

CHAPTER 2. THE ICT DEVELOPMENT INDEX (IDI)

2.1 Introduction to the IDI¹

The ICT Development Index (IDI) is a composite index combining 11 indicators into one benchmark measure that serves to monitor and compare developments in information and communication technology (ICT) across countries. The IDI was developed by ITU in 2008 and first presented in the 2009 edition of *Measuring the Information Society* (ITU, 2009a). It was established in response to ITU Member States' request to develop an ICT index and publish it regularly. This section briefly describes the main objectives, conceptual framework and methodology of the IDI.

The main objectives of the IDI are to measure:

- the *level and evolution over time* of ICT developments in countries and relative to other countries;
- progress in ICT development in both *developed and developing countries*: the index should be global and reflect changes taking place in countries at different levels of ICT development;
- the *digital divide*, i.e. differences between countries with different levels of ICT development;
- the *development potential* of ICTs or the extent to which countries can make use of ICTs to enhance growth and development, based on available capabilities and skills.

Conceptual framework

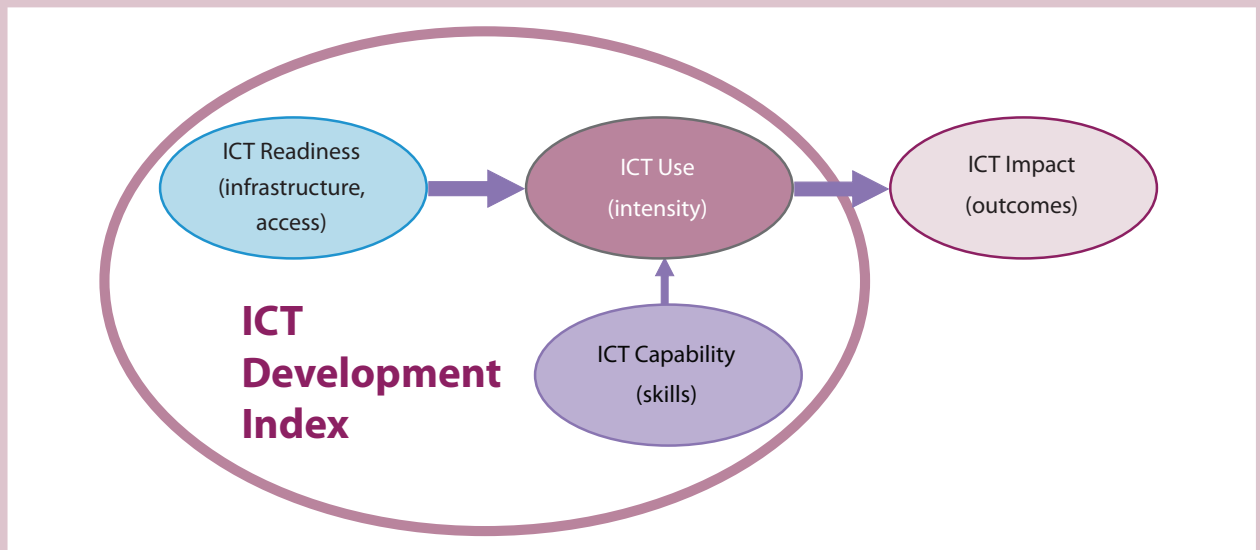
The recognition that ICTs can be a development enabler, if applied and used appropriately, is critical to countries that are moving towards information or knowledge-based societies, and is central to the IDI's conceptual framework. The ICT development process, and a country's transformation to becoming an information society, can be depicted using the following three-stage model (Figure 2.1):

- Stage 1: *ICT readiness* (reflecting the level of networked infrastructure and access to ICTs)
- Stage 2: *ICT intensity* (reflecting the level of use of ICTs in the society)
- Stage 3: *ICT impact* (reflecting the result/outcome of efficient and effective ICT use).

Advancing through these stages depends on a combination of three factors: the availability of ICT infrastructure and access, a high level of ICT usage and the capability to use ICTs effectively. Accordingly, the first two stages listed above correspond to two major components of the IDI: ICT access and ICT use.

Reaching the final stage, and maximizing the impact of ICTs, crucially depends on the third component of the IDI: *ICT skills*. ICT (and other) skills determine the effective use that is made of ICTs, and are critical to leveraging the full potential of ICTs for socio-economic development. Economic growth and development will remain below potential if economies

Figure 2.1: Three stages in the evolution towards an information society



Source: ITU.

are not capable of exploiting new technologies and reaping their benefits. Therefore, the IDI includes a measurement of the capability to use ICTs effectively.

A single indicator cannot track progress in all three components (access, usage and skills) of the ICT development process, and it is thus necessary to construct a composite index such as the IDI. The IDI aims to capture the evolution of the information society as it goes through its different stages of development, taking into consideration technology convergence and the emergence of new technologies.

Based on this conceptual framework, the IDI is divided into the following three sub-indices:

- *Access sub-index:* This sub-index captures ICT readiness, and includes five infrastructure and access indicators (fixed-telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, percentage of households with a computer, and percentage of households with Internet access).
- *Use sub-index:* This sub-index captures ICT intensity, and includes three ICT intensity and usage indicators (individuals using the Internet, fixed (wired)-broadband subscriptions, and wireless-broadband subscriptions).

- *Skills sub-index:* This sub-index captures ICT capability or skills as indispensable input indicators. In the absence of data on ICT skills, it includes three proxy indicators (adult literacy, gross secondary enrolment and gross tertiary enrolment), and is therefore given less weight in the computation of the IDI compared with the other two sub-indices.²

The choice of indicators included in the sub-indices reflects the corresponding stage of transformation to the information society. Therefore, the indicators in each sub-index may change over time to reflect technological developments related to ICTs, and as more and better data become available. For example, what was considered basic infrastructure in the past – such as fixed-telephone lines – is fast becoming less relevant in the light of increasing fixed-mobile substitution. Similarly, broadband is currently considered an advanced technology, characterizing intense Internet use, and is therefore included in stage 2 (as an indicator in the use sub-index). However, in the future it may come to be seen as essential and be moved to stage 1 (as an indicator in the access sub-index), while another, new technology may appear in stage 2.

Methodology

The IDI includes 11 indicators. A detailed definition of each indicator is provided in Annex 1.

Box 2.1: ITU expert groups

Much of ITU's work in the area of indicator definitions and methodologies is carried out through its two expert groups: the Expert Group on Telecommunication/ICT Indicators (EGTI) and the Expert Group on ICT Household Indicators (EGH). Created in 2009 and 2012, respectively, these two expert groups revise and review ITU's supply-side and demand-side statistics, and discuss methodological issues and new indicators. Both groups, which are open to all ITU members and to experts in the field of ICT statistics and data collection, work through online discussion forums and occasional face-to-face meetings. They periodically report back to the World

Telecommunication/ICT Indicators Symposium (WTIS), ITU's main forum on ICT statistics.

In 2011, EGTI opened a discussion item on the IDI on its online forum, and its experts are encouraged to provide suggestions on how to improve the IDI methodology.³ EGH includes discussion on the three demand-side indicators included in the IDI (households with a computer, households with Internet access, and individuals using the Internet).

Interested experts are invited to join the EGTI⁴ and/or the EGH⁵ discussion forum to share experiences, contribute to the discussions and participate in the decision-making process.

The indicators used to calculate the IDI were selected on the basis of the following criteria:

- *The relevance of a particular indicator for contributing to the main objectives and conceptual framework of the IDI.* For example, the selected indicators need to be relevant to both developed and developing countries, and should reflect – as much as possible – the framework's three components described above.⁶
- *Data availability and quality.* Data are required for a large number of countries, as the IDI is a global index. There is relative paucity of ICT-related data, especially at the household level, in the majority of developing countries. In particular, the three indicators included in the skills sub-index should be considered as proxies until data directly relating to ICT skills become available for more countries.
- *The results of various statistical analyses.* The statistical associations between various indicators were examined, and principal components analysis (PCA) was used to examine the underlying nature of the data and to explore whether the different dimensions are statistically well-balanced.

While the basic methodology has remained the same since the IDI was first published, minor adjustments are being made each year.

Given the dynamic nature of the ICT sector and related data availability, the types of indicators to be included in

the IDI and its sub-indices are under regular discussion in ITU, in consultation with experts. Indicator definitions and the IDI methodology are discussed in the ITU Expert Group on Telecommunication/ICT Indicators (EGTI) and the ITU Expert Group on ICT Household Indicators (EGH) (Box 2.1).

The indicator that has undergone the greatest change in recent years is the one serving to measure the uptake of wireless broadband. In 2010, ITU revised the definition of mobile-broadband subscriptions so as to reflect more accurately actual data connections to mobile-broadband networks rather than potential connections. In addition, the breakdown of broadband subscriptions was revised and changed from the previous "fixed vs mobile" to the current "wired vs wireless" classification. As a result, the new wireless-broadband indicators include satellite subscriptions, terrestrial fixed (wireless)-broadband subscriptions and active mobile-broadband subscriptions.⁷ In the 2011 edition of the IDI, the indicator "active mobile-broadband subscriptions" replaced the previous indicator "mobile-cellular subscriptions with access to data communications at broadband speeds", which measured the potential of mobile-cellular subscriptions to access, for example, 3G networks. In this year's IDI, as countries improve their data collection in the area of wireless broadband, all (combined) wireless-broadband technologies are taken into consideration (Box 2.2).

To improve the IDI, another major consideration for ITU has been to replace some of the subscription-based (supply-

Box 2.2: From active-mobile broadband to wireless broadband

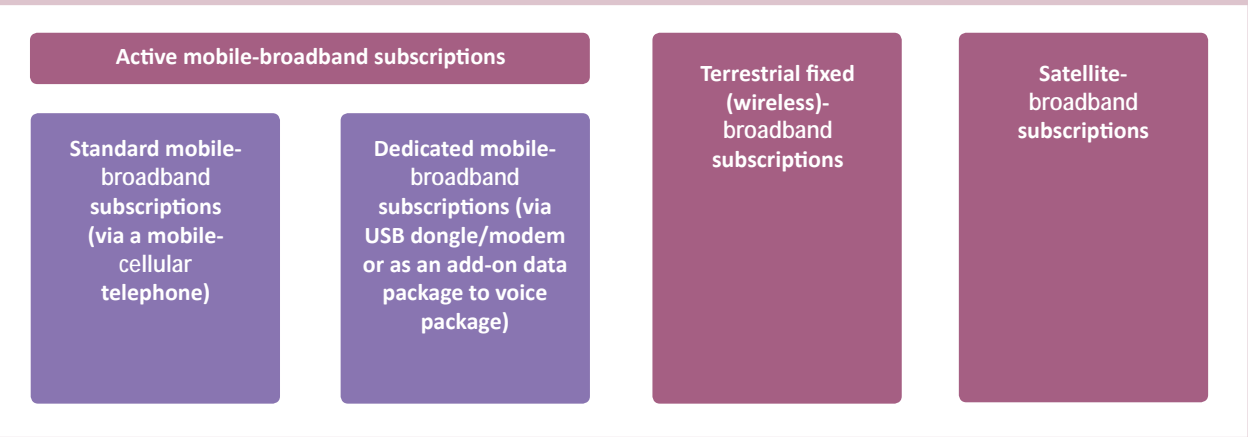
By 2013, the large majority of countries had launched 3G high-speed mobile-broadband networks, and more and more countries are starting to test and even commercialize LTE-advanced networks. By 2011, ITU had identified a definition to clearly separate fixed (wired)-broadband subscriptions from wireless-broadband subscriptions and to move from potential subscriptions to active subscriptions. This definition of wireless broadband, in line with that used by OECD, includes satellite subscriptions, terrestrial fixed (wireless)-broadband subscriptions and active mobile-broadband subscriptions. The latter includes both subscriptions that have been used to connect to the Internet using a mobile-cellular telephone and dedicated subscriptions using a USB modem/dongle (Figure Box 2.2).

When ITU started collecting data for these indicators in 2010, data reporting was relatively limited. Therefore, the IDI did not at first include satellite broadband, nor terrestrial fixed (wireless)-broadband subscriptions. More recently, though, most countries have aligned their definition and data reporting on the ITU definition and are henceforth providing data broken down by the different wireless-broadband technologies. Consequently, in the 2013 edition of the IDI, the indicator “active mobile-broadband

subscriptions” has been replaced with “wireless-broadband subscriptions”.

While the number of satellite subscriptions is relatively small (or even negligible) in most countries, a number of countries are deploying fixed (wireless)-broadband technologies, such as WiMAX. This is particularly true in some Arab States and some countries in the Americas and Europe. In Bahrain, for example, terrestrial fixed (wireless)-broadband subscriptions in 2011 accounted for close to 50 per cent of all wireless-broadband subscriptions. Poland and Brazil had well over 1 million fixed-wireless subscriptions in 2012, although the figures were much higher for active mobile-broadband subscriptions. In the Islamic Republic of Iran, where 3G mobile-broadband services were not available in 2012, fixed (wireless)-broadband subscriptions were the only wireless-broadband technology available to citizens. For most countries, however, especially those that have launched 3G mobile-broadband networks, the inclusion of satellite and terrestrial fixed (wireless)-broadband subscriptions in the IDI will not have a major impact on the data, or on their position in the IDI ranking.

Figure Box 2.2: Wireless-broadband subscriptions



Source: ITU (2011b).

side) data with more data based on national household surveys (demand-side indicators). This seems particularly important in the area of mobile-cellular services. By end 2013, ITU estimates that the number of mobile-cellular subscriptions will have reached 6.8 billion, close to the figure for the world’s population (7 billion). Also, by early

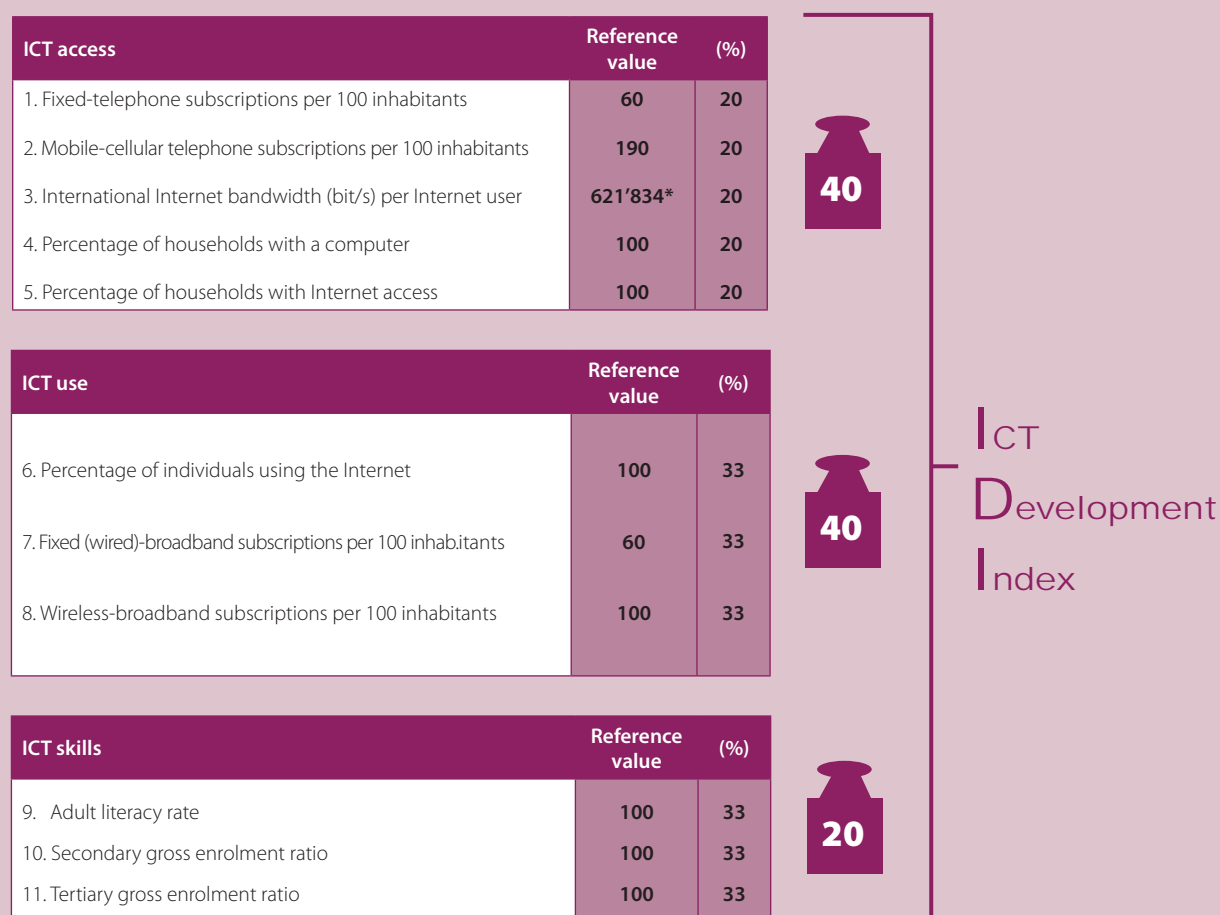
2013, no fewer than 93 economies of the 157 included in the IDI had passed the 100 per cent mobile-cellular penetration mark. The high number of mobile-cellular subscriptions is due mainly to multiple SIM cards that one person may own. The indicator on the number of individuals using a mobile-cellular telephone (which ITU

collects through its household survey questionnaire) would therefore provide a more accurate picture of the actual uptake, use and distribution of mobile-cellular services. While the number of countries that collect this information is increasing steadily, only 58 countries reported these data to ITU by end 2012. It is therefore too early to substitute the current mobile-cellular subscription data in the IDI with mobile-phone user data.

The IDI was computed using the same methodology as in the past, applying the following steps (details are provided in Figure 2.2 and Annex 1):

- *Preparation of the complete data set.* This step includes filling in missing values using various statistical techniques.
- *Normalization of data.* This is necessary in order to transform the values of the IDI indicators into the same unit of measurement. The chosen normalization method was the distance to a reference measure (or goalpost). The reference values were either 100 or obtained through a statistical procedure.
- *Rescaling of data.* The data were rescaled on a scale from 0 to 10 in order to compare the values of the indicators and the sub-indices.
- *Weighting of indicators and sub-indices.* The indicator weights were chosen based on the principal components analysis (PCA) results. The access and use sub-indices were given equal weight (40 per cent each). The skills sub-index was given less weight (20 per cent), since it is based on proxy indicators.

Figure 2.2: ICT Development Index: indicators, reference values and weights



Note: * This corresponds to a log value of 5.79, which was used in the normalization step.

Source: ITU.

This chapter presents the IDI results for 2012 in comparison with 2011. It should be noted that the 2011 IDI values have changed from those published in the previous edition of this report as a result of:

- *Country data revisions.* As more accurate data become available, countries provide ITU with revised statistics for previous years, which have been taken into consideration. This also allows ITU to identify inconsistencies and revise previous estimates.
- *Change from “active mobile-broadband subscriptions” to “wireless-broadband subscriptions”* (see Box 2.2).
- *Differences among countries included in the IDI.* The calculation of the IDI ranking depends on the values of the other countries included. In each new edition, some countries are excluded and others added based on data availability. Overall, this version of the IDI includes 157 countries/economies as compared with 155 in last year’s edition.

The remainder of the chapter is structured as follows. Section 2.2 presents the IDI results at the global level. It highlights some of the top performers, as well as the most dynamic countries as reflected by their changes in IDI value and rank. It also looks at the relationship between a country’s IDI score and its income level, presents IDI results by level of development (developed/developing countries) and by groups of countries with different IDI levels.

Section 2.3 analyses the three sub-indices (access, use and skills), providing additional insights into areas of high/low ICT growth, in order to identify areas requiring further attention from policy-makers and private stakeholders.

Finally, section 2.4 presents a regional analysis of the IDI. It shows IDI results for six regions (Africa, Americas, Arab States, Asia and the Pacific, Commonwealth of Independent States (CIS) and Europe), as well as a comparative analysis of the six regions.

2.2 Global IDI analysis

The results of the 2012 ICT Development Index (IDI) show that there are major differences in ICT levels between countries. In 2012, IDI values ranged from a low of 0.99 (Niger) to a high of 8.57 (Republic of Korea) – within the

possible (theoretical) range of 0 to 10. At the same time, nearly all countries increased their IDI values between 2011 and 2012, demonstrating that ICT levels continue to mature throughout the world. In 2012, the average IDI value climbed to 4.35, up about 5 per cent from 4.15 in 2011 (Table 2.1).

Differences are significant in all three sub-indices of the IDI, but are greatest in the use sub-index, which captures ICT uptake and intensity of usage. Its relatively high coefficient of variation, which measures the variation in countries’ IDI values, indicates the greatest disparity, higher than in terms of skills and access. This is consistent with the conceptual framework of the IDI, which holds that as countries evolve into information societies (at different speeds), they move from the stage of ICT access to ICT use. While most countries are constantly increasing access to ICTs, a number of countries continue to display very low levels of ICT use.

A comparison between 2011 and 2012 shows that, over this time period, both the maximum and minimum IDI values had increased, meaning that ICT levels are maturing not only in countries at the top but also in those at the very bottom. The range between the lowest and the highest IDI values has not changed (7.58 in both 2011 and 2012), suggesting that, overall, the ICT development gap between countries at the very top and at the very bottom has not altered over the year. Changes in the standard deviation (StDev) and the coefficient of variation (CV), which measure the variation or dispersion of all IDI values from the average IDI values, were also relatively minor, suggesting that, overall, countries are moving at similar speeds. A minor decrease in the coefficient of variation between 2011 and 2012 suggests that values are tending to get closer to the average IDI value.

Top IDI countries

The IDI 2012 includes a total of 157 countries (Table 2.2). The top ten IDI countries are predominantly from Europe and from Asia and the Pacific. While the Republic of Korea, with the highest IDI value of 8.57, continues to lead the world in terms of ICT developments, the Nordic countries Sweden, Iceland, Denmark, Finland and Norway follow closely. The Netherlands, the United Kingdom, Luxembourg and Hong Kong (China) also rank in the top ten. A comparison with the 2011 ranking shows that there is hardly any change in terms of the countries with the highest ICT levels. The United

Table 2.1: IDI values and changes, 2011 and 2012

	IDI 2012						IDI 2011						Change in average value 2011-2012
	Average value*	Min.	Max.	Range	StDev	CV	Average value*	Min.	Max.	Range	StDev	CV	
IDI	4.35	0.99	8.57	7.58	2.19	50.28	4.15	0.93	8.51	7.58	2.13	51.32	0.20
Access sub-index	4.74	1.12	9.18	8.06	2.25	47.56	4.56	1.12	9.13	8.01	2.25	49.23	0.18
Use sub-index	2.85	0.03	8.25	8.22	2.37	83.26	2.53	0.02	8.17	8.15	2.25	88.75	0.32
Skills sub-index	6.59	1.51	9.86	8.35	2.12	32.25	6.58	1.49	9.86	8.37	2.13	32.37	0.01

Note: * Simple average. StDev: Standard deviation, CV: Coefficient of variation.

Source: ITU.

Kingdom joined the top ten group (up from 11th position in 2011), replacing Japan.

Almost two-thirds of the top 30 IDI countries are from Europe, where a shared regulatory framework and a clear set of priority areas and goals and targets have helped countries evolve into advanced information economies (Box 2.3). Also among the top 30 are a number of high-income economies from Asia and the Pacific (Australia, Macao (China), Singapore and New Zealand) and the United States, Canada and Barbados from the Americas region.

All top ten IDI countries have reached very high levels of ICT access and use, and share a number of characteristics. These include highly competitive ICT markets and ICT services that were privatized and liberalized early on. The top ten economies achieve top scores on all IDI indicators, including in the area of wireless: the number of mobile-cellular subscriptions has surpassed the number of inhabitants in all top ten economies, and mobile-broadband penetration levels are high, and growing steadily. High-speed mobile-broadband networks were launched relatively early on, and by 2012 wireless-broadband penetration stood at over 50 per cent in all top ten economies. The Republic of Korea, together with Finland and Sweden, are leaders in terms of mobile-broadband uptake, and all three have passed the 100 per cent penetration rate for active mobile-broadband subscriptions.⁸

At the same time, all top performers benefit from abundant international Internet bandwidth, a highly developed backbone, and solid fixed-broadband infrastructure. Fixed-

broadband penetration exceeds 30 per cent in every one of the top ten economies.

The very large majority of households in the top ten IDI economies have a computer and Internet access. Another shared characteristic of these economies is their high level of Internet penetration: with the exception of Hong Kong (China), where Internet penetration in 2012 stood at 73 per cent, more than four out of five people in the top ten economies are online. In Iceland, Norway and Sweden, between 94 and 96 per cent of the population are using the Internet. In the Republic of Korea, over 97 per cent of households have access to the Internet, and the figure is over 90 per cent in the Netherlands (94 per cent), Luxembourg and Norway (93 per cent) and Denmark and Sweden (92 per cent).

Since countries at the top of the IDI are attaining high levels of ICT access and use, their performance is often measured in terms of objectives that go *beyond* those measured by the IDI indicators. Indeed, economies with the highest level of ICT use and uptake are increasingly focusing on exploiting the latest technologies, optimizing regulatory frameworks and pushing for increasingly fast and better ICT services. High-speed Internet access at home has become one of the common measures of success.

