

# Measuring the Information Society



2011

**EXECUTIVE  
SUMMARY**





I n t e r n a t i o n a l   T e l e c o m m u n i c a t i o n   U n i o n

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**2011**

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SUMMARY**



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## Foreword

I am pleased to present the 2011 edition of *Measuring the Information Society*. Each year, this publication features the latest *ICT Development Index (IDI)* and *ICT Price Basket (IPB)* – two benchmarking tools to monitor information society developments worldwide. While the IDI captures progress made in regard to ICT infrastructure, use and skills, the IPB is a powerful tool in monitoring the affordability of ICT services and in explaining why some countries have moved faster than others in their ICT development. The report also takes an in-depth look at broadband development and presents new data on subscriptions, speed and bandwidth. An analysis of Internet user statistics reveals some of the key challenges and opportunities that need to be addressed to bring more people online in developing countries.

Over the past two years, the world has witnessed continuous growth of ICT services and uptake worldwide. All 152 economies included in the IDI have improved their scores, confirming the continuous spread of ICTs and the growing global information society. While most of the leading IDI countries are still from the developed world, it is encouraging to see that the most dynamic performers are developing countries. The majority of these are middle-income countries, however, and most of the least developed countries remain at the bottom of the index. The report shows that while ICT and income levels are closely related, income constraints can be overcome by strong policy measures. A number of countries have succeeded in reaching higher IDI levels than would be expected given their income levels. This should encourage all countries to proactively promote ICT policies and create an enabling environment that allows the sector to grow.

The affordability of ICT services is key to bringing more people into the information age. Our latest IPB compares 2008 and 2010 tariffs for fixed-telephony, mobile-cellular telephony and fixed-broadband Internet services at global and regional levels, and highlights the difference in prices between developed and developing regions. Covering 165 economies, it is the only price basket to monitor the affordability of ICT services worldwide. The results show that ICT prices continue to fall, in particular fixed-broadband prices, which dropped by more than 50 per cent over the past two years. While this is extremely encouraging, broadband is still too expensive in many developing countries, where it costs on average more than 100 per cent of monthly income, compared with 1.5 per cent in developed countries. Countries without affordable broadband access run the risk of falling behind in the global information society, and I hope that this report will prompt policy-makers to look into ways of lowering ICT prices.

The ICT for development debate is witnessing an obvious shift: the focus is no longer on the mobile-cellular miracle, but on the need for high-speed broadband Internet access. The report shows that wireless-broadband Internet access is the strongest growth sector, with prepaid mobile broadband mushrooming in many developing countries and Internet users shifting from fixed to wireless connections and devices. The emergence of new mobile devices, such as smartphones and tablet computers, is accelerating this process, but they are still too expensive in developing countries and there is a need to develop more affordable models and products. Furthermore, the availability of bandwidth and capacity will increasingly determine the use and beneficial impact of ICTs. As this report shows, a digital divide is unfolding between those with high-speed/capacity/quality access (as is the case in many high-income countries) and those with lower speed/capacity/quality access (as is the case in many low-income countries). While the potential development impact of bringing people from developing countries online via wireless access is enormous, high-end users from the business sector and public and private organizations continue to rely on high-speed fixed-broadband connections. Policy-makers should act swiftly to facilitate the spread of broadband and ensure that broadband services are fast, reliable and affordable.

The policy focus is often on enhancing ICT infrastructure and access. The full ICT development impact will only be felt, however, once people are using the technologies effectively. As more and more countries collect Internet user data, they provide valuable insights into who is currently online. The report shows that the Internet usage

divide runs along gender, education, income and age lines, and there are significant differences between people living in rural and urban areas of developing countries. A promising way of bringing more people from developing countries online is by targeting the younger generation. Social networking and user-created content has become one of the main online activities in which young people especially are actively engaging. Given that 47 per cent of the population in developing countries are under 25 years of age, there is an incredible potential in terms of increasing the number of Internet users. Providing Internet access in schools starting at primary level is key – once students have started using the Internet they will strive to continue to do so irrespective of their age, gender, income or final school qualification.

To ensure that the information society will be truly global and inclusive, much needs to be done to bring its benefits to the poorest in our societies. This means that future policy action needs to address issues that are related not only to access, but also to:

- price;
- bandwidth;
- speed and quality of service;
- skills;
- content and language; and
- applications targeted to low-end users.

In order to effectively monitor trends and assess progress, there is need for continuous development of reliable indicators. Measuring the Information Society is a key contribution to this process. I trust that the data and analysis provided will be useful to policy-makers, the ICT industry, academia, market analysts and others who are monitoring global ICT developments.



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The report includes data received from Eurostat, the United Nations Population Division and Wireless Intelligence, as well as purchasing power parity conversion factors received from the World Bank and fibre-optic access data provided by the Fiber-to-the-Home Council, which is greatly acknowledged.

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# EXECUTIVE SUMMARY

## Chapter 1. Introduction

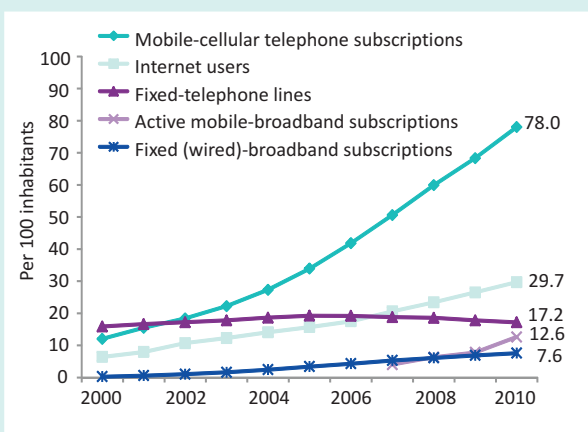
Over the past year, the world has witnessed continuous growth in ICT services and uptake worldwide. As post-2008-crisis data become available, they confirm the sustained growth of the telecommunication and Internet market overall, albeit with some notable variations. Key highlights include:

- Fixed telephony continues to decline, as it has done since 2005, especially in developed countries, where the fixed-line market has been overtaken by mobile-cellular telephony (Chart 1).
- Mobile-cellular penetration in developed countries has reached saturation levels, recording penetration rates of over 100 per cent and a growth of only one per cent during the past year; in developing countries, by contrast, growth in mobile subscrip-

tions is still buoyant, at 20 per cent, with no sign of a slowdown (Chart 2).

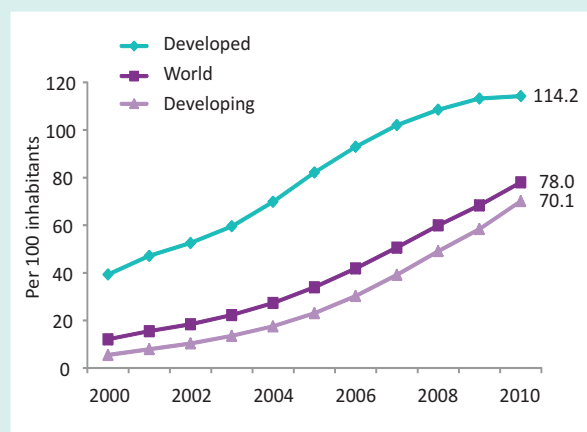
- Fixed-broadband penetration in developed countries had climbed to almost 24 per cent by end 2010, and growth is slowing, suggesting that saturation levels are being reached, while it stands at only 4.2 per cent in developing countries (Chart 3).
- Wireless-broadband Internet access remains the strongest growth sector and mobile broadband is mushrooming in developing countries, growing by 160 per cent between 2009 and 2010 (although starting from low levels) (Chart 4).
- Internet users have doubled over the past five years, and there are now more than two billion Internet users worldwide. Growth rates in deve-

**Chart 1: Global ICT developments, 2000-2010**



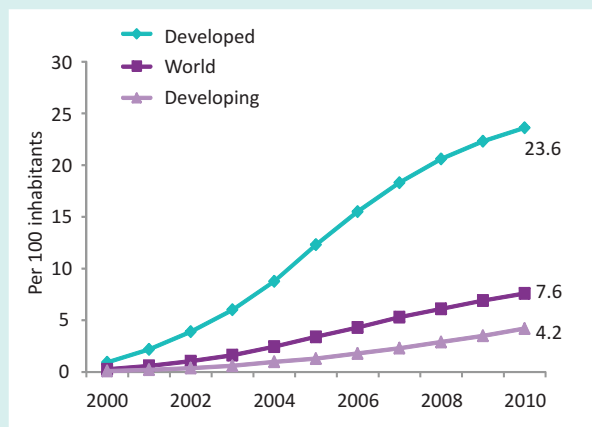
Source: ITU World Telecommunication/ICT Indicators database.

**Chart 2: Mobile-cellular subscriptions, 2000-2010, world and by level of development**



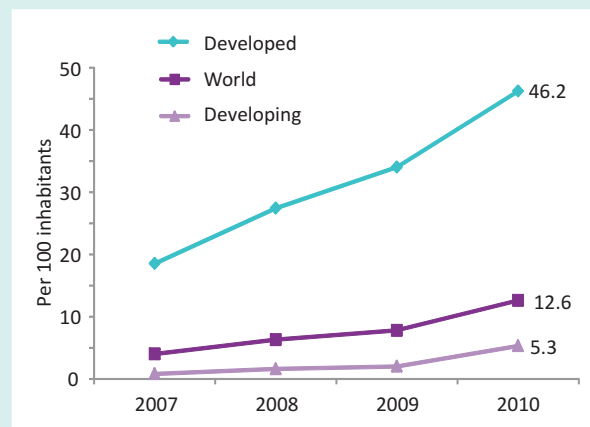
Source: ITU World Telecommunication/ICT Indicators database.

