to build 3G network.
	Altyn Asyr / TM Cell	-		

Table 2.1

IMT-2000/3G developments in CIS countries (continuation)

Country	Operator, brand name(s)	Year of launch	3G technology family	Notes
Ukraine	International Telecommunication Company - ITC (CDMA Ukraine)	2004	CDMA-2000	290' 000 subscriptions in 2008, 38 per cent share of CDMA market
	PEOPLEnet	2006	CDMA-2000	
	Intertelecom	2007	CDMA	
	Velton Telecom	2005	CDMA	119'608 subscriptions in 2009
	Ukrainian Mobile Communications (MTS UA, UMC UA), Ecotel, Jeans	2007	CDMA	3G enabled, applied for license
	Ukrtelecom (Utel)	2007	UMTS/HSDPA	
	Kyivstar, Mobilich, djuice			3G enabled, applied for license
	Ukrainian Radio Systems (Beeline UA, WellCOM)			3G enabled. applied for 3G license
	Astelit (life :))			3G enabled. applied for3G license
	Golden Telecom (UA GT)			3G enabled, applied for3G license
Uzbekistan	Perfectum Mobile	2001	CDMA	
	UzMobile	2006	CDMA	
	MTS	2008	UMTS/HSPA	3G license received in 2007
	Ucell (part of TeliaSonera)	2008	UMTS	
	Unitel (Beeline)	2008	UMTS	

Note: "-" Information not available.
Source: ITU, based on country information.

the Belarus Ministry of Communications and Information Technologies, which announced a tender for 3G UMTS licenses.[15]

Georgia licensed the first 3G network as early as June 2005, followed by two more launches in 2006. Two operators, MagtiCom and Geocell, a unit of TeliaSonera, have also launched High-Speed Downlink Packet Access (HSDPA) platforms. This 3.5G technology offers its customers a number of data-intensive mobile broadband applications, including video and music downloads. HSDPA technology can provide speeds of up to 14.4 Mbps albeit only to users with an HSDPA-supported phone.

In Georgia, the launch of HSDPA technology in 2009 provides users with faster mobile Internet browsing including video and music downloads, reaching speeds of up to 14.4 Mbps

All three mobile cellular operators in **Kazakhstan** – GSM Kazakhstan, Kar-Tel and Mobile Telecom Service – have confirmed their interest in launching mobile broadband networks and the Government is expected to offer licenses before the end of 2009. One of the challenges faced is that the frequencies necessary to launch 3G in certain areas (as in Astana and Alma-Ata) are currently allocated to defense purposes. Other frequencies have been reserved for broadcasting purposes and attributed to cable TV operators.

A significant part of **Kyrgyzstan** occupies scarcely populated and high-mountainous areas, which are difficult for radio coverage. Mobile cellular services have grown fast over the past years and the market seems to offer promising opportunities for mobile broadband operators. However, no commercial 3G network has been launched so far.

Two of three GSM operators in **Moldova** – Moldcell and Orange Moldova – started providing 3G+ services in 2008 and by the end of 2008, they reported a total of 188'000 mobile broadband subscriptions.[16]

Russia's mobile cellular telecommunications market is the largest and most dynamic in the CIS region. The rapidly growing sector is dominated by three major service

providers (MTS, VimpelCom and MegaFon) and despite a high level of penetration, the commercial deployment of mobile broadband services in Russia has been delayed. Mobile broadband penetration stood at below one per cent at the end of 2008. Although, in 2006, the Government decided to allocate the 2.1 GHz frequency band for the deployment of UMTS to a number of competing operators, there were several delays. Since frequencies had previously been allocated for military purposes, operations were tied to a number of geographical restrictions, particularly in the area of Moscow, and UMTS frequencies were not liberated immediately.[17] In the meantime, vacant 2.1 GHz frequencies in other parts of Russia were used by service providers. MTS already operates IMT-2000/3G networks in 35 towns across Russia and is planning to expand services to another 40 towns. Vimpelcom covers more than 60 localities. In order to be able to provide IMT-2000/3G services in Moscow, the main operators have been testing miniature base stations – femtocells[18] – which can be used to expand their services without interference with military frequencies. The results of these ongoing tests are expected to speed up the deployment of IMT-2000/3G services, although their registration cost, which is the same as for regular base stations, remains high. Operators are also concerned about the delay for obtaining permission to deploy femtocells, which can take up to a year. If this technology is to be a success, they insist, deployment costs and delays need to be reduced.[19] Given the country's high level of mobile cellular penetration and large population base, Russia is seen as a major mobile broadband market, and the service is expected to generate new and important revenue streams in the near future.

At the end of 2008, mobile broadband penetration in Russia was less than 1%

Five mobile operators in **Tajikistan** have licensed, and started to provide, IMT-2000/3G services. While 3G services have been available since 2006, operators initially concentrated on major urban centers and particularly Dushanbe, the capital. By the end of 2008, penetration was still relatively low, at below one per cent.

Turkmenistan's two mobile operators, Altyn Asyr and MTS have not yet launched 3G mobile networks and the country's mobile cellular penetration level (less than ten per cent in early 2009) is one of the region's lowest.[20]

In Ukraine, the regulator plans to end the monopoly situation and attribute four 3G network licenses by the end of 2009

In the **Ukraine**, the first IMT-2000/3G license was granted to incumbent Ukrtelecom, in 2005, but the network was only deployed and services commercialized in a limited number of regions two years later. The 3G monopoly is about to end and the country's regulatory authority was planning to attribute four licenses for 3G network deployments by the end of September 2009. As in several other CIS countries, frequency allocation has been delaying the process, and UMTS frequencies remain occupied for military use. The discussion on the liberalization of these frequencies and the reallocation for mobile network operations are still ongoing.[21]

By the end of 2008, all GSM operators in **Uzbekistan** were offering 3G mobile broadband services. The development of traditional (fixed) Internet broadband technologies in Uzbekistan is restricted by a limited fixed line infrastructure. Under these conditions, high-speed mobile broadband Internet access through new IMT-2000/3G networks are expected to help address the lack of broadband. While services remain highly concentrated in Tashkent, MTS has extended its services to regions outside the country's capital.

To conclude, while the fixed and mobile broadband markets in the CIS are still in their infancy, most countries have started to discuss policies and plans to increase broadband deployment. A number of concrete policy recommendations to accelerate broadband uptake in the region are provided in the final chapter of the Report.

Endnotes

[1] IMT refers to International Mobile Telecommunication and the IMT-2000 is the term used for third generation (3G) systems aimed at using the nominal 2GHz frequency band and providing smooth evolution paths to 3G from the various widely deployed existing 2G mobile networks, see: http://www.itu.int/osg/spu/imt-2000/technology.html#Cellular%20Standards%20for%20the%20Third%20Generation.

[2] See http://www.totaltele.com/view.aspx?C=0&ID=336917.

[3] Local Loop Unbundling (LLU) requires any former monopolist (i.e., the incumbent) to lease, at cost, part of its local network facilities to any requesting competitor (i.e., the new entrants). The local assets that can be leased from the incumbent are called unbundled network elements (UNEs). The aim of LLU is to foster competition within local telecommunication markets. From: http://encyclopedia.jrank.org/articles/pages/6657/Local-Loop-Unbundling.html.

[4] See EBRD (2008), at: http://ebrd.com/country/sector/law/telecoms/assess/report.pdf.

[5] See P&S Group. Broadband internet providers in Kiev – overview. 2009, at: http://www.p-s.com/files/Broadband%20internet%20providers%20in%20Kiev.pdf.

[6] FTTx refers to all possible optical fiber topologies from a telecom or cable carrier to its customers, based on the location of the fiber's termination point. See: http://www.pcmag.com/encyclopedia_term/0,2542,t=FTTx&i=55527,00.asp.

[7] See P&S Group. Broadband internet providers in Kiev – overview. 2009, at: http://www.p-s.com/files/Broadband%20internet%20providers%20in%20Kiev.pdf.

[8] See P&S Group. Broadband internet providers in Kiev – overview. 2009, at: http://www.p-s.com/files/Broadband%20internet%20providers%20in%20Kiev.pdf.

[9] See E-belarus.org, at http://www.e-belarus.org/news/200901311.html.

[10] See http://www.companiesandmarkets.com/print-friendly-russia-telecommunications-report-q3-2009-154321.aspx.

[11] See ITU (2009a) and (2009b).

[12] In conformity with the ITU World Telecommunication/ICT Indicators database, mobile broadband subscriptions refer to subscriptions to mobile cellular networks with access to data communications (e.g. the Internet) at broadband speeds (here defined as greater than or equal to 256 kbit/s in one or both directions) such as WCDMA, HSDPA, CDMA2000 1xEV-DO, CDMA 2000 1xEV-DV etc. These services are typically referred to as 3G or 3.5G

[13] See http://news.prnewswire.com/DisplayReleaseContent.aspx?ACCT=ind_focus.story&STORY=/www/story/04-20-2009/0005008550&EDATE=.

[14] See http://www.telegeography.com/cu/article.php?article_id=28853&email=html.

[15] See http://www.belta.by/en/news/econom/?id=227739.

[16] See http://en.anrceti.md/files/filefield/RAPORT_anual_2008_engl_fin_publ.pdf.

[17] See http://rumetrika.rambler.ru/publ/article_show.html?article=4052.

[18] A **femtocell** – originally known as an **Access Point Base Station** – is a small cellular base station, typically designed for use in a home or small business. It connects to the service provider's network via broadband (such as DSL or cable); current designs typically support 2 to 4 active mobile phones in a residential setting. A femtocell allows service providers to extend service coverage indoors, especially where access would otherwise be limited or unavailable. The femtocell incorporates the functionality of a typical base station but extends it to allow a simpler, self contained deployment. See: http://en.wikipedia.org/wiki/Femtocell.

[19] See http://eyeline.mobi/focus-on-russia/3g-femtocell-testing/.

[20] See http://www.turkmenistan-business.com/en/203-mts-plans-to-construct-3g-mobile.html.

[21] See http://www.ukraine-nachrichten.de/index.php?id=1772.

Chapter 3.