For example, in the Republic of Korea, where ICT continues to be a key priority area, by 2012 nearly all households had high-speed Internet access and the country enjoyed one of the highest average advertised broadband speeds in the world. ICTs have helped the Republic of Korea to

Table 2.2: ICT Development Index (IDI), 2011 and 2012

Economy	Rank 2012	IDI 2012	Rank 2011	IDI 2011
Korea (Rep.)	1	8.57	1	8.51
Sweden	2	8.45	2	8.41
Iceland	3	8.36	4	8.12
Denmark	4	8.35	3	8.18
Finland	5	8.24	5	7.99
Norway	6	8.13	6	7.97
Netherlands	7	8.00	7	7.85
United Kingdom	8	7.98	11	7.63
Luxembourg	9	7.93	9	7.76
Hong Kong, China	10	7.92	10	7.66
Australia	11	7.90	15	7.54
Japan	12	7.82	8	7.77
Switzerland	13	7.78	12	7.62
Macao, China	14	7.65	13	7.57
Singapore	15	7.65	14	7.55
New Zealand	16	7.64	18	7.31
United States	17	7.53	16	7.35
France	18	7.53	19	7.26
Germany	19	7.46	17	7.33
Canada	20	7.38	20	7.14
Austria	21	7.36	21	7.10
Estonia	22	7.28	25	6.74
Ireland	23	7.25	22	7.10
Malta	24	7.25	24	6.85
Belgium	25	7.16	23	6.85
Israel	26	7.11	26	6.70
Spain	27	6.89	27	6.65
Slovenia	28	6.76	28	6.60
Barbados	29	6.65	36	6.01
Italy	30	6.57	29	6.43
Qatar	31	6.54	30	6.41
Greece	32	6.45	33	6.21
United Arab Emirates	33	6.41	45	5.68
Czech Republic	34	6.40	31	6.30
Latvia	35	6.36	37	6.00
Portugal	36	6.32	35	6.07
Poland	37	6.31	32	6.22
Croatia	38	6.31	34	6.14
Bahrain	39	6.30	42	5.79
Russian Federation	40	6.19	38	5.94
Belarus	41	6.11	46	5.57
Hungary	42	6.10	39	5.91
Slovakia	43	6.05	40	5.85
Lithuania	44	5.88	41	5.79
Cyprus	45	5.86	43	5.71
Bulgaria	46	5.83	47	5.50
Uruguay	47	5.76	50	5.38
Kazakhstan	48	5.74	49	5.41
Antigua & Barbuda	49	5.74	44	5.70
Saudi Arabia	50	5.69	48	5.46
Chile	51	5.46	52	5.08
Lebanon	52	5.37	61	4.62
Argentina	53	5.36	53	5.06
Oman	54	5.36	58	4.80
Romania	55	5.35	54	5.05
Serbia	56	5.34	51	5.38
TFYR Macedonia	57	5.19	55	4.93
Brunei Darussalam	58	5.06	56	4.93
Malaysia	59	5.04	57	4.81
Costa Rica	60	5.03	65	4.47
Azerbaijan	61	5.01	60	4.62
Brazil	62	5.00	62	4.59
St. Vincent and the Gr.	63	4.81	59	4.71
Seychelles	64	4.75	70	4.36
Moldova	65	4.74	67	4.46
Trinidad & Tobago	66	4.73	63	4.54
Bosnia and Herzegovina	67	4.71	64	4.49
Ukraine	68	4.64	69	4.38
Turkey	69	4.64	66	4.47
Panama	70	4.61	68	4.38
Georgia	71	4.59	73	4.24
Mauritius	72	4.55	74	4.23
Maldives	73	4.53	71	4.31
Armenia	74	4.45	75	4.18
Saint Lucia	75	4.43	72	4.28
Jordan	76	4.22	77	3.90
Colombia	77	4.20	78	3.89
China	78	4.18	79	3.86
Venezuela	79	4.17	76	4.00

Economy	Rank 2012	IDI 2012	Rank 2011	IDI 2011
Albania	80	4.11	80	3.80
Ecuador	81	4.08	83	3.73
Fiji	82	3.99	81	3.79
Mexico	83	3.95	82	3.78
South Africa	84	3.95	85	3.67
Mongolia	85	3.92	90	3.59
Egypt	86	3.85	87	3.65
Suriname	87	3.84	84	3.73
Viet Nam	88	3.80	86	3.65
Morocco	89	3.79	89	3.59
Iran (I.R.)	90	3.79	88	3.61
Tunisia	91	3.70	92	3.58
Peru	92	3.68	91	3.58
Jamaica	93	3.68	93	3.54
Dominican Rep.	94	3.58	95	3.36
Thailand	95	3.54	94	3.42
Cape Verde	96	3.53	96	3.18
Indonesia	97	3.43	97	3.14
Philippines	98	3.34	98	3.14
Bolivia	99	3.28	102	3.08
El Salvador	100	3.25	103	3.06
Tonga	101	3.23	101	3.09
Syria	102	3.22	99	3.13
Paraguay	103	3.21	100	3.10
Uzbekistan	104	3.12	104	3.02
Guyana	105	3.08	106	2.96
Algeria	106	3.07	105	2.98
Sri Lanka	107	3.06	107	2.92
Botswana	108	3.00	108	2.83
Namibia	109	2.85	111	2.60
Honduras	110	2.74	109	2.70
Cuba	111	2.72	110	2.66
Gabon	112	2.61	112	2.46
Ghana	113	2.60	114	2.30
Nicaragua	114	2.54	113	2.39
Zimbabwe	115	2.52	119	2.16
Kenya	116	2.46	116	2.23
Swaziland	117	2.44	115	2.27
Bhutan	118	2.40	117	2.19
Sudan	119	2.33	118	2.19
Cambodia	120	2.30	121	2.05
India	121	2.21	120	2.13
Nigeria	122	2.18	123	1.96
Lao P.D.R.	123	2.10	122	1.99
Senegal	124	2.02	125	1.88
Solomon Islands	125	1.97	124	1.91
Lesotho	126	1.95	126	1.84
Yemen	127	1.89	129	1.76
Gambia	128	1.88	127	1.79
Pakistan	129	1.83	128	1.78
Uganda	130	1.81	130	1.72
Djibouti	131	1.77	131	1.71
Zambia	132	1.77	137	1.64
Mauritania	133	1.76	133	1.70
Myanmar	134	1.74	132	1.70
Bangladesh	135	1.73	139	1.62
Cameroon	136	1.72	136	1.66
Côte d'Ivoire	137	1.70	135	1.66
Comoros	138	1.70	134	1.68
Angola	139	1.68	138	1.63
Congo	140	1.66	140	1.58
Rwanda	141	1.66	143	1.54
Tanzania	142	1.65	141	1.57
Benin	143	1.60	142	1.57
Mali	144	1.54	144	1.43
Malawi	145	1.43	145	1.41
Liberia	146	1.39	148	1.27
Congo (Dem. Rep.)	147	1.31	146	1.30
Mozambique	148	1.31	149	1.26
Madagascar	149	1.28	147	1.28
Guinea-Bissau	150	1.26	152	1.19
Ethiopia	151	1.24	150	1.22
Guinea	152	1.23	151	1.20
Eritrea	153	1.20	153	1.15
Burkina Faso	154	1.18	154	1.11
Chad	155	1.01	156	0.94
Central African Rep.	156	1.00	155	1.00
Niger	157	0.99	157	0.93

Source: ITU.

become a robust economy, and overcome the 2008 financial crisis. They have driven growth and innovation, increased transparency and made the country one of the key ICT exporters in the world.⁹

By 2012, the large majority of households in Europe's Nordic countries also had high-speed Internet access. Sweden (87 per cent) registered the highest penetration of broadband connections, followed by Denmark and Finland (both 85 per cent). In the Netherlands and the United Kingdom, 83 per cent and 80 per cent, respectively, of all households had a broadband connection to the Internet in 2012.¹⁰ Sweden's Broadband Survey, conducted by the Swedish Post and Telecom Authority (PTS), showed that by early 2012 almost half of all households and businesses in Sweden could get broadband with a theoretical rate of at least 100 Mbit/s. Much of the increase was due to fibre being rolled out in the access network.¹¹

Most of the top performers in the IDI were also early adopters of Long Term Evolution (LTE) wireless technology, and they include the first countries to offer these mobile-broadband services commercially. In Europe, Sweden and Norway were the first countries to offer LTE, as early as end 2009.¹² By early 2012, about half of the population of Sweden lived in a place that had coverage by one of the 4G networks. In the Republic of Korea, where LTE services were launched in 2011, nationwide coverage was achieved by April 2012. In June 2012, the largest operators in the Republic of Korea and in Hong Kong (China) announced that they were offering users the benefits of the first LTE international roaming agreement.¹³

Another feature shared by top performers in the IDI is an independent and active regulatory authority that analyses and supervises the telecommunication markets in order to provide impartial and transparent information, protect consumer interests and guarantee an open and competitive market environment. Only recently, both the Swedish Post and Telecom Authority (PTS) and the Icelandic Post and Telecom Administration (PTA) laid down new rules for dominant operators identified as having significant market power, in order to ensure long-term competition. Recent decisions – also referred to as *ex ante* regulation, as the market is regulated in advance – imposed obligations on certain companies to offer

wholesale voice and data market services to competitors at fixed (non-discriminatory) prices.¹⁴

Regulators are also increasingly monitoring the speed and quality of fixed- and mobile-broadband subscriptions, and looking into regulatory measures to ensure that their country's backbone infrastructure is able to cope with increasing demand for bandwidth. In the United Kingdom, Ofcom recently published a report "to encourage competition in the business connectivity market, and identify how best to sustain critical fibre networks between businesses – which also support a growing number of consumer services".¹⁵ In Hong Kong (China), the Office of the Communications Authority offers users an online broadband performance test system to test both actual fixed-broadband and mobile-broadband speeds.¹⁶

Dynamic IDI countries

Between 2011 and 2012, there was hardly any change in the top ten IDI economies and only one country – the United Kingdom – joined the group from its previous 11th position. The group of the top 30 economies saw similarly few changes, suggesting that the countries that have reached high ICT levels – usually through a high and long-standing degree of liberalization and privatization and focused ICT policies – remain at the top. The ranking further highlights the link between income and education levels and ICT development: all of the top 30 economies in the IDI are high-income economies that share a high level of skills.

Although most countries in the ICT Development Index do not see dramatic changes in their IDI value or rank within a year, there are some significant and noteworthy movements. A number of so-called "dynamic" countries report *above-average* positive changes in their IDI rank and/or IDI value over the 12-month period. This group of dynamic countries predominantly includes developing countries found in the upper and medium group of the IDI (see section 2.3 and Table 2.5 for a division of countries into groups) (Table 2.3). The most dynamic countries come from all regions, except Europe, where IDI values are generally already very high and growth is more moderate.

The reasons underlying the improvement in IDI values and rankings in the most dynamic countries are multiple and varied, but can often be linked to a higher level of competition

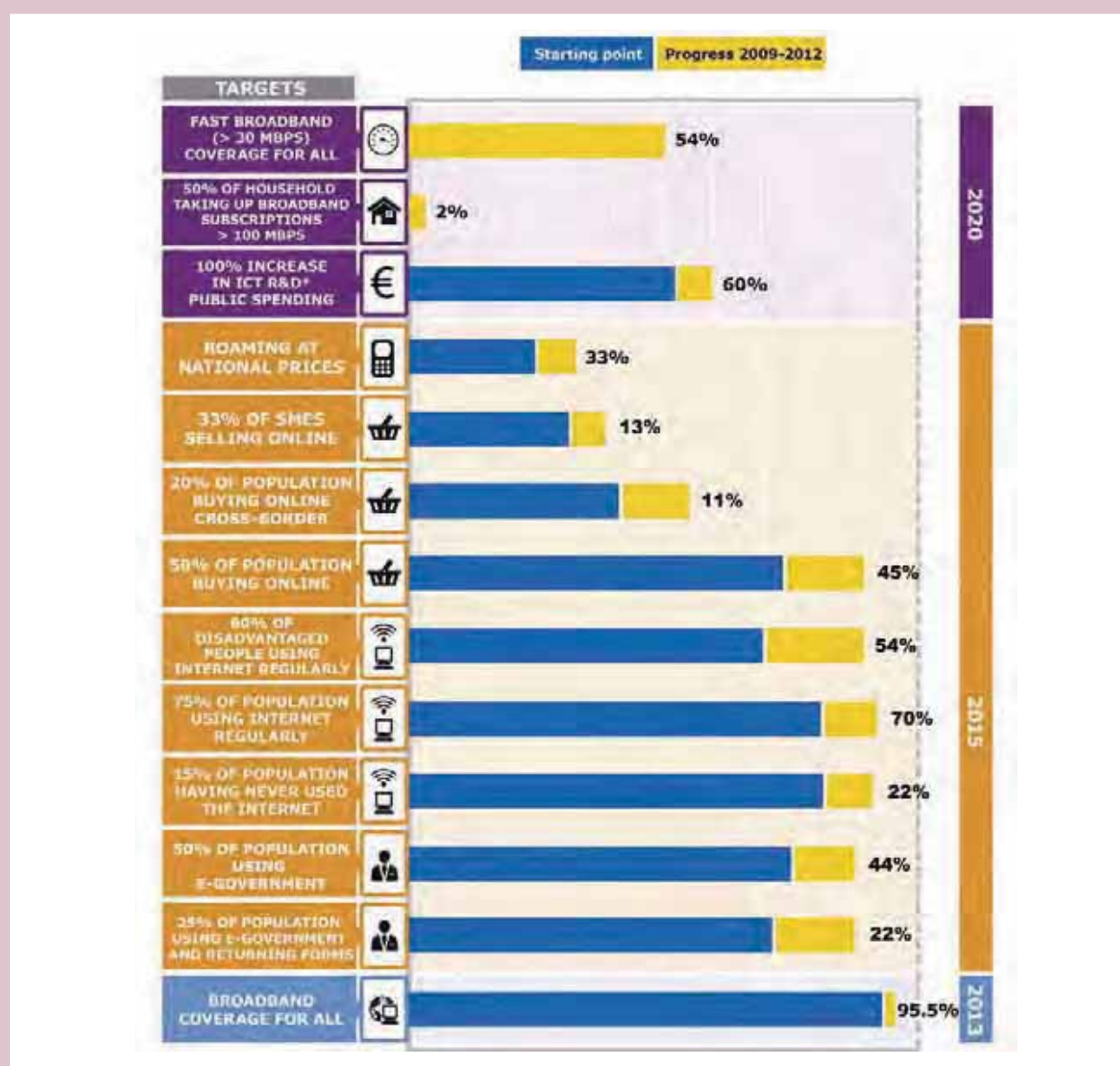
Box 2.3: Europe counts on ICTs: The Digital Agenda for Europe

The European Union has high hopes for information and communication technologies. Among other things, it is counting on ICTs to fuel competitiveness, drive innovation and create new job opportunities. To fully benefit from its potential, citizens and businesses alike must have access to a flawless, high-speed and universally available network infrastructure.

A shared regulatory framework and EU-wide rules created in 2002 and updated in 2009 were put in place to encourage competition, improve functioning of the internal market and

guarantee consumer rights. The rules, which apply to fixed and wireless telecommunication markets, the Internet and broadcasting services, were designed to be simple, to foster deregulation and to be technology-neutral and sufficiently flexible to deal with fast-changing market environments.¹⁷ In 2010, the existing regulatory framework was complemented with the Digital Agenda for Europe (DAE), the first of seven flagship initiatives under Europe 2020 – the EU's strategy to deliver smart, sustainable and inclusive growth. The DAE, which

Figure Box 2.3: The EU's Digital Agenda Scoreboard



Box 2.3: Europe counts on ICTs: The Digital Agenda for Europe (continued)

was updated in 2013, includes over 100 actions grouped into seven pillars that include a single digital market, trust and security, and fast and ultra-fast Internet access. It also includes a set of specific targets that should be achieved by 2020 and that are tracked via the EU scoreboard (Figure Box 2.3).¹⁸

Progress on the actions and towards the specific targets is monitored closely and can be viewed by country, or for the EU as a whole.¹⁹ In the last review, major achievements were highlighted – including the fact that, by 2013, no fewer

than 54 per cent of EU citizens have broadband available at speeds greater than 30 Mbit/s. At the same time, the report also pinpointed shortcomings, including fragmented national markets and the need to move even further and create a Single Telecoms Market to foster growth and further streamline regulation.²⁰ Although details have not been discussed, a single telecommunication market could, for example, mean the EU-wide licensing of certain telecommunication services, facilitate cross-border merger of telecommunication operators, and affect roaming charges.

Source: ITU, based on <https://ec.europa.eu/digital-agenda/en/digital-agenda-europe>.

and positive role of the private sector. In a number of cases, government-driven programmes or initiatives have also helped to increase ICT access and use. Finally, strong growth in the number of wireless- and fixed-broadband subscriptions is enabling more and more countries to increase household ICT access and use, and to bring more people online. The following section looks at the most dynamic countries in more detail. Figure 2.3 contains spider charts of the most dynamic countries, which illustrate normalized values and changes between 2011 and 2012, for each one of the 11 indicators included in the IDI.

Australia increased its IDI from 7.54 in 2011 to 7.90 in 2012, moving up four places on the IDI in the process, to 11th position. While Australia already boasts a very high level of ICT development, consistent growth rates were recorded on the indicators included in the access sub-index. The highest jump, however, occurred in the use sub-index, with an increase of 0.80 value points (as compared with the global average increase of 0.32) to 7.46 in 2012. Australia has seen a significant rise in the number of wireless-broadband subscriptions, and wireless-broadband penetration

Table 2.3: Most dynamic countries – changes between IDI 2011 and 2012

Change in IDI ranking			Change in IDI value (absolute)		
IDI rank 2012	Country	IDI rank change	IDI rank 2012	Country	IDI value change
33	United Arab Emirates	12	52	Lebanon	0.75
52	Lebanon	9	33	United Arab Emirates	0.73
29	Barbados	7	29	Barbados	0.65
64	Seychelles	6	54	Oman	0.56
41	Belarus	5	60	Costa Rica	0.56
60	Costa Rica	5	41	Belarus	0.55
85	Mongolia	5	22	Estonia	0.54
132	Zambia	5	39	Bahrain	0.51
11/135	Australia/Bangladesh	4*	26	Israel	0.41
54/115	Oman/Zimbabwe	4*	62	Brazil	0.41

Note: * Australia, Bangladesh, Oman and Zimbabwe all went up four places in the IDI rankings between 2011 and 2012.

Source: ITU.

increased from 81 per cent in 2011 to 103 per cent in 2012, which is among the highest rates in the world. A report by the Australian Communications and Media Authority (ACMA) links the surge in wireless-broadband usage to the increased uptake of smartphones and tablets (Box 2.4).

Bahrain entered the top 40 of the IDI 2012, with an IDI value increase of 0.51. The country improved in both the access and use sub-indices. Within the access sub-index, mobile-cellular telephone penetration climbed from 128 per cent in 2011 to 156 per cent in 2012. This comes after mobile number portability (MNP) was introduced in July 2011, accompanied

by the public awareness campaign “I Love My Number.”²¹ The introduction of MNP further heightened the competitiveness of the relatively small mobile-cellular market in which three operators compete. Within the IDI use sub-index, both the number of Internet users and the number of wireless-broadband subscriptions grew significantly. The percentage of individuals using the Internet increased to 88 per cent in 2012, up from 77 per cent the year before. At the same time, broadband has spread successfully around Bahrain and, at 13 per cent, Bahrain’s fixed (wired)-broadband penetration is the highest in the Arab States region. Since 2010, all of

Box 2.4: Smarter phones and faster networks are driving data usage and revenues in Australia

Between 2011 and 2012, Australia’s wireless-broadband penetration grew by 27 per cent, from 81 subscriptions per 100 inhabitants in 2011, to 103 in 2012. This constitutes not only one of the highest growth rates, but also one of the highest 2012 penetration levels worldwide (see Chart Box 2.4).

According to a report by the Australian Communications and Media Authority (ACMA), improvements in mobile-broadband infrastructure as well as the rapid uptake of smartphones and tablets have revived the Australian mobile market, in which mobile-cellular penetration had reached 100 per cent in 2007 and growth was stagnating.

The report highlights the importance of the mobile-broadband market as an opportunity for new revenue streams and market

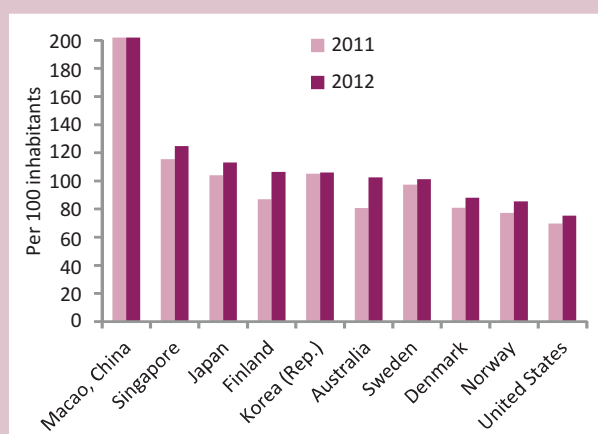
growth. Increasing weight is being given to the smartphone and tablet market, as more and more customers switch from basic and feature phones to smartphones and tablets. ACMA estimates that, in May 2012, 8.67 million Australians were using a smartphone, 4.37 million were using a tablet and 3.65 million customers were using both a mobile phone and a tablet to access the Internet. The rise in smartphone usage is in turn driving data usage, and the report shows that, in comparison with non-smartphone users, smartphone users are:

- nine times more likely to go online via their handsets;
- four times more likely to purchase goods online;
- three times more likely to stream or download audio or video content;
- three times more likely to pay bills online;
- twice as likely to access social networking sites.

Young people, in particular, were accessing the Internet via their mobile phones: 76 per cent of 18 to 24 year olds and 78 per cent of 25 to 34 year olds, as compared with 51 per cent of the population as a whole.

To facilitate Internet access via smartphones or tablets, an estimated 4.5 million Australians downloaded a mobile application during the month of June 2012. Operators, on the other hand, are doing their part and are busy upgrading networks, including by supporting the roll-out of 4G.

Chart Box 2.4: Wireless-broadband subscriptions, top ten economies, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

Source: ITU, based on ACMA, 2013.

the Kingdom's Internet subscriptions are broadband. In 2011, more than half of all broadband subscriptions were to plans with advertised speeds of more than 2 Mbit/s.²² Wireless-broadband penetration almost doubled, reaching 33.5 per cent in 2012. The country also has a nationwide WiMAX network, which the operator Bahrain Zain launched to complement its mobile 3G cellular voice and data network, and upgraded in 2011 in order to provide higher speeds and increase reliability.²³ Bahraini Internet subscribers are thus benefiting from the improved quality and speed offered by broadband connections.

Bangladesh climbed four places to 135th in the IDI 2012, with the access sub-index showing the highest increases. In particular, mobile-cellular telephone penetration rose from 56 per cent in 2011 to 64 per cent in 2012. Bangladesh has a highly competitive mobile market, with six mobile-cellular operators. Fierce competition led to the lowering of mobile-cellular prices and a concomitant rise in subscription numbers. The ICT Price Basket shows that Bangladesh has relatively affordable mobile-cellular prices and that prices have dropped consistently over the past years. In terms of PPP\$, the country had one of the least expensive offers in 2012 (see Annex 4). Operators in Bangladesh are competing for a large group of low-income customers and were thus obliged to reduce access costs. This includes the introduction of prepaid offers, per-second billing and the reduction of handset prices (Yusuf et al, 2010). Furthermore, important progress has been made with regard to international Internet bandwidth. In 2012, the Bangladesh Telecommunications Regulatory Commission (BTRC) issued six licenses for the operation of an international terrestrial cable (ITC).²⁴ Until then, the country's only connection to the world wide web was the SEA-ME-WE4 submarine cable, controlled by the government-owned BTCL.²⁵ The newly established terrestrial link via India has nearly doubled international Internet bandwidth per Internet user, from 1 500 Mbit/s to almost 3 000 Mbit/s by end 2012, as well as enhancing the reliability of Bangladesh's international connectivity. While the advances made in the access sub-index are very encouraging, little progress has been made in the use sub-index. Both fixed (wired)-broadband and wireless-broadband penetration remain below 0.5 per cent. The proportion of individuals using the Internet went up by 26 per cent, to 6 per cent in 2012.

Barbados increased its IDI by 0.65 value points, rising seven places to 29th position in the IDI 2012. Most progress has been made in the use sub-index. The country's two mobile operators, Digicel and Lime, launched their mobile-broadband networks in November 2011.²⁶ Mobile-broadband had been long awaited in Barbados, one of the last countries in the Americas region to offer the service. Subsequently, wireless-broadband penetration went up from less than 1 per cent in 2011 to 37 per cent in 2012. Lime and Digicel offer a variety of data plans allowing users to choose according to their needs and budget. Customers can choose between prepaid and postpaid offers for both handset- and computer-based usage, as well as different validity periods and data allowances.²⁷ The IDI access sub-index highlights improvements as well. By end 2012, the proportion of households with a computer and with Internet access both increased by around 6 per cent to 69 per cent and 58 per cent, respectively. Furthermore, international Internet bandwidth per Internet user almost doubled, from around 38 000 bit/s in 2011 to close to 70 000 bit/s in 2012.

Belarus is the only country from the CIS region among the most dynamic countries. Between 2011 and 2012, the country climbed five places to 41st position globally. The country has committed to an ambitious "State Programme for innovative development of Belarus for 2011-2015" in order to improve the quality of ICT services and to modernize and expand telecommunication networks.²⁸ Improvements in both the access and the use sub-indices indicate a first success of the programme. Household connectivity made significant strides in 2012, the proportion of households with a computer increasing from 46 per cent in 2011 to 52 per cent in 2012 and the proportion of households with Internet access growing from 40 per cent in 2011 to 48 per cent in 2012. The indicators applied to measure the use sub-index all showed good progress. Most notably, fixed (wired)-broadband penetration went up from 22 per cent in 2011 to 27 per cent in 2012, which is by far the highest penetration in the CIS region. At the same time, wireless broadband is becoming increasingly important, having reached a penetration rate of 33 per cent by end 2012. MTS, the country's largest mobile operator, has achieved 100 per cent 3G mobile-broadband population coverage in the countries' cities and regional centres.²⁹ The proportion of individuals using the Internet is increasing, too, reaching 47 per cent in 2012, up from 40 per cent in 2011.