**Chart 3: Fixed-broadband subscriptions, 2000-2010, world and by level of development**



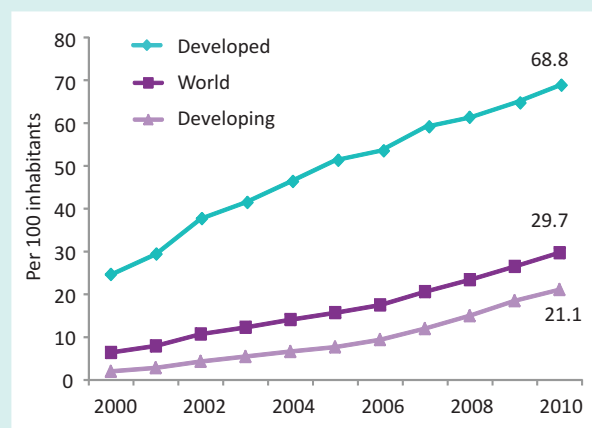
Source: ITU World Telecommunication/ICT Indicators database.

**Chart 4: Mobile-broadband subscriptions, 2007-2010, world and by level of development**



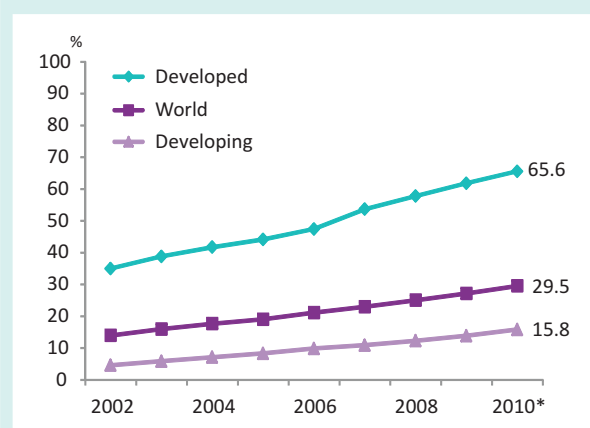
Source: ITU World Telecommunication/ICT Indicators database.

**Chart 5: Internet users, 2000-2010, world and by level of development**



Source: ITU World Telecommunication/ICT Indicators database.

**Chart 6: Households with Internet access, 2002-2010, world and by level of development**



Source: ITU World Telecommunication/ICT Indicators database.

developing countries are high (14 per cent between 2009 and 2010), and absolute numbers are driven by large countries such as Brazil, China, India, Nigeria and the Russian Federation. By end 2010, around 30 per cent of the world’s population was online – up from around 12 per cent in 2003 and six per cent in 2000 (Chart 5).

- The proportion of households with access to the Internet is growing steadily, especially in

developing countries (Chart 6), where around 16 per cent of households had access to the Internet at end 2010, as compared with 66 per cent in developed countries.

Recent events such as those related to the Arab spring and the publication of confidential political information on the Internet have demonstrated the power of communication and connectedness and enormously increased political interest in the information society.

The spread of ICTs in societies where communication and access to information has hitherto been very limited is making ICTs an even more powerful tool than ever.

Despite these encouraging trends, as at end 2010, some 70 per cent of the world's population (and almost 80 per cent of the developing countries' population) were not yet using the Internet, and even fewer via a broadband connection. In most developing countries, households, schools, hospitals and other public institutions located outside the major urban areas are not yet connected to high-speed Internet.

The revolution experienced through the mobile telephone therefore needs to be replicated to bring people online. The emergence of new mobile devices (such as smartphones and tablet computers) is certainly accelerating this process, but they are still too expensive in developing countries and there is a need to develop more affordable models and devices. Furthermore, the use and hence the beneficial impact of ICTs will increasingly be determined by the availability of bandwidth and capacity. A digital divide is unfolding between those with high-speed/capacity/quality access (as is the case in many high-income countries) and those with lower speed/capacity/quality access (as is the case in many low-income countries).

To ensure that the information society will be truly global and inclusive, future policy action needs to address issues not only of access, but also of price; bandwidth; speed and quality of service; skills; content and language; and applications targeted to low-end users.

## Chapter 2. The ICT Development Index (IDI)

The ICT Development Index (IDI) is a useful tool to benchmark and track the overall progress countries are making towards becoming information societies. The IDI is a composite index made up of 11 indicators covering ICT access, use and skills. It has been constructed to measure the level and evolution over time of ICT developments, taking into consideration the situations of both developed and developing countries.

Between 2008 and 2010, all 152 economies included in the IDI improved their scores, which confirms the continuous spread of ICTs and the growth of the information society worldwide (Table 1). The values of

the three sub-indices (access sub-index, use sub-index and skills sub-index) also increased. For the first time, the use sub-index grew more than the other two sub-indices between 2008 and 2010, which shows that more and more people are using broadband and the Internet.

The top ten IDI 2010 economies are (in order of their ranks) the Republic of Korea, Sweden, Iceland, Denmark, Finland, Hong Kong (China), Luxembourg, Switzerland, Netherlands and the United Kingdom. All but two of these are from Europe, and all of them are characterized by high increases in Internet and broadband access and use. They largely correspond to the world's high-income economies, given the strong correlation between the level of ICT development and GDP.

A number of economies, in particular from the developing world, have made considerable progress on the IDI over the two-year period, improving their IDI absolute or relative values. These "dynamic" economies include (in alphabetical order) Armenia, Azerbaijan, Belarus, Cyprus, Finland, Georgia, Iceland, Kenya, Macao (China), Moldova, Morocco, Oman, Portugal, Qatar, Saudi Arabia, Viet Nam and the Russian Federation. In those economies, both the access sub-index and the use sub-index grew strongly, and above average, indicating the growth in their information societies.

There are huge differences between countries when it comes to ICT development, with an IDI value of 0.8 for the country ranking at the bottom and 8.4 for the country ranking at the top of the IDI (on a scale from 1 to 10). Of particular concern is the observation that the gap has actually increased for both the IDI itself and two of its sub-indices (access and use). In other words, the difference between the country at the top and the country at the bottom has increased, with relatively more progress being made at the top and almost no progress being made at the very bottom.

Overall, IDI values in developing countries are about half those of developed countries in 2010, but relative growth in developing countries is stronger. The access sub-index has continued to grow at higher levels than the use sub-index in developing countries, whereas growth in the access sub-index in developed countries is relatively low, indicating that most developed countries have reached saturation levels. Developing countries, on the other hand, are still building their ICT access levels, at least partly, even if some of them have already moved to the next stage and become intense ICT users.

Table 1: ICT Development Index (IDI), 2010 and 2008

Economy	Rank 2010	IDI 2010	Rank 2008	IDI 2008
Korea (Rep.)	1	8.40	1	7.80
Sweden	2	8.23	2	7.53
Iceland	3	8.06	7	7.12
Denmark	4	7.97	3	7.46
Finland	5	7.87	12	6.92
Hong Kong, China	6	7.79	6	7.14
Luxembourg	7	7.78	4	7.34
Switzerland	8	7.67	9	7.06
Netherlands	9	7.61	5	7.30
United Kingdom	10	7.60	10	7.03
Norway	11	7.60	8	7.12
New Zealand	12	7.43	16	6.65
Japan	13	7.42	11	7.01
Australia	14	7.36	14	6.78
Germany	15	7.27	13	6.87
Austria	16	7.17	21	6.41
United States	17	7.09	17	6.55
France	18	7.09	18	6.48
Singapore	19	7.08	15	6.71
Israel	20	6.87	23	6.20
Macao, China	21	6.84	27	5.84
Belgium	22	6.83	22	6.31
Ireland	23	6.78	19	6.43
Slovenia	24	6.75	24	6.19
Spain	25	6.73	25	6.18
Canada	26	6.69	20	6.42
Portugal	27	6.64	29	5.70
Italy	28	6.57	26	6.10
Malta	29	6.43	31	5.68
Greece	30	6.28	30	5.70
Croatia	31	6.21	36	5.43
United Arab Emirates	32	6.19	32	5.63
Estonia	33	6.16	28	5.81
Hungary	34	6.04	34	5.47
Lithuania	35	6.04	35	5.44
Cyprus	36	5.98	43	5.02
Czech Republic	37	5.97	37	5.42
Poland	38	5.95	41	5.29
Slovak Republic	39	5.94	40	5.30
Latvia	40	5.90	39	5.31
Barbados	41	5.83	33	5.47
Antigua & Barbuda	42	5.63	38	5.32
Brunei Darussalam	43	5.61	44	4.97
Qatar	44	5.60	48	4.50
Bahrain	45	5.57	42	5.16
Saudi Arabia	46	5.42	55	4.13
Russia	47	5.38	49	4.42
Romania	48	5.20	46	4.67
Bulgaria	49	5.19	45	4.75
Serbia	50	5.11	47	4.51
Montenegro	51	5.03	50	4.29
Belarus	52	5.01	58	3.93
TFYR Macedonia	53	4.98	52	4.20
Uruguay	54	4.93	51	4.21
Chile	55	4.65	54	4.14
Argentina	56	4.64	53	4.16
Moldova	57	4.47	64	3.57
Malaysia	58	4.45	57	3.96
Turkey	59	4.42	60	3.81
Oman	60	4.38	68	3.45
Trinidad & Tobago	61	4.36	56	3.99
Ukraine	62	4.34	59	3.83
Bosnia and Herzegovina	63	4.31	63	3.58
Brazil	64	4.22	62	3.72
Venezuela	65	4.11	61	3.73
Panama	66	4.09	67	3.52
Maldives	67	4.05	66	3.54
Kazakhstan	68	4.02	72	3.39
Mauritius	69	4.00	70	3.43
Costa Rica	70	3.99	69	3.45
Seychelles	71	3.94	65	3.56
Armenia	72	3.87	86	2.94
Jordan	73	3.83	73	3.29
Azerbaijan	74	3.78	83	2.97
Mexico	75	3.75	74	3.26
Colombia	76	3.75	71	3.39