Benchmarking ICT developments in the CIS

3.1 Regional analysis of the ICT Development Index (IDI)

The ITU presented the ICT Development Index (IDI) in March 2009[1] in response to calls for benchmarking information society developments made during the World Summit on the Information Society (WSIS).[2] The IDI is a composite index made up of eleven different indicators, grouped into three sub-indices (Figure 3.1). The sub-indices measure ICT infrastructure and access (sub-index access[3]), ICT use and intensity of use (sub-index use[4]), and the capacity to use ICTs effectively (sub-index skills[5]). The following section analyses the IDI of countries in the CIS region, comparing it against the performance of other regions.

All CIS countries improved their IDI scores in the five-year period

Table 3.1 shows the results of the IDI in the CIS for two benchmarking years, 2002 and 2007, ranked by the 2007 values (for details on the three sub-indices see Annex 2). All CIS countries improved their IDI scores in the five-year period, as did most countries in the world. Indeed, access and use of ICTs are globally increasing, as well as the skills needed to use these technologies effectively.

ICT Development Index – Weighting of indicators

ICT access	Ref. Value	(%)
1. Fixed telephone lines per 100 inhabitants	60	20
2. Mobile cellular telephone subscriptions per 100 inhabitants	150	20
3. International Internet bandwidth (bit/s) per Internet user	100'000*	20
4. Proportion of households with a computer	100	20
5. Proportion of households with Internet access at home	100	20

40

ICT use	Ref. Value	(%)
6. Internet users per 100 inhabitants	100	33
7. Fixed broadband Internet subscribers per 100 inhabitants	60	33
8. Mobile broadband subscribers per 100 inhabitants	100	33

40

ICT skills	Ref. Value	(%)
9. Adult literacy rate	100	33
10. Secondary gross enrolment ratio	100	33
11. Tertiary gross enrolment ratio	100	33

20

ICT Development Index

Figure 3.1

Source: ITU.

Table 3.1

ICT Development Index (IDI), 2002 and 2007, CIS

Country	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2002-2007	IDI change 2002-2007
Russia	1	3.83	1	2.71	0	1.12
Ukraine	2	3.80	3	2.50	1	1.30
Belarus	3	3.76	2	2.53	-1	1.24
Moldova	4	3.31	5	2.13	1	1.18
Kazakhstan	5	3.25	4	2.18	-1	1.07
Armenia	6	3.12	7	2.03	1	1.09
Georgia	7	2.91	6	2.13	-1	0.78
Azerbaijan	8	2.71	12	1.74	4	0.99
Kyrgyzstan	9	2.61	8	1.97	-1	0.27
Turkmenistan	10	2.23	9	1.96	-1	0.27
Tajikistan	11	2.14	10	1.76	-1	0.38
Uzbekistan	12	2.05	11	1.75	-1	0.30

Source: ITU.

Russia tops the regional IDI 2007 ranking, closely followed by Ukraine and Belarus. These three countries were already at the top of the IDI 2002 ranking and have maintained their leading position in the region due to a growth in their IDI value of more than 40 per cent during the five-year period.[6] This is a significant achievement, particularly for Russia and Ukraine, which have a large population base (over 140 and 45 million inhabitants, respectively).

Azerbaijan stands out for being the country in the region with the highest relative IDI growth (58 %)

Moldova, Kazakhstan and Armenia have also experienced remarkable IDI increases between 2002 and 2007. Azerbaijan stands out for being the country in the region with the highest relative IDI growth (58 per cent increase). While in 2002 the country ranked last in the CIS region, in 2007 it moved up four places to the 8th position. Turkmenistan, Tajikistan and Uzbekistan figure at the bottom of the regional IDI 2007 ranking. These countries have experienced moderate IDI growth in the five-year period (the lowest in the CIS in both absolute and relative terms[7]) and, as a result, the gap between them and the rest of the countries in the region has widened.

Belarus, Ukraine and Moldova have higher-than-expected ICT levels given their income

Chart 3.1 shows the relationship between the IDI and GNI per capita (expressed in US$) in the CIS, using a logarithmic regression. The relationship between ICT development and income in the region is weak (R square value of 0.66)[8] when compared to that of the world (R square value of 0.82)[9], of Asia and the Pacific (R square value of 0.93)[10] or of the Americas (R square 0.85)[11]. Indeed, in the CIS the relation between IDI and GNI per capita is as weak as in Africa (R square 0.69)[12]. This is partly because the economic development of most CIS countries has been based largely on their natural resources (especially exports of oil, natural gas and metals) and, as a result, the ICT industry is less developed.

Belarus, Ukraine and Moldova have higher-than-expected IDI levels, given their income per capita. This finding suggests that targeted ICT policies, even in countries with relatively low income per capita, such as Moldova, can be successful in stimulating

IDI and GNI per capita, 2007

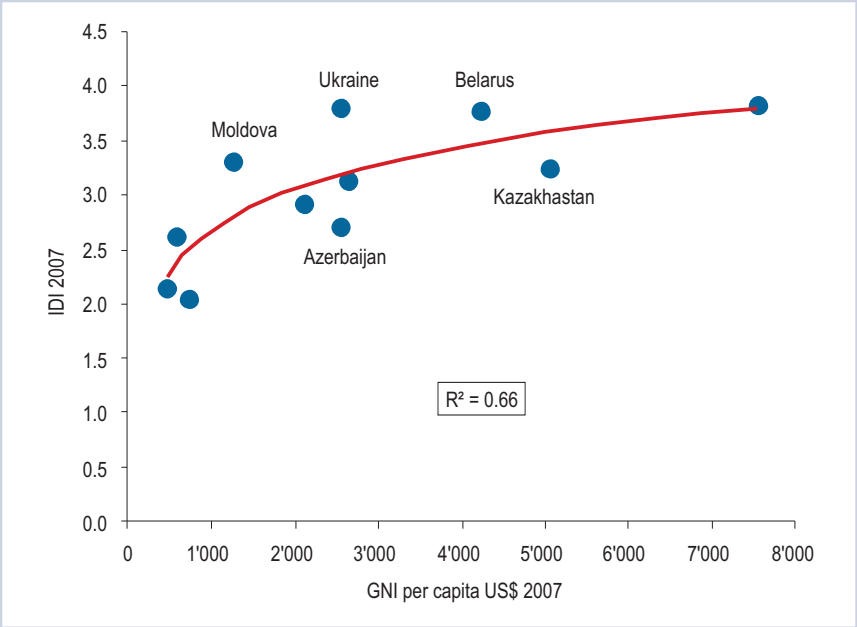


Chart 3.1

Observed
Logarithmic

Source: ITU and World Bank (GNI per capita data).

the uptake of ICTs.[13] On the other hand, Azerbaijan and Kazakhstan have lower-than-expected ICT levels. Indeed, compared to other CIS countries with similar income per capita, these two countries have relatively low ICT levels. While Azerbaijan has made remarkable achievements in its ICT uptake levels between 2002 and 2007,[14] there is a great potential for further progress.

Table 3.2 summarizes the average changes for the five-year period in each of the three IDI sub-indices and in the IDI value. On average, the 2007 value of the CIS region stood below that of the world. The region lagged behind in both ICT access and ICT use, while in skills it was above the world's average. As further analyzed below, the region is catching up in terms of ICT access, yet the intensity of ICT use improved very little between 2002 and 2007, and levels remained very low.[15]

The region lags behind the world in both ICT access and ICT use, while in skills it is above the world's average

Increases in the IDI in the CIS countries were mainly the result of an above-average increase in the sub-index access, higher than the world for the same period. Moderate progress was achieved in the sub-indices use and skills. These dynamics are explained by the sequential three-stage model on which the index is based:[16] countries advance towards becoming information societies by developing first ICT infrastructure and access, then ICT use and intensity of use, and finally achieving ICT impact, which is enabled by ICT capabilities or skills. In the CIS, all countries experienced a higher increase in the sub-index access than in the sub-index use between 2002 and 2007. This suggests that overall the region is in the first stage of ICT development, and therefore ICT growth is focused on infrastructure and access developments. This is confirmed by the fact that the highest average increase in the region was achieved in the sub-index access (four times as much as that in the sub-index use).

Table 3.2

IDI changes in the CIS and the world, 2002-2007

	CIS			World	
	Average value 2002	Average value 2007	Change in value 2002-2007	Average value 2007	Change in value 2002-2007
IDI	2.11	2.98	0.86	3.40	0.92
Sub-index access	1.50	3.12	1.62	3.91	1.23
Sub-index use	0.09	0.48	0.39	1.43	0.89
Sub-index skills	7.39	7.67	0.28	6.31	0.37

Source: ITU.

It is important to bear in mind though that changes in education and literacy take effect over longer periods of time than those concerning ICT access and use. Value changes in the sub-index skills tend to be lower than in the other sub-indices. The average increase in the sub-index skills in CIS countries is the lowest of all three sub-indices, but it is still significant, taking into account that the region already had relatively high education and literacy levels in 2002.

In the CIS region, progress in the sub-index access was mainly due to a remarkable increase in mobile cellular subscriptions

In the CIS region, progress in the **sub-index access** was mainly due to a remarkable increase in mobile cellular subscriptions per 100 inhabitants (from nine per cent in 2002 to 94 per cent in 2007). Although the increase in mobile cellular penetration is a worldwide trend, it has been stronger in the CIS than in most other regions. Indeed, by 2008, there were more subscriptions than inhabitants in the CIS, and its penetration rate was only surpassed by that of Europe (see chapter 1). However, these results need to be treated with caution, because of the weight Russia has in the region in terms of population, and the fact that cellular penetration in Russia is much higher than in most CIS countries. Indeed, if Russia were excluded from the computation, mobile cellular penetration would be much lower (5 per cent in 2002, and 71 per cent in 2007).

All CIS countries lie below the world average in both mobile and fixed broadband penetration rates

Additionally, international Internet bandwidth per Internet user in the region also improved over the same five-year period (from 646 to 1'979 bits / s / user),[17] although all countries in the region stood below the world's average (14'972 bits / s / user, see Chart 3.2). Finally, and to a lesser extent, the increase in the proportion of households with a computer (an estimated progress from 2 to 14 per cent) also contributed to the improvement of the region in the sub-index access.