Brazil is among the most dynamic countries in the IDI 2012, with a value increase of 0.41 as compared with the global average increase of 0.20. The country ranks 62nd in the IDI 2012. Improvements can be seen in both the access and use sub-indices, with the strongest growth in the latter. Brazil stood out in the IDI 2011 for significantly improving household connectivity, and the country continued to make great strides in 2012. The proportion of households with a computer increased from 45 per cent in 2011 to 50 per cent by end 2012. The proportion of households with Internet access shows an even stronger growth, from 38 per cent in 2011 to 45 per cent in 2012. ICT household connectivity is one of the main emphases of Brazil's national broadband plan – *Programa Nacional de Banda Larga* (PNBL). The plan aims to bring fast (at least 1 Mbit/s) and affordable broadband access to 40 million Brazilian households by 2014 (CGPID, 2010). The government has concluded agreements with a number of Brazilian operators to extend broadband access to communities, in particular in rural areas, and to cap monthly subscription prices at USD 30 to 35 for connections offering speeds of 1 Mbit/s.³⁰ The plan further includes tax cuts for investments in network deployment and upgrades, and the revision of legal frameworks for deploying ICT infrastructure. Mobile broadband is an integral part of the PNBL, and its expansion is promoted in order to increase broadband coverage and Internet usage throughout Brazil.³¹ The country's wireless-broadband penetration rose from 22 per cent in 2011 to 37 per cent in 2012. Brazilian consulting firm Teleco reports that, by end 2012, 88 per cent of the Brazilian population was covered by a 3G network. Under the 3G licence agreement, operators were required to roll out a 3G network to all cities with a population of more than 200 000 people by April 2012, a goal that two of the five licensees had achieved by the deadline.³²

Costa Rica improved its IDI by 0.56, almost three times the global average increase. It moved up five places to 60th position, and improved its standing in the Americas region by overtaking Brazil (in 62nd position) in the IDI 2012. The monopoly of incumbent ICE was ended in November 2011, when two new mobile operators, Claro (América Móvil) and Movistar (Telefónica), entered the mobile market (Box 2.5).³³ Strong growth in mobile subscriptions has been recorded since then. Mobile-cellular penetration exceeded the number of inhabitants, and stood at 128 per cent by end 2012. Wireless-broadband penetration saw an important

increase, with all three mobile operators offering postpaid and prepaid 3G plans. Further changes in the mobile sector are to be expected with the anticipated introduction of MNP in 2013.³⁴ The country also stands out for its increase in the number of households with Internet access, penetration climbing from 34 per cent in 2011 to 47 per cent in 2012.

Estonia improved its IDI by 0.54 value points between 2011 and 2012, and in 2012 ranks 22nd, with an IDI of 7.28. Impressive progress was made in regard to both the access and use sub-indices, with the greatest improvements in the latter. Mobile-cellular penetration, already at a very high level in 2011, further increased to 155 per cent in 2012. The proportion of households with a computer and with Internet access at home grew by around 6 per cent, to 76 per cent and 75 per cent, respectively. Estonia's use sub-index value increased by 1.08 value points, almost three times the average increase. The penetration of Internet users (79 per cent) and fixed (wired)-broadband subscriptions (26 per cent) continue to rise at very high rates. Most impressive are the developments in regard to wireless broadband: penetration went up from 46 per cent in 2011 to 74 per cent in 2012, one of the highest penetration levels worldwide, and Estonians are ardent users of e- and m-services.³⁵ In 2012, no fewer than 94 per cent of Estonians filed their tax declarations online. E-banking is another very popular online service, with 98 per cent of banking transactions carried out online. Mobile applications are being offered for public services as well, and Estonians can use their mobile phones to pay, for example, for parking (m-parking) or a bus ticket (m-ticket).³⁶ Estonia has also been singled out for its achievements in terms of making superfast broadband available in homes. According to Point Topic, the country has made great progress in achieving one of the EU's most ambitious targets, namely to make sure that 100 per cent of households can get very high-speed broadband Internet access by 2012. A study at end 2012 showed that in Europe the country "is one of only two countries, together with Finland, to claim 100 per cent coverage by HSPA, the up-to-date standard for 3G broadband. It also has the third-highest availability of LTE, the 4G mobile standard".³⁷

Israel's IDI rose by 0.41 value points, which is more than twice the global average increase, to 7.11. The country ranks in 26th position in the IDI 2012. Growth was strongest in the use sub-index, in particular in the number

Box 2.5: Competition pushes Costa Rica above the regional average

Until 2011, Costa Rica had one of the last remaining state telecommunication-sector monopolies in the world. The *Instituto Costarricense de Electricidad* (ICE), founded in 1963, had been offering all main telecommunication services in the country, including mobile-cellular services through the brand *kölbí*. When Costa Rica signed the Dominican Republic-Central America-United States Free Trade Agreement (CAFTA-DR) in 2009, a liberalized telecommunication market was one of the requirements of the agreement. This effectively meant the end of ICE's monopoly, which was enshrined in the 2008 General Telecommunications Law.³⁸

As the ITU ICT Price Basket shows, ICT services in Costa Rica were relatively affordable even under the monopoly. For instance, in the IPB 2011, Costa Rica had the cheapest mobile-cellular basket in terms of PPP\$ in the region (ITU, 2012a). However, prior to the liberalization, mobile-cellular penetration levels were below the regional average, at only 65 per cent in 2010 and 92 per cent in 2011 (Chart Box 2.5).

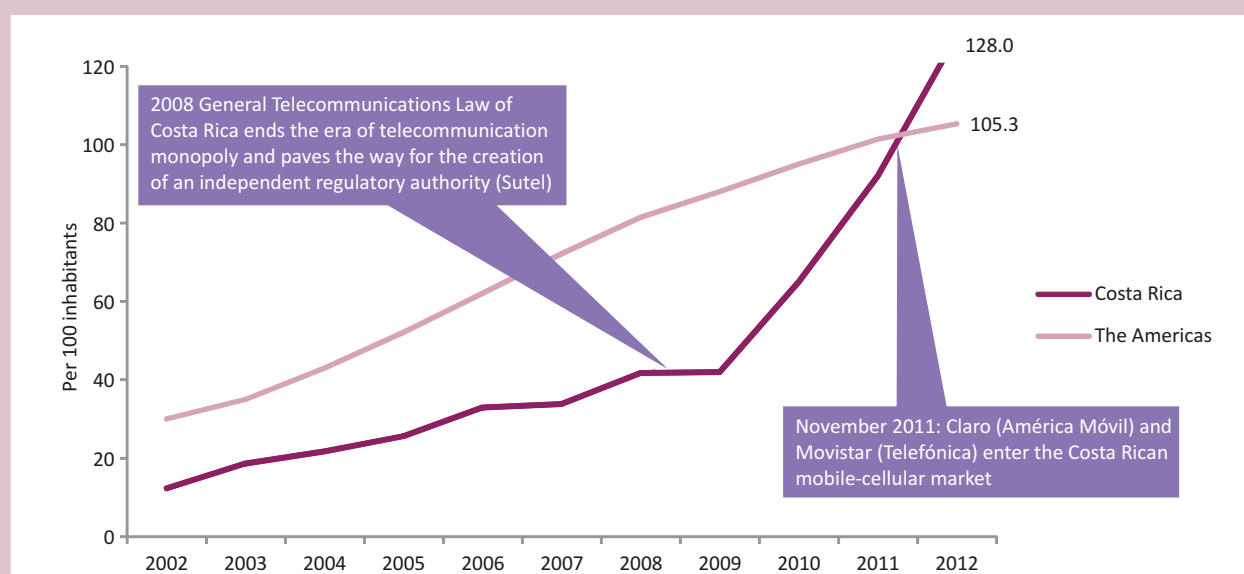
Costa Rica was lagging behind other countries in the region in terms of the introduction of new services: ICE's 3G network was launched relatively late – in 2009 – and Costa Rica was the last country in the world to offer its customers mobile-cellular *prepaid* services, in 2010. Furthermore, waiting lists for mobile services were often long, as ICE was running out

of mobile connections.³⁹ While penetration numbers were on the rise before the introduction of competition, they started to increase markedly once competition had been made a legal requirement, and much higher levels were reached after the market entry of the two new mobile operators, Claro (América Móvil) and Movistar (Telefónica) in November 2011. By end 2012, mobile-cellular penetration had reached 128 per cent, and exceeded the regional average.⁴⁰

Further important developments in the mobile market include the introduction of wireless-broadband services, first offered by the then monopolist ICE in 2009⁴¹ and now available from all Costa Rican mobile operators to both postpaid and prepaid customers. By end 2012, wireless-broadband penetration had reached 28 per cent, up from 10 per cent in 2011. In 2011, prior to market liberalization, the country's first MVNOs were launched by ICE to pre-empt any such moves by Claro and Movistar. This was also the first retailer launch of an MVNO in the Latin American region by two Costa Rican electronics and furniture retailers.⁴²

Further changes are on the horizon for the country's mobile market, with both MNP⁴³ and LTE to be launched in 2013.

Chart Box 2.5: Mobile-cellular subscriptions per 100 inhabitants, Costa Rica and the Americas region, 2009-2012



Source: ITU World Telecommunication/ICT Indicators database.

of Internet users and wireless-broadband subscriptions. Wireless-broadband penetration climbed by more than 61 per cent, from 41 per cent in 2011 to 65 per cent in 2012. In June 2012, two mobile operators, Golan Telecom and HOT Mobile, launched 3G services.⁴⁴ This brings the total number of mobile operators in the country to five, all of them offering mobile-broadband services. Israel has a competitive Internet market environment, with five main ISPs and 45 smaller licence-holders, and a highly-developed infrastructure. Ninety-nine per cent of homes are within reach of a fixed (wired)-broadband connection, and fixed (wired)-broadband penetration had reached 22 per cent by end 2012. In 2012, a total of 73 per cent of the Israeli population were using the Internet, up from 69 per cent in 2011. Apart from Israel's well-developed broadband infrastructure, the Ministry of Communications attributes the strong growth in the number of Internet users to the vast offer of local content and language websites as well as extensive e-government services.⁴⁵

Lebanon has an IDI value of 5.37, and ranks 52nd in the IDI 2012. It is the country with the highest increase in IDI value of 0.75 points. In the IDI 2011, the country stood out for increases in the access sub-index (ITU, 2012a). The 2012 data show that while the access sub-index value continues to improve, Lebanon was able to translate progress in ICT access and infrastructure into more intense use of services. The country's broadband market has seen a number of changes between 2011 and 2012, in particular with the introduction of wireless broadband. 3G was commercially launched in November 2011 by Touch and Alfa, Lebanon's two state-owned mobile operators, and wireless-broadband penetration went up from 11 per cent in 2011 to 26 per cent in 2012. Fixed (wired)-broadband penetration more than doubled, from 5 per cent in 2011 to 12 per cent in 2012. A new entry-level broadband plan was introduced by governmental decree in September 2011, lowering the cost of entry-level broadband by 70 per cent. The price of this new package lies below the Arab States average, according to a study by the Lebanese Telecommunications Regulatory Authority (TRA).⁴⁶ The proportion of individuals using the Internet climbed to 61 per cent in 2012, up from 52 per cent in 2011.

Mongolia moved up five places to 85th in the IDI 2012. Both the access and the use sub-index values improved by more

than the global average. Great strides were made in terms of ICT household connectivity: the percentage of households with a computer shot up from 24 per cent in 2011 to 30 per cent in 2012, and the proportion of households with Internet access progressed in equal measure, from 9 per cent in 2011 to 14 per cent in 2012. The ICT sector has been an important focus of the government's development strategy, and several policy programmes have been put in place to foster ICT development in the country. One of the objectives of the national broadband programme, to be implemented by 2015, is the provision of affordable broadband access. The establishment of services such as e-government, e-learning and e-health have also been identified by the Mongolian Government as crucial development enablers.⁴⁷ Wireless broadband is of particular importance for connecting people to the Internet in a country like Mongolia, with its nomadic tradition and being one of the least densely populated countries in the world.⁴⁸ Wireless-broadband penetration has increased significantly, from 17 per cent in 2011 to 27 per cent in 2012. The percentage of individuals using the Internet has increased, too, with 16 per cent of Mongolians using the Internet in 2012, up from 13 per cent in 2011.

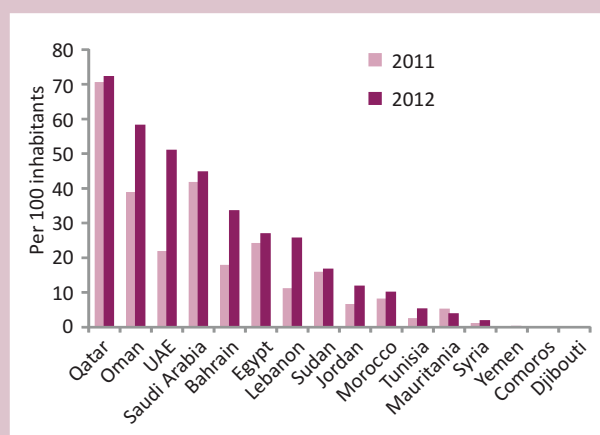
Oman improved its IDI by 0.56 value places and four ranks, moving up to 54th position in the IDI 2012. Progress is visible on both the access and use sub-indices, and can be linked to the country's e-Oman digital strategy (Box 2.6). Wireless-broadband penetration has seen a sizeable increase, from 39 per cent in 2011 to 58 per cent in 2012, and the country's operators are not only expanding the 3G network but also deploying WiMax and LTE.⁴⁹ Mobile broadband is relatively affordable in Oman: the 1 GB postpaid computer-based basket remains below 1 per cent of GNI p.c. and is one of the cheapest in the region (see Chapter 3). Internet usage proportion increased between 2011 and 2012, from 48 per cent to 60 per cent.

Seychelles improved its ranking by six places, and now stands in 64th position in the IDI 2012. All indicators included in the use sub-index showed consistent growth rates from 2011 to 2012. The percentage of individuals using the Internet (47 per cent) and the country's fixed (wired)-broadband penetration (12 per cent) are the highest of all countries in the Africa region. Seychelles stands out for gains in the access sub-index. From 2011

Box 2.6: Oman boasts second highest wireless-broadband subscriptions penetration in the region

The Omani Government has undertaken several initiatives to foster ICT development and increase rural connectivity in particular. The country's digital strategy – e-Oman, adopted in 2002 – is based on six main pillars that are aimed at turning the country into an information society. They include the development of Oman's human capital, its ICT industry and national content, and the enhancement of ICT infrastructure and e-government services. E-Oman also focuses on infrastructure development, in particular the provision of affordable fixed- and wireless-broadband access.⁵⁰

Chart Box 2.6: Wireless-broadband subscriptions, Arab States, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

The Telecommunications Regulatory Authority (TRA) has been working with the mobile operators to extend network coverage, improve rural connectivity and provide faster broadband access through 3G and LTE services. In 2012, important network upgrades were undertaken by the country's two mobile operators. Omantel launched its LTE network in July 2012,⁵¹ and the second mobile operator, Nawras – through the Turbocharging Programme – has been upgrading its base stations to improve 3G coverage and introduce LTE and WiMAX services.⁵² In June 2012, TRA announced a plan to bring basic telecommunication services to 150 villages in remote and rural areas of the Sultanate by the end of 2013.⁵³

Special attention has been given to e-government and wireless services. The e-government portal Omanuna was created to provide government services and information online. Omanuna includes a mobile portal through which a number of services can be accessed via a mobile phone.⁵⁴ Wireless-broadband penetration in particular increased substantially, from 39 per cent in 2011 to 58 per cent in 2012. Oman now has the second-highest wireless-broadband penetration in the region, topped only by the region's highest-ranked country, Qatar (72 per cent) (see Chart Box 2.6). The country has also made important progress in bringing more people online, and the proportion of individuals using the Internet rose by around 25 per cent, from 48 per cent in 2011 to 60 per cent in 2012.

to 2012, it improved its score by 0.62 value points, more than three times the average increase. With the landing of the Seychelles East Africa System (SEAS) fibre-optic cable, available international Internet bandwidth almost tripled in 2012. SEAS was implemented under a private-public partnership between Seychelles' Government and the archipelago's two main telecommunication operators, Airtel and Cable and Wireless.⁵⁵

The **United Arab Emirates** records the highest increase in rank, shooting up 12 places to 33rd in the IDI 2012. Value increases in the access and use sub-indices are both considerably above the global average. All indicators included in the access sub-index showed improvement from 2011 to 2012. Mobile-cellular telephone penetration in particular rose by more than 14 per cent, to 170 per cent

in 2012. A household survey conducted by the country's Telecommunication Regulatory Authority (TRA, 2012) confirms that virtually all residents use a mobile phone and that 85 per cent of the population use the Internet regularly, and for the most part through a high-speed connection (Box 2.7). In the use sub-index, UAE registered great progress in the number of wireless-broadband subscriptions. By end 2012, penetration had reached 51 per cent, as against 22 per cent the previous year. Furthermore, services are relatively cheap: the UAE ranks among the most affordable countries for prepaid mobile-broadband services, which cost less than 1 per cent of GNI p.c. (see Chapter 3).

Zambia, the country with the lowest IDI among the most dynamic countries, managed to improve its ranking by five places to 132nd, with an IDI of 1.77. While the use sub-index

Box 2.7: An ICT user profile from the United Arab Emirates

The United Arab Emirates achieved the highest increase in IDI rank and the second highest increase in IDI value between 2011 and 2012, and now stands in 33rd position in the IDI 2012, with an IDI value of 6.41. Both its access and use sub-index values increased by many times the global average. A household survey commissioned by the UAE Telecommunication Regulatory Authority (TRA) provides insights into the usage of ICTs in the country (TRA, 2012).

With regard to mobile-cellular telephony, the survey, which included individuals between the ages of 15 and 74,⁵⁶ found that virtually all the survey participants use a mobile phone. Mobile-cellular penetration stood at 170 per cent by end 2012, and the survey confirms that 32 per cent of customers have more than one SIM card in use on a regular basis (see Chart Box 2.7). The main reasons for owning multiple SIM cards include: to take advantage of different promotions offered by the two operators (60 per cent), to have a separate card for private and business use (59 per cent), and to benefit from better connectivity in different regions of the United Arab Emirates (18 per cent). Prepaid telephony is the preferred choice among customers, with 86 per cent of subscriptions being prepaid. At the same time, 43 per cent of SIM cards have been owned for more than five years. The TRA survey further revealed that an almost equal

number of mobile-broadband customers access the Internet via their mobile phones (45 per cent) or their laptops (47 per cent).

The proportion of households with Internet access at home has improved significantly over the past year, standing at 72 per cent by end 2012 (see Chart Box 2.7). Almost all home Internet subscriptions are to broadband services (92 per cent are ADSL and 7 per cent are mobile-broadband connections). The percentage of individuals using the Internet is one of the highest in the world at 85 per cent (Chart Box 2.7). Of those, 80 per cent access from home and 56 per cent from work. Most users access the Internet on a very regular basis: 75 per cent of those accessing from home did so at least once a day. Internet users in the UAE spent 58 per cent of their time on English-language websites, while 37 per cent of time spent online is on Arabic websites. The most common activity online is using e-mailing services (88 per cent), followed by social networking (83 per cent) and reading online newspapers or magazines (72 per cent).

The survey confirms that social networking sites are very popular among Internet users in the United Arab Emirates, and can be identified as one of the drivers of Internet usage. A total of 69 per cent of users have a profile on a social networking site, of which Facebook is by far the most popular. The majority of users with a profile visit the social networking site every day.

Chart Box 2.7: Mobile-cellular subscriptions (left), individuals using the Internet (centre), households with Internet access (right), 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

shows no significant increase, growth in the access sub-index is above the global average. This is due to an increase in the country's mobile-cellular penetration, from 61 per cent in 2011 to 76 per cent in 2012. Rural connectivity has become an increasingly important issue for policy-makers, who are taking concrete steps to connect remote and rural areas. These include a tax waiver on GSM equipment passed by the Zambian government in 2011, which has allowed mobile operators to extend the country's mobile network.⁵⁷ Several network-extension projects have been implemented by the country's mobile operators, and the private sector is trying to extend coverage and services. This also means dealing with grid-power shortages that often afflict rural areas. MTN, for example, has set up "solar

green sites" to connect remote areas that had previously been cut off on account of limited and costly electricity.⁵⁸ Other projects are based on public-private partnerships, including Airtel partnering with the Zambian Information Communication and Technology Authority (ZICTA) to expand the mobile network to rural areas. This project, which is financially supported by the government, is part of the Universal Access Network Roll-out project⁵⁹ (Box 2.8).

Zimbabwe is among the most dynamic countries in the IDI 2012, having moved up four places in the overall IDI ranking, to 115th position. The country made significant progress on both the access and the use sub-indices of the IDI. In both sub-indices, it is the mobile/wireless indicators

Box 2.8: Rural roll-out in Zambia

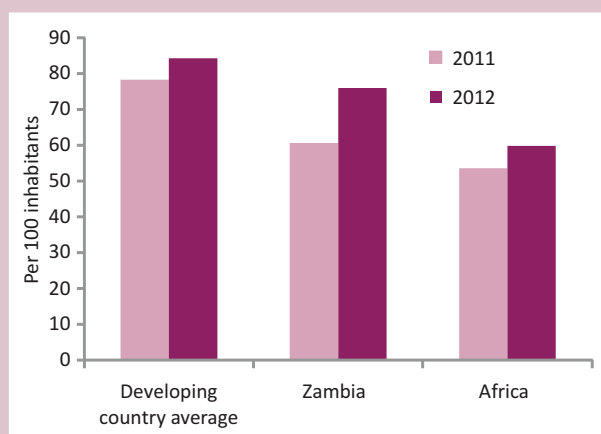
Zambia has registered a significant increase in mobile-cellular penetration, from 61 per cent in 2011 to 76 per cent in 2012. While this still puts the country behind the average penetration in developing countries (84 per cent), mobile-cellular penetration in Zambia is well above the African regional average of 60 per cent (see Chart Box 2.8).

The Zambian Government understands ICTs to be a development enabler, and has committed to making services available to its citizens in rural and remote areas of the country. In 2012, according to the Ministry of Transport, Works, Supply and Communication, a total of 2 070 mobile-communication

towers existed in Zambia, providing network coverage to 78 per cent of the territory.⁶⁰ However, mobile-cellular services are concentrated in urban areas, and the Zambian government has initiated a rural roll-out project to cover all of the country's chiefdoms in cooperation with Zambia's three mobile operators and other relevant stakeholders, such as the Electrification Unit, funded through the Universal Access Fund.⁶¹ The project has faced a number of challenges, including "lack of access roads, lack of commercial power, vandalism of erected sites (...), poor demand resulting in poor or no return on investment for operators (...)", which has slowed down the roll-out.⁶² The lack of an energy infrastructure in rural Zambia constitutes a major obstacle, and the expansion of the power grid is an expensive undertaking. The Rural Electrification Authority (REA) is implementing its rural electrification programme to provide access to electricity by the year 2030, from which mobile operators can also benefit.⁶³ Solar energy represents an alternative that has been exploited by the operator MTN, which erected the first solar site in early 2012, with further sites being planned.⁶⁴

Zambia's end-2012 mobile-cellular penetration rate confirms the initial success of the roll-out project. Airtel Zambia has indicated that a significant proportion of its new customers are from rural areas.⁶⁵ The challenge that lies ahead is to increase broadband penetration and bring an increasing number of Zambians online. By end 2012, the country's wireless-broadband and fixed (wired)-broadband penetration rates still languished at below 1 per cent, and the proportion of households with Internet access did not exceed 3 per cent.