Economy	Rank 2010	IDI 2010	Rank 2008	IDI 2008
Georgia	77	3.65	85	2.96
Albania	78	3.61	81	2.99
Lebanon	79	3.57	77	3.12
China	80	3.55	75	3.17
Viet Nam	81	3.53	91	2.76
Suriname	82	3.52	78	3.09
Peru	83	3.52	76	3.12
Tunisia	84	3.43	82	2.98
Jamaica	85	3.41	79	3.06
Mongolia	86	3.41	87	2.90
Iran (I.R.)	87	3.39	84	2.96
Ecuador	88	3.37	88	2.87
Thailand	89	3.30	80	3.03
Morocco	90	3.29	100	2.60
Egypt	91	3.28	92	2.73
Philippines	92	3.22	95	2.69
Dominican Rep.	93	3.21	89	2.84
Fiji	94	3.16	90	2.82
Guyana	95	3.08	93	2.73
Syria	96	3.05	96	2.66
South Africa	97	3.00	94	2.71
El Salvador	98	2.89	101	2.57
Paraguay	99	2.87	97	2.66
Kyrgyzstan	100	2.84	99	2.62
Indonesia	101	2.83	107	2.39
Bolivia	102	2.83	102	2.54
Algeria	103	2.82	105	2.41
Cape Verde	104	2.81	103	2.50
Sri Lanka	105	2.79	106	2.41
Honduras	106	2.72	104	2.42
Cuba	107	2.69	98	2.62
Guatemala	108	2.65	108	2.39
Botswana	109	2.59	109	2.25
Uzbekistan	110	2.55	110	2.22
Turkmenistan	111	2.50	111	2.15
Gabon	112	2.42	112	2.10
Namibia	113	2.36	114	2.06
Nicaragua	114	2.31	113	2.09
Kenya	115	2.29	116	1.74
India	116	2.01	117	1.72
Cambodia	117	1.99	120	1.63
Swaziland	118	1.93	115	1.80
Bhutan	119	1.93	123	1.58
Ghana	120	1.90	118	1.68
Lao P.D.R.	121	1.90	119	1.64
Nigeria	122	1.85	125	1.54
Pakistan	123	1.83	121	1.59
Zimbabwe	124	1.81	128	1.49
Senegal	125	1.78	129	1.46
Gambia	126	1.74	122	1.59
Yemen	127	1.72	127	1.49
Comoros	128	1.67	130	1.44
Djibouti	129	1.66	124	1.56
Côte d'Ivoire	130	1.61	132	1.43
Mauritania	131	1.58	126	1.50
Angola	132	1.58	136	1.31
Togo	133	1.57	134	1.36
Nepal	134	1.56	137	1.28
Benin	135	1.54	138	1.27
Cameroon	136	1.53	133	1.40
Bangladesh	137	1.52	135	1.31
Tanzania	138	1.51	141	1.23
Zambia	139	1.50	131	1.44
Uganda	140	1.49	140	1.24
Madagascar	141	1.45	142	1.20
Rwanda	142	1.44	143	1.18
Papua New Guinea	143	1.38	139	1.24
Guinea	144	1.31	144	1.16
Mozambique	145	1.30	146	1.10
Mali	146	1.26	145	1.11
Congo (Dem. Rep.)	147	1.17	147	1.04
Eritrea	148	1.09	148	1.03
Burkina Faso	149	1.08	149	0.98
Ethiopia	150	1.08	150	0.94
Niger	151	0.92	152	0.79
Chad	152	0.83	151	0.80

Source: ITU.

Although the use sub-index shows stronger growth than in the previous period, it still registers rather low absolute levels for developing countries on average. The skills sub-index shows relatively little movement, which reflects the high level of achievement in developed countries as well as the nature of the proxy indicators employed. Since the sub-index is composed of school enrolment and literacy indicators, change and growth is much less dynamic than for ICT infrastructure market developments and ICT uptake in society, in particular in developing countries.

One of the advantages of the IDI is that it enables countries to be grouped according to their ICT levels. The real digital divide between countries can thus be illustrated based on their different levels of ICT. The report presents countries divided into four groups based on their IDI levels, and looks at movements between groups over the two-year period. Countries that have succeeded in moving to a higher IDI group include Bosnia and Herzegovina, Botswana, Croatia, Guatemala, Moldova, Oman, Panama and the United Arab Emirates. In these countries, IDI values have increased more than in countries with previously similar IDI values, thus elevating them into the next-highest IDI group.

A further analysis of the three sub-indices reveals that the greatest change took place in the use sub-index, which recorded a value change of 0.62 between 2008 and 2010, as against a value change of only 0.48 for the access sub-index. This reflects the fact that many countries have reached saturation levels in terms of ICT readiness, and are moving towards the ICT intensity and usage stage.

Between 2008 and 2010, the greatest changes *within the access sub-index* have taken place in terms of international Internet bandwidth, which has increased from 29 000 Gbit/s to 59 000 Gbit/s globally, bringing down both wholesale and retail broadband prices. A number of new fibre-optic submarine cables in Africa, in particular, have made the headlines and substantially increased bandwidth capacity in that part of the world. Other indicators included in the access sub-index are fixed-telephone lines, mobile-cellular telephone penetration, and the proportion of households with a computer and with Internet access.

Not surprisingly, the top performers in the access sub-index, including Hong Kong (China), Iceland, Sweden and Denmark, also rank high on the overall IDI. Outstanding (i.e. above-average) improvements on the ICT access sub-index were made by Albania,

Armenia, Azerbaijan, Belarus, the Islamic Republic of Iran, Madagascar, Moldova, Mongolia, Panama, Qatar, Saudi Arabia, the Russian Federation, Turkmenistan, Uruguay, Viet Nam and Zimbabwe.

The strong growth of the *use sub-index*, between 2008 and 2010, reflects the developments that have taken place in fixed-broadband and particularly mobile-broadband technologies, services and Internet uptake. The number of mobile-broadband subscriptions worldwide more than doubled between 2008 (when it overtook the number of fixed-broadband subscriptions) and 2010, and by end 2010 no fewer than 154 economies had launched 3G mobile-broadband networks.

An analysis of the most dynamic economies in terms of the change in their IDI use sub-index values and rankings between 2008 and 2010 reveals that the economies that have registered substantial gains in the use sub-index are mostly those which have achieved a sizeable increase in mobile-broadband subscriptions. These include Angola, Armenia, Austria, Belarus, Cambodia, Cyprus, Finland, Iceland, Kenya, Macao (China), Moldova, Portugal, Oman, Qatar, Saudi Arabia, Sweden and Syria.

A regional analysis of the IDI shows that the countries with the highest IDI rankings are from Europe and Asia and the Pacific (Table 2). The highest ranked countries from the Arab States and the Commonwealth of Independent States (CIS) are the United Arab Emirates and the Russian Federation, ranked 32nd and 47th, respectively. Africa lags behind, with Mauritius being the highest ranked country in the region, but occupying only 69th place globally. Ranges within regions also differ significantly. A comparison of regional ranges shows that by far the largest regional IDI value ranges in both 2008 and 2010 - calculated by deducting the lowest from the highest value - are found in Asia and the Pacific. The Americas has the second highest range in countries' IDI values for 2010, followed by Europe and the Arab States, which share the same range figure. Africa and the CIS have relatively smaller range values.

Between 2008 and 2010, ranges increased somewhat in all regions, suggesting that regional differences (or gaps) are widening. However, in Europe, for example, the difference is negligible, which indicates that European countries are moving at similar speeds. The largest increase in IDI ranges can be observed in the CIS, followed by Africa, where countries with relatively lower ICT levels are not catching up as fast as their counterparts in other regions.

**Table 2: The top five in each region and their ranking in the global IDI**

Regional IDI rank	Europe	Global IDI rank	Asia & Pacific	Global IDI rank	Americas	Global IDI rank	Arab States	Global IDI rank	CIS	Global IDI rank	Africa	Global IDI rank
1	Sweden	2	Korea (Rep.)	1	United States	17	UAE	32	Russia	47	Mauritius	69
2	Iceland	3	HK, China	6	Canada	26	Qatar	44	Belarus	52	Seychelles	71
3	Denmark	4	New Zealand	12	Barbados	41	Bahrain	45	Moldova	57	South Africa	97
4	Finland	5	Japan	13	Uruguay	54	Saudi Arabia	46	Ukraine	62	Cape Verde	104
5	Luxembourg	7	Australia	14	Chile	55	Oman	60	Kazakhstan	68	Botswana	109

Source: ITU.

An analysis of the relation between IDI and GNI per capita in each region highlights that the CIS and Africa display the weakest correlation between the two variables. For instance, a country with a GNI per capita of PPP\$ 10 000 in Africa will tend to have a lower IDI than a country with the same income from any other region. To a lesser extent, this also applies to CIS countries. This finding highlights the importance of effective ICT policies and efficient investment, which may make the difference in terms of achieving increased ICT development with the same (or similar) economic resources. At the other end of the scale, of all regions which are home to countries with high GNI per capita, the Arab States region has the weakest correlation between income and IDI. This means that, for instance, a country with a GNI per capita of PPP\$ 40 000 in the Arab States will tend to have a lower IDI than a country with the same income in the Americas, Asia and the Pacific or Europe. It may be concluded that, given their economic resources, some of the Arab States possess a high potential for further ICT development, at least to reach the ICT performance of countries with similar incomes in other regions.

### Chapter 3. The ICT Price Basket (IPB)

ICT services have to be affordable if people are going to use them. The ICT Price Basket (IPB), which is a composite measure based on the price for fixed-telephony, mobile-cellular telephony and fixed-broadband Internet services, helps monitor the cost of ICT services and provides a useful indication of how affordable services are across 165 economies, for the period between 2008 and 2010. It provides information

on global and regional trends in ICT tariffs, and points to the difference in prices between developed and developing regions.

In 2010, the IPB corresponded to an average of 12 per cent of GNI per capita, as compared with 15 per cent in 2008 – a relative drop of 18 per cent. The biggest decrease was in fixed-broadband Internet services, where prices have come down by no less than 52.2 per cent. This compares with decreases of 21.8 per cent in mobile-cellular services and 6.8 per cent in fixed telephony, over the same two-year period.