Between 2002 and 2007, the CIS experienced low progress in the **sub-index use** – only half of the increase of the world as a whole for the same period. This can be explained by the unavailability of mobile broadband in many countries in the CIS region, and nearly negligible penetration in those countries that have launched mobile broadband networks. In addition, fixed Internet broadband penetration remains very low in the region. All CIS countries lie below the world average in both mobile and fixed broadband penetration rates. Except for fixed broadband penetration in Russia and mobile broadband penetration in Georgia, all countries fall short of the developing countries' average levels (Chart 3.3).

International Internet bandwidth per Internet user in CIS countries, 2002 and 2007

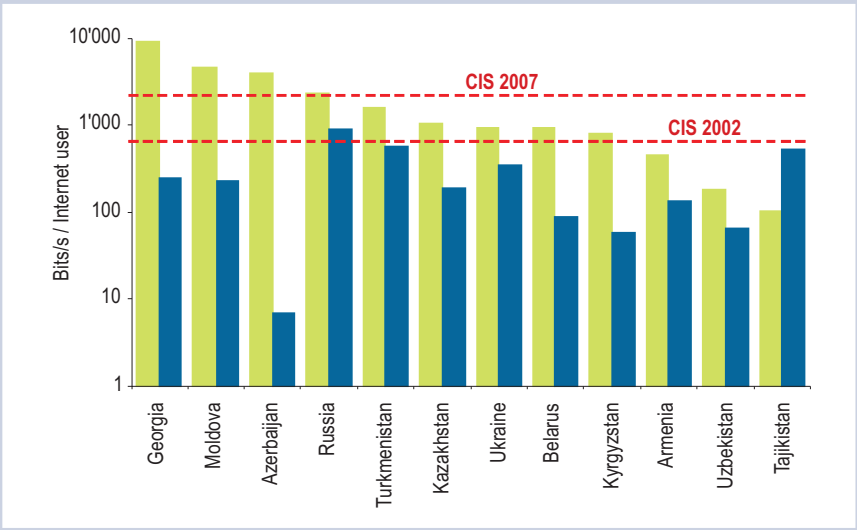


Chart 3.2

Source: ITU World Telecommunication/ICT Indicators database.

Fixed and mobile broadband penetration in the CIS, and the world's developing countries, 2007

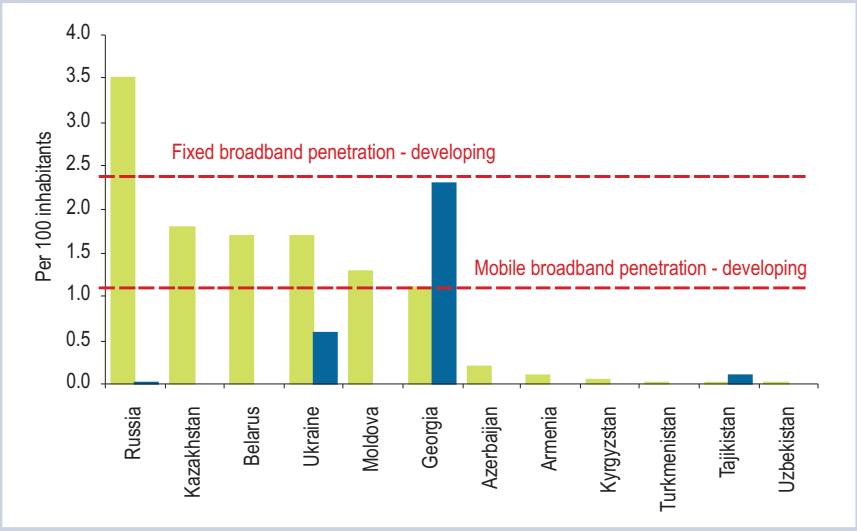


Chart 3.3

Source: ITU World Telecommunication/ICT Indicators database.

The main source of growth in the sub-index use in the CIS was the increase in Internet usage (from 3 per cent in 2002 to 20 per cent in 2007). Over the five-year period the number of Internet users increased more than five times in the CIS, achieving the highest relative growth of all regions in the period – mainly due to very low initial levels. Even excluding Russia, Internet usage grew remarkably in the CIS in the five-year period (from 2 to 17 per cent penetration, a more than eight-fold increase).

On average, the CIS region's **sub-index skills** value was above the global average in 2007. Adult literacy levels in CIS countries experienced little change between 2002 and 2007, as they were on average already close to 99 per cent in 2002. Secondary enrolment improved slightly, in line with global enrolment rates over the same period. Tertiary enrolment experienced the highest increase of all three sub-index skills indicators in the CIS (from 36 to 41 per cent), somewhat higher than that of the world during the same period.

The following section takes a closer look at the IDI rankings in the CIS, and highlights key features of each country in the region:[18]

In the IDI 2007, Russia is the highest ranked BRIC country

- In 2007, **Russia** topped the regional IDI ranking, keeping the lead it already had in 2002. The country improved its IDI value by 1.12 points, well above the world average for the five-year period. Worldwide, it is the highest ranked BRIC country.[19] This was due to outstanding progress in mobile cellular penetration (from 12 to 115 per cent), and also to the increase in the number of fixed telephone lines per 100 inhabitants (from 24 to 31 lines per 100 inhabitants), which was lower than that of cellular subscriptions yet significant taking into account that worldwide the number of fixed telephone lines is stagnating. Internet usage increased from four per cent in 2002 to 25 per cent in 2007. Although Russia had the highest fixed broadband penetration in the CIS (3.5 per cent in 2007), it is still far behind the advanced countries in other regions. Moreover, mobile broadband was only launched in 2007[20] and penetration stood at only 0.03 per cent by end 2007. Therefore, notwithstanding its leading position in the CIS, Russia has ample room for improving its ICT levels.[21]

Ukraine experienced the highest gain in IDI value of all CIS countries

- **Ukraine** ranks 2nd in the regional IDI 2007, up one place from 2002. The country experienced the largest increase in the IDI value of all CIS countries . Ukraine witnessed the highest increase of all CIS countries in mobile cellular penetration (from 8 to 119 per cent) and Internet usage grew from less than 2 per cent to 22 per cent. The tertiary enrolment ratio saw an impressive jump (from 57 to 76 per cent), allowing Ukraine to surpass Russia and to become the country with the highest tertiary enrolment in the CIS. However, mobile and fixed broadband levels were negligible and international connectivity per Internet user was low (956 bits/s / user), even when compared to other CIS countries.

- **Belarus** lost one position in the regional IDI, ranking 3rd in 2007. Within the CIS, Belarus has the highest level of main telephone lines per 100 inhabitants (38 per cent in 2007). In the five-year period, it significantly improved its mobile cellular penetration (from 5 to 72 per cent) and its proportion of households with a computer (from 3 to 25 per cent). Additionally, Internet user penetration grew from 9 to 29 per cent. In the sub-index skills, Belarus had the highest gain of the CIS in the five-year period, based on progress in both secondary and tertiary enrolment ratios. Compared to Russia and Ukraine, the two countries in the region with similar IDI levels, Belarus lags behind in terms of mobile cellular penetration (Russia and Ukraine have more than 100 subscriptions per 100 inhabitants), and international Internet bandwidth per Internet user (911 bits/s / user in 2007). By 2007, 3G services had not been commercially launched in Belarus.[22]

- **Moldova** advanced one position to rank 4th in the regional IDI 2007. The country experienced a high gain in the sub-index access, only surpassed in the region by Armenia. Unlike most countries in the region, this improvement was not entirely due to progress in mobile cellular penetration, but rather to advances in all sub-index access indicators. Thus, between 2002 and 2007 Moldova experienced the highest progress in the region in terms of fixed telephone penetration (from 18 to 29 per cent) and in Internet household penetration, achieving 16 per cent of households with Internet access in 2007, the highest penetration in the region. International Internet bandwidth per Internet user also increased impressively, from 227 to 4'724 bits/s / user. By 2007, mobile cellular penetration had reached 50 per cent, well below that of most countries in the region. Mobile broadband was unavailable in the country in 2007 since 3G mobile broadband services were only launched in late 2008.

Between 2002 and 2007 Moldova experienced the highest progress in the region in terms of fixed telephone penetration (from 18 to 29 %)

- **Kazakhstan** ranks 5th in the regional IDI 2007, down one place from 2002. In the five-year period, the country made remarkable improvements in its mobile cellular penetration (from 7 to 80 per cent), reaching the third highest mobile penetration level in the region in 2007, after Russia and Ukraine. International Internet bandwidth per Internet user increased from 192 to 1'052 bits/s / user, and the ICT usage sub-index increased somewhat due to progress in Internet usage, reaching 12 per cent in 2007. Despite the progress, Internet usage was still low and mobile broadband services unavailable in 2007.

- **Armenia** climbed up one position in the regional IDI, ranking 6th in 2007. Between 2002 and 2007, the country experienced the highest increase in the region in the sub-index access. Growth was driven mainly by significant improvements in mobile cellular penetration (from 2 to 62 per cent). However, ICT usage remained very low in 2007: Internet user penetration stood at only 0.6 per cent, fixed broadband was almost negligible (as in all countries in the region, except for Russia) and mobile broadband services were not available.

- **Georgia** ranks 7th in the regional IDI 2007, down from 6th place in 2002. The country reached the highest mobile broadband penetration in the CIS in 2007 (2.3 subscriptions per 100 inhabitants), yet it still has to improve making mobile broadband available to a significant part of the population and in order to close the gap with the uptake in other countries in other regions.[23] Georgia remarkably improved its international Internet bandwidth per Internet user, achieving 9'103 bits/s / user in 2007, the highest value in the CIS. Despite these achievements, the number of fixed lines stagnated at 13 per 100 inhabitants in 2007, and the proportion of households with Internet access stood at 2 per cent.

Georgia has the highest mobile broadband penetration in the CIS (2.3 %)

- **Azerbaijan** advanced four places, from last to rank 8 in the regional 2007 IDI, achieving the highest ranking gain in the CIS between 2002 and 2007. Progress was driven by an increase in international bandwidth per Internet user (from less than 10 to 3'955 bits/s / user) and by improvements in mobile cellular penetration (from 10 to 53 per cent). These are important advances for a country that ranked last in the regional 2002 IDI. Still, Azerbaijan has the lowest sub-index

skills value in the CIS given the country's slow progress over the five-year period and with its tertiary enrolment ratio even slightly decreasing.