Chart Box 2.8: Mobile-cellular subscriptions, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

Figure 2.3: IDI spider charts, selected dynamic countries, 2011 and 2012

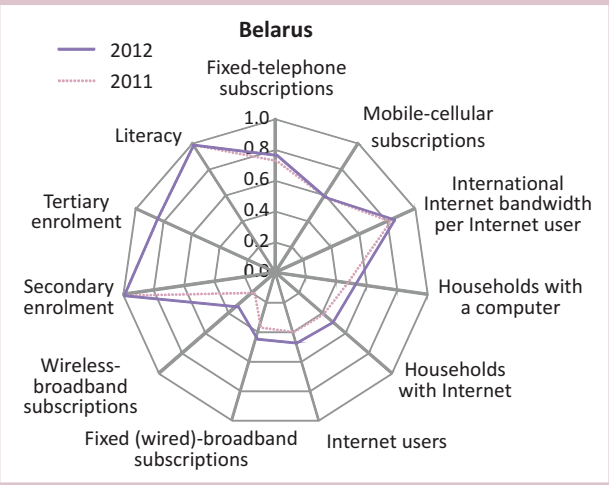
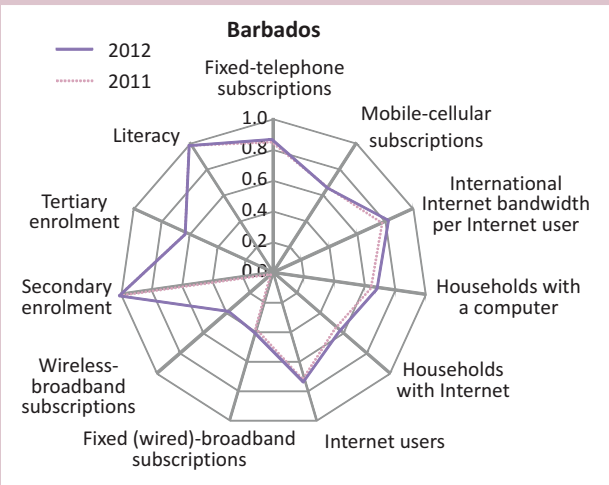
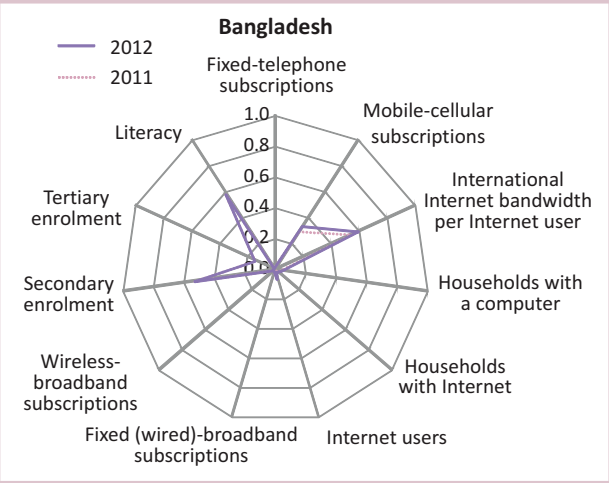
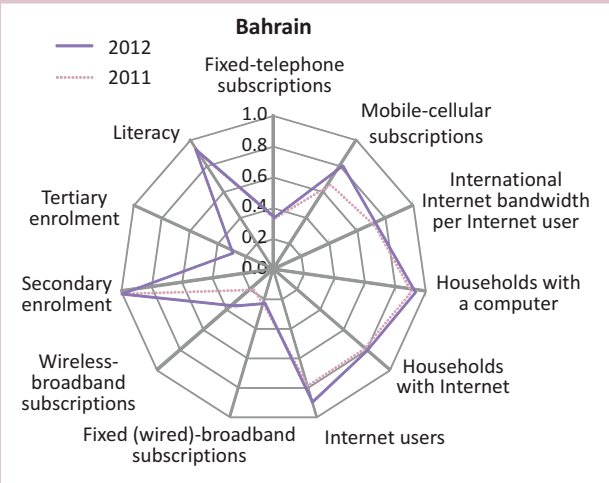
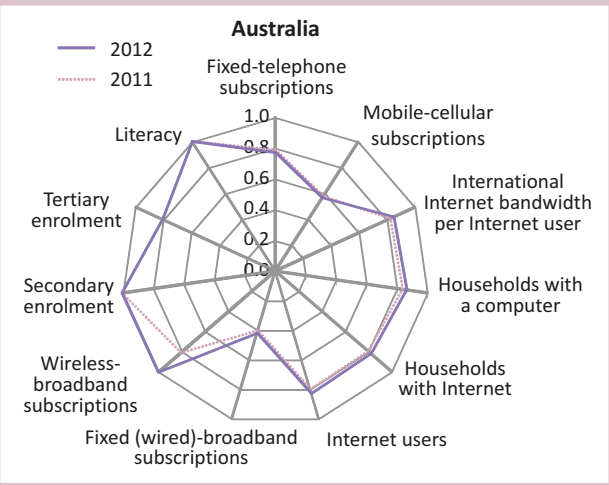
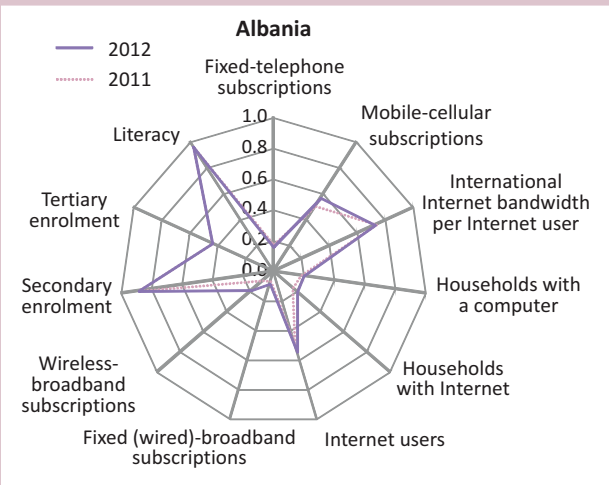


Figure 2.3: IDI spider charts, selected dynamic countries, 2011 and 2012 (continued)

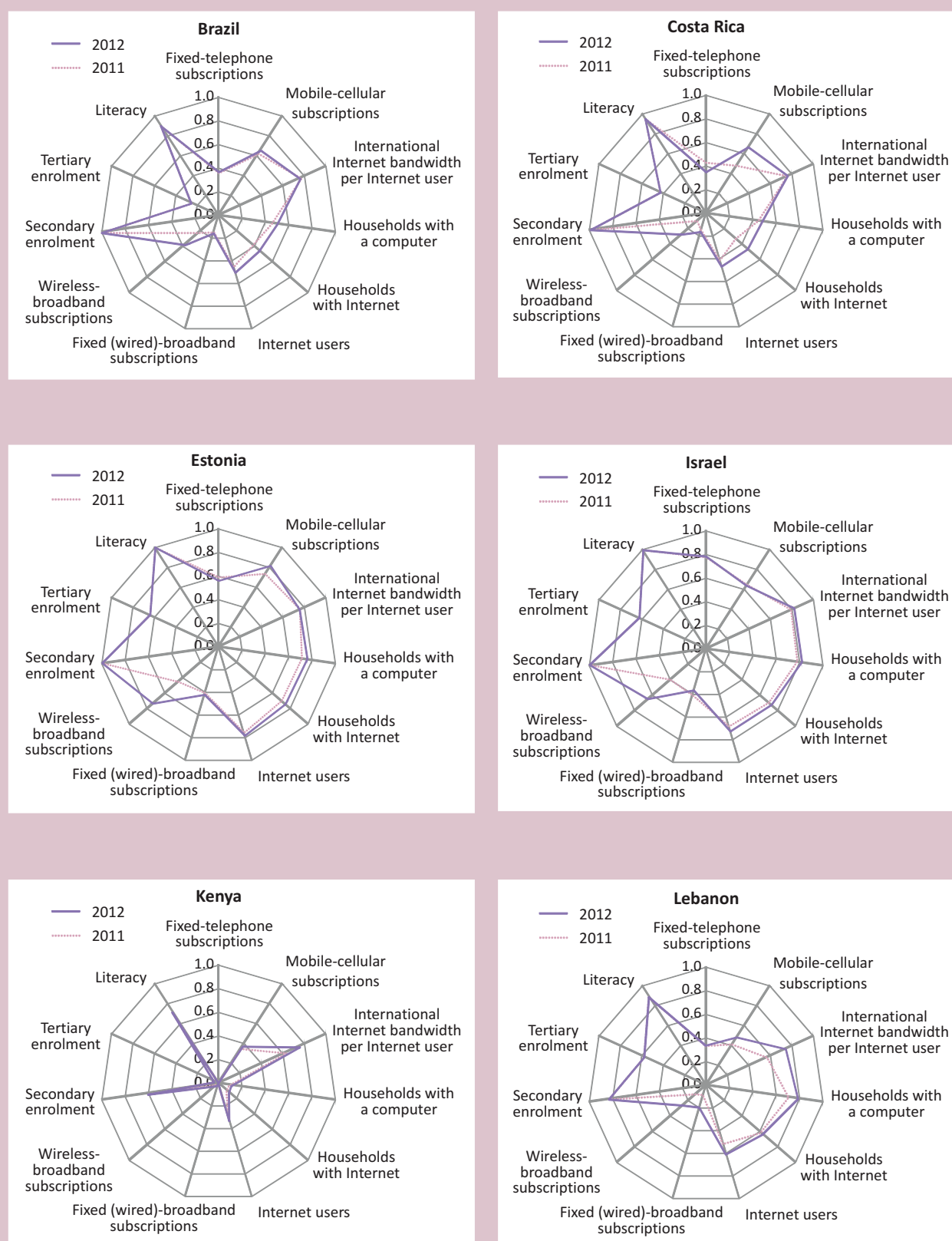
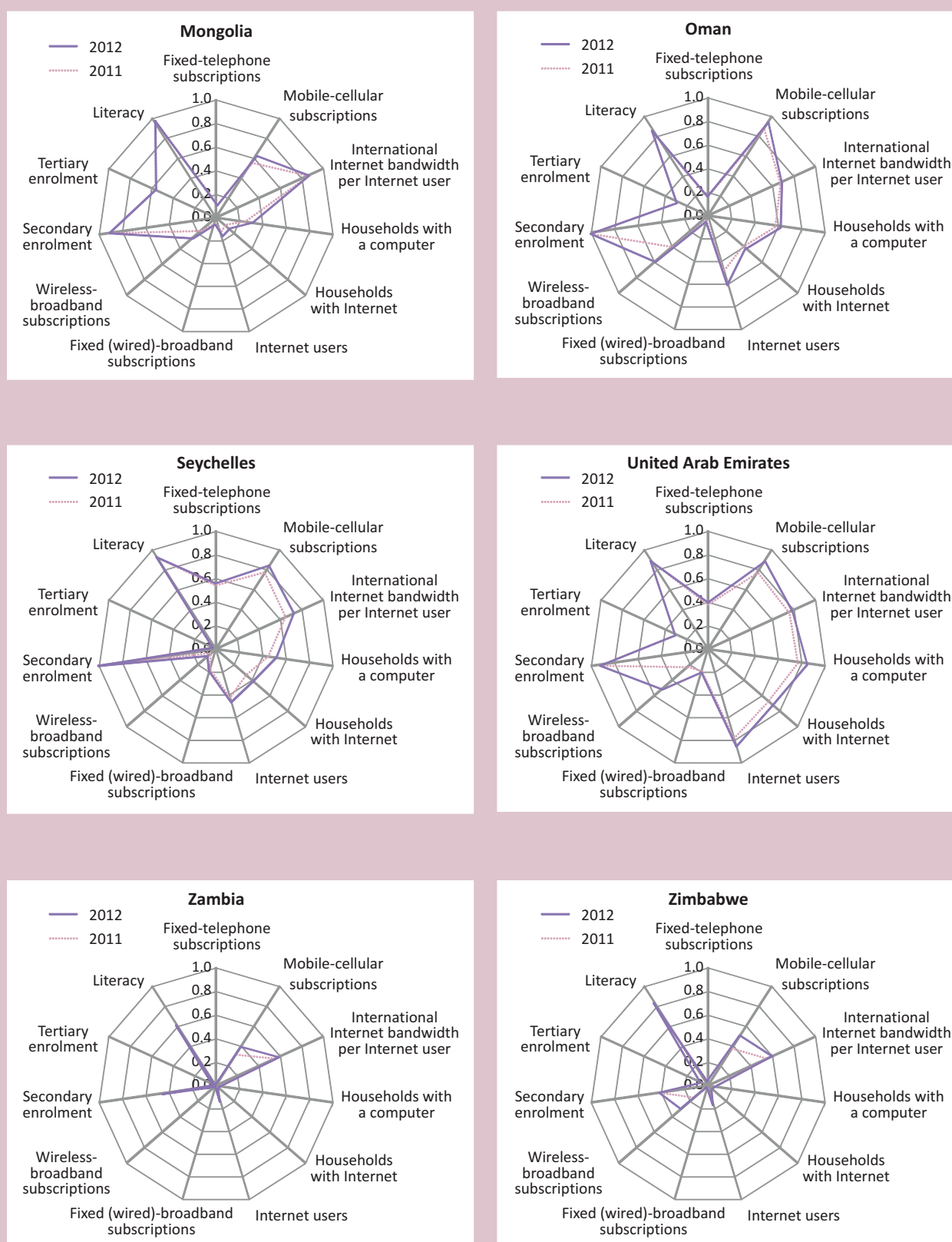


Figure 2.3: IDI spider charts, selected dynamic countries, 2011 and 2012 (continued)



Note: These charts show normalized values of the indicators included in the IDI.
Source: ITU.

where the most progress was made. Zimbabwe's mobile-cellular penetration went up from 72 per cent in 2011 to 97 per cent in 2012. In the use sub-index, wireless-broadband penetration doubled from 15 to 30 per cent over the same period. As a result, Zimbabwe has the second-highest penetration rate in Africa, just after Ghana (34 per cent). In 2012, Zimbabwe's three mobile operators undertook roll-out projects and increased coverage, especially in rural areas of the country.⁶⁶ At the same time, the country's Postal and Telecommunications Regulatory Authority (POTRAZ) has started to set up base stations in the country's underserved areas, funded through the Universal Services Fund (USF).⁶⁷ Apart from infrastructure projects, m-banking is gaining importance in Zimbabwe and increasing the popularity of mobile services. The country's leading operator, Econet Wireless, started a mobile payment service – Ecocash – in 2011, which attracted 1.7 million customers in its first year and, according to the company, is the region's second most successful service after Kenya's m-pesa.⁶⁸ Statistics from POTRAZ further show that the highest share of investments in the telecommunication and postal sector was in data and Internet services (78 per cent of total investments in the second quarter of 2012).⁶⁹

2.3 Monitoring the digital divide: developed, developing and least connected countries

One of the key purposes of measuring ICT developments and for which ITU produces the IDI is to assess and track the global digital divide. The digital divide can be understood as the difference in ICT access and use between countries, between regions, or between other groupings that share common characteristics. At the global level, a common way of identifying differences between countries is to look at national ICT levels in relation to the world average, or to group the world into developed and developing countries and compare their respective performance.

The IDI is an especially useful tool for comparing differences in ICT developments since, as a composite index, it consolidates several ICT indicators into one single value. On the basis of the 2012 and 2011 data presented in this chapter, it is possible not only to gauge the magnitude of

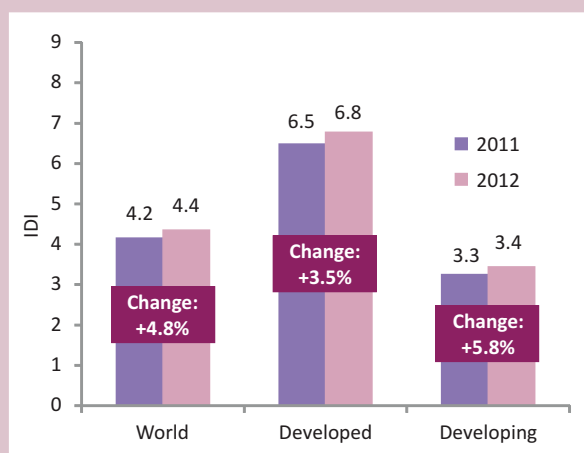
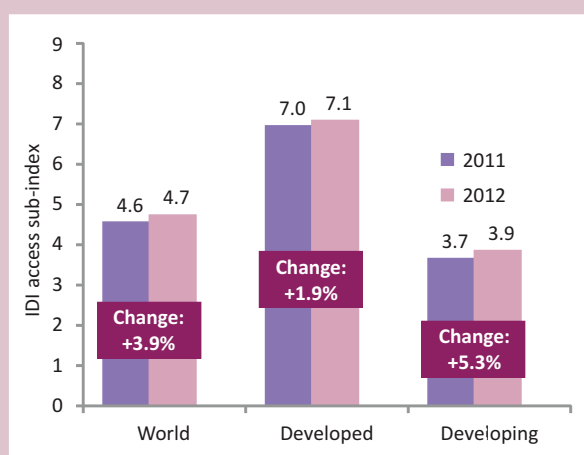
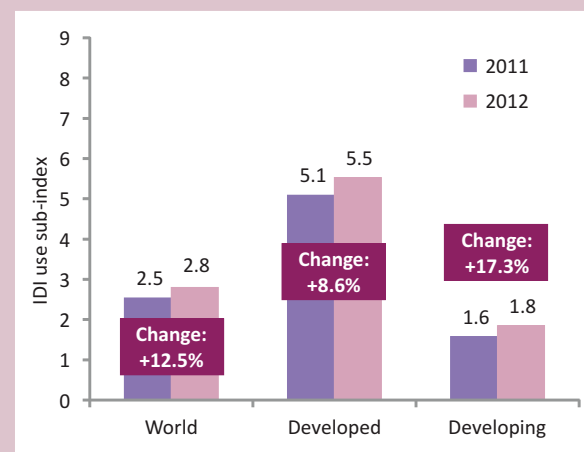
the current (2012) divide but also to ascertain whether the divide has been increasing or decreasing over the past year.

An analysis of the IDI points to a significant divide between the developed and developing world. In 2012, the average developed-country IDI value was exactly twice as high as the developing-country average. At the same time, the developing-country average IDI value is growing faster, at a rate of 5.8 per cent, as against 3.5 per cent for developed countries. While developed countries are starting to reach saturation levels, in particular in terms of mobile-cellular subscriptions and household ICT access, developing countries, where penetration levels remain much lower, continue to have ample potential for growth (Chart 2.1).

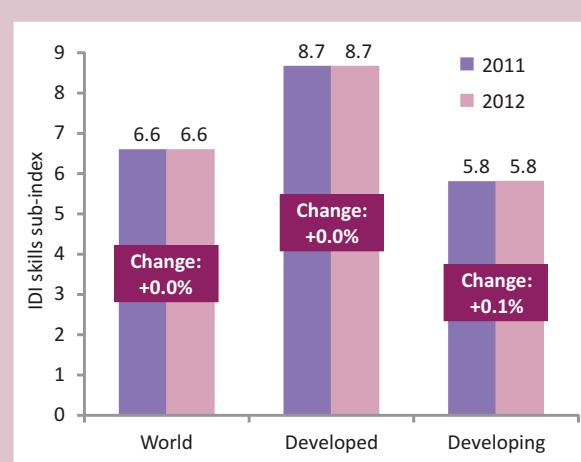
The difference in the access sub-index (Chart 2.2), which measures ICT infrastructure and readiness, is smaller than the difference in the use sub-index, thus confirming that developing countries have been able to make greater progress in providing basic ICT access. Progress has been achieved particularly through mobile-cellular technology, but also through an increase in household access to ICTs and increased availability of international Internet bandwidth. Between 2011 and 2012, the access sub-index in the developing countries grew three times as fast as in the developed world.

The divide, which is measured as the difference in IDI values between groups, is largest in terms of the use sub-index, which measures the uptake and intensity of ICT use. Here, developed countries have reached over three times the average 2012 IDI value of developing countries (Chart 2.3). This gap points to the considerable differences that exist between the developed and developing world in terms of Internet users and fixed (wired)-broadband and wireless-broadband subscriptions. In many developing countries, broadband access remains very limited, and still today some countries have not yet launched 3G high-speed mobile broadband networks, effectively limiting the potential to bring more people online. At the same time, the use sub-index is growing at twice the speed in developing countries. This is a positive development, suggesting that developing countries are catching up.

The smallest differences between developed and developing countries and smallest change between 2011 and 2012 are

Chart 2.1: IDI, world and by level of development**Chart 2.2: IDI access sub-index, world and by level of development****Chart 2.3: IDI use sub-index, world and by level of development**

Note: Simple averages.
Source: ITU.

Chart 2.4: IDI skills sub-index, world and by level of development

Note: Simple averages.
Source: ITU.

found in the skills sub-index (Chart 2.4), where changes take time to come into effect. While developed countries have reached very high levels of literacy and school enrolment, developing countries need to ensure that all citizens are equipped with basic skills to enable them to participate in the information society. This is particularly – and increasingly – important as infrastructure barriers are being overcome and ICTs are made available to an increasingly large proportion of the world's population.

Another way of analysing the digital divide is by tracking the IDI range that separates the countries with the highest and the lowest IDI values. This exercise helps to understand how the top performers are evolving compared to those at the bottom. Between 2011 and 2012, the IDI range remained the same globally as well as in developing countries (7.58 for both), suggesting that the countries with the highest and the lowest ICT levels developed at similar speeds. The IDI range in developed countries, on the other hand, decreased from 4.61 to 4.34, indicating that the gap between the top and bottom performers within the developed-country group is closing slightly. Indeed, the maximum and minimum IDI values in the developed countries show that, between 2011 and 2012, the IDI of the top performer increased only slightly (from 8.41 to 8.45), while the IDI of the developed country with the lowest value increased from 3.80 to 4.11 (Table 2.4).

Table 2.4: IDI by level of development, 2011 and 2012

	IDI 2012						IDI 2011						Change in average value 2011-2012
	Average value*	Min.	Max.	Range	StDev	CV	Average value*	Min.	Max.	Range	StDev	CV	
World	4.35	0.99	8.57	7.58	2.19	50.28	4.15	0.93	8.51	7.58	2.13	51.32	0.20
Developed	6.78	4.11	8.45	4.34	1.14	16.82	6.55	3.80	8.41	4.61	1.16	17.66	0.23
Developing	3.44	0.99	8.57	7.58	1.75	50.79	3.25	0.93	8.51	7.58	1.67	51.26	0.19

Note: * Simple average. StDev: Standard deviation, CV: Coefficient of variation.

Source: ITU.

For both developed and developing countries, the coefficient of variation (CV), which measures the variation or dispersion of all IDI values from the mean IDI values, decreased slightly between 2011 and 2012, suggesting that both groups became slightly more homogeneous.

One shortcoming of grouping countries into only two categories (developed and developing) is that the categories each include countries at very different stages of ICT development. The developing-country group, for instance, which is defined on the basis of the United Nations classification, also includes ICT champions such as the Republic of Korea, Hong Kong (China) and Singapore.

Another way of grouping and comparing countries in order to monitor and analyse the digital divide is by creating

groups based on countries' level of ICT development, i.e. their IDI value. To this end, four groups/quartiles were formed, reflecting four different levels of ICT development: high, upper, medium and low (Table 2.5).

Between 2011 and 2012, the IDI range within each group decreased for the high and upper IDI groups, and increased for the medium and low IDI groups. This suggests that while countries with higher IDI levels are moving at similar speeds, the difference in IDI levels of those at the lower end is increasing. The high and upper groups also have smaller coefficients of variation (CV) than the medium and low groups, suggesting that there is more variation in IDI in the groups with lower levels of ICT development. Between 2011 and 2012, the CV decreased slightly for the medium IDI group, but increased for the low IDI group. This highlights

Table 2.5: IDI by groups, 2011 and 2012

Group	IDI 2012							IDI 2011					
	Number of countries	Average value*	Min.	Max.	Range	StDev	CV	Average value*	Min.	Max.	Range	StDev	CV
High	40	7.30	6.19	8.57	2.38	0.72	9.86	7.06	5.68	8.51	2.83	0.78	11.11
Upper	39	5.08	4.17	6.11	1.95	0.59	11.55	4.80	3.86	5.91	2.05	0.60	12.44
Medium	39	3.31	2.40	4.11	1.70	0.53	15.89	3.12	2.16	3.80	1.64	0.52	16.58
Low	39	1.64	0.99	2.33	1.34	0.36	21.95	1.56	0.93	2.19	1.25	0.33	20.97
Total	157	4.35	0.99	8.57	7.58	2.19	50.28	4.15	0.93	8.51	7.58	2.13	51.32

Note: * Simple average. StDev: Standard deviation, CV: Coefficient of variation.

Source: ITU.

Box 2.9: The least connected countries (LCCs) – home to 2.4 billion people – are not making enough progress to reduce the digital divide

The world's least connected countries (LCCs) are the group of 39 countries with low IDI 2012 values, based on a categorization that divides the 157 countries included in the IDI into four groups (high, upper, medium, and low). In these LCCs, most ICT access and use is limited to basic voice and low-speed data services. While a number of LCCs have reached relatively high levels of mobile-cellular penetration, more advanced ICT services, including broadband Internet access, remain very limited.

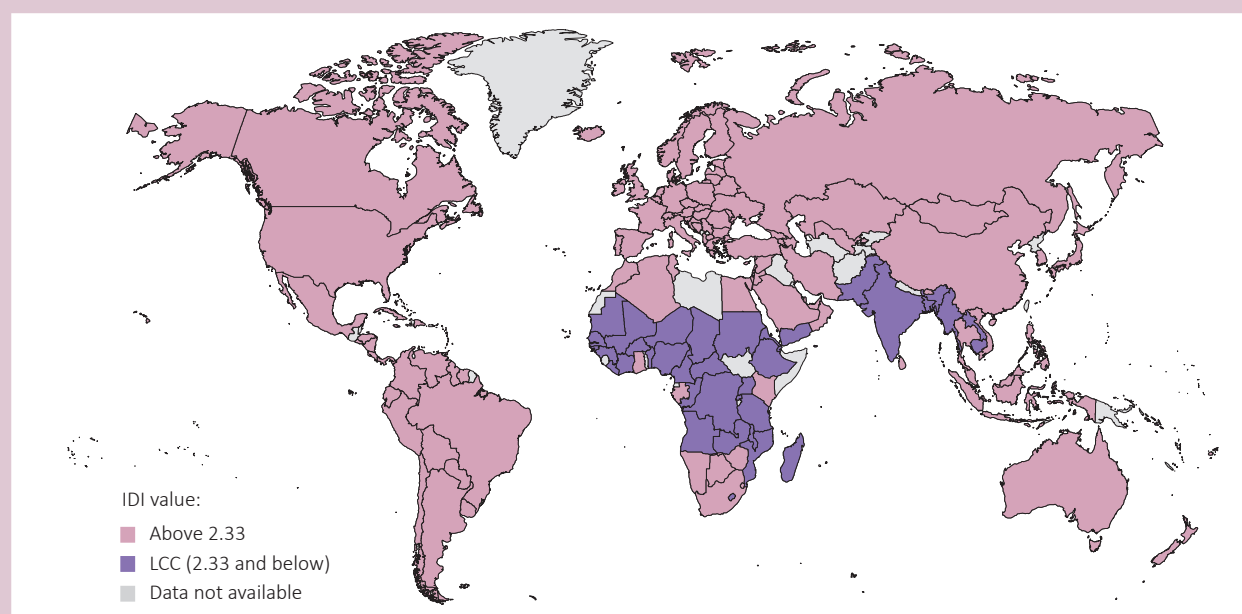
In the majority of LCCs, Internet access is limited, hardly ever high-speed, very expensive, and used by only a small percentage of the population. In Cameroon, Djibouti, Pakistan, Rwanda and Togo, fewer than one in ten people use the Internet. In Papua New Guinea, Myanmar, Eritrea and Niger, fewer than 2 per cent of the population is online. The LCCs also tend to have very low fixed- and mobile-broadband penetration levels, and most only launched and commercialized 3G mobile-broadband networks

relatively late. Some, like Chad, the Central African Republic and Niger had not launched 3G services by end 2012.