There are large price divides among the 165 economies included in the ICT Price Basket (Table 3). All of the economies ranked at the top of the IPB have high GNI per capita, including many small economies such as Macao (China), Monaco, Liechtenstein, Hong Kong (China) and Singapore. With the exception of the United Arab Emirates, all economies in the top ten are from Europe and Asia and the Pacific. In 98 per cent of developed countries, the ICT Price Basket value corresponds to no more than five per cent of monthly per capita income. At the other end of the scale, high IPB values are found only in developing countries.

A comparison of the IPB and IDI results shows that countries with relatively high ICT prices have relatively low levels of ICT access and use. Conversely, more people access and use ICTs in countries where ICT services are relatively affordable, and almost all of the economies listed in the top 25 of the IDI also rank within the top 25 of the IPB.

Between 2008 and 2010, the steepest falls in the IPB in relative terms were observed in countries from different

regions, and with varying income levels. Relative prices decreased by over 50 per cent in Azerbaijan, Bhutan, Sri Lanka, Bangladesh, Venezuela, Guyana, Uganda and Austria. The top ten countries with the greatest IPB value drop are countries with high IPB values and, apart from Bangladesh, all are from Africa.

Results of the three sub-baskets highlight the differences in prices between countries and regions for the three services (Charts 7-10). The *fixed-telephone sub-basket* corresponded on average to 5.8 per cent of monthly GNI per capita in 2010. It has decreased, or remained the same, in about two-thirds of all countries included in the IPB, while prices have increased in others. CIS and Europe are the only regions where there is a double-digit decrease in the fixed-telephone sub-basket (14 and 12 per cent, respectively). In Africa, fixed-telephone prices dropped by ten per cent, which could reflect a reaction to stiff competition from the mobile market. In developed countries, the fixed-telephone sub-basket decreased by 9.8 per cent, as against 6.7 per cent in developing countries.

The *mobile-cellular sub-basket* corresponded to an average of 8.6 per cent of the monthly GNI per capita in 2010. The top ten economies with the lowest mobile-cellular sub-baskets are high-income economies, including Hong Kong (China), United Arab Emirates, Macao (China), Denmark, Singapore, Norway and Finland. Costa Rica stands out in that it has a relatively low GNI per capita but ranks 18th on the mobile-cellular sub-basket.

While Europeans pay on average 1.6 per cent of their monthly income for the mobile sub-basket, Africans pay on average as much as 24.6 per cent. Mobile prices are more affordable in the CIS and Asia and the Pacific, where they correspond to 4.1 and 4.6 per cent of incomes, respectively, compared with 5.1 per cent in the Americas and 7.4 per cent in the Arab States. Whereas people living in developed countries pay on average two per cent of their monthly income for mobile-cellular services, those in developing countries average as much as 11.4 per cent.

Africa and CIS were the regions recording the greatest decrease in mobile-cellular prices. Here, prices dropped by 25 per cent between 2008 and 2010, compared with 18 and 15 per cent in Asia and the Pacific and the Arab States, respectively. Prices decreased by around 11 per cent in the Americas and 15 per cent in Europe. By end 2010, the mobile-cellular sub-basket corresponded to less than 10 per cent of monthly average incomes in all regions except Africa.

At 79 per cent of monthly GNI per capita, the *fixed-broadband Internet sub-basket* remains the most expensive service of the ICT Price Basket in 2010. The top ten economies with the relatively cheapest broadband prices are all high-income economies, and include many of those ranked at the top of the overall IPB: Monaco, Macao (China), Israel, Liechtenstein, United States and Austria. In a total of 31 countries (or 18 per cent), people pay an equivalent of one per cent - or less - of their average monthly GNI per capita for an entry-level broadband connection.

The fixed-broadband sub-basket registered the largest decrease of all sub-baskets (at 52 per cent). Although this shows that high-speed Internet access is becoming more affordable, it is still beyond the means of most people in the world. Inequalities in broadband prices are reflected in the different prices that people in developed and developing countries pay. While broadband Internet access represents 1.5 per cent of incomes in developed countries, the figure is 112 per cent in the developing countries.

In 19 countries, high-speed fixed Internet access remains unaffordable for many citizens, with broadband prices corresponding to more than 100 per cent of the monthly average GNI per capita. Most of these countries are low-income economies, many of them African LDCs. Although Africa's fixed-broadband basket has dropped by over 50 per cent, the service remains prohibitively expensive, and in 2010 still represented almost three times the monthly average per capita income. The same is true in the Arab States and in Asia and the Pacific, where the fixed-broadband sub-basket stood at 52.6 and 27.3, respectively.

Despite the high prices of fixed broadband in some countries, prices continue to decrease across the world's regions, the greatest drop being seen in Africa, where the fixed-broadband sub-basket fell by 55 per cent. The CIS witnessed a similar decrease (of 51.8 per cent) in broadband prices over the same period, followed by Asia and the Pacific (46.7 per cent), the Arab States (34.7 per cent) and Europe (18 per cent). The Americas displays the most modest decrease in fixed-broadband prices, being the only region where the decrease was below ten per cent. Developing countries benefited from a higher price drop (52.3 per cent) than developed countries (35.4 per cent), suggesting that the broadband price divide is narrowing.

Given the importance of *mobile-broadband access*, particularly in countries where fixed-broadband access

Table 3: ICT Price Basket and sub-baskets, 2010 and 2008

Rank	Economy	ICT Price Basket		Fixed-telephone sub-basket as a % of GNI per capita		Mobile-cellular sub-basket as a % of GNI per capita		Fixed-broadband sub-basket as a % of GNI per capita		GNI per capita, USD, 2009 (or latest available year)
		2010	2008	2010	2008	2010	2008	2010	2008	
1	Monaco	0.2	N/A	0.1	N/A	0.3	N/A	0.3	N/A	203'900
2	Macao, China	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	35'360
3	Liechtenstein	0.4	N/A	0.3	N/A	0.2	N/A	0.5	N/A	113'210
4	Hong Kong, China	0.4	0.3	0.3	0.3	0.1	0.1	0.7	0.6	31'420
5	United Arab Emirates	0.4	0.4	0.1	0.1	0.2	0.2	0.8	0.8	57'340
6	Singapore	0.5	0.4	0.3	0.2	0.3	0.2	0.9	0.7	37'220
7	Luxembourg	0.5	0.5	0.4	0.4	0.4	0.4	0.6	0.6	76'710
8	Norway	0.5	0.5	0.5	0.5	0.3	0.3	0.7	0.7	84'640
9	Iceland	0.5	0.7	0.5	0.5	0.5	0.5	0.7	1.1	43'430
10	Denmark	0.6	0.5	0.6	0.6	0.2	0.2	0.9	0.6	59'060
11	Austria	0.6	1.1	0.7	0.7	0.4	1.2	0.7	1.5	46'450
12	United States	0.6	0.5	0.3	0.4	0.8	0.8	0.5	0.4	46'360
13	San Marino	0.6	N/A	0.6	N/A	0.6	N/A	0.5	N/A	50'670
14	Finland	0.6	0.7	0.4	0.5	0.3	0.7	0.9	0.9	45'940
15	Sweden	0.6	0.6	0.6	0.5	0.4	0.8	0.8	0.7	48'840
16	Switzerland	0.7	0.8	0.5	0.6	1.0	1.2	0.6	0.7	65'430
17	Netherlands	0.7	0.9	0.6	0.7	0.8	1.0	0.8	0.9	48'460
18	Bahrain	0.7	0.7	0.2	0.2	0.7	0.7	1.3	1.3	25'420
19	United Kingdom	0.7	0.8	0.6	0.7	0.9	1.0	0.7	0.7	41'370
20	Germany	0.7	0.8	0.8	0.8	0.4	0.4	1.1	1.0	42'450
21	Canada	0.8	0.8	0.6	0.9	1.0	0.9	0.7	0.6	41'980
22	Cyprus	0.8	0.7	1.1	1.1	0.3	0.4	0.9	0.7	26'940
23	Australia	0.8	1.1	0.8	0.7	0.8	1.2	1.0	1.4	43'770
24	Belgium	0.9	0.9	0.8	0.9	1.1	1.1	0.7	0.8	45'270
25	Ireland	0.9	0.9	0.7	1.0	1.0	0.9	0.9	0.9	44'280
26	Korea (Rep.)	0.9	0.8	0.3	0.3	0.9	1.1	1.5	1.0	19'830
27	Israel	0.9	N/A	0.7	N/A	1.6	N/A	0.4	N/A	25'790
28	Italy	0.9	1.0	0.9	0.9	1.0	1.2	0.9	0.8	35'110
29	France	1.0	1.2	0.7	0.8	1.4	1.6	0.8	1.0	42'620
30	Trinidad & Tobago	1.1	1.2	1.4	1.5	0.9	1.1	0.9	1.0	16'700
31	Latvia	1.1	1.7	1.0	1.1	1.0	1.4	1.2	2.5	12'390
32	Russia	1.1	1.3	0.8	0.8	1.2	1.6	1.3	1.7	9'340
33	Costa Rica	1.1	1.2	1.3	0.9	0.6	1.1	1.3	1.7	6'260
34	Japan	1.1	1.1	0.8	0.6	1.8	1.5	0.7	1.0	38'080
35	Greece	1.1	1.3	1.0	1.1	1.6	1.8	0.8	1.0	29'040
36	Saudi Arabia	1.1	1.5	0.6	0.6	1.0	1.1	1.8	2.7	17'700
37	Lithuania	1.2	1.5	1.4	1.5	1.0	1.4	1.1	1.5	11'410
38	Brunei Darussalam	1.2	N/A	0.5	N/A	0.7	N/A	2.3	N/A	26'740
39	Oman	1.2	1.1	0.9	0.7	0.6	0.7	2.1	2.1	17'890
40	Slovenia	1.2	1.4	0.9	1.0	1.1	1.1	1.7	2.1	23'520
41	Malta	1.3	1.6	0.9	1.0	1.6	2.2	1.3	1.5	16'680
42	Bahamas	1.3	N/A	0.9	N/A	1.0	N/A	2.0	N/A	21'390
43	Spain	1.3	1.5	1.0	1.1	2.0	2.2	1.0	1.0	32'120
44	Portugal	1.4	1.5	1.4	1.5	1.3	1.3	1.4	1.6	21'910
45	Croatia	1.5	2.0	1.5	1.6	1.5	2.5	1.6	1.8	13'720
46	Estonia	1.6	2.1	1.0	1.1	1.9	2.2	1.8	3.1	14'060
47	Mauritius	1.6	2.3	0.9	1.0	1.1	1.3	2.7	4.6	7'250
48	Venezuela	1.6	4.3	0.2	0.9	2.7	5.6	1.9	6.2	10'090
49	New Zealand	1.6	1.4	1.5	1.4	2.1	1.7	1.3	1.2	27'260
50	Kazakhstan	1.7	N/A	0.4	N/A	2.5	N/A	2.3	N/A	6'920
51	Poland	1.8	2.4	2.0	2.6	1.5	2.0	1.8	2.5	12'260
52	Malaysia	1.8	1.9	0.8	0.8	1.2	1.6	3.3	3.3	7'350
53	Azerbaijan	1.8	9.9	0.6	0.8	1.7	2.2	3.1	26.7	4'840
54	Maldives	1.9	2.2	1.2	1.3	1.7	2.1	2.8	3.0	3'970
55	Romania	1.9	2.2	1.9	2.0	3.1	3.5	0.7	1.0	8'330
56	Belarus	2.0	N/A	0.3	N/A	1.7	N/A	3.9	N/A	5'560
57	Czech Republic	2.0	2.2	1.9	2.1	1.9	2.5	2.2	2.0	17'310
58	Hungary	2.1	2.6	2.0	2.6	2.4	3.0	1.9	2.2	12'980
59	Slovak Republic	2.1	2.2	1.5	1.7	2.8	2.9	1.9	2.0	16'130
60	Serbia	2.1	3.3	1.1	1.0	2.3	2.5	3.1	6.4	6'000
61	Uruguay	2.2	2.8	1.8	1.9	2.4	3.1	2.6	3.5	9'010
62	Panama	2.3	2.1	2.2	1.7	1.6	1.7	3.0	2.9	6'570
63	Sri Lanka	2.4	7.3	3.0	3.5	1.1	2.6	3.0	15.7	1'990
64	Mexico	2.4	3.0	2.5	2.5	2.3	2.3	2.3	4.2	8'960
65	Tunisia	2.5	3.1	0.8	1.0	3.2	4.3	3.4	4.1	3'720
66	St. Kitts and Nevis	2.5	N/A	1.4	N/A	1.8	N/A	4.3	N/A	10'150
67	Antigua & Barbuda	2.5	N/A	1.4	N/A	2.2	N/A	4.0	N/A	12'130
68	Montenegro	2.6	2.8	1.4	1.9	3.0	2.8	3.3	3.8	6'650
69	Ukraine	2.6	4.6	1.3	1.5	3.2	5.2	3.2	7.1	2'800
70	Qatar	2.7	2.7	0.9	0.9	1.8	1.7	5.5	5.5	12'000
71	Algeria	3.0	3.5	1.5	1.3	3.4	4.4	4.0	4.8	4'420
72	Lebanon	3.0	3.8	1.5	1.8	4.1	5.7	3.4	4.0	8'060
73	China	3.1	3.7	1.5	1.5	2.0	2.3	5.9	7.4	3'650
74	Argentina	3.2	3.5	0.6	0.8	4.9	3.4	4.1	6.3	7'550
75	Bosnia and Herzegovina	3.3	3.7	2.4	2.4	3.9	4.8	3.7	3.8	4'700
76	Barbados	3.4	3.8	2.6	2.4	2.6	2.6	5.0	6.4	9'330
77	Seychelles	3.5	2.8	1.3	1.1	2.3	1.9	6.8	5.5	8'480
78	Egypt	3.5	4.4	1.7	2.0	4.1	5.6	4.6	5.5	2'070
79	Bhutan	3.6	14.7	2.0	2.2	2.7	3.6	6.2	38.3	2'030
80	Turkey	3.7	N/A	2.3	N/A	6.0	N/A	2.6	N/A	8'720
81	Chile	3.7	4.1	3.2	3.1	3.0	3.2	5.0	6.0	9'470
82	Bulgaria	3.7	4.4	2.5	2.9	6.1	7.2	2.7	3.1	6'060
83	Thailand	3.9	3.7	2.8	1.9	2.8	3.4	6.0	5.8	3'760