- **Kyrgyzstan** ranks 9th in the regional IDI 2007, down one place from 2002. Although the country made progress in all three sub-indices, it did not match the region's overall progress. The main sources of growth were the increase in mobile cellular penetration (from 1 to 41 per cent) and in international Internet bandwidth per Internet user (from 59 to 796 bits / s / user), yet in both cases Kyrgyzstan remained below the CIS average. Likewise, progress in Internet usage resulted in an Internet user penetration of 14 per cent, slightly below the region's overall Internet user penetration (15 per cent in 2007, excluding Russia). Kyrgyzstan has a very low fixed telephone penetration (9 per cent in 2007).

- **Turkmenistan**, **Tajikistan** and **Uzbekistan** all moved down one position to occupy the last three places in the regional IDI 2007. All three countries have a very low proportion of households with a computer (below 2.5 per cent in 2007), and a low proportion of households with Internet access at home (less than 1 per cent in 2007). Mobile cellular penetration rates are low, especially in the case of Turkmenistan (7 per cent in 2007). Turkmenistan has the highest fixed telephone penetration of the three (9 fixed telephone lines per 100 inhabitants), and the highest sub-index skills value. By 2007, Tajikistan was the only country amidst the three offering mobile broadband services, although with a negligible uptake. Both Internet usage and fixed broadband penetration were low in all three countries.

In 2007, mobile cellular penetration in Turkmenistan was only 7 %

3.2 Regional analysis of the ICT Price Basket

ITU presented the ICT Price Basket in March 2009[24] in order to raise awareness of the impact of ICT prices on ICT usage and to allow policy makers to evaluate the cost of ICT services in their country and benchmark ICT prices against those of other countries. ITU's global 2008 ICT Price Basket included a total of 150 countries.[25]

The ICT Price Basket is made up of three sub-baskets, which measure the prices of fixed telephone, mobile cellular and fixed broadband Internet services. Each sub-basket is presented in US$[26], in PPP$[27] and as a percentage of monthly GNI per capita. The three sub-baskets are combined into a single ICT Price Basket value, which determines the overall rank.

The ICT Price Basket is the value computed as the sum of the price of each sub-basket (in US$) as a percentage of a country's monthly GNI per capita (World Bank, US$, Atlas Method), divided by three (Chart 3.4). For this exercise, the cost of each sub-basket as a percentage of the monthly GNI per capita is limited to a maximum value of 100, so that the final ICT Price Basket value may vary between a theoretical 'zero' (tariffs represent zero per cent of average monthly GNI per capita, and all three services are for free), and 100 (the price of all three sub-baskets is equal to or exceeds the monthly GNI per capita). Based on the ICT Price Basket value, countries are ranked.

This section analyses the results of the 2008 ICT Price Basket in the CIS. Only half of the CIS countries were included in the 2008 ICT Price Basket since data for at

least one of the three tariff components was unavailable for the remaining six CIS countries. The CIS countries included in the ICT Price Basket are Russia, Ukraine, Armenia, Moldova, Georgia and Azerbaijan.[28] As a result, the following analysis is limited to these six countries, which are referred to as the "CIS (6)".

Overall results of the ICT Price Basket

On average, the 2008 ICT Price Basket value in the CIS (6) corresponds to 9.0 per cent of the countries' average GNI per capita. However, it varies from 1.8 per cent in Russia to 16 per cent in Azerbaijan. Compared to the average of the world (15.1 per cent), the 2008 ICT Price Basket is significantly less expensive in the CIS (6). The average cost of the ICT Price Basket in Russia is in line with that of developed countries (1.6 per cent), while in other CIS (6) countries, the ICT Price Basket value is closer to that of other developing regions, such as Northern Africa (5.7 per cent), South America (8.4 per cent) or Southern Asia (14.5 per cent).

The 2008 ICT Price Basket value in the CIS (6) corresponds to 9 % of the countries' average income ranging from 1.8 % in Russia to 16 % in Azerbaijan

Chart 3.5 shows in more detail the distribution of the ICT Price Basket in CIS (6) countries, as well as the contribution of each sub-basket to the cost of the ICT Price Basket.[29] It shows that differences in the ICT Price Basket are mainly due to high fixed broadband prices in several CIS (6) countries. Variation between the CIS (6) countries in terms of fixed broadband prices are smaller than in other regions, such as Africa, or Asia and the Pacific, where some countries have fixed broadband sub-baskets that correspond to more than 100 per cent of their monthly GNI per capita.

Table 3.3 presents the results of the ICT Price Basket in the CIS (6). The ranking is topped by Russia, the country in the region with the highest income per capita (nearly three times as much as the next CIS country in terms of GNI per capita). On the other hand, Moldova has the lowest income per capita of the CIS and ranks 4th in the regional ICT Price Basket ranking, higher than Georgia and Azerbaijan.

ICT Price Basket methodology

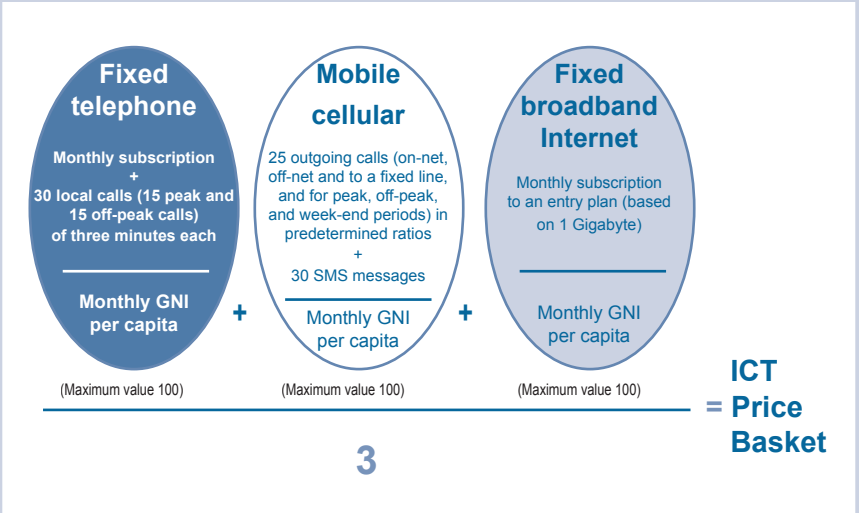
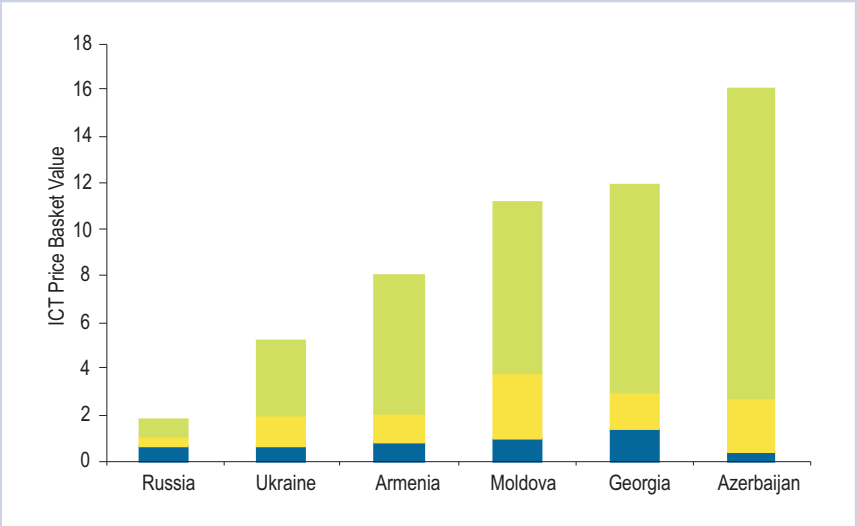


Chart 3.4

Note: In countries where no mobile prepaid offers are available, the monthly fixed cost (minus the free minutes included, if applicable) of a postpaid subscription is added to the basket. For monthly fixed broadband Internet plans that limit the amount of data transferred by including caps below 1 Gigabyte, the cost for additional bytes is added.
Source: ITU.

Chart 3.5

Cost of the ICT Price Basket by sub-baskets, CIS (6), 2008



Source: ITU (2009a).

This finding and the fact that Moldova ranks relatively high in the regional IDI 2007 suggest that low ICT Prices, even in low-income countries, can be an important factor in promoting ICT uptake and usage.

In Moldova, ICT prices are relatively low compared to the country's level of income

The remaining countries included in the regional ICT Price Basket (Ukraine, Armenia, Georgia and Azerbaijan) have similar income levels and yet substantially different ICT Price Basket values. The analysis of these results can be a good starting point for policymakers to assess the affordability of ICT services in their countries, and to address policies affecting ICT prices – such as those fostering competition, regulating operator's revenues and efficiency, or concerning specific tariff policies.

Among all CIS (6) countries, Azerbaijan is the only one where ICT prices (as measured by the ICT Price Basket) are above the world's average, due to high mobile and fixed broadband prices.

Table 3.3

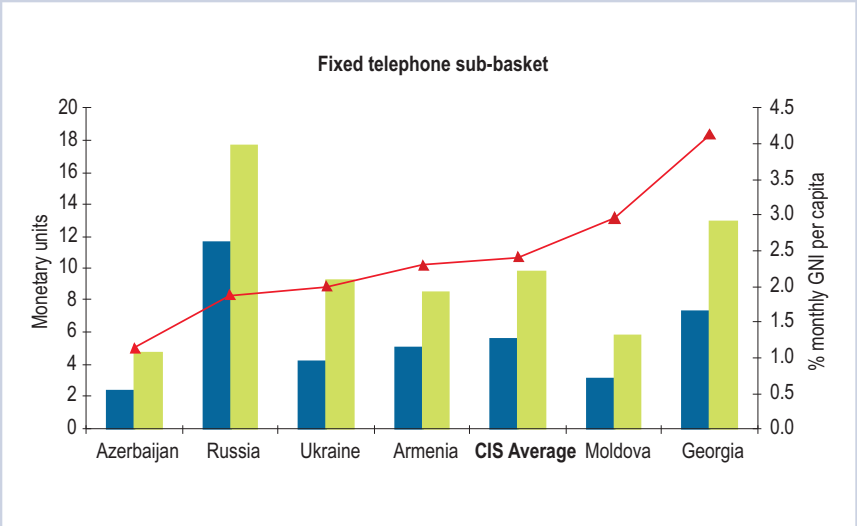
ICT Price Basket 2008, CIS (6)

Rank	Economy	ICT Price Basket Value***	Sub-baskets: Fixed (% of GNI per capita*)	Sub-baskets: Mobile (% of GNI per capita*)	Sub-baskets: Broadband (% of GNI per capita*)	GNI per capita**, USD
1	Russia	1.8	1.9	1.4	2.2	7'560
2	Ukraine	5.2	2.0	3.8	9.8	2'550
3	Armenia	8.0	2.3	3.8	17.8	2'640
4	Moldova	11.2	3.0	8.5	22.1	1'260
5	Georgia	12.0	4.1	4.8	26.9	2'120
6	Azerbaijan	16.0	1.1	7.2	39.8	2'550
	WORLD	**15.1**	**7.3**	**7.6**	**218.9**	**11'189***

Note: * The World's Bank GNI per capita is computed as the average GNI per capita of the 150 countries included in the world's ICT Price Basket 2008.
**The GNI per capita is based on the World Bank's Atlas Method.
*** The ICT Price Basket Value is the sum of the three sub-baskets as a percentage of GNI per capita, divided by three.
Source: ITU.