The LCCs include many of the world's least developed countries (LDCs), and the majority are in Africa. However, they also include a number of highly populated countries that are not LDCs, including India, Nigeria and Pakistan, and they represent a total population of 2.4 billion, which is more than one-third of the world's total (2012) population.

They are the countries that could potentially derive great benefits from better access to and use of ICTs, including in areas such as health, education and employment. Most of the countries on the list of LCCs are also those that are lagging behind with respect to the Millennium Development Goals (MDGs). This highlights the need to give special attention to these countries and to adapt national policies so that they can make the most of ICTs in order to help foster development and achieve the MDGs.

Figure Box 2.9: Least connected countries (LCCs), 2012

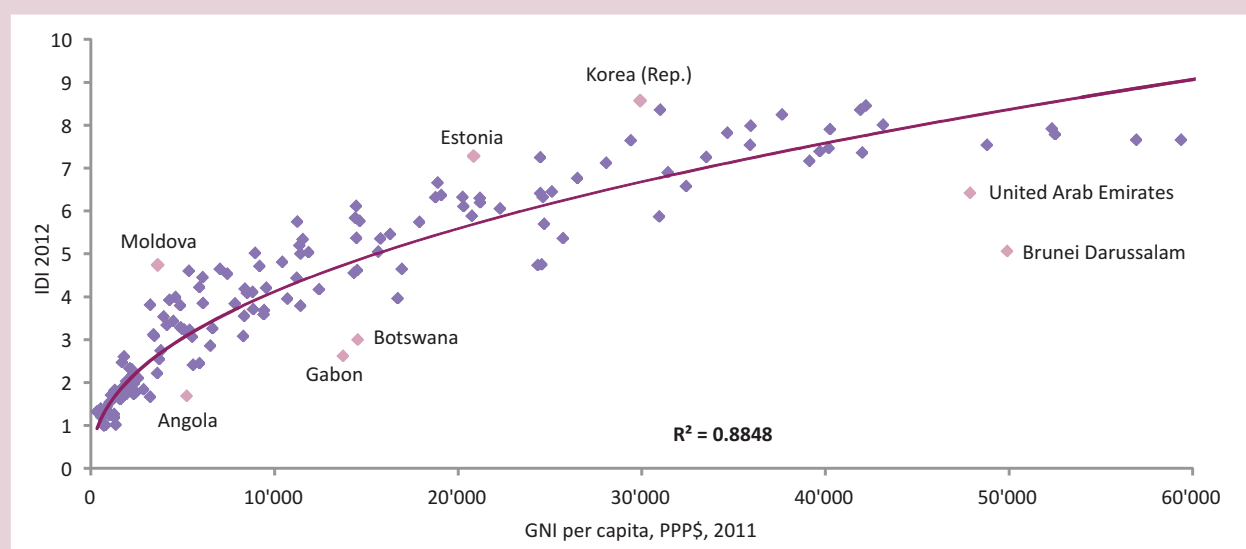


Source: ITU.

that this latter group – comprising the lowest quartile of the 157 countries included in the 2012 IDI – is becoming more heterogeneous and that the divide within this group is widening. Additionally, this group of countries with very low levels of ICT uptake and use also recorded the smallest

increase in the average IDI value between 2011 and 2012 (of only 0.08). Introduced as “least connected countries” (LCCs) in last year’s MIS report (ITU, 2012a), the countries in this group are not making enough progress to catch up in terms of ICT developments (Box 2.9).

Chart 2.5: IDI and GNI per capita



Source: ITU.

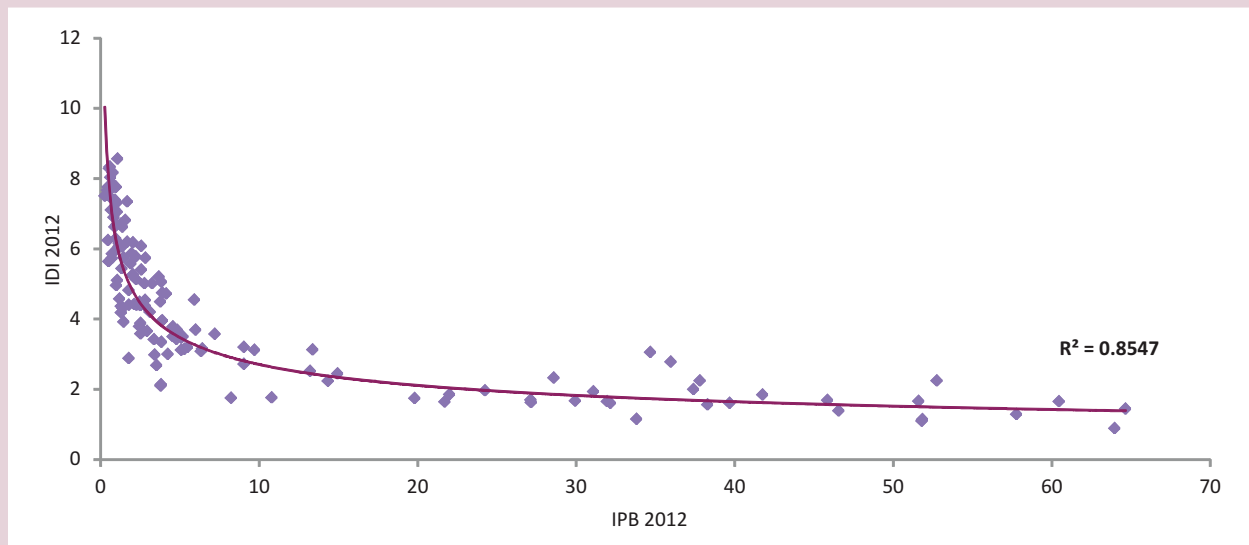
There are many reasons why some countries lag behind in terms of ICTs. While governments can foster ICT growth and uptake to a certain extent, including by creating an open regulatory framework and encouraging private-sector investment, there is a strong link between ICT uptake (and other development issues) and income levels. Indeed, a regression analysis of IDI values and GNI per capita shows a high R-squared value (0.88), which confirms the strong relationship that exists between how wealthy countries are and how advanced their information societies are (Chart 2.5).

Despite the strong link between income and ICT development variables, some countries are faring comparatively better (or worse) than their income levels would predict. Countries such as the Republic of Korea, Estonia and Moldova, for example, lie well above the regression curve and have relatively high IDI values in relation to their gross national income (GNI) level. The Republic of Korea and Estonia, in particular, have made ICTs a national priority and showcased clear leadership in developing and using ICTs and formulating targeted ICT policies that have driven ICT growth and uptake. Countries with relatively high income levels but comparatively lower IDI values include the United Arab Emirates and Brunei

Darussalam, but also Angola, Gabon and Botswana. The comparison suggests that, in these countries, focused policies and government action could quickly lead to higher ICT levels.

ITU has repeatedly highlighted the link between the uptake of ICTs and the price of telecommunication services. Unless voice and Internet services are affordable, people will not be able to use and take advantage of them. Prices are increasingly a subject of investigation by regulatory authorities in charge of ensuring fair competition and consumer protection, and the importance of prices and the differences between countries are further elaborated on in Chapter 3 of this report. A comparison of the IDI with the ICT Price Basket (IPB), ITU's unique metric that compares the affordability of ICT services in more than 160 countries worldwide, confirms the link between ICT uptake and affordability (Chart 2.6). A high R-squared value of 0.85 substantiates the claim that relatively high prices tend to hamper the spread of ICTs, while affordable services foster their uptake and use. Countries with very high ICT prices and very low ICT levels, in particular, must address pricing policies in order to allow more people to join the information society.

Chart 2.6: IDI and IPB



Source: ITU.

2.4 IDI sub-indices: access, use and skills

On the basis of the underlying conceptual framework, which identifies three stages in the evolution of countries towards becoming information societies, the ICT Development Index (IDI) is divided into the three sub-indices: ICT access, ICT use and ICT skills. Each sub-index is composed of a set of indicators that capture these different stages (see section 2.1).

Access sub-index

The access sub-index of the IDI measures ICT infrastructure and readiness – a basic requirement for using and benefiting from ICTs – and is composed of five indicators: fixed-telephone subscriptions per 100 inhabitants, mobile-cellular telephone subscriptions per 100 inhabitants, international Internet bandwidth per Internet user, percentage of households with a computer, and percentage of households with Internet access at home.

Globally, mobile-cellular penetration has reached a high of 96 per cent, and a total of 98 economies (out of the 157 included in the IDI) have attained penetration levels above 100 per cent. In 2012, only few economies, such as Cuba, Eritrea, Ethiopia, Mozambique and Niger, recorded mobile-

cellular penetration rates of around 30 per cent or less. Between 2011 and 2012, mobile-cellular growth rates stood at around 8 per cent in developing countries (as compared with 4 per cent in developed countries), and many developing countries, such as Cambodia, Cameroon, Costa Rica, Rwanda and Zambia, continue to achieve significant increases in the number of mobile-cellular subscriptions.

Major advances are also being made in terms of increasing international Internet bandwidth, and a number of new fibre-optic submarine cables are providing countries with more capacity. According to Telegeography, “International bandwidth demand growth has been robust on all five of the world’s major submarine cable routes, but has been particularly rapid on key routes to emerging markets in Asia, Africa, the Middle East and Latin America”.⁷⁰ While a number of landlocked developing countries, such as the Central African Republic and Chad, continue to suffer from very low levels of international connectivity, many countries, including Indonesia, Kenya, Lebanon and South Africa, have benefited from new cable deployments, and public-private partnerships to distribute them.

The level of household access to ICTs varies greatly among the countries included in the IDI. While in some countries practically all households have a computer and Internet

Box 2.10: Abundant and secure international Internet bandwidth and fast broadband to protect and run Hong Kong (China)'s financial centre

Hong Kong (China)'s telecommunication regulator has ensured that, as one of the world's key financial hubs, Hong Kong has an abundant amount of bandwidth. Its international Internet bandwidth per Internet user is the second highest in the world (after Luxembourg). In December 2012, the eighth high-speed undersea cable system, the Asia Submarine-cable Express (ASE), landed in Hong Kong (China), and more cables are planned. ACE "offers both unparalleled ultra-low latency performance to the region as well as high resiliency on natural disasters and supports enterprises' growth in particular financial institutions for which every millisecond counts in the highly competitive market".⁷¹

According to the Office of the Communications Authority (OFCA), the state-of-the-art telecommunication infrastructure has been an important factor in making Hong Kong (China) one

of the world's leading business and financial centres. OFCA's goal is to ensure that "consumers get the best services available in terms of capacity, quality and price". By end 2012, Hong Kong (China) had 185 licensed broadband Internet service providers and about 2.27 million registered customers (from a population of just over 7 million) enjoying broadband services with speeds up to 1'000 Mbit/s. Some 87 per cent of households had fixed broadband at home, and Hong Kong is also one of the world leaders in the deployment of FTTH/B technologies. In addition to a highly competitive 3G market, all five mobile network operators have deployed LTE technology.

ITU price data also show that Hong Kong's fixed- and mobile-broadband services are very affordable, in particular when compared internationally (see Chapter 3).

Source: ITU, based on <http://www.gov.hk/en/about/abouthk/factsheets/docs/telecommunications.pdf>.

access, penetration rates remain very low in many of the low-income economies. In Bangladesh, Burkina Faso, Democratic Republic of the Congo and Liberia, for example, fewer than 5 per cent of households have a computer. In Mali, Myanmar and Rwanda, fewer than 3 per cent of households have Internet access at home. To increase ICT access in homes, services need to be made available and affordable, and an increasing number of countries have instituted specific programmes and set goals for connecting homes. According to the latest report of the Broadband Commission for Digital Development, on broadband plans, 58 per cent of broadband plans in 2013 reference household targets. In total, some 133 countries (around 70 per cent) had a national broadband plan.⁷²

Most countries in the world are not making any changes in terms of their fixed-telephone penetration, and growth has been negative in developed and developing regions since 2009. Exceptions, where an increase in the number of fixed-telephone subscriptions has influenced countries' IDI access sub-index value, include Moldova, Seychelles and the United Arab Emirates.

Given the importance of basic access as a prerequisite for making use of ICTs, many of the economies that rank

at the top of the overall IDI also have a very high access sub-index value. The list is topped by Hong Kong (China), which displays a very high value of 9.18, and also ranked first in last year's access sub-index. An important financial hub, Hong Kong (China) continues to make sure that it has access to abundant international Internet bandwidth and that it benefits from a high degree of competition, the latest broadband technologies and low prices (Box 2.10). The list of the top ten economies on the access sub-index includes a number of other smaller economies (Luxembourg, Iceland, Switzerland, Singapore and Malta), but also countries with large populations (Germany and the United Kingdom) (Table 2.6).

The IDI access sub-index highlights very important differences in ICT readiness worldwide. While the top performer is approaching the maximum value of ten, the countries at the bottom (Central African Republic and Eritrea) have access values of just above one. The range that separates the countries at the top from those at the bottom actually increased slightly between 2011 and 2012 (from 8.01 to 8.06), suggesting that the divide in basic access to ICTs is far from being bridged (Table 2.1).

Table 2.6: IDI access sub-index, 2011 and 2012

Economy	Rank 2012	Access 2012	Rank 2011	Access 2011
Hong Kong, China	1	9.18	1	9.13
Luxembourg	2	8.93	2	8.72
Iceland	3	8.77	3	8.71
Switzerland	4	8.73	4	8.61
Germany	5	8.51	5	8.48
United Kingdom	6	8.46	7	8.30
Sweden	7	8.37	6	8.36
Singapore	8	8.31	9	8.21
Netherlands	9	8.28	8	8.23
Malta	10	8.28	11	8.16
Korea (Rep.)	11	8.28	10	8.19
Denmark	12	8.18	12	8.14
Austria	13	7.96	15	7.74
France	14	7.95	14	7.77
Macao, China	15	7.93	13	7.91
Japan	16	7.73	17	7.64
Norway	17	7.72	16	7.70
New Zealand	18	7.69	22	7.49
Belgium	19	7.67	18	7.58
Finland	20	7.66	20	7.55
Canada	21	7.65	19	7.58
Australia	22	7.64	21	7.55
Ireland	23	7.59	23	7.49
Israel	24	7.57	24	7.38
United Arab Emirates	25	7.31	35	6.73
Barbados	26	7.29	28	7.03
Estonia	27	7.27	29	7.00
Bahrain	28	7.25	34	6.82
United States	29	7.24	26	7.12
Slovenia	30	7.23	25	7.17
Italy	31	7.15	27	7.08
Qatar	32	7.10	32	6.88
Spain	33	7.05	30	6.99
Antigua & Barbuda	34	7.03	31	6.94
Portugal	35	7.00	33	6.83
Saudi Arabia	36	6.76	38	6.58
Russian Federation	37	6.73	39	6.53
Greece	38	6.69	36	6.58
Croatia	39	6.66	37	6.58
Czech Republic	40	6.60	40	6.49
Kazakhstan	41	6.60	47	6.14
Brunei Darussalam	42	6.55	42	6.35
Lithuania	43	6.47	41	6.44
Poland	44	6.46	43	6.32
Hungary	45	6.46	44	6.30
Cyprus	46	6.45	45	6.29
Belarus	47	6.41	53	6.01
Uruguay	48	6.38	49	6.06
Bulgaria	49	6.33	50	6.04
Slovakia	50	6.28	48	6.13
Latvia	51	6.25	52	6.02
St. Vincent and the Gr.	52	6.12	51	6.02
Seychelles	53	6.10	57	5.49
Malaysia	54	6.09	54	5.76
Lebanon	55	6.04	64	5.34
Argentina	56	5.88	56	5.59
Serbia	57	5.82	46	6.24
Romania	58	5.81	55	5.61
Moldova	59	5.81	60	5.45
Oman	60	5.74	61	5.42
Trinidad & Tobago	61	5.67	58	5.46
Chile	62	5.65	62	5.40
TFYR Macedonia	63	5.65	59	5.45
Maldives	64	5.62	63	5.38
Costa Rica	65	5.53	69	4.95
Panama	66	5.51	66	5.06
Brazil	67	5.49	65	5.18
Ukraine	68	5.27	71	4.88
Saint Lucia	69	5.20	67	5.04
Azerbaijan	70	5.17	72	4.84
Mauritius	71	5.17	70	4.91
Turkey	72	5.11	68	5.01
Georgia	73	5.06	74	4.65
Jordan	74	4.95	76	4.53
Suriname	75	4.90	73	4.79
Bosnia and Herzegovina	76	4.83	75	4.58
Iran (I.R.)	77	4.68	77	4.53
Morocco	78	4.67	78	4.39
Armenia	79	4.52	79	4.23

Economy	Rank 2012	Access 2012	Rank 2011	Access 2011
China	80	4.36	82	4.04
Colombia	81	4.35	84	3.99
Ecuador	82	4.34	81	4.05
Egypt	83	4.20	83	4.00
Syria	84	4.20	80	4.12
South Africa	85	4.14	88	3.90
Venezuela	86	4.13	87	3.91
Mexico	87	4.11	85	3.93
Mongolia	88	4.04	95	3.69
Viet Nam	89	4.04	89	3.87
Thailand	90	4.00	92	3.77
Tunisia	91	3.95	90	3.79
El Salvador	92	3.95	91	3.78
Jamaica	93	3.93	86	3.91
Fiji	94	3.86	93	3.76
Peru	95	3.85	94	3.74
Albania	96	3.73	96	3.53
Gabon	97	3.67	102	3.30
Indonesia	98	3.62	100	3.35
Paraguay	99	3.60	98	3.45
Algeria	100	3.60	99	3.43
Botswana	101	3.58	97	3.46
Cape Verde	102	3.46	101	3.32
Philippines	103	3.41	106	3.19
Sri Lanka	104	3.36	105	3.21
Dominican Rep.	105	3.35	103	3.30
Bolivia	106	3.27	108	3.06
Tonga	107	3.25	104	3.23
Guyana	108	3.18	109	3.01
Cambodia	109	3.14	112	2.72
Namibia	110	3.09	110	2.87
Honduras	111	3.05	107	3.11
Nicaragua	112	2.99	111	2.74
Kenya	113	2.73	123	2.35
Bhutan	114	2.68	116	2.46
Sudan	115	2.62	120	2.37
Senegal	116	2.59	121	2.37
Côte d'Ivoire	117	2.58	113	2.48
Mauritania	118	2.58	119	2.41
Pakistan	119	2.56	115	2.47
Zimbabwe	120	2.54	126	2.19
Lao P.D.R.	121	2.53	122	2.36
India	122	2.50	114	2.47
Mali	123	2.44	127	2.18
Swaziland	124	2.43	117	2.46
Gambia	125	2.42	125	2.26
Ghana	126	2.40	128	2.15
Uzbekistan	127	2.38	118	2.44
Benin	128	2.36	124	2.27
Lesotho	129	2.26	130	2.01
Zambia	130	2.12	133	1.89
Djibouti	131	2.11	129	2.08
Yemen	132	2.09	134	1.86
Bangladesh	133	2.03	138	1.81
Solomon Islands	134	2.02	131	1.97
Nigeria	135	1.99	136	1.85
Congo	136	1.99	135	1.85
Rwanda	137	1.96	141	1.78
Uganda	138	1.95	132	1.93
Cameroon	139	1.87	143	1.72
Tanzania	140	1.87	139	1.79
Burkina Faso	141	1.87	142	1.76
Comoros	142	1.87	137	1.82
Angola	143	1.83	140	1.78
Liberia	144	1.80	148	1.54
Malawi	145	1.72	144	1.72
Guinea	146	1.71	145	1.65
Mozambique	147	1.69	146	1.60
Niger	148	1.65	149	1.54
Ethiopia	149	1.64	147	1.60
Myanmar	150	1.62	150	1.53
Guinea-Bissau	151	1.49	154	1.32
Madagascar	152	1.48	151	1.48
Cuba	153	1.45	152	1.38
Chad	154	1.40	155	1.23
Congo (Dem. Rep.)	155	1.33	153	1.32
Eritrea	156	1.23	156	1.12
Central African Rep.	157	1.12	157	1.12

Source: ITU.

Box 2.11: Kenya – largest amount of international Internet bandwidth per Internet user in Africa

Kenya has made significant advances in its access sub-index, which rose from 2.35 in 2011 to 2.73 in 2012. This allowed the country to climb ten places in the access sub-index rankings, although it did not improve in the overall IDI ranking, where it still stands in 116th position in 2012. Within the access sub-index, international Internet bandwidth per Internet user increased substantially in 2012, and Kenya has become the country with the largest amount of international Internet bandwidth per Internet user in the Africa region (see Chart Box 2.11).

Prior to 2009, Kenya's international Internet connectivity was dependent on satellite links. Understanding the importance of greater Internet capacity, the Kenyan Government has long advocated the landing of submarine cables on its shores. Instead of relying on the private sector, the Kenyan

authorities decided to participate in the construction project for a submarine cable system. The East African Marine System (TEAMS), a public-private partnership (PPP) between the Kenyan Government and Etisalat, the United Arab Emirates incumbent telecommunication operator, went live in October 2009 and links Kenya's coastal town of Mombasa with the United Arab Emirates.⁷³ However, TEAMS is not Kenya's only source of international Internet bandwidth. Since 2009, SEACOM, the Eastern Africa Submarine Cable System (EASSy) and LION2 have all become operational. While the latter two are run and operated by several international telecommunication companies, SEACOM is owned by private investors.

Following the success of TEAMS, another PPP was initiated to expand the country's national backbone network. Kenya's open access National Optical Fibre Backbone Infrastructure (NOFBI) terrestrial network complements the country's cable systems and brings bandwidth to the districts.⁷⁴

With the landing of the fourth submarine cable system (LION2) in April 2012, the country was able to increase its capacity significantly. LION2 is an extension of the LION submarine cable system which connects countries bordering the Indian Ocean.⁷⁵ Apart from boosting Kenya's international Internet bandwidth capacity, the additional cable will provide redundancy in case of outages and thus guarantee network stability and reliability. LION2 will also allow a greater quantity of international Internet traffic to go through Kenya and strengthen the country's position as a regional communication hub, according to Telekom Kenya, one of the shareholders.⁷⁶ Data from the Communications Commission of Kenya (CCK) shows that the total used bandwidth has increased during the course of 2012,⁷⁷ driven mostly by the bandwidth capacity of submarine cables (CCK, 2012).

Chart Box 2.11: International Internet bandwidth per Internet user, top five countries, Africa, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

The economies that have made the most progress between 2011 and 2012 in terms of ICT access are all from the developing world (Table 2.7). Most of them are ranked in the upper and medium groups on the overall IDI, but the list also includes the high-income economy of the United Arab Emirates.

The **United Arab Emirates** improved its ranking on the access sub-index by ten places by significantly increasing penetration rates for all the indicators making up the access

sub-index. Both fixed- and mobile-cellular penetration increased, from 23 to 24 per cent and from 149 to 170 per cent, respectively, in 2012. The proportion of households with a computer and with Internet access increased from 77 to 85 per cent and from 67 to 72 per cent, respectively. The country's international Internet bandwidth increased substantially, by almost 70 per cent, to 254 000 Mbit/s (Box 2.7).

Kenya also improved its position by ten places, to 113th on the access sub-index in 2012, thanks primarily to a large

Table 2.7: Top ten economies with the greatest 2011-2012 change in the IDI access sub-index, by absolute value change (left) and rank change (right)

IDI rank 2012	Access rank 2012	Country	Access value change 2011-2012
52	55	Lebanon	0.70
64	53	Seychelles	0.62
33	25	United Arab Emirates	0.58
60	65	Costa Rica	0.57
48	41	Kazakhstan	0.45
70	66	Panama	0.45
39	28	Bahrain	0.44
120	109	Cambodia	0.43
76	74	Jordan	0.42
71	73	Georgia	0.41

IDI rank 2012	Access rank 2012	Country	Access rank change 2011-2012
33	25	United Arab Emirates	10
116	113	Kenya	10
52	55	Lebanon	9
85	88	Mongolia	7
39	28	Bahrain	6
48	41	Kazakhstan	6
41	47	Belarus	6
115	120	Zimbabwe	6
112	97	Gabon	5
119	115	Sudan	5

Source: ITU.

Box 2.12: Cambodia's heated mobile market

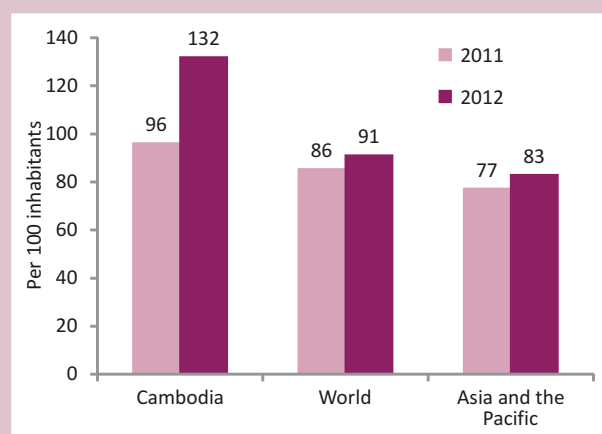
Cambodia registered one of the highest increases in the IDI access sub-index between 2011 and 2012, improving its access sub-index value by 0.43 and moving up three places in the sub-index rankings. It ranks 120th in the overall IDI in 2012, up one position from the year before.