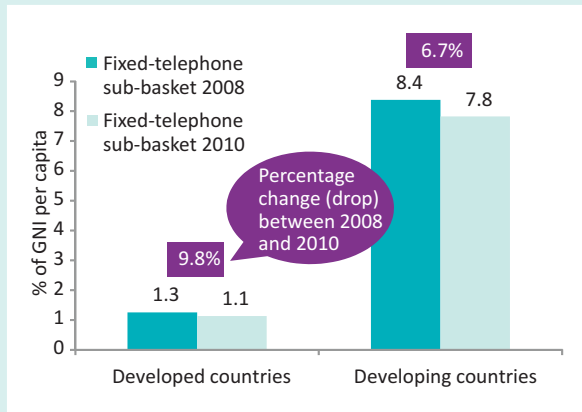
Table 3: ICT Price Basket and sub-baskets, 2010 and 2008 (continued)

Rank	Economy	ICT Price Basket		Fixed-telephone sub-basket as a % of GNI per capita		Mobile-cellular sub-basket as a % of GNI per capita		Fixed-broadband sub-basket as a % of GNI per capita		GNI per capita, USD, 2009 (or latest available year)
		2010	2008	2010	2008	2010	2008	2010	2008	
84	Jordan	3.9	4.4	2.9	3.1	3.2	3.4	5.7	6.7	3'980
85	Botswana	3.9	3.5	3.6	3.2	2.5	2.4	5.7	5.0	6'260
86	Grenada	4.0	3.8	2.6	2.4	3.1	3.2	6.3	6.0	5'580
87	India	4.1	4.6	3.3	3.7	3.4	3.9	5.6	6.4	1'180
88	Jamaica	4.2	6.0	3.0	2.6	3.1	3.6	6.5	11.9	4'590
89	Albania	4.3	7.7	1.9	1.3	7.7	12.6	3.2	9.2	4'000
90	TFYR Macedonia	4.4	5.1	3.3	3.9	6.4	7.4	3.5	4.1	4'400
91	Dominican Rep.	4.4	5.1	4.1	3.1	4.1	4.7	5.0	7.6	4'550
92	St. Vincent and the Grenadines	4.6	6.7	2.6	2.5	3.5	4.5	7.9	12.9	5'130
93	Colombia	4.7	4.9	1.4	1.3	4.1	4.4	8.5	8.8	4'990
94	Fiji	4.7	6.0	2.4	2.8	5.9	7.8	5.7	7.3	3'840
95	Suriname	4.8	N/A	0.6	N/A	3.3	N/A	10.6	N/A	4'760
96	Brazil	4.8	6.8	3.4	4.2	8.5	9.2	2.5	6.9	8'040
97	Ecuador	4.8	N/A	4.3	N/A	4.2	N/A	6.1	N/A	3'970
98	St. Lucia	4.9	6.5	2.7	2.6	5.1	4.7	6.8	12.2	5'190
99	South Africa	5.3	4.5	5.2	4.2	4.8	4.5	5.7	4.9	5'760
100	El Salvador	5.3	5.5	3.6	3.9	3.4	5.6	8.9	7.1	3'370
101	Moldova	5.4	10.8	1.5	1.8	9.7	12.0	5.0	18.5	1'560
102	Armenia	5.9	7.0	1.6	1.8	3.4	5.2	12.5	14.0	3'100
103	Dominica	6.0	6.6	2.6	2.7	3.5	5.1	11.7	12.0	4'900
104	Paraguay	6.1	10.2	3.6	4.0	4.6	5.3	10.1	21.4	2'250
105	Indonesia	6.7	7.2	2.9	3.0	4.6	5.4	12.6	13.2	2'050
106	Guatemala	6.9	8.0	2.5	2.7	3.6	4.2	14.7	17.1	2'650
107	Syria	7.1	N/A	0.6	N/A	9.9	N/A	10.8	N/A	2'410
108	Viet Nam	7.9	12.2	3.2	3.2	7.0	9.9	13.5	23.5	930
109	Pakistan	8.0	10.0	4.0	4.5	3.0	3.8	17.1	21.7	1'000
110	Honduras	8.3	N/A	4.2	N/A	5.9	N/A	14.7	N/A	1'800
111	Georgia	8.4	10.4	1.1	1.3	5.5	6.8	18.7	23.0	2'530
112	Guyana	8.5	17.7	2.1	2.1	7.8	10.3	15.7	40.6	1'450
113	Tonga	8.8	14.7	2.3	2.2	4.0	3.8	19.9	38.1	3'260
114	Philippines	9.2	9.5	9.0	8.7	5.9	5.5	12.8	14.3	2'050
115	Micronesia	9.3	9.3	4.5	3.9	4.4	4.4	19.2	19.5	2'500
116	Peru	9.5	9.9	4.2	4.6	12.4	14.3	12.1	10.8	4'200
117	Morocco	9.6	12.5	9.2	11.1	14.3	17.2	5.1	9.2	2'770
118	Cape Verde	10.8	12.6	3.3	2.3	16.6	19.4	12.6	16.2	3'010
119	Namibia	11.9	7.5	4.3	3.7	4.8	4.9	26.7	13.7	4'270
120	Bangladesh	12.6	36.4	2.8	3.1	4.2	6.0	31.0	123.8	580
121	Samoa	12.7	N/A	5.1	N/A	7.5	N/A	25.7	N/A	2'840
122	Ghana	15.5	26.2	7.3	4.5	7.4	10.8	31.8	63.1	1'190
123	Belize	16.3	16.6	6.3	7.5	10.0	10.0	32.8	32.3	3'740
124	Bolivia	17.2	18.7	17.5	19.0	8.3	9.1	25.7	28.0	1'630
125	Angola	18.0	24.7	5.3	7.3	6.2	8.1	42.7	58.8	3'750
126	Nicaragua	20.9	24.2	5.4	5.8	15.8	27.4	41.4	39.4	1'000
127	Timor-Leste	21.5	N/A	8.4	N/A	7.9	N/A	48.3	N/A	2'460
128	Senegal	22.7	28.7	11.8	20.4	14.6	16.4	41.6	49.2	1'040
129	Mauritania	23.4	38.0	22.5	18.2	18.3	18.6	29.4	77.1	960
130	Djibouti	24.7	40.4	7.7	8.1	14.0	13.1	52.3	111.6	1'280
131	Nepal	26.4	28.9	8.5	9.7	7.3	12.6	63.4	64.5	440
132	Nigeria	27.2	44.1	14.1	10.3	13.9	22.0	53.5	692.1	1'190
133	Kyrgyzstan	27.3	N/A	1.7	N/A	4.9	N/A	75.3	N/A	870
134	Côte d'Ivoire	27.4	37.4	22.0	26.7	15.3	30.8	45.0	54.7	1'070
135	Uganda	30.2	61.8	22.8	34.9	31.8	50.4	35.9	374.9	460