Fixed telephone sub-basket in the CIS (6), 2008

Chart 3.6



Source: ITU (2009a).

Fixed telephone sub-basket

The fixed telephone sub-basket represents the cost of local fixed residential telephone service. It includes the fee of the monthly subscription, plus the cost of 30 local calls to the same (fixed) network (15 peak and 15 off-peak calls) of three minutes each.[30]

The lowest fixed telephone prices in the CIS (6) are those of Azerbaijan (US$ 2.4, PPP$ 4.8). Furthermore, Azerbaijan is among the world's top ten countries with the least costly fixed telephone sub-basket, both in US$ and PPP prices. On the other hand, Russia has the most expensive fixed telephone prices of all countries included in the regional ICT Price Basket (US$ 11.7, PPP$ 17.7).

Chart 3.6 shows the fixed telephone sub-basket of CIS (6) countries sorted by percentage of monthly GNI per capita. Russia's high prices are compensated by a high GNI per capita, which makes prices rather affordable (1.9 per cent of their GNI per capita). Nevertheless, Azerbaijan has also the lowest prices in terms of GNI per capita (1.1 per cent). The highest fixed telephone prices as a percentage of GNI per capita in the CIS (6) are those of Georgia (4.1 per cent).

Azerbaijan has the lowest fixed telephone prices in the CIS (6)

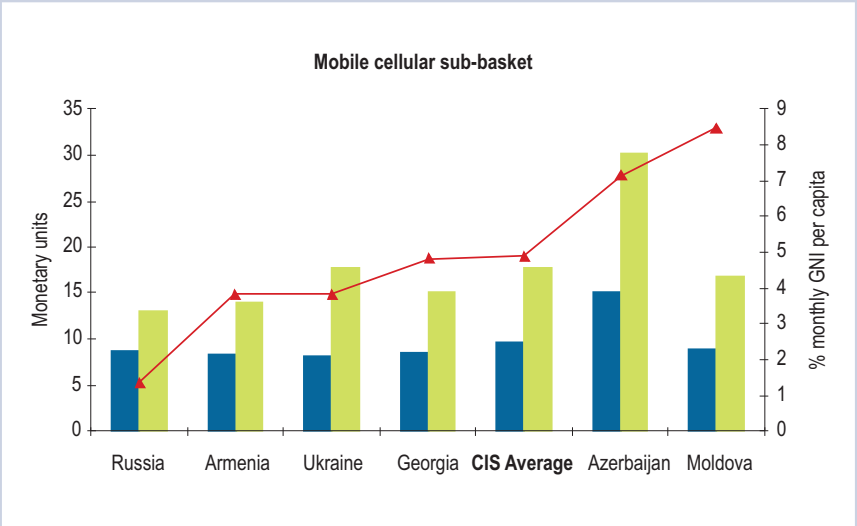
On average, the fixed telephone sub-basket is the cheapest of all three sub-baskets in the CIS (6), and the one that displays smaller differences between the six countries included in the regional ICT Price Basket. All CIS (6) countries are below the world's average, and only Russia has a mobile sub-basket that is cheaper than the fixed telephone one.[31]

Mobile cellular sub-basket

The mobile cellular sub-basket corresponds to the price of a standard (low-user) basket of mobile monthly usage based on the OECD/Teligen methodology.[32] It includes

Chart 3.7

Mobile cellular sub-basket in the CIS (6), 2008



Source: ITU (2009a).

25 outgoing calls per month (on-net, off-net and to a fixed line), in predetermined ratios of minutes, plus 30 Short Message Service (SMS) messages.[33]

On average, the cost of the mobile sub-basket in CIS (6) countries represents 4.9 per cent of their monthly GNI per capita, which is twice as much as the average cost of the fixed telephone sub-basket.

Mobile cellular prices in US$ are similar in all CIS (6) countries except Azerbaijan, and range between US$ 8 and US$ 9. Azerbaijan's mobile sub-basket is the most expensive in the CIS (6) (US$ 15.2). In PPP terms, Azerbaijan has also the most expensive mobile sub-basket (PPP$ 30.1) and Russia the cheapest one (PPP$ 13.1). However, when compared with the top ten countries in the world with the least costly mobile cellular sub-basket (all of them have a mobile sub-basket of less than PPP$ 6.0), Russia's mobile sub-basket is still expensive.

Russia's mobile sub-basket is lower than its fixed telephone sub-basket

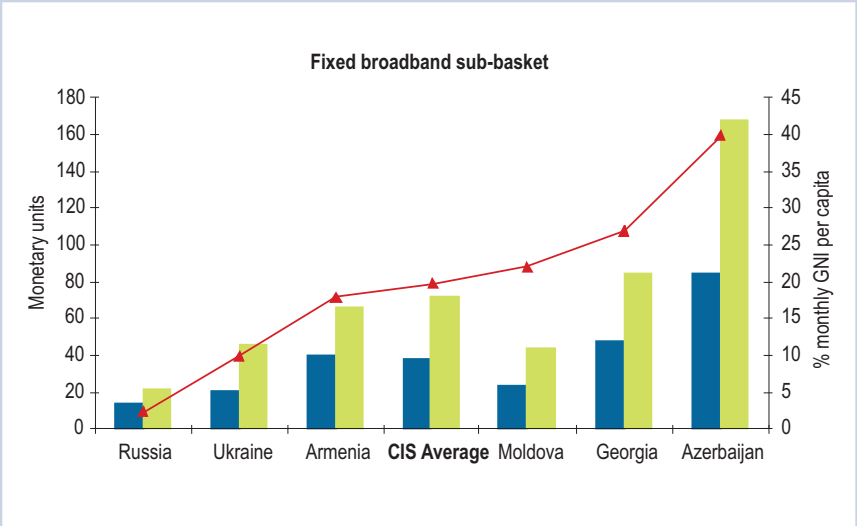
As a percentage of monthly GNI per capita (Chart 3.7), Russia has the cheapest mobile sub-basket (1.4 per cent), while Moldova has the most costly one (8.5 per cent), more expensive than that of Azerbaijan (7.2 per cent). This is due to the fact that Azerbaijan's income is twice as high as Moldova's and therefore its mobile tariffs, although higher than those of Moldova in absolute terms, are more affordable to the population. Moldova is the only country in the CIS (6) with a more costly mobile cellular sub-basket than the world's average (in terms of monthly GNI per capita).

Fixed broadband Internet sub-basket

The fixed broadband Internet sub-basket is calculated based on the price of the monthly subscription to an entry level fixed broadband plan, at a minimum speed of 256 kbit/s.[34]

Fixed broadband Internet sub-basket in the CIS (6), 2008

Chart 3.8



Source: ITU (2009a).

Similar to other regions, in the CIS (6) the fixed broadband Internet sub-basket is the most expensive among the three sub-baskets,[35] and displays the highest differences between the six countries included in the regional ICT Price Basket. Prices range from US$ 13.9 (PPP$ 21.1) in Russia to US$ 84.5 (PPP$ 167.3) in Azerbaijan. Russia's fixed broadband prices are significantly lower than those of other CIS (6) countries and, moreover, the country is among the world's top 15 countries with the least costly fixed broadband Internet sub-basket in both PPP and US$ terms.

As a percentage of monthly GNI per capita (Chart 3.8), fixed broadband prices in the CIS (6) range from 2.2 per cent in Russia to 39.8 per cent in Azerbaijan. The cost of fixed broadband in Georgia and Azerbaijan is above the region's average, and higher than in Moldova, a country with half their income per capita. This suggests that both Georgia and Azerbaijan have room to lower the price of fixed broadband, and thus improve its affordability.

The fixed broadband Internet sub-basket is the most expensive among the three sub-baskets and displays the highest differences between the 6 countries included in the regional ICT Price Basket

Endnotes

1 See ITU (2009a).

2 For more information on the WSIS and its outcome documents, see http://www.itu.int/wsis/index.html.

3 The sub-index access includes the following indicators: fixed telephone lines per 100 inhabitants, mobile cellular telephone subscriptions per 100 inhabitants, international Internet bandwidth (bits/s) per Internet user, proportion of households with a computer, and proportion of households with Internet access at home.

4 The sub-index use includes the following indicators: Internet users per 100 inhabitants, fixed broadband Internet subscribers per 100 inhabitants, and mobile broadband subscribers per 100 inhabitants.

5 The sub-index skills includes the following indicators: adult literacy rate, secondary gross enrolment ratio, and tertiary gross enrolment ratio.

6 This growth corresponds to an absolute increase of more than one IDI point (Table 3.1). Although it is indeed a significant increase, it is considerably lower than that of the world's top countries in terms of IDI growth, such as Luxembourg (2.42 IDI gain between 2002 and 2007), Lithuania (2.12), Estonia (2.04), the United Arab Emirates (2.02) and Ireland (2.01).

7 Between 2002 and 2007, Turkmenistan's IDI value grew 14 per cent, Tajikistan's 21 per cent, and Uzbekistan's 17 per cent.

8 The R square value of a logarithmic regression provides a measure of how well the trend line approximates the real data points. It varies from 0 to 1, where 1 corresponds to the value obtained by a perfect fit of the data points.