During this time period, mobile-cellular subscriptions went up from 96 to 132 per 100 inhabitants. This represents a 37 per cent growth in mobile-cellular penetration, well above the global and regional average (Chart Box 2.12). Cambodia has a highly competitive and fast-moving mobile market in which eight to ten

carriers have been operating in recent years.⁷⁸ In this competitive environment, price wars have occurred over market shares, with operators trying to lure new customers by offering free SIM cards, high top-up bonuses for SMS, minutes and data, as well as cash prizes. The latest price war erupted in 2012 between the mobile operators Smart and MobiTel. Both were offering very cheap prices and high top-up bonuses for calls, SMS and data. The country's telecommunication regulator ended this latest price war, with reference to the 2009 proclamation, which set a minimum price per minute in order to ensure the sustainable development of the mobile market.⁷⁹

Mobile communication has expanded rapidly and plays an important role in this least-developed country, where fixed telecommunication infrastructure is very limited. Fixed-telephone penetration in Cambodia stood at 4 per cent at end 2012, compared to the Asia and the Pacific regional average of 13 per cent and the developing-country average of 11 per cent. Fixed (wired)-broadband penetration remains very low, at 0.20 per cent at end 2012.

Cambodia also made good progress on the use sub-index, moving up eight places in the rankings. In 2012, the country extended its mobile-broadband network, and increased wireless-broadband penetration from 2 per cent in 2011 to 7 per cent in 2012. In 2013, Cambodia has finalized its National Broadband Policy, which – once implemented – will help foster broadband development in the country.⁸⁰

Chart Box 2.12: Mobile-cellular telephone subscriptions, 2011 and 2012

Source: ITU World Telecommunication/ICT Indicators database.

increase in international Internet bandwidth per Internet user, which jumped from 4 500 Mbit/s in 2011 to 24 000 Mbit/s in 2012. In terms of international Internet bandwidth per Internet user, this makes Kenya the bandwidth-richest country in Africa (Box 2.11).

A very sizeable expansion in international Internet bandwidth also took place in **Lebanon**, and between 2011 and 2012 Lebanon was the country with the highest value change on the access sub-index. The country, which has been highlighted for its achievements in terms of household access to ICTs, also improved its ranking, from 64th in 2011 to 55th in 2012.⁸¹

Cambodia and **Sudan** are the only countries from the group of LCCs that feature in the top ten economies showing the greatest change in the IDI access sub-index between 2011 and 2012. In Cambodia, household access to ICTs remains low, but the number of mobile-cellular subscriptions increased to 132 per 100 inhabitants in 2012, from 96 a year earlier (Box 2.12). In Sudan, the number of households with a computer and with Internet access increased substantially, from 11 to 14 per cent and from 21 to 29 per cent, respectively.

Use sub-index

The use sub-index of the IDI measures the uptake of ICTs and the intensity of usage – indispensable for countries to become information economies and societies. The use sub-index is composed of three indicators: Internet users per 100 inhabitants, fixed (wired)-broadband subscriptions per 100 inhabitants, and wireless-broadband subscriptions per 100 inhabitants.

The number of Internet users worldwide is increasing steadily and ITU estimates that, by end 2013, there will be some 2.7 billion Internet users, representing a penetration rate of 40 per cent. Many high-income economies have Internet penetration rates of over 80 per cent and in some of them, including in Iceland, Norway and Denmark, over 90 per cent of people are online. In developing countries, fewer people are able to benefit of the potential of the Internet and in some economies, including Pakistan, Rwanda and Djibouti, fewer than one in ten people are online. In some of the world's LCCs (see Box 2.9), Internet penetration rates remain insignificant.

Chart 2.7: Countries with a national broadband plan



Source: ITU World Telecommunication/ICT Regulatory Database.

Increasing growth in fixed (wired)-broadband and particularly wireless-broadband penetration rates, however, is enabling many countries in the world to connect previously unconnected areas and bring more people online. Between 2011 and 2012, the total number of mobile-broadband subscriptions grew by 34 per cent globally, and by over 60 per cent in developing countries. A number of countries were able to improve their rankings on the IDI use sub-index significantly by virtue of very strong wireless-broadband growth rates between 2011 and 2012. In some of these countries, such as Albania, Barbados and Lebanon, 3G services were launched relatively recently and so wireless broadband is starting from low levels. In more and more countries, governments are making broadband access to the Internet a policy priority and, according to recent ITU data, in early 2013 over 70 per cent of countries had a national plan, strategy or policy already in place to promote broadband, while another 7 per cent were planning to introduce such measures in the near future (Chart 2.7).

The countries found at the top of the IDI use sub-index correspond to a large extent to those ranking high on the overall IDI. Sweden, the Republic of Korea and Iceland come first, second and third, respectively, and the top ten also includes Japan and Australia (Table 2.8).

The IDI use sub-index reveals important differences in ICT use and intensity globally. Whereas the countries

Table 2.8: IDI use sub-index, 2011 and 2012

Economy	Rank 2012	Use 2012	Rank 2011	Use 2011
Sweden	1	8.25	2	8.16
Korea (Rep.)	2	8.22	1	8.17
Denmark	3	8.15	3	7.78
Norway	4	8.05	4	7.67
Finland	5	8.05	5	7.51
Japan	6	7.51	6	7.49
Iceland	7	7.50	10	6.96
Australia	8	7.46	12	6.66
Netherlands	9	7.32	9	6.99
Luxembourg	10	7.29	8	7.07
Singapore	11	7.25	7	7.12
United Kingdom	12	7.19	13	6.46
Macao, China	13	6.88	11	6.71
United States	14	6.76	14	6.43
New Zealand	15	6.72	17	6.09
Hong Kong, China	16	6.62	18	6.02
France	17	6.60	16	6.11
Switzerland	18	6.54	15	6.24
Estonia	19	6.52	24	5.45
Canada	20	6.38	19	5.84
Ireland	21	6.08	20	5.81
Germany	22	6.05	21	5.76
Malta	23	6.04	25	5.17
Austria	24	5.97	23	5.56
Israel	25	5.86	27	5.02
Qatar	26	5.79	22	5.70
Belgium	27	5.75	26	5.07
Spain	28	5.52	29	4.96
Latvia	29	5.45	30	4.78
United Arab Emirates	30	5.18	40	3.93
Czech Republic	31	5.17	28	5.02
Barbados	32	5.00	44	3.64
Croatia	33	4.99	32	4.63
Slovenia	34	4.94	33	4.61
Italy	35	4.89	34	4.60
Poland	36	4.84	31	4.75
Slovakia	37	4.79	35	4.42
Bahrain	38	4.75	41	3.92
Greece	39	4.65	36	4.17
Hungary	40	4.48	37	4.17
Portugal	41	4.45	39	4.00
Russian Federation	42	4.34	42	3.91
Cyprus	43	4.23	38	4.00
Bulgaria	44	4.20	45	3.64
Belarus	45	4.13	52	3.17
Oman	46	4.07	54	2.99
Uruguay	47	3.84	51	3.19
Antigua & Barbuda	48	3.77	43	3.76
Lithuania	49	3.76	46	3.58
Azerbaijan	50	3.72	53	3.07
Kazakhstan	51	3.71	47	3.37
TFYR Macedonia	52	3.67	49	3.22
Chile	53	3.67	55	2.98
Saudi Arabia	54	3.67	48	3.28
Lebanon	55	3.54	63	2.37
Serbia	56	3.52	50	3.20
Brazil	57	3.41	59	2.69
Romania	58	3.34	58	2.78
Bosnia and Herzegovina	59	3.19	56	2.90
Argentina	60	3.16	60	2.69
Malaysia	61	3.11	57	2.85
Costa Rica	62	3.06	68	2.24
Trinidad & Tobago	63	2.83	61	2.56
Georgia	64	2.82	64	2.35
Albania	65	2.71	74	2.15
China	66	2.70	69	2.24
Mauritius	67	2.69	76	2.12
Turkey	68	2.63	66	2.30
Armenia	69	2.60	70	2.21
Brunei Darussalam	70	2.53	62	2.39
Seychelles	71	2.52	71	2.18
Egypt	72	2.51	67	2.25
Panama	73	2.46	65	2.34
Saint Lucia	74	2.39	72	2.17
South Africa	75	2.35	81	1.89
Maldives	76	2.32	77	2.02
Morocco	77	2.28	75	2.13
St. Vincent and the Gr.	78	2.27	73	2.15
Dominican Rep.	79	2.27	84	1.77
Moldova	80	2.27	80	1.94
Colombia	81	2.26	82	1.86
Mexico	82	2.23	79	1.97
Viet Nam	83	2.22	78	2.01
Ecuador	84	2.22	87	1.63
Cape Verde	85	2.12	93	1.39
Venezuela	86	2.00	83	1.82
Fiji	87	1.99	88	1.60
Uzbekistan	88	1.95	86	1.65
Jordan	89	1.92	89	1.55
Jamaica	90	1.84	90	1.51
Tunisia	91	1.82	85	1.67
Ukraine	92	1.76	91	1.49
Nigeria	93	1.72	95	1.29
Ghana	94	1.71	96	1.25
Mongolia	95	1.64	100	1.17
Indonesia	96	1.64	98	1.21
Peru	97	1.63	92	1.47
Zimbabwe	98	1.59	105	1.03
Namibia	99	1.55	102	1.14
Suriname	100	1.49	94	1.33
Philippines	101	1.46	99	1.18
Bolivia	102	1.42	103	1.13
Guyana	103	1.36	97	1.21
Sudan	104	1.26	101	1.16
El Salvador	105	1.25	108	0.93
Tonga	106	1.24	109	0.90
Thailand	107	1.23	104	1.10
Paraguay	108	1.17	106	1.02
Kenya	109	1.15	107	0.95
Iran (I.R.)	110	1.14	110	0.85
Swaziland	111	1.11	118	0.65
Bhutan	112	1.05	111	0.83
Botswana	113	1.00	114	0.70
Syria	114	0.97	112	0.81
Sri Lanka	115	0.87	116	0.67
Cuba	116	0.86	113	0.78
Honduras	117	0.81	117	0.66
Senegal	118	0.80	115	0.68
Uganda	119	0.75	121	0.53
Algeria	120	0.68	119	0.62
India	121	0.65	124	0.46
Angola	122	0.62	120	0.55
Yemen	123	0.62	122	0.52
Nicaragua	124	0.58	123	0.46
Tanzania	125	0.49	126	0.44
Lesotho	126	0.48	125	0.45
Zambia	127	0.48	127	0.40
Solomon Islands	128	0.47	130	0.35
Lao P.D.R.	129	0.46	129	0.36
Gambia	130	0.46	128	0.38
Cambodia	131	0.41	139	0.19
Pakistan	132	0.38	131	0.34
Rwanda	133	0.38	135	0.27
Djibouti	134	0.37	133	0.30
Mauritania	135	0.32	132	0.33
Gabon	136	0.30	134	0.28
Congo	137	0.28	137	0.20
Malawi	138	0.26	136	0.21
Bangladesh	139	0.24	138	0.20
Mozambique	140	0.23	141	0.18
Comoros	141	0.20	140	0.18
Cameroon	142	0.19	142	0.17
Benin	143	0.14	143	0.13
Burkina Faso	144	0.13	144	0.10
Liberia	145	0.13	145	0.10
Central African Rep.	146	0.10	149	0.07
Guinea-Bissau	147	0.10	146	0.09
Mali	148	0.10	148	0.08
Côte d'Ivoire	149	0.09	147	0.09
Chad	150	0.08	150	0.07
Madagascar	151	0.07	151	0.07
Niger	152	0.07	152	0.06
Ethiopia	153	0.07	153	0.05
Congo (Dem. Rep.)	154	0.06	155	0.04
Guinea	155	0.05	154	0.04
Myanmar	156	0.04	156	0.03
Eritrea	157	0.03	157	0.02

Source: ITU.

Table 2.9: Top ten economies with the greatest 2011-2012 change in IDI use sub-index, by absolute value change (left) and rank change (right)

IDI rank 2012	Use rank 2012	Country	Use value change 2011-2012
68	92	Ukraine	2.89
90	110	Iran (I.R.)	2.76
63	78	St. Vincent and the Gr.	2.57
58	70	Brunei Darussalam	2.54
65	80	Moldova	2.52
85	95	Mongolia	2.42
41	45	Belarus	2.40
87	100	Suriname	2.40
53	60	Argentina	2.38
106	120	Algeria	2.36

IDI rank 2012	Use rank 2012	Country	Use rank change 2011-2012
29	32	Barbados	12
33	30	United Arab Emirates	10
72	67	Mauritius	9
80	65	Albania	9
52	55	Lebanon	8
120	131	Cambodia	8
54	46	Oman	8
96	85	Cape Verde	8
41	45	Belarus	7
117	111	Swaziland	7

Source: ITU.

with the highest levels of ICT use have reached IDI values approaching 9 (out of a maximum of 10), the countries with the weakest ICT use levels (Niger and the Central African Republic) have IDI values of only one, or less. In both these countries, broadband Internet access is extremely limited and the number of fixed (wired)-broadband and wireless-broadband subscriptions insignificant. Indeed, in 2012 the Central African Republic reported that fixed (wired)-broadband services had been suspended and that WiMAX was the only operational broadband service in the country, which also suffers from a lack of international Internet bandwidth.⁸²

All of the countries that have made the most progress between 2011 and 2012 in terms of ICT use are developing countries (Table 2.9), most of them with upper and medium IDI values. Cambodia, which has also made significant progress in terms of ICT access, is the only country with a low IDI value. The country increased its wireless-broadband penetration from 2 per cent in 2011 to 7 per cent in 2012. Over the same period, Internet penetration rose from 3 per cent to 5 per cent (see Box 2.12).

Barbados and the **United Arab Emirates** – both countries with high IDI values – made the greatest progress in terms of their ranking on the IDI use sub-index. Between 2011 and 2012, they moved up 12 and 10 positions in the rankings, respectively. While both countries made only small progress in terms of their fixed (wired)-broadband penetration, both

made significant strides in spreading high-speed wireless services. In the UAE, wireless-broadband penetration increased from 22 to 51 per cent within one year (see Box 2.7).

Lebanon was singled out in the 2012 MIS report for its strong growth in the IDI access sub-index, but lagged behind in terms of ICT use. Since then, this has changed, and the country has also succeeded in making impressive progress on the use sub-index. The relatively late launch (in October 2011) of 3G mobile-broadband services by the operators MTC Touch and Alfa has quickly driven broadband uptake and Internet user growth. Internet connectivity was also improved through a big increase in the number of fixed-broadband subscriptions, from 210 000 in 2011 to half a million at end 2012, by which time over 60 per cent of the population were using the Internet (up from 52 per cent in 2011).

Both **Mauritius** and **Albania** gained nine places in the IDI use sub-index rankings, thanks especially to strong growth in the number of wireless-broadband subscriptions. In Mauritius, wireless broadband penetration grew by 73 per cent, to 22 per 100 inhabitants in 2012. In Albania, where a growing number of mobile operators are competing for customers and expanding the 3G network, wireless-broadband penetration grew by 109 per cent, to 18 per cent in 2012 (Box 2.13).

Box 2.13: Growth in broadband networks brings more Albanians online

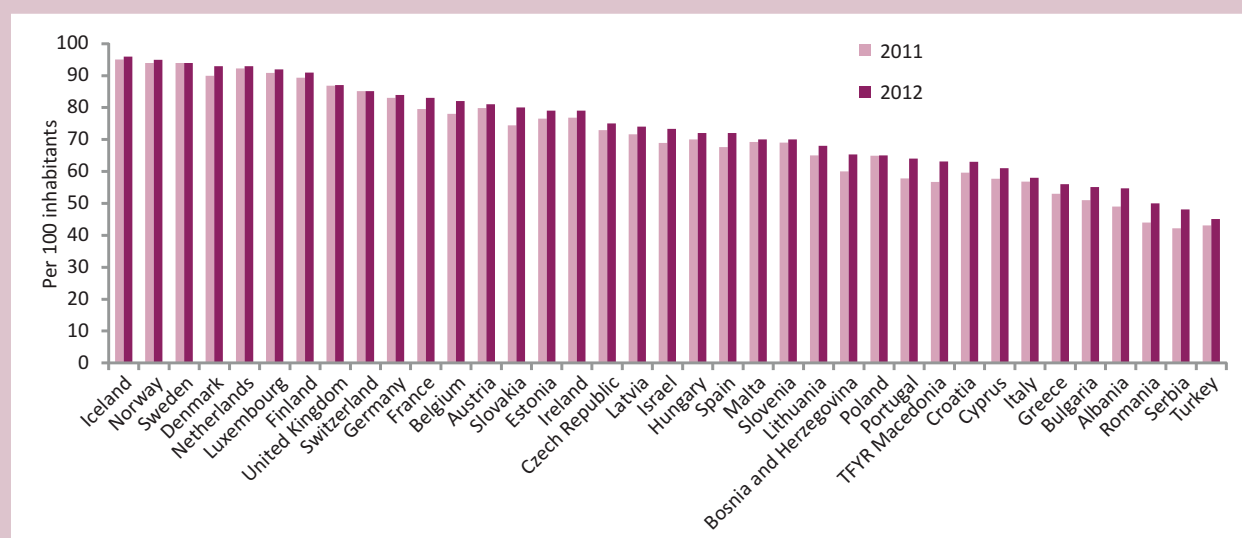
Albania climbed nine places in the IDI use sub-index rankings, with an increase in its use sub-index value of almost twice the global average (0.32), from 2.15 in 2011 to 2.71 in 2012. Growth in the access sub-index was not strong enough to improve the country's overall ranking in the IDI, however, and Albania continues to occupy 80th position globally.

Albania's wireless-broadband penetration doubled, from 9 per cent in 2011 to 18 per cent in 2012. Mobile broadband was first launched in the country in 2010 by Vodafone Albania. A second licence was issued to the mobile operator AMC in November 2011 (MITIC, 2012). Mobile-broadband network coverage expanded quite rapidly: by April 2012, AMC had already achieved 95 per cent population coverage, while Vodafone's 3G network covered 99 per cent of the country's population.⁸³ Both operators offer 3G to prepaid and postpaid customers and for use on a computer or handset, and services are relatively affordable (see Chapter 3). Two additional mobile-broadband licences were auctioned off in 2012, and Eagle Mobile is set to launch 3G services in 2013, thus further increasing competition in the market.⁸⁴ The expansion of wireless broadband as well as fixed

(wired) broadband – where the country saw the highest 2011–2012 growth rate in Europe – has helped to bring Internet access to an increasing number of Albanian households. Between 2011 and 2012, the proportion of households with Internet access is estimated to have increased from 17 per cent to 21 per cent.

The number of Albanians using the Internet is on the rise as well. With an increase in the percentage of individuals using the Internet of around 12 per cent – from 49 per cent in 2011 to 55 per cent in 2012 – Albania has seen one of the highest Internet user growth rates in the Europe region. However, the country remains below the regional European average (71 per cent), and still has one of the lowest Internet user penetration rates in the region after Turkey (45 per cent), Serbia (48 per cent) and Romania (50 per cent) (Chart Box 2.13). A number of policies exist to foster ICT development in the country and further increase Internet user penetration. Albania's broadband strategy⁸⁵ aims at improving broadband infrastructure, increasing competition in the sector, lowering prices and improving the quality of services. Furthermore, the Albanian Government aims to increase the number of public services, including e-government, offered online.⁸⁶

Chart Box 2.13: Individuals using the Internet, Europe, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

Another country that has made good progress on the use sub-index is **Oman**, which went up eight places, to 46th, in 2012. Early launch of 3G mobile-broadband services has

driven broadband competition and increased wireless-broadband penetration from 39 per cent in 2011 to a high of 58 per cent in 2012 (see Box 2.6).

Skills sub-index

The three indicators included in the skills sub-index of the IDI are: adult literacy rate, gross secondary enrolment ratio, and gross tertiary enrolment ratio. These indicators are used as proxy indicators to help capture each country's level of human capacity and its population's ability to make use of ICTs, in the absence of more targeted indicators such as ICT literacy. Therefore, the skills sub-index is weighted less in the calculation of the IDI and makes up 20 per cent of the overall IDI, as compared with 40 per cent for each of the two other sub-indices.

Skills sub-index values change only very gradually, in particular in developed countries where very high levels of literacy and enrolment have already been achieved. Furthermore, data are not always available for the latest year. Thus, 2011 and 2012 sub-index values are identical for most countries (see Table 2.10). Nevertheless, the skills sub-index provides a good indication of the overall level of human capacity in a country. This is important because, in addition to ICT infrastructure, education and skills are necessary for making effective use of ICTs and building a competitive and inclusive information society.

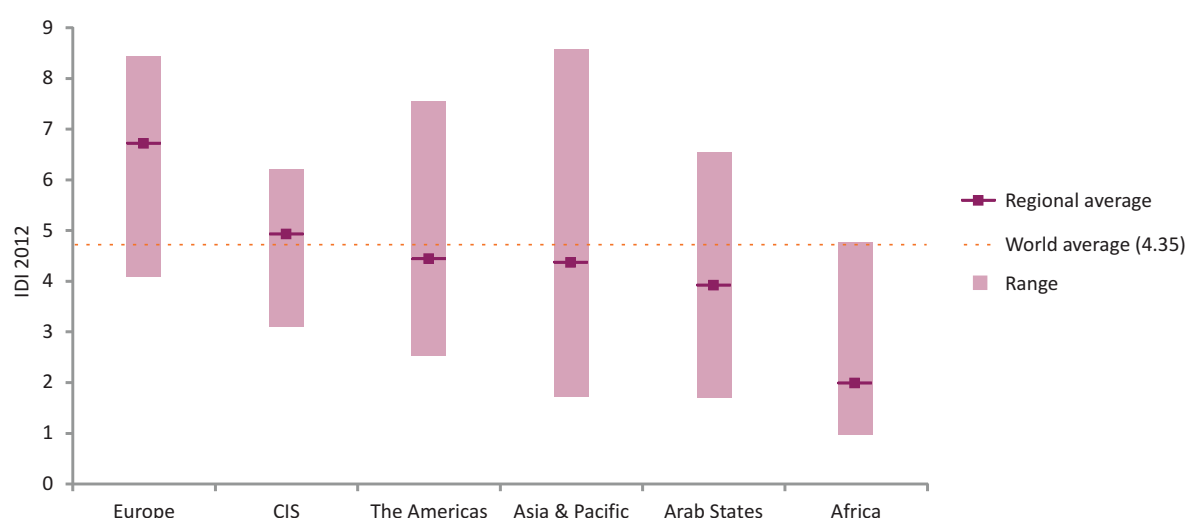
2.5 Regional IDI analysis

The regional analysis of the IDI provides insights into differences in ICT development within and between each of the six regions.⁸⁷ Countries from the Europe region generally have a high IDI, and the region boasts by far the highest regional average IDI of 6.73. The CIS region follows, with the second highest regional IDI of 4.95, followed by the Americas (4.45) and Asia and the Pacific (4.37). The Arab States regional IDI, at 3.94, is slightly below the global average of 4.35. Africa has the lowest regional IDI of 2.0, which is just half that of the Arab States average and less than one-third of the European regional average (see Chart 2.8).

An analysis of the IDI range (calculated by subtracting the lowest IDI value in the region from the highest value) and the coefficient of variation⁸⁸ (which describes the dispersion of a variable) for each region gauges differences in ICT development within each region (see Table 2.11).

Asia and the Pacific displays the largest disparities in ICT development. The region contains both the Republic of Korea, the country with the highest IDI 2012 value, and countries with very low IDI levels, such as Bangladesh and

Chart 2.8: IDI ranges and averages, by region, 2012



Note: Simple averages.
Source: ITU.