136	Tanzania	31.4	57.0	21.1	28.1	23.2	43.1	50.0	174.4	500
137	Chad	32.5	43.2	37.0	41.2	34.1	59.1	26.3	29.3	540
138	Kenya	33.1	49.8	22.4	18.0	17.0	31.5	59.9	261.2	760
139	Uzbekistan	34.8	N/A	1.2	N/A	3.3	N/A	218.2	N/A	1'100
140	Tajikistan	34.9	N/A	1.5	N/A	3.2	N/A	621.4	N/A	700
141	Cuba	35.8	36.5	0.1	0.1	7.3	9.3	379.0	380.6	5'550
142	Vanuatu	35.9	41.5	18.8	11.8	10.7	12.7	78.3	209.3	2'620
143	Lesotho	36.0	30.7	15.9	13.6	29.6	25.2	62.4	53.2	980
144	Yemen	36.8	37.4	1.2	1.0	9.2	11.0	134.9	281.6	1'060
145	Lao P.D.R.	38.0	38.6	5.5	6.4	8.6	9.5	190.5	435.5	880
146	Swaziland	38.1	37.3	2.4	2.1	11.7	10.0	424.9	805.7	2'470
147	Benin	38.5	50.2	14.4	17.5	20.9	33.1	80.2	172.3	750
148	Cameroon	38.8	48.7	15.2	15.0	20.2	31.1	80.8	185.7	1'190
149	Ethiopia	39.5	44.2	3.5	6.3	14.9	26.5	1070.8	2721.4	330
150	Guinea	39.5	42.2	5.2	9.6	13.4	17.1	2594.6	2823.5	370
151	Kiribati	39.6	N/A	7.6	N/A	11.3	N/A	251.2	N/A	1'830
152	Cambodia	40.1	44.5	14.5	15.7	13.2	17.6	92.5	177.3	610
153	S. Tomé & Príncipe	40.7	43.3	8.7	12.2	13.4	17.8	300.4	316.2	1'140
154	Zambia	41.3	52.9	29.8	33.0	20.8	25.8	73.3	108.8	970
155	Papua New Guinea	42.8	43.1	4.6	4.3	23.7	25.1	142.5	150.9	1'180
156	Mali	43.0	50.1	15.0	18.7	25.5	31.7	88.4	109.8	680
157	Mozambique	46.6	71.8	33.7	55.0	46.2	60.4	59.8	311.9	440
158	Comoros	49.1	53.7	13.8	17.9	33.5	43.2	534.5	690.8	870
159	Rwanda	56.9	58.1	34.4	21.2	36.3	53.1	224.5	267.6	460
160	Burkina Faso	58.5	62.6	25.6	24.6	49.9	63.2	194.2	4466.2	510
161	Togo	61.5	72.2	30.1	35.0	54.3	81.5	451.5	539.9	440
162	Madagascar	65.4	71.6	52.1	49.9	44.1	65.0	259.0	327.8	420
163	Zimbabwe	66.2	N/A	30.2	N/A	68.3	N/A	1353.2	N/A	360
164	Malawi	69.7	66.8	18.2	15.4	91.0	85.0	2408.0	4880.7	280
165	Niger	71.6	77.1	41.3	47.4	73.4	83.9	210.5	241.6	340

Note: N/A: Not available.

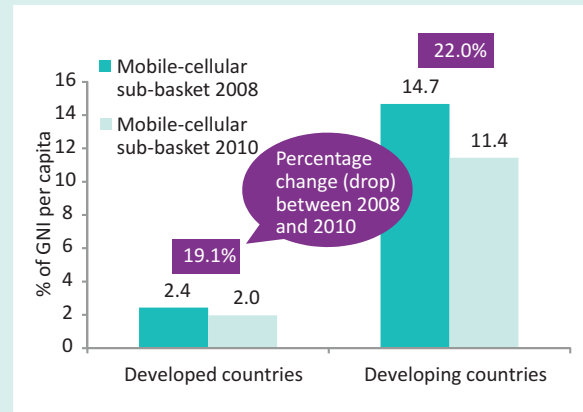
Source: ITU.

**Chart 7: Fixed-telephone sub-basket by level of development, 2008 and 2010**



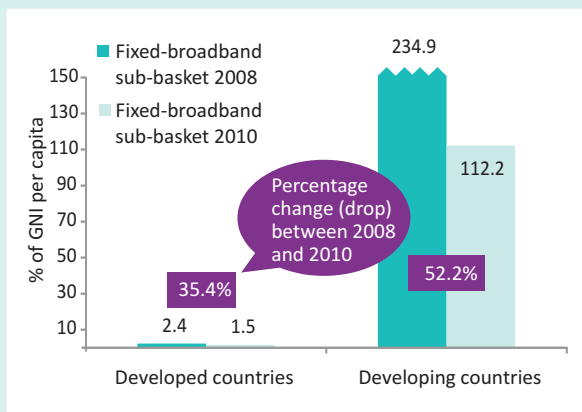
Source: ITU.

**Chart 8: Mobile-cellular sub-basket by level of development, 2008 and 2010**



Source: ITU.

**Chart 9: Fixed-broadband sub-basket by level of development, 2008 and 2010**



Source: ITU.

is limited, prices for mobile-broadband services were also examined for some 20 economies from different regions and with varying development levels. Results highlight that people in developing countries pay relatively more than their counterparts in developed countries. Furthermore, in almost half the countries included in the analysis, 1 GB of data is cheaper over the mobile network. Mobile-broadband users get more for their money for 1 GB of data volume since the entry-level mobile-broadband (theoretical) speeds are much higher than those for fixed broadband. Different price packages for mobile-broadband services reveal

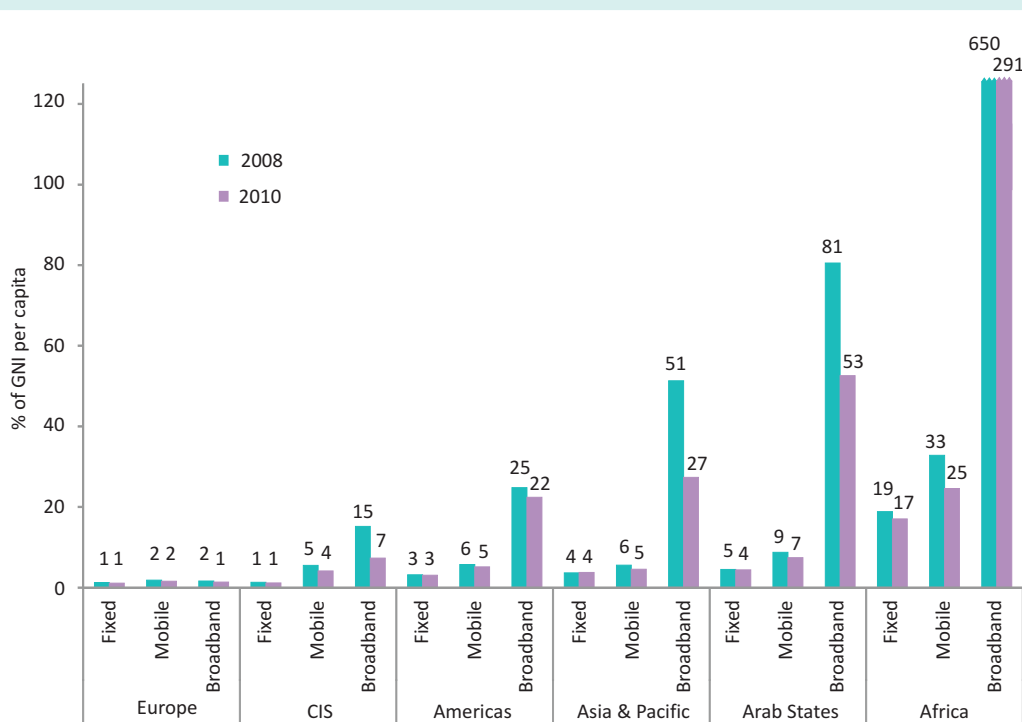
that postpaid tariffs tend to be cheaper, usually because operators offer lower tariffs whenever they can count on a predetermined level of consumption, and hence revenue, as for instance when customers of postpaid subscriptions are tied to a contract for a minimum of either 12 or 24 months (which is often the case).