9 For a more detailed analysis of the link between income and the global IDI, see ITU (2009a).

10 See ITU (2009b), Chapter 3, for more details.

11 See ITU (2009d), Chapter 3, for more details.

12 See ITU (2009c), Chapter 3, for more details.

13 In March 2005, Moldova approved the National Strategy on Information Society Development – "e-Moldova"– and the National Action Plan for its implementation, which is concentrated on the following areas: e-government, e-economy, e-education, e-science, e-culture, and e-health. For more details, see http://en.anrceti.md/fileupload/13.

14 Azerbaijan had the highest IDI ranking gain between 2002 and 2007 in the CIS, and experienced an IDI growth of 0.99 points.

15 In 2007, the average sub-index use value in the CIS was three times lower than the world.

16 See ITU (2009a), Chapter 3, for more details on the conceptual framework of the IDI.

17 Excluding Russia, international connectivity in the CIS increased from 176 bits / s / user in 2002 to1'651bits / s / user in 2007.

18 References to rankings made in this section apply to rankings of economies within the region. It is to be noted that these rankings differ from the world IDI ranking, which includes 154 economies (see ITU, 2009a).

19 BRIC refers to Brazil, Russia, India and China. Russia has a 2007 IDI value of 3.80 and ranks 50th in the world IDI ranking. Russia is the first ranked BRIC country: Brazil ranks 60th (IDI value of 3.48), China 73rd (IDI value of 3.11), and India 118th (IDI value of 1.59). Furthermore, among the BRIC, only China experienced a higher IDI growth between 2002 and 2007 (1.16 compared to 1.12 IDI points).

20 In October 2007, MegaFon was the first operator to provide mobile broadband services (through UMTS and HSDPA technologies) in Russia (see http://eng.megafon.ru/news/events/00162/). In May 2008, MTS launched also mobile broadband services commercially using HSPA technology (see http://www.mtsgsm.com/news/2008-05-28-26789/), and in September 2008 VimpelCom started offering mobile broadband services with UMTS/HSDPA technology (see http://www.vimpelcom.com/news/press.wbp?y=2008&id=fe8dc73a-7b88-409d-a5ba-8be1868788aa).

21 Compared to most European countries, the United States, Canada, Japan or South Korea. Russia lags behind particularly in terms of broadband uptake (both fixed and mobile), as well as in the

proportion of households with a computer, and the proportion of households with Internet access at home.

[22] See CNBC, Turkcell Belarus unit receives 3G frequencies, July 2009, at: http://www.cnbc.com/id/32236212.

[23] Many European countries, such as Cyprus (11 per cent), Denmark (12 per cent), Finland (15 per cent), France (14 per cent) or Greece (10 per cent), have a mobile broadband penetration above 10 per cent. World leading countries in terms of mobile broadband, such as Japan (57 per cent), the Republic of Korea (49 per cent) or Luxembourg (43 per cent) have much higher penetration rates.

[24] See ITU (2009a) for more details.

[25] The main reason for not including a specific country in the ICT Price Basket was the unavailability of one or several of the tariffs used to calculate the Price Basket.

[26] The average United Nations operational rate of exchange from January 2008 to September 2008 was used (the month when prices were gathered).

[27] Current international dollars (PPP $) are calculated using Purchasing Power Parity (PPP) conversion factors instead of regular exchange rates. The use of PPP exchange factors helps screening price and exchange rate distortions, thus providing a measure of the cost of a given service taking into account the purchasing power equivalences between countries. PPP data used in the ICT Price Basket were provided by the World Bank. For more information on PPP methodology and data, see http://go.worldbank.org/UI22NH9ME0 and the World Bank (2008).

[28] The following CIS economies included in the ITU World Telecommunication/ICT Indicators database were not included in the ICT Price Basket because of lack of data: Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

[29] The ICT Price Basket is the value computed as the sum of the price of each sub-basket (in US$) as a percentage of the country's monthly GNI per capita (World Bank, US$, Atlas Method), divided by three. Therefore, the contribution of each sub-basket to the ICT Price Basket is a third of the price of the sub-basket expressed as a percentage of the monthly GNI per capita.

[30] See ITU (2009a), Annex 2, for more details.

[31] In other regions, such as Southern Asia and South-Eastern Asia, the mobile sub-basket is in most countries less expensive than the fixed sub-basket. For instance, that is the case of India, Pakistan, the Philippines or Thailand, among others.

[32] See OECD (2002).

[33] See ITU (2009a), Annex 2, for more details.

[34] Fixed broadband is considered any dedicated connection to the Internet at speeds equal to, or greater than, 256 kbit/s, in one or both directions. Where several offers were available, preference was given to a 256 kbit/s connection. The tariff represents the cheapest broadband entry plan (although special offers – limited in time or to specific geographic areas – were not taken into consideration) but does not necessarily represent the fastest or most cost-effective connection since often the price for a higher-speed plan is relatively cheaper (in terms of the caps). See ITU (2009a), Annex 2, for more details.

[35x] On average, the fixed broadband sub-basket in the CIS (6) costs four times as much as the mobile sub-basket, and seven times as much as the fixed telephone sub-basket.

Chapter 4.

Conclusions and recommendations

Over the past decade, key ICT services and uptake have increased throughout the CIS region. Between 2003 and 2008, the number of fixed telephone lines, Internet users and mobile cellular subscriptions has grown twice as fast annually as in the world. Contrary to Europe and the Americas region, the number of fixed telephone lines in the CIS continues to grow. Nevertheless, there is a clear shift from fixed to mobile telephony in the region, with mobile cellular subscriptions surpassing fixed lines in 2003, and between 2003 and 2008, the number of mobile cellular subscriptions increased more than six times. At the end of 2008, the CIS region stands out for having the second highest mobile cellular penetration rate in the word. At 113 per cent, the CIS average lies just behind Europe (116 per cent) but ahead of every other region, as well as ahead of the developing world average.

There is a striking difference in the region between mobile cellular penetration rates and other ICTs

The region's large territories, difficult geographic conditions and major differences in income make widespread ICT access and use in the CIS a challenging task. Russia is not only the largest economy in the region, by far, but also the most advanced when it comes to ICT developments, characterized by a strong and growing telecommunications market. Upper-middle-income countries such as Russia and Ukraine have mobile penetration rates well above 100 per cent, high Internet growth rates and a dynamic ICT sector, which is an impressive achievement given their large populations. At the other end of the scale, low-income countries such as Tajikistan and Uzbekistan have low ICT penetration and moderate ICT growth.

Russia and Ukraine also lead in terms of the total number of fixed and mobile broadband subscriptions, although Russia, with 6.6 fixed broadband subscribers per 100 inhabitants lies just above the world average and far behind its European neighbours. Overall, the CIS region's fixed and mobile broadband penetration rate, at 4.6 and 0.9 per cent, respectively (in 2008), stood below the world averages and were similar to those in the developing world. Recent broadband data also suggest that mobile broadband has been relatively slow to develop in the CIS, compared to other regions. While globally, the number of mobile broadband subscriptions overtook the number of fixed broadband subscribers in 2008, the CIS, at the end of 2008, had almost 12.5 million fixed broadband subscribers compared to only 2.5 million mobile broadband subscriptions. At the same time, fixed infrastructure to deliver high-speed Internet access is often limited to urban centers and out of the reach of many CIS inhabitants.

A major challenge for CIS countries is to bring the benefits of Internet and broadband to a larger part of its population

Of concern are also relatively low penetration rates for Internet users and household access to ICTs in low and lower-middle-income economies. A major challenge for CIS countries therefore is to bring the benefits of Internet and broadband to a larger part of its population.

However, the Report also revealed that ICT progress (as measured by the ITU ICT Development Index (IDI)) is not strongly correlated with income in CIS countries, and less than in countries of other regions of the world. In other words, some CIS countries have relatively high ICT uptake given their income levels, and vice versa. This suggests that policies targeted towards the development of the ICT sector (or the lack thereof) play an important role when it comes to explaining the level of ICT uptake in CIS countries.

ICT-targeted policies (or the lack thereof) play an important role when it comes to explaining the level of ICT uptake in CIS countries

A closer look at fixed and mobile broadband in the region reveals that in many countries the market is still dominated by incumbent operators, which have yet to roll-out backbone broadband infrastructure, especially outside the capital cities. So far, most incumbent operators have been resisting the push towards broadband. However, this is changing with an increase in deregulation, the emergence of new competitors and a strong demand for high-speed Internet services. While the existing two dominant fixed broadband access modes are DSL and cable modem, FTTx has started to emerge as a serious broadband platform, mainly in major urban areas. Operators are expected to leverage on new solutions such as IPTV, multimedia services and broadband Internet in order to increase revenues and reinforce their market positions.

Mobile broadband networks are being launched throughout the region, including in Armenia, Moldova, Russia, Ukraine and Uzbekistan. Although penetration levels remain low, mobile broadband technologies and services are expected to help overcome the broadband divide, especially in areas with limited fixed line infrastructure. At the same time, WiMAX deployment is ongoing in several countries throughout the region, with the potential of bringing high-speed Internet to rural and underserved areas.

Main priorities are to encourage new broadband operators and stimulate competition, and to use universal service funds to distribute broadband to rural and underserved areas

In view of these developments, the main priorities for policy makers in the region will be to encourage new broadband operators to enter the market and stimulate competition, use universal service funds to roll-out broadband to rural and underserved areas, promote the development of online e-government services and encourage more citizens to access relevant services and applications.

Based on the findings of the Report, a number of specific **recommendations** are provided in order to enhance Internet and broadband uptake in the CIS region:

- Create favorable conditions to ensure liberalization, privatization and transparent markets. By providing a clear regulatory framework and rules, policy makers can encourage fair competition and limit barriers to market access to attract private investment and stimulate innovation. Concrete issues to be addressed include introducing mobile number portability, simplifying licensing procedures, opening up competition in all building blocks, including in international services, and ensuring unbundled access to the local loop owned by incumbent operators for all players; new operators should be allowed to set up their own networks, especially in underserved areas.

- Implement regulatory reform to ensure regulatory independence and the implementation of competitive safeguards, for example, through the analysis of dominant market shares. To this end, all regulatory authorities should track market developments, operators' market shares and ICT penetration rates. The

regular collection and dissemination of statistical indicators are critical to this process.