Table 2.10: IDI skills sub-index, 2011 and 2012

Economy	Rank 2012	Skills 2012	Rank 2011	Skills 2011
Korea (Rep.)	1	9.86	1	9.86
Finland	2	9.80	2	9.80
United States	3	9.65	3	9.65
Greece	4	9.55	4	9.55
Belarus	5	9.48	5	9.48
Slovenia	6	9.44	6	9.44
New Zealand	7	9.38	7	9.38
Spain	8	9.34	8	9.34
Australia	9	9.29	9	9.29
Iceland	10	9.24	10	9.24
Ukraine	11	9.17	11	9.17
Norway	12	9.10	12	9.10
Denmark	13	9.08	13	9.08
Cuba	14	9.00	14	9.00
Sweden	15	9.00	15	9.00
Belgium	16	8.98	16	8.98
Poland	17	8.96	17	8.96
Lithuania	18	8.92	18	8.92
Austria	19	8.92	19	8.92
Ireland	20	8.89	20	8.89
Canada	21	8.85	21	8.85
Netherlands	22	8.80	22	8.80
Russian Federation	23	8.80	23	8.80
Estonia	24	8.79	24	8.79
Italy	25	8.79	25	8.79
Argentina	26	8.75	26	8.75
Israel	27	8.71	27	8.71
Portugal	28	8.69	28	8.69
Barbados	29	8.69	29	8.69
Chile	30	8.64	30	8.64
Macao, China	31	8.63	31	8.63
Hungary	32	8.62	32	8.62
United Kingdom	33	8.62	33	8.62
Japan	34	8.62	34	8.62
Venezuela	35	8.56	35	8.56
France	36	8.55	36	8.55
Czech Republic	37	8.48	37	8.48
Romania	38	8.45	38	8.45
Latvia	39	8.42	39	8.42
Uruguay	40	8.38	40	8.38
Switzerland	41	8.37	41	8.37
Croatia	42	8.28	42	8.28
Fiji	43	8.24	43	8.24
Mongolia	44	8.23	44	8.23
Germany	45	8.17	45	8.17
Slovakia	46	8.13	46	8.13
Bulgaria	47	8.13	47	8.13
Kazakhstan	48	8.09	49	8.00
Armenia	49	8.01	48	8.01
Serbia	50	7.99	50	7.99
Hong Kong, China	51	7.98	51	7.98
Costa Rica	52	7.97	52	7.97
Cyprus	53	7.94	53	7.94
Colombia	54	7.79	54	7.79
Turkey	55	7.71	55	7.71
Lebanon	56	7.68	56	7.68
Albania	57	7.65	57	7.65
Saudi Arabia	58	7.60	58	7.60
Malta	59	7.58	59	7.58
Moldova	60	7.53	60	7.53
Bosnia and Herzegovina	61	7.51	61	7.51
Bahrain	62	7.47	62	7.47
Peru	63	7.45	63	7.45
Jordan	64	7.35	64	7.35
TFYR Macedonia	65	7.31	66	7.31
Iran (I.R.)	66	7.30	67	7.30
Ecuador	67	7.29	68	7.29
Azerbaijan	68	7.28	69	7.28
Thailand	69	7.26	65	7.34
St. Vincent and the Gr.	70	7.23	70	7.23
Luxembourg	71	7.23	71	7.23
Brazil	72	7.19	72	7.19
Georgia	73	7.19	73	7.19
Oman	74	7.18	74	7.18
Tonga	75	7.17	75	7.17
Brunei Darussalam	76	7.16	76	7.16
Singapore	77	7.12	77	7.12
Antigua & Barbuda	78	7.11	78	7.11
Panama	79	7.11	79	7.11

Economy	Rank 2012	Skills 2012	Rank 2011	Skills 2011
Mexico	80	7.09	80	7.09
United Arab Emirates	81	7.08	81	7.08
Mauritius	82	7.07	82	7.07
Bolivia	83	7.02	83	7.02
Saint Lucia	84	6.98	84	6.98
Tunisia	85	6.95	85	6.95
Philippines	86	6.94	86	6.94
Uzbekistan	87	6.94	87	6.94
Qatar	88	6.92	88	6.92
Jamaica	89	6.85	89	6.85
Sri Lanka	90	6.84	90	6.84
Algeria	91	6.82	91	6.82
Malaysia	92	6.81	92	6.81
China	93	6.77	93	6.77
Maldives	94	6.77	94	6.77
South Africa	95	6.75	95	6.75
Dominican Rep.	96	6.67	96	6.67
Trinidad & Tobago	97	6.67	97	6.67
Indonesia	98	6.61	98	6.61
Paraguay	99	6.54	99	6.54
Cape Verde	100	6.50	100	6.50
Viet Nam	101	6.49	101	6.49
Seychelles	102	6.47	102	6.47
Suriname	103	6.40	103	6.40
Guyana	104	6.34	104	6.34
Honduras	105	5.99	105	5.99
El Salvador	106	5.88	106	5.88
Botswana	107	5.82	107	5.82
Egypt	108	5.80	109	5.74
Syria	109	5.77	108	5.77
Nicaragua	110	5.56	110	5.56
Myanmar	111	5.39	111	5.39
Gabon	112	5.13	112	5.13
Swaziland	113	5.12	113	5.12
Morocco	114	5.03	115	4.93
Namibia	115	4.98	114	4.98
Solomon Islands	116	4.88	116	4.88
India	117	4.79	117	4.79
Ghana	118	4.76	118	4.72
Bhutan	119	4.56	123	4.38
Kenya	120	4.54	119	4.54
Lao P.D.R.	121	4.53	120	4.53
Cameroon	122	4.50	121	4.50
Cambodia	123	4.42	122	4.42
Comoros	124	4.38	124	4.38
Zimbabwe	125	4.35	125	4.35
Lesotho	126	4.28	126	4.28
Bangladesh	127	4.10	127	4.10
Yemen	128	4.04	128	4.04
Djibouti	129	3.90	131	3.80
Sudan	130	3.88	129	3.88
Congo (Dem. Rep.)	131	3.80	130	3.80
Congo	132	3.78	132	3.78
Uganda	133	3.69	133	3.69
Zambia	134	3.64	134	3.64
Gambia	135	3.64	135	3.64
Rwanda	136	3.61	136	3.61
Tanzania	137	3.56	140	3.38
Nigeria	138	3.51	137	3.51
Angola	139	3.51	138	3.51
Eritrea	140	3.46	139	3.46
Senegal	141	3.32	141	3.32
Madagascar	142	3.32	142	3.32
Pakistan	143	3.27	143	3.27
Malawi	144	3.21	144	3.21
Côte d'Ivoire	145	3.16	145	3.16
Guinea-Bissau	146	3.13	146	3.13
Liberia	147	3.07	147	3.07
Benin	148	3.02	148	3.02
Mauritania	149	3.01	149	3.01
Ethiopia	150	2.80	150	2.80
Mozambique	151	2.71	151	2.73
Guinea	152	2.64	153	2.61
Mali	153	2.63	152	2.63
Central African Rep.	154	2.59	154	2.59
Chad	155	2.10	155	2.10
Burkina Faso	156	1.91	156	1.84
Niger	157	1.51	157	1.49

Source: ITU.

Myanmar. As a result, it has by far the highest range (6.84), but also the highest coefficient of variation (51.83), which underlines that there is an important divide in terms of ICT development between the highest and lowest ranked countries. The stark differences in ICT development reflect the region's diversity in terms of development and income levels. Nevertheless, it is very encouraging that Asia and the Pacific registered the largest decrease in the coefficient of variation (-1.76) from 2011 to 2012, which suggests that the regional digital divide is narrowing. The range also decreased slightly, and both the highest ranked country (Republic of Korea) and lowest ranked country (Bangladesh) in the region progressed.

The picture is very different in Africa, the region with the second highest coefficient of variation (46.98). Between 2011 and 2012, Africa was the region where the CV value increased the most, implying a widening of the regional digital divide. The region's top IDI countries (including Seychelles, Mauritius, South Africa and Cape Verde) continue to make good progress in terms of ICT development, while the countries at the bottom (including Central Africa Republic, Burkina Faso, Guinea and Ethiopia) are failing to keep pace both regionally and globally. This is also confirmed by an increase in the regional range.

The regional range and the coefficient of variation increased in both the Arab States and CIS regions between 2011 and 2012. A number of countries from the Arab States region with relatively high IDI values continue to make great

progress in ICT development, and four out of the regional top six – Bahrain, Lebanon, Oman and the United Arab Emirates – are among the most dynamic countries in the IDI 2012. Of the countries that rank further down in regional comparison, Yemen moved up two places in the IDI rankings between 2001 and 2012, to 127th. Syria and Comoros, on the other hand, made little progress and dropped four and three places, respectively.

In the CIS region, the coefficient of variation is much lower – the second lowest globally after Europe – although it increased slightly from 2011 to 2012. Yet there is a quite a divide in terms of ICT development between countries such as the Russian Federation, Belarus and Kazakhstan, which feature in the global top 50, and, for example, Uzbekistan, which comes in 104th position in the IDI 2012.

In the Americas region, the coefficient of variation decreased very slightly. The region is quite diverse and includes, on the one hand, the United States and Canada, which are high-income, developed countries, and, on the other, the developing countries in Latin American and the Caribbean. In the IDI 2012, a number of Latin American and Caribbean countries stand out for having significantly improved their IDI value, including Barbados, Brazil and Costa Rica, which are among the most dynamic countries in the IDI 2012.

Europe is not only the region with the highest average IDI, at 6.73; it is also the most homogeneous. Furthermore, both the range and coefficient of variation continued to decrease

Table 2.11: IDI by region, 2011 and 2012

Region	IDI 2012						IDI 2011						Difference 2011-2012		
	Max.	Min.	Range	Average value*	StDev	CV	Max.	Min.	Range	Average value*	StDev	CV	Range	Average value*	CV
Europe	8.45	4.11	4.34	6.73	1.14	16.89	8.41	3.80	4.61	6.51	1.14	17.49	-0.27	0.22	-0.61
CIS	6.19	3.12	3.07	4.95	0.96	19.40	5.94	3.02	2.91	4.65	0.88	18.96	0.16	0.31	0.45
The Americas	7.53	2.54	4.99	4.45	1.33	29.87	7.35	2.39	4.96	4.22	1.26	29.91	0.03	0.22	-0.04
Asia & Pacific	8.57	1.73	6.84	4.37	2.26	51.83	8.51	1.62	6.89	4.20	2.25	53.59	-0.05	0.17	-1.76
Arab States	6.54	1.70	4.84	3.94	1.74	44.08	6.41	1.68	4.74	3.68	1.58	42.82	0.10	0.26	1.25
Africa	4.75	0.99	3.75	2.00	0.94	46.98	4.36	0.93	3.43	1.87	0.85	45.22	0.33	0.13	1.76

Note: * Simple average. StDev: Standard deviation; CV: Coefficient of variation.

Source: ITU.

Table 2.12: The top five economies in each region and their ranking in the global IDI, 2012

Regional IDI rank	Europe	Global IDI rank	Asia & Pacific	Global IDI rank	The 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	Qatar	31	Russian Federation	40	Seychelles	64
2	Iceland	3	Hong Kong, China	10	Canada	20	United Arab Emirates	33	Belarus	41	Mauritius	72
3	Denmark	4	Australia	11	Barbados	29	Bahrain	39	Kazakhstan	48	South Africa	84
4	Finland	5	Japan	12	Uruguay	47	Saudi Arabia	50	Azerbaijan	61	Cape Verde	96
5	Norway	6	Macao, China	14	Antigua & Barbuda	49	Lebanon	52	Moldova	65	Botswana	108

Source: ITU.

during the period 2011 to 2012, indicating a narrowing of the regional digital divide.

A comparison of the global and regional ranking of the top five countries in each region further highlights global differences in ICT development and regional divides (see Table 2.12). The European top five countries occupy an almost identical global and regional ranking. In the CIS and Arab States regions, the top five countries also rank relatively close together, although their position globally is somewhat lower compared with the European countries. The top five in the Asia and the Pacific region rank closely together globally, with the Republic of Korea standing apart as the global number one. In the Americas region, there is a clear divide between the North American countries (United States and Canada), which rank in the global top 20, and their Caribbean and Latin American neighbours. Africa's regional top five are the most diverse and lowest ranked globally. The Seychelles ranks first in the region and 64th globally.

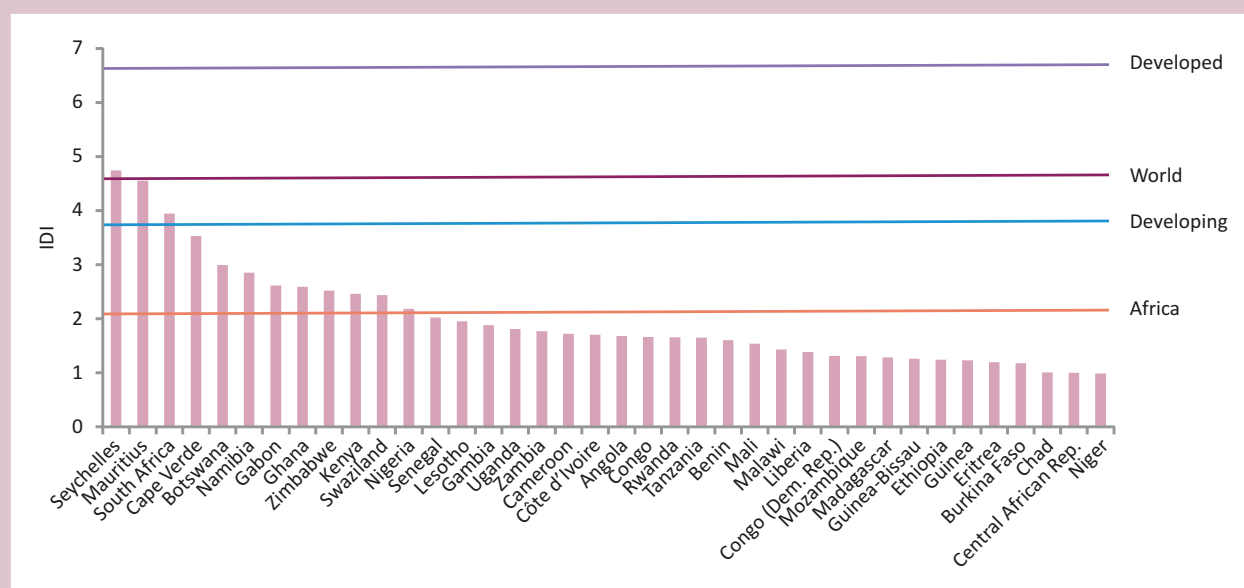
Africa

Seychelles and Mauritius are the top ranked countries in the Africa region. They are the only African countries with an IDI above the global average. The African regional IDI of 2.0 is by far the lowest of all regions, and apart from Seychelles and Mauritius only South Africa and Cape Verde have IDI values above the developing-country average. All remaining countries lie below that average and rank very low globally. The bottom nineteen countries in the IDI 2012 are all African countries, with Niger in last position globally with an IDI of 0.99 (Chart 2.9).

Between 2011 and 2012, more African countries moved up than moved down the global rankings. Moreover, countries that lost ground in the global IDI fell by no more than two places. However, the biggest gains were made by the region's top ranked countries, and the regional digital divide actually widened between 2011 and 2012. The country at the top of the regional rankings – Seychelles – saw the highest increase in rank, from 70th in 2011 to 64th in 2012, which places the country among the most dynamic in the IDI 2012, together with Zambia and Zimbabwe. All three countries stand out for improvements in the access sub-index. Zambia and Zimbabwe improved in particular their mobile-cellular penetration, while the Seychelles recorded notable increases across all the indicators in the use sub-index. Zimbabwe also registered a high increase in wireless-broadband penetration between 2011 and 2012, and overtook both Kenya and Swaziland in the IDI ranking (see Table 2.13).

Mobile-cellular penetration continues to progress throughout the region, with eighteen countries recording double-digit growth rates from 2011 to 2012. There is, however, still some room for growth on this indicator, insofar as a mere eight African countries had achieved more than 100 per cent mobile-cellular penetration by end 2012. Eritrea has the lowest penetration rate worldwide, at just 5 per cent at end 2012, and showed very little growth from 2011 (see Chart 2.10).

The strongest growth in international Internet bandwidth per Internet user was recorded in Kenya, where the figure shot up from just 4 500 Mbit/s in 2011 to 24 000 Mbit/s in 2012.

Chart 2.9: IDI values compared with the global, regional and developing/developed-country averages, Africa, 2012

Source: ITU.

The country connected to the submarine cable system LION2 in April 2012 (see Box 2.11).⁸⁹ In the Seychelles, international Internet bandwidth almost tripled with the landing of the Seychelles East Africa System (SEAS) fibre-optic cable.⁹⁰ At the same time, in a number of other African countries, including Botswana, Côte d'Ivoire and Ethiopia, international Internet bandwidth per Internet user has actually decreased, not because there was a reduction in the international bandwidth, but because the number of Internet users increased faster than the amount of bandwidth.

The percentage of households with Internet access is extremely low in Africa, with a regional average of just 5.3 per cent by end 2012, far short of the developing-country average of 24 per cent. Furthermore, little progress can be seen from 2011 to 2012 in regard to the percentage of households with Internet access in the region. Most improvements took place in Seychelles and Mauritius, countries which already enjoyed a relatively high penetration of households with Internet access, and both reached 42 per cent by end 2012.

A number of African countries, in particular those at the top of the regional ranking, achieved increases in the

use sub-index that exceeded the global average increase (+0.32) from 2011 to 2012. Cape Verde's use sub-index value increased most, from 1.39 in 2011 to 2.12 in 2012, which represents one of the highest increases worldwide. The country greatly extended its wireless-broadband penetration, reaching 22.5 per cent by end 2012. Progress in wireless broadband was also made in countries such as Ghana, Mauritius, Swaziland and Zimbabwe. At the same time, a large number of African countries were late to launch mobile-broadband networks and have yet to launch 3G high-speed services. Thus, wireless-broadband penetration is marginal in many countries, and more than half of African countries had a penetration of less than 2 per cent by end 2012.

Fixed telecommunication infrastructure is underdeveloped on the continent and only the Seychelles (12 per cent) and Mauritius (10.5 per cent) have notable fixed (wired)-broadband penetration rates. In the case of Seychelles, the fixed (wired)-broadband penetration is even somewhat higher than the wireless-broadband penetration rate. The two countries also have the highest percentage of individuals using the Internet: 47 per cent in Seychelles and

Table 2.13: IDI – Africa

Economy	Regional rank 2012	Global rank 2012	IDI 2012	Global rank 2011	IDI 2011	Global rank change 2011-2012
Seychelles	1	64	4.75	70	4.36	6
Mauritius	2	72	4.55	74	4.23	2
South Africa	3	84	3.95	85	3.67	1
Cape Verde	4	96	3.53	96	3.18	0
Botswana	5	108	3.00	108	2.83	0
Namibia	6	109	2.85	111	2.60	2
Gabon	7	112	2.61	112	2.46	0
Ghana	8	113	2.60	114	2.30	1
Zimbabwe	9	115	2.52	119	2.16	4
Kenya	10	116	2.46	116	2.23	0
Swaziland	11	117	2.44	115	2.27	-2
Nigeria	12	122	2.18	123	1.96	1
Senegal	13	124	2.02	125	1.88	1
Lesotho	14	126	1.95	126	1.84	0
Gambia	15	128	1.88	127	1.79	-1
Uganda	16	130	1.81	130	1.72	0
Zambia	17	132	1.77	137	1.64	5
Cameroon	18	136	1.72	136	1.66	0
Côte d'Ivoire	19	137	1.70	135	1.66	-2
Angola	20	139	1.68	138	1.63	-1
Congo	21	140	1.66	140	1.58	0
Rwanda	22	141	1.66	143	1.54	2
Tanzania	23	142	1.65	141	1.57	-1
Benin	24	143	1.60	142	1.57	-1
Mali	25	144	1.54	144	1.43	0
Malawi	26	145	1.43	145	1.41	0
Liberia	27	146	1.39	148	1.27	2
Congo (Dem. Rep.)	28	147	1.31	146	1.30	-1
Mozambique	29	148	1.31	149	1.26	1
Madagascar	30	149	1.28	147	1.28	-2
Guinea-Bissau	31	150	1.26	152	1.19	2
Ethiopia	32	151	1.24	150	1.22	-1
Guinea	33	152	1.23	151	1.20	-1
Eritrea	34	153	1.20	153	1.15	0
Burkina Faso	35	154	1.18	154	1.11	0
Chad	36	155	1.01	156	0.94	1
Central African Rep.	37	156	1.00	155	1.00	-1
Niger	38	157	0.99	157	0.93	0
Average*			2.00		1.87	

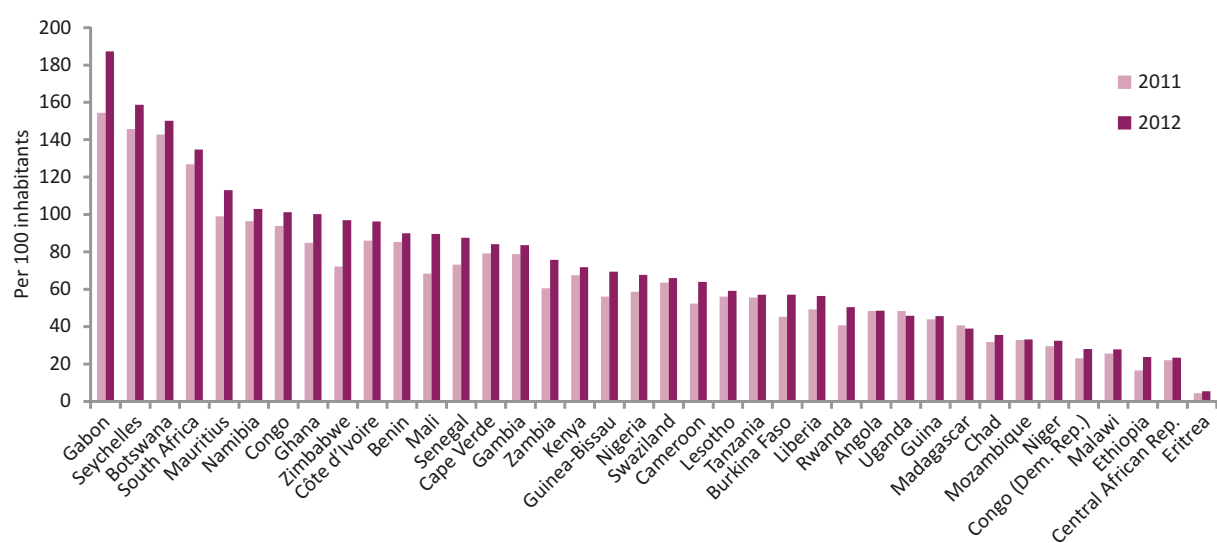
Note: *Simple average.

Source: ITU.

41 per cent in Mauritius. Cape Verde (35 per cent), Nigeria (33 per cent), Kenya (32 per cent) and South Africa (41 per cent) also stand out for having a relatively high proportion of individuals using the Internet, well above the developing-country average (27.5 per cent) at end 2012. South Africa has seen the highest increase in the proportion of individuals using the Internet in the region, from 34 per cent in 2011 to 41 per cent in 2012. In other African countries, only a very small proportion of the population is online. In Eritrea, Ethiopia, Guinea and Niger, for instance, penetration stood at around 1 per cent by end 2012.

Arab States

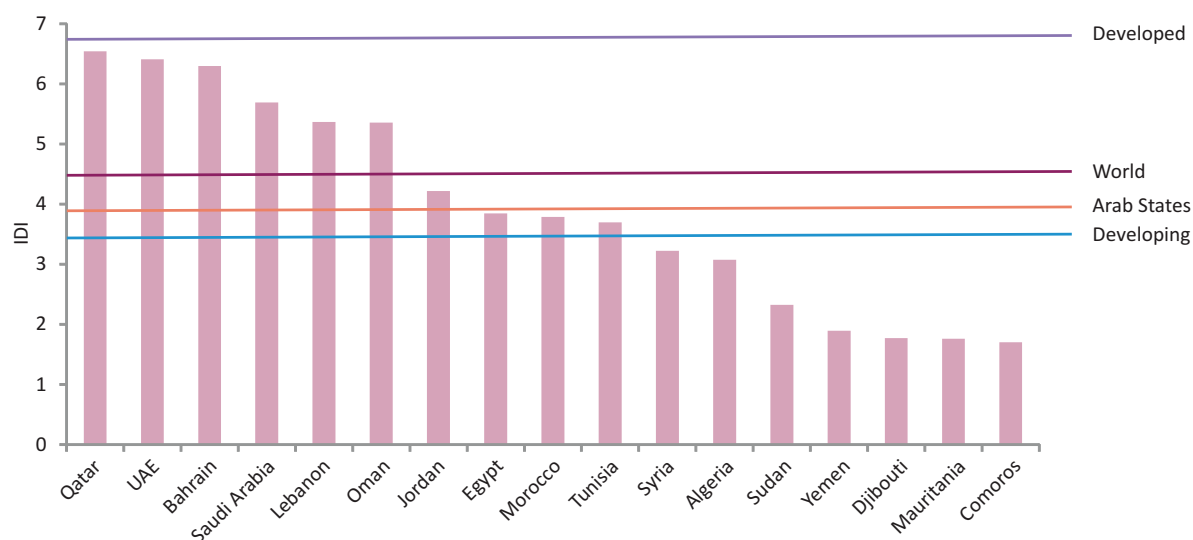
The Arab States regional ranking closely reflects income disparities in the region. Qatar tops the regional ranking, with an IDI of 6.54, followed by the United Arab Emirates and Bahrain. Together with Saudi Arabia, Lebanon and Oman, these countries boast a higher IDI than the global average of 4.35. The countries ranked at the bottom of the 2012 regional IDI, namely Yemen, Djibouti, Mauritania and Comoros, with IDI values of less than two, even lie far below the developing-country average (see Chart 2.11).

Chart 2.10: Mobile-cellular telephone subscriptions, Africa, 2011 and 2012

Source: ITU World Telecommunication/ICT Indicators database.

A number of countries from the Arab States region with relatively high IDI values – Bahrain, Lebanon, Oman and the United Arab Emirates – are among the most dynamic

countries in the IDI 2012 (see section 2.2 and Boxes 2.6 and 2.7). Within the region, the United Arab Emirates, in particular, is making good progress and catching up with

Chart 2.11: IDI values compared with the global, regional and developing/developed-country averages, Arab States, 2012

Source: ITU.

Qatar, the region's number one: between 2011 and 2012, the United Arab Emirates was able to reduce the difference in IDI value between itself and Qatar from 0.73 to 0.13, and by 2012 the two Gulf countries rank very close – only two places apart – in the global IDI. Lebanon also made substantial progress and overtook Oman in the regional and global IDI rankings. Most Arab countries with lower IDI values were unable to improve their IDI value to any significant extent, and are falling behind in international comparison. Comoros' IDI barely improved, from 1.68 in 2011 to 1.70 in 2012, with the result that the country lost four places in the global IDI ranking. Djibouti and Mauritania only slightly increased their IDI value, and were thus unable to improve their global IDI ranking, while Algeria, Sudan and Syria fell in the rankings between 2011 and 2012 (see Table 2.14).

In the access sub-index, the region records generally high mobile-cellular penetration rates. No fewer than 11 out of 17 Arab States have achieved more than 100 per cent mobile-cellular penetration by end 2012. However, while penetration increased significantly in a number of countries that already had very high penetration rates in 2011, including Bahrain, Jordan and the United Arab Emirates, very little progress was made in the countries with the lowest rates. Comoros and Djibouti increased their mobile-cellular

penetration rates by a mere 10 per cent each between 2011 and 2012, from 29 per cent to 32 per cent and from 21 per cent to 23 per cent, respectively; and in Syria, penetration even decreased slightly, from 63 per cent in 2011 to 61 per cent in 2012.