#### Chapter 4: Understanding broadband: addressing issues of capacity, speed and quality of service

The ICT for development debate is witnessing an obvious shift: the focus is no longer on the mobile-cellular miracle, but on the need for broadband Internet access. Ambitious policy-makers are trying to set the right regulatory stage while simultaneously calling upon investors, operators and device manufacturers to learn from and leverage the mobile success story. At the same time, there is a growing debate about the meaning and the impact of broadband. Research has to go beyond analysing just the number of broadband subscriptions - which are defined as an Internet connection providing the user with a minimum downstream speed of 256 kbit/s - and examine other factors, such as speed and quality of service. The underlying backbone and access infrastructure deserves special attention, as it is a key factor for determining the quality of the broadband service that a user will experience.

As this report shows, these issues are particularly relevant since there are signs that the world is facing

Chart 10: ICT price sub-baskets by region, 2008 and 2010



Source: ITU.

a growing divide in terms of broadband speeds and quality.

During the past few years, Internet connections have evolved from dial-up narrowband to broadband. The number of dial-up subscriptions started to decrease rapidly in 2007 and, based on current trends, the “death of dial-up” is expected to play out over the next few years. Mobile-broadband technologies increasingly play an important role in the transition to broadband. Indeed, the number of active mobile-broadband subscriptions overtook the number of fixed-broadband subscriptions in 2008, and by end 2010 more than 150 economies had launched mobile-broadband services. It is to be expected that 3G services will soon be available in all countries.

There are substantial differences in fixed- and mobile-broadband technologies, with important variations in the speeds that these technologies can provide. ITU data on fixed-broadband subscriptions broken down by (advertised) speed show that in countries like Portugal, the United Kingdom and Bulgaria there are very few subscriptions with speeds below 2 Mbit/s – and none in the Republic of Korea - while in Azerbaijan, Oman, Ghana, Mongolia and Venezuela these speeds represent

more than 90 per cent of total fixed-broadband connections (Chart 11).

The minimum speed for broadband (256 kbit/s) may be sufficient for using e-mail and other very basic services, but it is inadequate for delivering data-intensive applications and services. In addition, the actual speed experienced by fixed- and mobile-broadband customers is often much lower than the theoretical and advertised speed. To truly grasp the potential impact that broadband Internet access can have, and to be able to compare countries, it is therefore important to track and measure actual speeds. Finally, some applications may have requirements that involve other quality-of-service (QoS) parameters. The quality of a voice-over-IP connection, for example, will depend not only on the capacity of a broadband connection but more on the quality of the connection as measured by latency, packet loss and jitter.

There are qualitative differences between fixed- and mobile-broadband services, which have implications for the comparison of the number and type of broadband subscriptions. The current capacity and speed of a mobile-broadband subscription does not

Chart 11: Fixed (wired)-broadband subscriptions by speed, selected economies, 2010



Note: Data from Iceland refer to ADSL connections only, which account for 87 per cent of the market. Norway's speed intervals refer to: 128 kbit/s to ≤ 2 Mbit/s; 2 Mbit/s to ≤ 8 Mbit/s; and > 8 Mbit/s. Data from the Netherlands represent 95 per cent of the total broadband subscriptions in the country, and do not include fibre subscriptions, nor data from the smallest operators.  
 Source: ITU World Telecommunication/ICT Indicators database.

usually match that of a high-speed fixed subscription, and mobile-broadband subscriptions almost always include data caps, unlike often ‘unlimited’ fixed-broadband offers. Comparisons between the total number of fixed and mobile subscriptions should therefore be made with caution. These issues are particularly challenging when mobile-broadband technologies are the *only* broadband access technology available to end users, which is the case in many developing countries, especially in rural and remote

areas. Unlike in most developed countries, in developing countries mobile-broadband technologies are not complementing, but rather substituting, fixed-broadband connections. Therefore, mobile-broadband may help reduce, but not overcome the broadband divide. Fixed-broadband technologies, in particular fibre-optic networks, need to be deployed in order to cater for data-intensive users (businesses, organizations), and in geographic areas where Internet users are concentrated.

The dominant fixed-broadband technology worldwide continues to be xDSL (accounting for about 65 per cent of the world's total), but cable modem and fibre-optic are also important technologies. To meet current and future user needs for high-speed, high-capacity broadband connections, developments in fixed-broadband networks include extending the fibre network from the core, and bringing it closer or direct to the end user. Other developments include the upgrading of cable networks, which enables connections at very high speeds, on a par with those currently being provided by commercial fibre connections. This is important in those countries where cable represents a big share of total fixed-broadband subscriptions, such as the United States, Canada, Chile, Panama and Colombia.

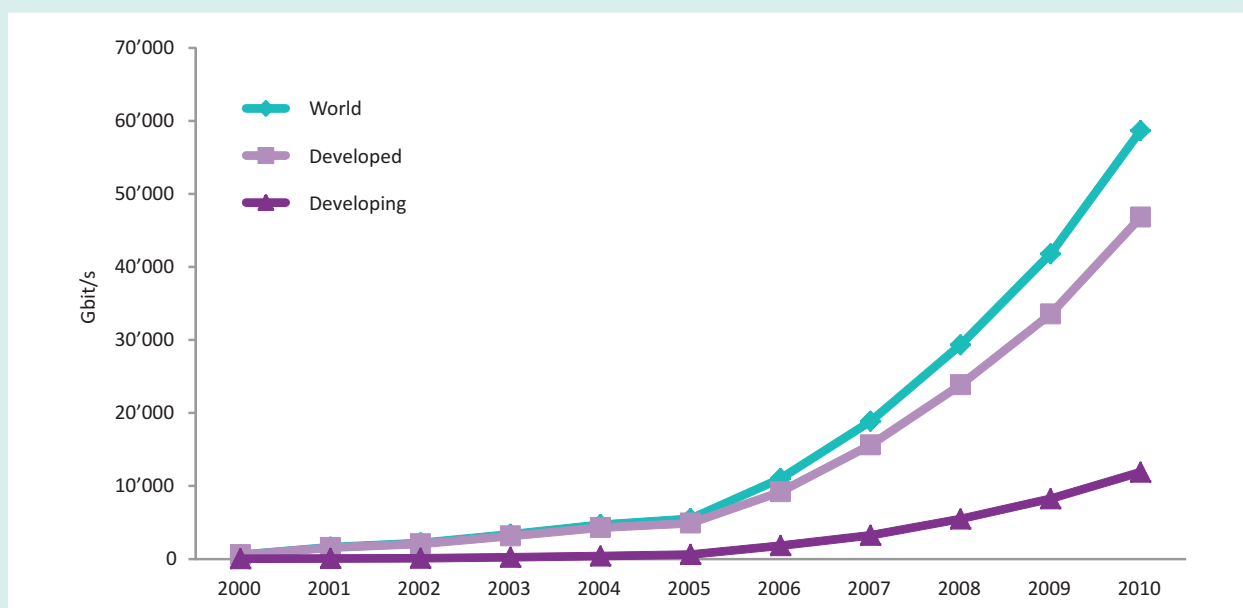
For developing countries, the most significant development in terms of access to broadband networks has been the progress made in *wireless*, and in particular *mobile-broadband* technologies and services. Third-generation mobile-broadband services have increased the choice for delivering high-speed Internet access to the end user and in many cases created additional facilities-based (inter-modal) competition.

Mobile-broadband technologies face a number of speed, capacity and quality challenges that are less of an issue for fixed technologies. While it is possible to

duplicate and add a (theoretically) unlimited amount of wires, the quality and speed of mobile-broadband connectivity relies on a limited and shared resource – the radio-frequency spectrum. Although the wireless industry and regulators continue to make devices and network infrastructure more efficient, a limited amount of spectrum means a limited amount of bandwidth, and hence speed. The rapidly growing mobile-broadband market is facing a spectrum crisis, in which there is a risk of demand exceeding wireless network capacity.

The upgrade of access networks will only be effective in improving the user's broadband experience if international Internet bandwidth is improved accordingly. International connectivity has traditionally been a key network bottleneck in the developing world. Much progress has been achieved, and international Internet bandwidth has increased tenfold over the last ten years and particularly between 2008 and 2010, when it almost doubled from 29 000 Gbit/s to 59 000 Gbit/s. In developing countries, between 2005 and 2010 international Internet bandwidth increased from 0.6 Tbit/s to 11.9 Tbit/s (Chart 12). Africa has also greatly improved international connectivity as a result of a number of new and competing submarine cables that went live in 2010. However, total capacity in the region still stood at 0.08 Tbit/s, which points to the need to further extend international connections.

Chart 12: Total international Internet bandwidth (in Gbit/s), by level of development, 2000-2010



Source: ITU World Telecommunication/ICT Indicators Database.

The shift from voice to data traffic has had important implications not only for international Internet connectivity, but also in regard to the type of national backbone infrastructure needed. Data traffic requires high-capacity core networks, typically based on fibre-optic cables. Fixed-broadband operators as well as mobile-broadband operators, which have effectively become Internet service providers by offering mobile-broadband services, are playing an increasingly important role in expanding core networks. Realizing the importance of a functioning and high-capacity national backbone, many countries have included the upgrading of national backbone networks as part of their broadband development strategies; this is the case, for instance, in Argentina, Australia, Costa Rica, India, Paraguay, Poland and Thailand.

These and other policy initiatives addressing the issues of network capacity and speed will be necessary in order to maximize the impact of broadband. Furthermore, policy-makers need to monitor and survey the quality of fixed- and mobile-broadband services, including the difference between advertised and real speeds. Regulators should encourage operators to provide consumers with clear information on coverage, speeds, prices (including data roaming charges) and quality of service, and set QoS standards.

### **Chapter 5: Increasing Internet use: the role of education, income, gender, age and location**

ICT developments are often analysed from the standpoint of progress made in the deployment of ICT infrastructures and technologies, such as broadband Internet. Much less is known about the usage and the users of those technologies. Answers to questions such as who is on the Internet (and who is not), and what they do online, are crucial for policy-makers, businesses, organizations and those who want to reach out to communicate and interact with potential customers, citizens and other constituencies. Information about Internet usage can be obtained from demand-side ICT data, which are typically collected through national representative household surveys.