- Reduce prices for telecommunication services, especially broadband Internet. This can in part be achieved through deeper liberalization and privatization. In addition, policy makers can lower taxes, regulate interconnection rates and reduce regulatory fees; by encouraging operators to engage in tower sharing and other infrastructure sharing procedures, operators can save costs and reduce prices.

- Grant preferential rights and conditions to mobile operators for using limited radio resources for development and offering mobile broadband services, including in rural areas. For example, regulators could launch UMTS (3G) services in the 900 Mhz spectrum used now by GSM operators. In countries where spectrum has been allocated for military purposes, policy makers could liberate spectrum to provide more people with access to ICTs. Wireless broadband deployment could be included in universal access policies.

- To satisfy demand for fixed telephone services, administrations, regulators and operators should focus not only on traditional copper lines but turn to alternative technologies, including fixed CDMA.

Measures to lower prices and stimulate ICT uptake include reducing taxes on ICT services, regulate interconnection rates and reduce regulatory fees

Policy makers and regulators have a major role to play in providing an environment conducive to the successful development of the market and to attract operators and investors. Other measures to stimulate ICT deployment and uptake include reducing taxes on ICT services, encouraging competition and boosting investment in power supply and international connectivity, all of which will result in lower prices to end users and therefore growth in ICT uptake. Policy makers can further contribute by ensuring the development of a skills base adapted to not only using ICTs but also reaping the economic and social benefits provided and enabled by ICTs.

References

Bolun I., Cosuleanu I., Gândea S. and V. Sidorenco. 2009. Challenges of e-development in the Republic of Moldova. IT-Moldova. ITU-D Regional Development Forum for Europe and CIS: NGN and Broadband, Opportunities and challenges. 24-26 August 2009, Chisinau, Republic of Moldova. Special issue. P. 29-31.

European Bank for Reconstruction and Development (EBRD). 2008. Legal Transition Programme. Telecommunications Regulatory Development. Comparative Assessment of the Telecommunications Sector in the Transition Countries. December 2008.

Gandea S., Cosuleanu I., and V. Sidorenco. 2008. Broadband services development in Moldova: ways of moving forward. IT-Moldova. ITU-D Regional Development Forum for Europe and CIS. NGN and Broadband, Opportunities and challenges. 24-26 August 2009, Chisinau, Republic of Moldova. Special issue. P. 24-26.

ITU. 2009a. Measuring the Information Society - The ICT Development Index. Geneva.

ITU. 2009b. Information Society Statistical Profiles 2009: Asia and the Pacific. Geneva.

ITU. 2009c. Information Society Statistical Profiles 2009: Africa. Geneva.

ITU. 2009d. Information Society Statistical Profiles 2009: Americas. Geneva.

National Regulatory Agency for Electronic Communications and Information Technology (ANRCETI) of the Republic of Moldova. 2008. Report on the Activity of the National Regulatory Agency for Electronic Communications and Information Technology and Evolution of Electronic Communications Market in 2008.

OECD. 2002. OECD Mobile Basket Revisions. (DSTI/ICCP/TISP (2002)9). Available at: http://www.oecd.org/dataoecd/56/26/41049548.pdf.

PMR Publications. 2008. Russia's mobile telephony market still on course for steady growth. PMR. July 2008.

PMR Publications. 2009. Broadband to drive development of CIS telecoms markets in 2009 and 2010. July 2009. 5 p. http://www.pmrpublications.com/free_articles/Broadband-to-drive-development-of-CIS-telecoms-markets-in-2009-and-2010-_-July-2009.shtml.

Ponder, Jaroslaw K. 2008. ICT Trends in CIS. July 2008. ITU TDB. www.itu.int/itu-d/eur.

Public Opinion Foundation. 2009. Interrogations "The Internet in Russia". Special release. March 2009. Moscow.

Statistical Yearbook of Armenia. 2008. Yerevan. National Statistical Service of the Republic of Armenia 2008.

World Bank. 2008. Global Purchasing Power Parities and Real Expenditures: 2005 international comparison program. Washington.

World Economic Forum and INSEAD. 2009. The Global Information Technology Report 2008-2009. Mobility in a Networked World. Geneva. 2009.

Annex 1. List of countries in the CIS region

Armenia	Moldova
Azerbaijan	Russia
Belarus	Tajikistan
Georgia	Turkmenistan
Kazakhstan	Ukraine
Kyrgyzstan	Uzbekistan

Note: Until 2009, the CIS region included the above countries. Georgia exited the Commonwealth on August 18, 2009, but is included in this report.

Annex 2. IDI sub-indices (access, use, skills) for CIS countries

IDI access sub-index (2002 and 2007)

Country	Rank 2007	Access 2007	Rank 2002	Access 2002	Rank change 2002-2007	Access change 2002-2007
Russia	1	4.45	1	2.36	0	2.09
Ukraine	2	4.17	2	1.94	0	2.24
Belarus	3	4.01	3	1.92	0	2.09
Moldova	4	3.87	4	1.63	0	2.24
Armenia	5	3.85	7	1.52	2	2.33
Kazakhstan	6	3.56	6	1.55	0	2.01
Azerbaijan	7	3.12	12	0.91	5	2.20
Georgia	8	3.09	5	1.56	-3	1.53
Kyrgyzstan	9	2.25	10	1.05	1	1.20
Turkmenistan	10	1.84	8	1.37	-2	0.47
Tajikistan	11	1.74	9	1.22	-2	0.53
Uzbekistan	12	1.49	11	0.96	-1	0.53

Note: Based on ITU (2009a).

IDI use sub-index (2002 and 2007)

Country	Rank 2007	Use 2007	Rank 2002	Use 2002	Rank change 2002-2007	Use change 2002-2007
Belarus	1	1.02	1	0.30	0	0.72
Russia	2	0.86	2	0.14	0	0.72
Ukraine	3	0.84	7	0.06	4	0.77
Moldova	4	0.68	4	0.12	0	0.57
Kazakhstan	5	0.51	8	0.06	3	0.45
Kyrgyzstan	6	0.47	5	0.10	-1	0.37
Georgia	7	0.41	9	0.05	2	0.35
Azerbaijan	8	0.37	3	0.12	-5	0.25
Tajikistan	9	0.24	12	0.00	3	0.24
Armenia	10	0.22	6	0.07	-4	0.15
Uzbekistan	11	0.15	10	0.04	-1	0.11
Turkmenistan	12	0.05	11	0.01	-1	0.04

Note: Based on ITU (2009a).

IDI skills sub-index (2002 and 2007)

Country	Rank 2007	Skills 2007	Rank 2002	Skills 2002	Rank change 2002-2007	Skills change 2002-2007
Ukraine	1	8.98	2	8.49	1	0.49
Belarus	2	8.76	3	8.19	1	0.57
Russia	3	8.54	1	8.53	-2	0.01
Kazakhstan	4	8.09	4	7.69	0	0.40
Kyrgyzstan	5	7.60	5	7.54	0	0.06
Georgia	6	7.54	6	7.39	0	0.15
Armenia	7	7.46	9	6.98	2	0.48
Moldova	8	7.44	7	7.15	-1	0.30
Turkmenistan	9	7.34	8	7.03	-1	0.31
Uzbekistan	10	6.95	10	6.77	0	0.18
Tajikistan	11	6.74	12	6.38	1	0.36
Azerbaijan	12	6.56	11	6.49	-1	0.07

Note: Based on ITU (2009a).

Annex 3. Statistical tables

Introduction

Data generally refer to the end of the calendar year indicated in the table *List of economies*.

The following signs and symbols are used in the document:

*	Estimate
000s	Thousands (e.g., 1'000)
M	Millions (e.g., 1'000'000)
B	Billions (e.g., 1'000'000'000)
US$	United States dollars. See the *Technical notes* for how US$ figures are obtained.
%	Per cent
-	Zero or a quantity less than half the unit shown.
...	Data not available
CAGR	Compound Annual Growth Rate. See the *Technical notes* for how this is computed.

The absence of any sign or symbol indicates that data are in units.

List of economies

Full designation	Designation in document	Fiscal year
Armenia (Republic of)	Armenia	Ending 31.12
Azerbaijani Republic	Azerbaijan	Ending 31.12
Belarus (Republic of)	Belarus	Ending 31.12
Georgia	Georgia	Ending 31.12
Kazakhstan (Republic of)	Kazakhstan	Ending 31.12
Kyrgyz Republic	Kyrgyzstan	Ending 31.12
Moldova (Republic of)	Moldova	Ending 31.12
Russian Federation	Russia	Ending 31.12
Tajikistan (Republic of)	Tajikistan	Ending 31.12
Turkmenistan	Turkmenistan	Ending 31.12
Ukraine	Ukraine	Ending 31.12
Uzbekistan (Republic of)	Uzbekistan	Ending 31.12

1. Main (fixed) telephone lines

		Main (fixed) telephone lines (000s)		CAGR (%)	Main (fixed) telephone lines per 100 inhabitants		CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Armenia	563.7	626.0	2.1	18.4	20.3	2.0
2	Azerbaijan	941.4	1'310.6	6.8	11.3	15.0	5.8
3	Belarus	3'071.3	3'718.1	3.9	31.0	38.4	4.4
4	Georgia	667.1	618.0	-1.5	14.6	14.4	-0.3
5	Kazakhstan	2'228.4	3'409.6	8.9	14.9	22.0	8.1
6	Kyrgyzstan	396.2	494.5	4.5	7.7	9.1	3.4
7	Moldova	791.1	1'114.6	7.1	20.4	30.7	8.6
8	Russia	36'100.0	44'897.0	4.5	25.0	31.8	4.9
9	Tajikistan	245.2	286.9	3.2	3.8	4.2	1.8
10	Turkmenistan	376.1	477.7	4.9	8.0	9.5	3.4
11	Ukraine	11'109.5	13'176.9	3.5	23.3	28.7	4.2
12	Uzbekistan	1'717.1	1'849.6	1.5	6.7	6.8	0.4
	CIS	**58'207.1**	**71'979.5**	**4.3**	**20.9**	**26.0**	**4.5**

Note: For data comparability and coverage, see the technical notes.
Source: ITU World Telecommunication/ICT Indicators Database.

2. Mobile cellular subscriptions

		Mobile cellular subscriptions			Mobile cellular subscriptions per 100 inhabitants		
		(000s)		CAGR (%)			CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Armenia	114	3'077	93,2	3,7	100,0	93,0
2	Azerbaijan	1'057	6'548	44,0	12,7	75,0	42,6
3	Belarus	1'118	8'128	48,7	11,3	84,0	49,4
4	Georgia	711	2'755	31,1	15,6	64,0	32,7
5	Kazakhstan	1'331	14'911	62,1	8,9	96,1	61,0
6	Kyrgyzstan	138	3'394	89,7	2,7	62,7	87,5
7	Moldova	476	2'423	38,5	12,2	66,7	40,4
8	Russia	36'135	199'522	40,7	25,0	141,1	41,4
9	Tajikistan	48	3'674	138,5	0,8	53,7	135,2
10	Turkmenistan	9	1'135	162,0	0,2	22,5	158,4
11	Ukraine	6'498	55'694	53,7	13,6	121,1	54,8
12	Uzbekistan	321	12'734	108,8	1,3	46,8	106,5
	CIS	**47'957,0**	**313'995,0**	**45,6**	**17,2**	**113,4**	**45,8**

Note: For data comparability and coverage, see the technical notes.
Source: ITU World Telecommunication/ICT Indicators Database.

2. Mobile cellular subscriptions (continuation)

		Mobile cellular subscriptions			Mobile broadband subscriptions		
		Prepaid subscriptions (%)	Population coverage (%)	As % of total telephone subscribers	(000s)		Per 100 inhabitants
		2008	2007	2008	2003	2008	2008
1	Armenia	84.4 *	87.8 *	83.1	-	-	-
2	Azerbaijan	97.0	99.0	83.3	-	-	-
3	Belarus	...	98.6	68.6	-	-	-
4	Georgia	...	95.9 *	81.7	-	409.3	9.5
5	Kazakhstan	76.5	81.0 *	81.4	-	-	-
6	Kyrgyzstan	79.2 *	24.3 *	87.3	-	-	-
7	Moldova	79.1 *	98.0 *	68.5	-	188.5	5.2
8	Russia	69.7 *	95.0 *	81.6	-	847.8	0.6
9	Tajikistan	...	...	92.8	-	50.5	0.7
10	Turkmenistan	...	13.7 *	70.4	-	-	-
11	Ukraine	93.2 *	100.0 *	80.9	-	844.9	1.8
12	Uzbekistan	54.9	93.0 *	87.3	-	123.8	0.5
	CIS	**75.1**	**93.0**	**81.4**	**-**	**2'464.8**	**0.9**

Note: For data comparability and coverage, see the technical notes. * Estimate.
Source: ITU World Telecommunication/ICT Indicators Database.

3. Internet users

		Internet users (000s)		CAGR (%)	Internet users per 100 inhabitants		CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Armenia	140.0	191.0	6.4	4.6	6.2	6.3
2	Azerbaijan	350.0	1'485.1	33.5	4.2	17.1	32.2
3	Belarus	1'607.0	3'106.9	14.1	16.2	32.1	14.6
4	Georgia	117.0	1'024.0	54.3	2.6	23.8	56.2
5	Kazakhstan	300.0	2'300.0	50.3	2.0	14.8	49.3
6	Kyrgyzstan	200.0	850.0	33.6	3.9	15.7	32.1
7	Moldova	288.0	850.0	24.2	7.4	23.4	25.9
8	Russia	12'000.0	45'250.0	30.4	8.3	32.0	31.0
9	Tajikistan	4.1	600.0	170.8	0.1	8.8	167.1
10	Turkmenistan	20.0	75.0 *	30.3	0.4	1.5 *	28.5
11	Ukraine	2'500.0	10'354.0	32.9	5.3	22.5	33.8
12	Uzbekistan	492.0	2'469.0	38.1	1.9	9.1	36.6
	CIS	**18'018.2**	**68'555.0**	**30.6**	**6.5**	**24.8**	**30.8**

Note: For data comparability and coverage, see the technical notes. * ITU estimate.
Source: ITU World Telecommunication/ICT Indicators Database.

4. International Internet bandwidth

		International Internet bandwidth					
		Mbps		CAGR (%)	Bits/s per Internet user		CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Armenia	28.0	68.0 *	142.9	200.0	453.3 *	126.7
2	Azerbaijan	150.0	10'240.0	132.7	428.6	3'170.1	49.2
3	Belarus	200.0	7'244.0 *	105.0	124.5	2'331.6 *	79.7
4	Georgia	32.0	3'277.0	152.4	273.5	3'200.2	63.6
5	Kazakhstan	48.0	11'000.0	196.5	160.0	4'782.6	97.3
6	Kyrgyzstan	11.0	597.0 *	122.3	55.0	702.4 *	66.4
7	Moldova	79.2	3'543.0	113.9	275.0	4'168.2	72.2
8	Russia	6'604.0	81'370.0	87.4	550.3	2'324.9	43.4
9	Tajikistan	2.0	...	-	485.4	...	-54.1
10	Turkmenistan	12.0	76.0 *	151.7	600.0	1'573.5 *	61.9
11	Ukraine	517.0	9'562.0	79.2	206.8	923.5	34.9
12	Uzbekistan	32.0	825.0	91.5	65.0	334.1	38.7
	CIS	**7'715.2**	**127'802.0**	**75.3**	**428.2**	**2'049.0**	**38.1**

Note: For data comparability and coverage, see the technical notes. * Estimate.
Source: ITU World Telecommunication/ICT Indicators Database.

5. Fixed broadband Internet subscribers

		Fixed broadband Internet subscribers			Fixed broadband Internet subscribers per 100 inhabitants		
		(000s)		CAGR (%)			CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Armenia	-	2.0 *	...	-	0.1 *	...
2	Azerbaijan	0.4	60.0	166.1	-	0.7	163.4
3	Belarus	0.1	477.8	422.2	-	4.9	424.7
4	Georgia	1.4	96.1	132.7	-	2.2	135.5
5	Kazakhstan	1.0	660.8	266.6	-	4.3	264.1
6	Kyrgyzstan	0.1	2.9 *	83.6	-	0.1	81.5
7	Moldova	0.6	115.1	186.4	-	3.2	190.4
8	Russia	343.0	9'280.0	93.4	0.2	6.6	94.3
9	Tajikistan	-	...	...	-	...	...
10	Turkmenistan	...	...	...	...	...	...
11	Ukraine	-	1'600.0	...	-	3.5	...
12	Uzbekistan	2.8	66.0	88.7	-	0.2	86.6
	CIS	**349.5**	**12'360.8**	**104.0**	**0.1**	**4.6**	**104.5**

Note: For data comparability and coverage, see the technical notes. * Estimate.
Source: ITU World Telecommunication/ICT Indicators Database.

Technical Notes

General methodology

The compound annual growth rate (CAGR) is computed by the formula:

$$[(P_v / P_0)^{(1/n)}]-1$$

where P_v = Present value
P_0 = Beginning value
n = Number of periods

The result is multiplied by 100 to obtain a percentage.

Regional aggregates are either *totals* or weighted *averages* depending on the indicator. For example, for main (fixed) telephone lines, the total number of *main (fixed) telephone lines* is shown, while for *main (fixed) lines per 100 inhabitants* the weighted average is shown. Growth rates generally refer to countries for which data are available for both years.

1. Main (fixed) telephone lines

Main (fixed) telephone lines refer to telephone lines connecting a customer's equipment (e.g., telephone set, facsimile machine) to the Public Switched Telephone Network (PSTN) and which have a dedicated port on a telephone exchange. Note that for most countries, main (fixed) lines also include public payphones. Many countries also include ISDN channels in main (fixed) lines (see below ISDN and ADSL). *Main (fixed) telephone lines per 100 inhabitants* is calculated by dividing the number of main (fixed) lines by the population and multiplying by 100.

2. Mobile cellular subscriptions

Mobile cellular subscriptions refers to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the PSTN. *Per 100 inhabitants* is obtained by dividing the number of mobile cellular subscriptions by the population and multiplying by 100. *Prepaid subscriptions* refers to the percentage of mobile cellular subscriptions using prepaid cards. *Population coverage* measures the percentage of inhabitants that are within range of a mobile cellular signal whether or not they are subscribers. This is calculated by dividing the number of inhabitants within range of a mobile cellular signal by the total population and multiplying by 100. *Mobile broadband subscriptions* refers to the number of subscriptions to mobile cellular networks with access to data communications (e.g. the Internet) at broadband speeds (greater than or equal to 256 kbit/s in one or both directions) such as WCDMA, HSDPA, CDMA2000 1xEV-DO, CDMA 2000 1xEV-DV etc. *Per 100 inhabitants* is obtained by dividing the number of mobile broadband subscriptions by the population and multiplying by 100.

3. Internet users

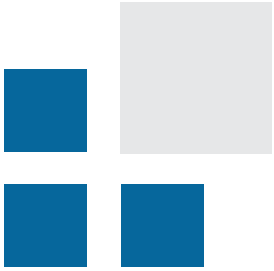
Internet users is based on nationally reported data. In some cases, surveys have been carried out that give a more precise figure for the number of Internet users. However, surveys differ across countries in the age and frequency of use they cover. The reported figure for Internet users – which may refer to only users above a certain age – is divided by the total population and multiplied by 100 to obtain *Internet users per 100 inhabitants*. Countries that do not have surveys generally base their estimates on derivations from reported Internet Service Provider subscriber counts, calculated by multiplying the number of subscribers by a multiplier.

4. International Internet bandwidth

International Internet bandwidth refers to the amount of international Internet bandwidth measured in Mega Bits Per Second (Mbps). Data for Internet bandwidth originate from ITU's annual questionnaire supplemented with data from TeleGeography. *Bits/s per Internet user* is calculated by dividing the international Internet bandwidth (in bits/s) by the number of Internet users.

5. Fixed broadband Internet subscribers

Fixed broadband Internet subscribers refers to subscribers who pay for high-speed access to the public Internet (a TCP/IP connection) at speeds equal to, or greater than, 256 kbps in one or both directions. It includes the sum of DSL, cable modem and other fixed broadband subscribers. *Fixed broadband Internet subscribers per 100 inhabitants* is calculated by dividing the number of fixed broadband Internet subscribers by the population of the country and by multiplying by 100.



Printed in Switzerland
Geneva, 2009