Such data show that the Internet user divide separating those who are online from those who are not cuts across education, gender, income, age and geographical location of users (urban/rural areas). The main barriers to Internet use are thus not necessarily related

to infrastructure and access. Today, most cities in developing countries provide public Internet access for those who can afford it. The report finds that there is remarkably little difference in terms of Internet usage among highly educated, high-income individuals, across the developing and developed world. This suggests that there is ample scope for increasing Internet usage by addressing barriers such as affordability and skills.

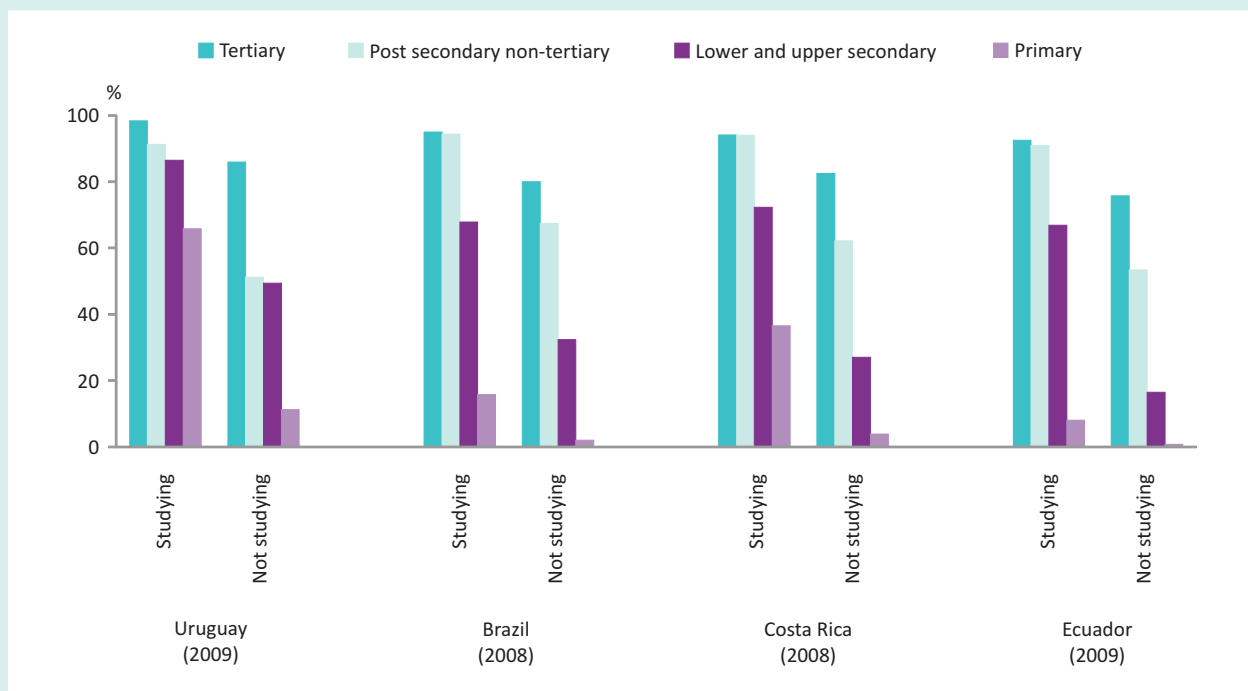
In all countries for which data are available, individuals who attained a higher (secondary or tertiary) educational degree use the Internet more than those with or at a lower level of education. Moreover, data from Latin America show that students use the Internet more than those who are no longer studying/enrolled (Chart 13). Assuming that people will continue using the Internet once they have been online, this finding suggests that those currently enrolled at school or university are most likely to be future Internet users, too.

There are also gender-related differences in Internet use, with on average more men using the Internet than women. These differences do not seem to be tied to development levels, as even in the European Union a higher percentage of men than women are online, although the differences are larger in a number of developing countries. The gender divide may be linked to the fact that women tend to have lower incomes and lower educational attainment, which could point to the need for measures aimed at ensuring equal opportunities in those areas.

Another relevant factor that determines Internet use is geographical location. Data reveal a significant divide between urban and rural populations in the use of the Internet, especially in developing countries. Although the rural/urban divide is closely linked to differences in education and income levels, there is room for improvement in terms of telecommunication infrastructure and services in rural areas, in particular high-speed mobile broadband.

Internet access in rural areas, and for people from low-income households, can also be improved through public Internet access facilities. Unlike people with higher incomes, who use the Internet at home or work, people with low incomes often have recourse to public Internet access points. Commercial Internet access facilities (e.g. Internet cafés) are the most common location for Internet use in Africa, and are widely used in Latin America. Community access centres or publicly subsidized Internet access points, where Internet access is typically free of charge, on the other

**Chart 13: Percentage of individuals using the Internet, by highest education attained or currently studying, selected Latin American countries, latest available year**



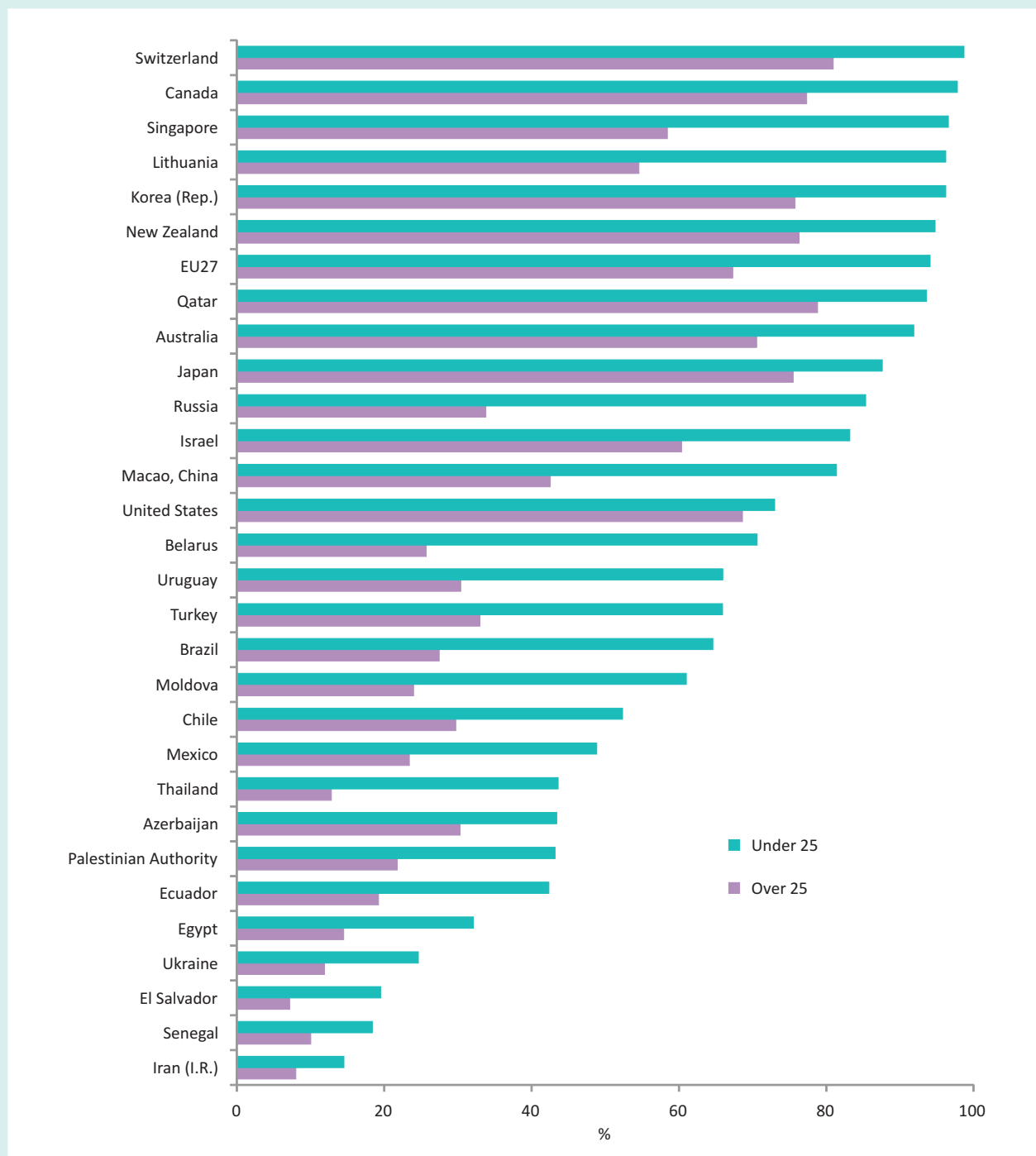
Source: ITU calculation based on OSILAC, ECLAC: <http://www.eclac.cl/tic/flash/default.asp?idioma=IN>.

hand, are hardly used. The success of commercially-run cybercafés highlights the need to support innovative commercial business models for public access, especially in developing countries. Public access will play an important role in reducing the Internet divide in the short to medium term, in the absence of affordable home access. As income increases and prices fall, usage of ICTs at home or through personal devices will increase and usage in public facilities will decrease.

Lastly, an analysis of the main activities pursued online shows that most people use the Internet

for communication and entertainment purposes. Social networking and user-created content have become key drivers of Internet uptake, particularly for young people who tend to be more online in almost all countries, both developed and developing (Chart 14). Given that 46 per cent of the population in developing countries is below the age of 25 (i.e. more than 2.5 billion people), these countries could significantly improve Internet use by targeting the younger generation, for example through connecting schools and other education institutions, and improving enrolment rates.

**Chart 14: Proportion of individuals\* using the Internet, by age group, latest available year (2009/2010)**



Note: \* Minimum and maximum age scope varies across countries, see Annex Table 3.1 to the full report.  
 Source: ITU World Telecommunication/ICT Indicators database



**The full version of the report, as well as the executive summary in all six official languages of the ITU, are available at:**

**<http://www.itu.int/ITU-D/ict/publications/idi/2011/index.html>**