A number of countries from the region achieved sizeable increases in international Internet connectivity. Morocco more than doubled its available bandwidth with the landing of the submarine cable Loukkos.⁹¹ The Gulf Bridge International (GBI) cable system went live in February 2012, adding more international Internet bandwidth in Bahrain, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

Bahrain and Qatar attained the highest proportion of households with a computer in the region, at above 90 per cent. Qatar also has the highest percentage of households with Internet access region-wide, at 88 per cent. On the other hand, differences in household connectivity across the region are quite pronounced, and few households are connected to the Internet in Comoros (3 per cent), Mauritania (3 per cent) and Yemen (5 per cent). In these countries, the number of households with a computer is also very low, and little progress has been made from 2011 to 2012. At the same time, it is encouraging to see

Table 2.14: IDI – Arab States

Economy	Regional rank 2012	Global rank 2012	IDI 2012	Global rank 2011	IDI 2011	Global rank change 2011-2012
Qatar	1	31	6.54	30	6.41	-1
United Arab Emirates	2	33	6.41	45	5.68	12
Bahrain	3	39	6.30	42	5.79	3
Saudi Arabia	4	50	5.69	48	5.46	-2
Lebanon	5	52	5.37	61	4.62	9
Oman	6	54	5.36	58	4.80	4
Jordan	7	76	4.22	77	3.90	1
Egypt	8	86	3.85	87	3.65	1
Morocco	9	89	3.79	89	3.59	0
Tunisia	10	91	3.70	92	3.58	1
Syria	11	102	3.22	99	3.13	-3
Algeria	12	106	3.07	105	2.98	-1
Sudan	13	119	2.33	118	2.19	-1
Yemen	14	127	1.89	129	1.76	2
Djibouti	15	131	1.77	131	1.71	0
Mauritania	16	133	1.76	133	1.70	0
Comoros	17	138	1.70	134	1.68	-4
Average*			3.94		3.68	

Note: *Simple average.

Source: ITU.

that Jordan and Morocco, countries with a percentage of households with Internet access around the global average (37.4 per cent), registered considerable increases. Sudan and Tunisia, although still below the global average penetration, managed to increase the proportion of households with Internet access to 29 per cent and 21 per cent, respectively, by end 2012.

In line with the global trend, wireless broadband is the most dynamic indicator within the use sub-index in the Arab States. While most of the growth in terms of wireless subscriptions stems from active mobile-broadband subscriptions (using the 3G mobile-broadband network), a number of countries in the Arab States region, including Jordan and Bahrain, have extended WiMAX networks to provide additional connectivity. Considerable increases in wireless-broadband penetration were observed in Lebanon and the United Arab Emirates, where the rate more than doubled, to 26 per cent and 51 per cent, respectively. Tunisia and Jordan also doubled their wireless-broadband penetration, although at a much lower level, to achieve 5 per cent and 12 per cent, respectively. Oman stands out in particular: the country further improved its wireless-broadband penetration from 39 per cent in 2011 to 58 per cent in 2012, a rate comparable to that of many of the IDI top performers. At the same time, no wireless-broadband services exist in three Arab States, namely Algeria, Comoros and Djibouti, and penetration is marginal (below 2 per cent) in Syria and Yemen.

Fixed (wired)-broadband penetration is traditionally low in the region, with an average penetration of 2.6 per cent by end 2012, the second lowest regional average just ahead of Africa. With the exception of Lebanon, where fixed (wired)-broadband penetration more than doubled, from 5 per cent in 2011 to 12 per cent in 2012, no important increases in penetration were registered between 2011 and 2012. A number of countries, including Bahrain, Jordan, Qatar and Tunisia, even saw their number of subscriptions per 100 inhabitants decrease very slightly. In some cases, for example in Bahrain, an increase in the number of WiMAX subscriptions seems to suggest that terrestrial fixed-wireless broadband is a substitute to fixed (wired)-broadband. Bahrain has the highest fixed-broadband penetration in the region, at 13 per cent, which is only somewhat higher than the global average (9 per cent).

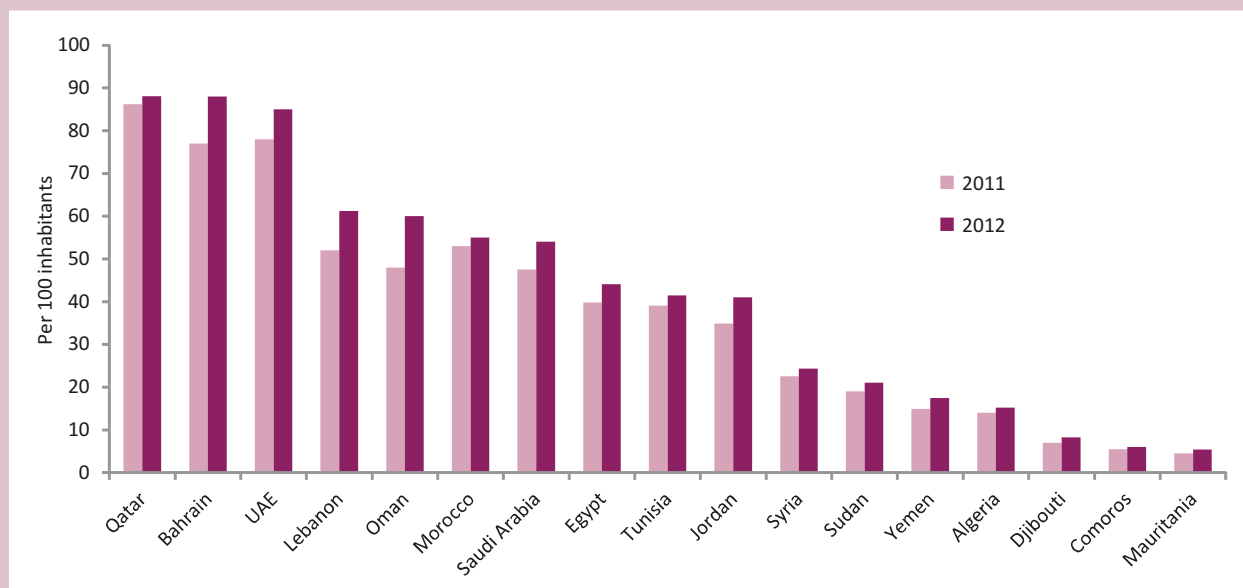
The proportion of the population using the Internet varies considerably throughout the Arab States region. With more than 85 per cent of the population using the Internet in Bahrain, Qatar and the United Arab Emirates, these countries are doing well, globally. On the other hand, Internet user penetration in Mauritania and Comoros is around just 5 per cent. Algeria (15 per cent), Djibouti (8 per cent), Sudan (21 per cent), Syria (24 per cent) and Yemen (17 per cent) remain below the global average of 35.7 per cent. The country registering the highest increase in the number of Internet users in the region is Oman, where penetration grew by 25 per cent, from 48 per cent in 2011 to 60 per cent in 2012. In Djibouti, Jordan, Lebanon, Mauritania and Yemen, the proportion of individuals using the Internet increased by more than 15 per cent (see Chart 2.12).

Asia and the Pacific

The regional digital divide is very pronounced in the Asia and the Pacific region. The region is home to some of the IDI's front runners, including the global number one, the Republic of Korea. Other economies with high IDI values, above the global (4.35) and the developed-country (6.78) averages, include Hong Kong (China), Australia, Japan, Macao (China), Singapore and New Zealand. This group of economies clearly stands apart from the rest of the Asia and the Pacific region, and the gap between the regional number seven (New Zealand, with an IDI of 7.64) and number eight (Brunei Darussalam with an IDI of 5.06) is striking. While Brunei Darussalam, Malaysia and the Maldives still have IDI values above the global average, the remaining Asia and the Pacific countries do not. The gap in IDI values becomes even more severe at the bottom of the regional ranking: 12 countries have IDI values below the developing-country average of 3.44. Solomon Islands, Pakistan, Myanmar and Bangladesh have the lowest IDI values in the region, and rank very low globally (see Chart 2.13).

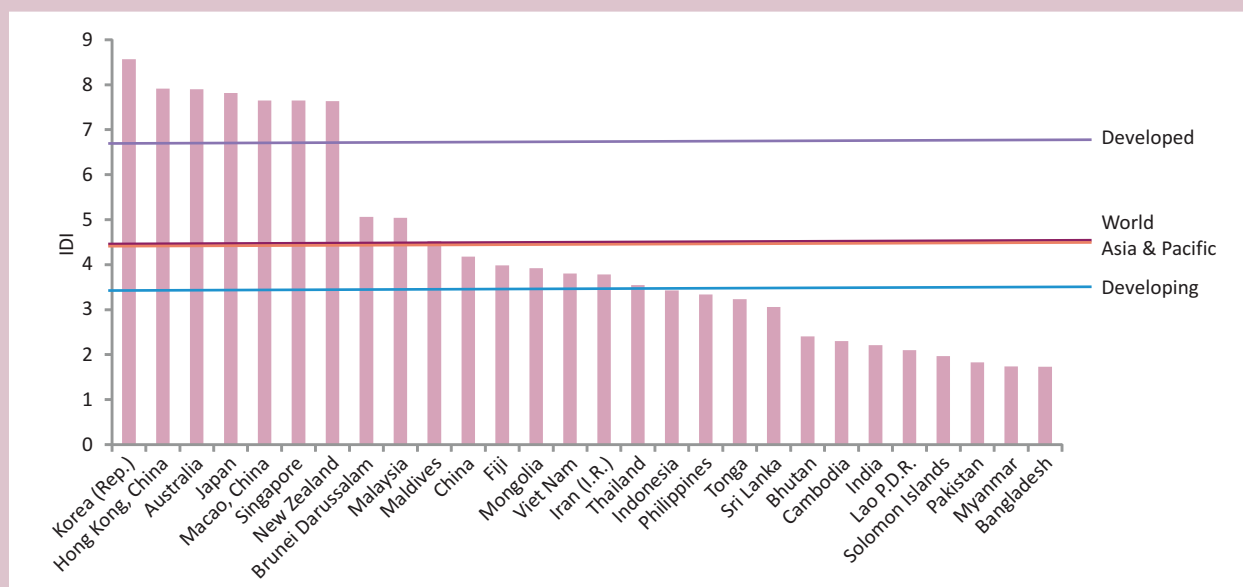
Three countries from the Asia and the Pacific region – Australia, Bangladesh and Mongolia – are among the most dynamic in the 2012 IDI. Australia's IDI value increased thanks mostly to advances in the use sub-index, in particular in regard to wireless-broadband penetration, and the country was able to overtake Japan in the IDI ranking (see Box 2.4). Bangladesh made most progress in the access sub-index, in particular with regard to mobile-cellular

Chart 2.12: Individuals using the Internet, Arab States, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

Chart 2.13: IDI values compared with the global, regional and developing/developed-country averages, Asia and the Pacific, 2012



Source: ITU.

penetration and international Internet connectivity. Nonetheless, Bangladesh still remains at the bottom of the regional ranking and in 135th position globally. Mongolia,

on the other hand, moved up five places in the global IDI between 2011 and 2012, overtaking both Viet Nam and the Islamic Republic of Iran.

A comparison of the global rankings in 2011 and 2012 shows that the majority of Asia and the Pacific countries are falling behind in international comparison (i.e. losing at least one place in comparison with the previous year). Japan, which saw one of the lowest increases in use sub-index value in 2012, lost four places compared to 2011. Countries that fell two places in 2012 compared to the previous year include Brunei Darussalam, the Islamic Republic of Iran and Viet Nam (see Table 2.15).

While the Asia and the Pacific region's relative performance in relation to other regions has been lower, all countries in the region increased their absolute IDI values between 2011 and 2012. The region's developing countries improved mostly in the access sub-index, while the high-income developed countries generally progressed most on the indicators included in the use sub-index. This reflects the three stages of the conceptual framework upon which the IDI has been built.

Cambodia is the country registering the highest increase in the access sub-index regionally, and indeed improved well above the global average (0.18). An increase in mobile-cellular penetration, the second highest in the region, is mostly responsible for this improvement. Penetration increased by 37 per cent, reaching 132 per cent by end 2012. On the other hand, some of the countries with the lowest penetration, most notably India and the Islamic Republic of Iran, added very few new mobile-cellular subscriptions in 2012 (see Chart 2.14).

The proportion of households with Internet access is highest globally in the Republic of Korea (97 per cent), followed by New Zealand (87 per cent) and Japan (86 per cent). A number of developing countries saw significant increases in household Internet connectivity, and hence average growth in the access sub-index. The proportion of households with Internet access improved by more than 21 per cent in China.

Table 2.15: IDI – Asia and the Pacific

Economy	Regional rank 2012	Global rank 2012	IDI 2012	Global rank 2011	IDI 2011	Global rank change 2011-2012
Korea (Rep.)	1	1	8.57	1	8.51	0
Hong Kong, China	2	10	7.92	10	7.66	0
Australia	3	11	7.90	15	7.54	4
Japan	4	12	7.82	8	7.77	-4
Macao, China	5	14	7.65	13	7.57	-1
Singapore	6	15	7.65	14	7.55	-1
New Zealand	7	16	7.64	18	7.31	2
Brunei Darussalam	8	58	5.06	56	4.93	-2
Malaysia	9	59	5.04	57	4.81	-2
Maldives	10	73	4.53	71	4.31	-2
China	11	78	4.18	79	3.86	1
Fiji	12	82	3.99	81	3.79	-1
Mongolia	13	85	3.92	90	3.59	5
Viet Nam	14	88	3.80	86	3.65	-2
Iran (I.R.)	15	90	3.79	88	3.61	-2
Thailand	16	95	3.54	94	3.42	-1
Indonesia	17	97	3.43	97	3.14	0
Philippines	18	98	3.34	98	3.14	0
Tonga	19	101	3.23	101	3.09	0
Sri Lanka	20	107	3.06	107	2.92	0
Bhutan	21	118	2.40	117	2.19	-1
Cambodia	22	120	2.30	121	2.05	1
India	23	121	2.21	120	2.13	-1
Lao P.D.R.	24	123	2.10	122	1.99	-1
Solomon Islands	25	125	1.97	124	1.91	-1
Pakistan	26	129	1.83	128	1.78	-1
Myanmar	27	134	1.74	132	1.70	-2
Bangladesh	28	135	1.73	139	1.62	4
Average*			4.37		4.20	

Note: *Simple average.

Source: ITU.

Chart 2.14: Mobile-cellular telephone subscriptions, Asia and the Pacific, 2011 and 2012

Source: ITU World Telecommunication/ICT Indicators database.

With this increase, China has reached the global average of 37.4 per cent.

Wireless broadband is the most dynamic indicator in the use sub-index, but there are large disparities in terms of penetration and growth rates throughout the region. A number of countries from the Asia and the Pacific region still do not have a commercially available 3G network by end 2012, including Bangladesh, Islamic Republic of Iran, Pakistan, Tonga and Thailand. In those countries, satellite broadband and fixed (wireless)-broadband subscriptions, in particular WiMAX, were the main wireless-broadband technologies available. The highest increase took place in countries with a well-developed mobile-broadband market and high penetration rates, such as Macao (China), Australia and Hong Kong (China). Indonesia attained a wireless-broadband penetration of 32 per cent, above the global average of 22 per cent: 3G was launched in Indonesia as early as 2006⁹² and services there are among the most affordable in the region (see Chapter 3).

Asia and the Pacific countries with a well-developed ICT infrastructure display high levels of fixed (wired)-broadband penetration. These include, for instance, Hong Kong (China) (31.5 per cent), New Zealand (28 per cent), the Republic

of Korea (38 per cent) and Singapore (26 per cent). Fixed (wired)-broadband penetration is generally low in the region's developing countries. China is an exception, with a fixed (wired)-broadband penetration of 13 per cent. This represents a total of close to 176 million subscriptions at end 2012, over 20 million more than in 2011. China also has a large number of fibre connections, and ranks relatively high globally in terms of its fibre-to-the-home/building penetration (close to 5 per cent in mid-2012)⁹³ Apart from China, only Malaysia (8 per cent), Maldives (5.5 per cent) and Thailand (6 per cent) have a fixed-broadband penetration above the developing-country average of 5 per cent by end 2012.

Commonwealth of Independent States (CIS)

The Commonwealth of Independent States (CIS) regional ranking is headed by the Russian Federation, with an IDI of 6.19, just ahead of Belarus (6.11) and Kazakhstan (5.74). Belarus is among the most dynamic countries of the IDI, and is closing the gap with respect to the Russian Federation. Uzbekistan ranks last with an IDI of 3.12, which is by far the lowest IDI value in the region (Table 2.16). While all CIS countries – with the exception of Uzbekistan – have an IDI

above the world average, all the countries in the region remain below the developed-country average (see Chart 2.15). The CIS region is the region showing the strongest improvement in regional IDI value from 2011 to 2012, with the regional IDI climbing from 4.65 in 2011 to 4.95 in 2012. This is the second highest regional IDI after the Europe region (6.73). All CIS countries, with the exception of Uzbekistan, display above-average increases in IDI value. In particular, major improvements can be seen in the access

sub-index, with a number of countries, including Belarus, Georgia, Kazakhstan, Moldova and Ukraine, increasing their value by at least twice the global average.

By end 2012, mobile-cellular penetration exceeded 100 per cent in all CIS countries except Uzbekistan. The CIS region has by far the highest mobile-cellular penetration (158.9 per cent) of all regions. Such high mobile-cellular penetration is partly explained by the high proportion of prepaid subscriptions

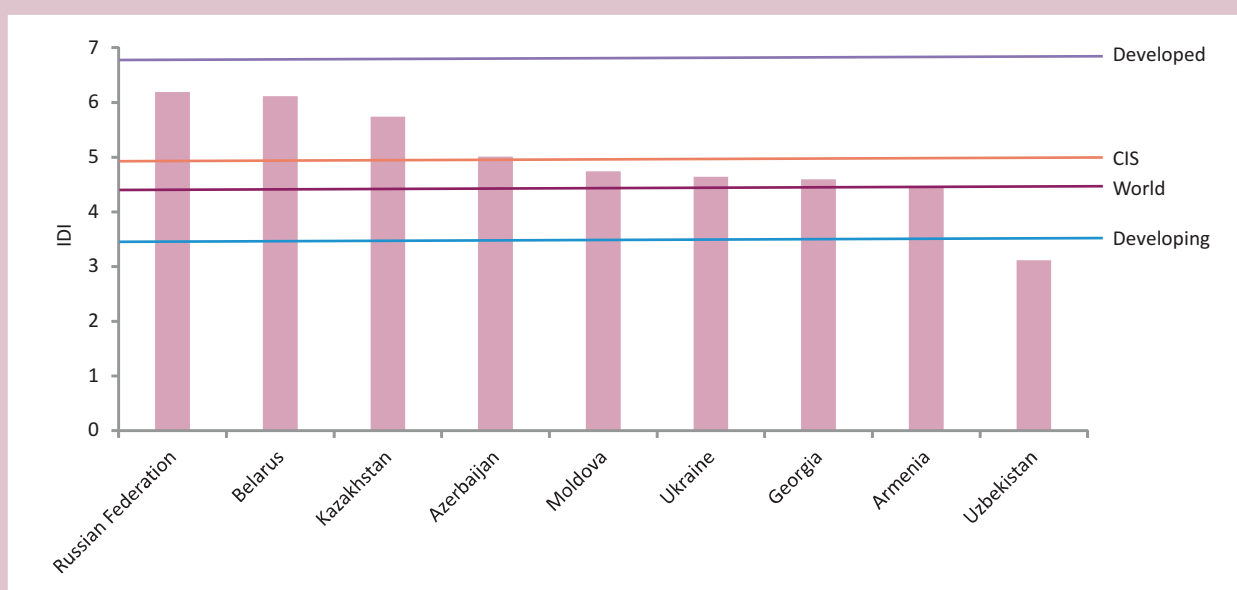
Table 2.16: IDI – CIS

Economy	Regional rank 2012	Global rank 2012	IDI 2012	Global rank 2011	IDI 2011	Global rank change 2011-2012
Russian Federation	1	40	6.19	38	5.94	-2
Belarus	2	41	6.11	46	5.57	5
Kazakhstan	3	48	5.74	49	5.41	1
Azerbaijan	4	61	5.01	60	4.62	-1
Moldova	5	65	4.74	67	4.46	2
Ukraine	6	68	4.64	69	4.38	1
Georgia	7	71	4.59	73	4.24	2
Armenia	8	74	4.45	75	4.18	1
Uzbekistan	9	104	3.12	104	3.02	0
Average*			4.95		4.65	

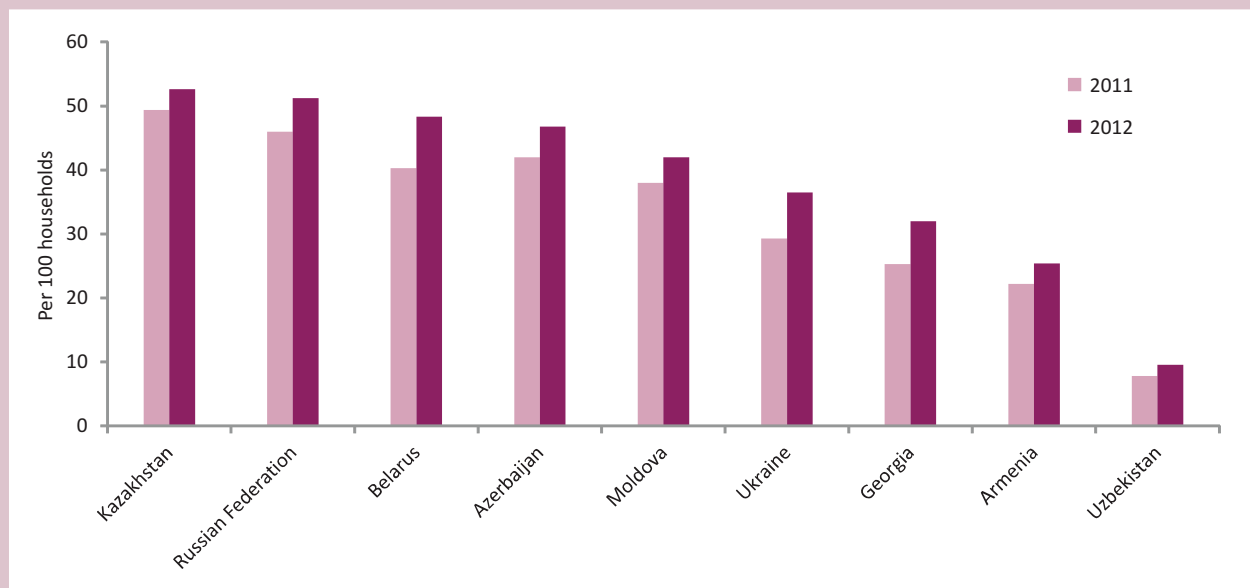
Note: *Simple average.

Source: ITU.

Chart 2.15: IDI values compared with the global, regional and developing/developed-country averages, CIS, 2012



Source: ITU.

Chart 2.16: Households with Internet access, CIS, 2011 and 2012

Source: ITU World Telecommunication/ICT Indicators database.

in the region, and the use of several SIM cards by single subscribers in order to avoid paying high off-net prices. As noted by the Ukrainian regulator, “the number of mobile subscriptions is higher than the population in the country. This situation refers to the fact that one person has several SIM-cards of different operators. However, there are still the residents having no mobile phone in Ukraine, mainly they are children and seniors. One of the main reasons of buying several SIM-cards is the substantial difference between the tariffs for on-net calls and off-net calls. This led to the fact that nearly 94% of mobile outgoing traffic falls on on-net calls” (NCCIR, 2013). The usual regulatory remedy applied to prevent high off-net prices becoming a barrier to competition is the regulation of mobile termination rates (MTRs). Lower MTRs help reduce off-net call prices and promote competition in mobile markets, as has been proven in the European Union, where MTRs are clearly regulated in all Member States.⁹⁴

The Russian Federation and Kazakhstan have both achieved 50 per cent of households with Internet access by end 2012. However, household Internet connectivity varies quite a lot throughout the region. The proportion of households with Internet access is still fairly low in Uzbekistan (10 per cent) and Armenia (25 per cent). A number of CIS countries have seen significant increases on this indicator,

in particular Ukraine and Belarus. In Ukraine, the proportion of households with Internet access rose from 29 per cent in 2011 to 37 per cent in 2012; in Belarus, the proportion increased from 40 per cent in 2011 to 48 per cent in 2012 (see Chart 2.16).

Significant progress was also registered on the use sub-index between 2011 and 2012, and all CIS countries apart from Uzbekistan and Ukraine saw above-average increases in their use sub-index value. The highest increase occurred in Belarus, which added 0.96 value points to reach a use sub-index value of 4.13 in 2012, the second highest in the region after the Russian Federation (4.34). Wireless-broadband penetration is high in a number of CIS countries, including in the Russian Federation (53 per cent) and Kazakhstan (42 per cent). Increases in wireless-broadband penetration were smaller in most CIS countries compared with other regions. Important advances in penetration were made in Belarus, where penetration grew by over 70 per cent and increased from 19 per cent in 2011 to 33 per cent in 2012. In Azerbaijan and Moldova, wireless broadband penetration grew by 42 per cent, to 34 per cent and 5 per cent in 2012, respectively. Moldova, together with Ukraine, remains one of the countries with the lowest wireless-broadband penetration in the CIS region.

Fixed (wired)-broadband penetration in the CIS is well above the global and developing-country average. Belarus has by far the highest fixed (wired)-broadband penetration in the region. In both Moldova and Ukraine, fixed (wired)-broadband plays an important role, and penetration stands at 12 per cent and 8 per cent, respectively. The situation is very different in Uzbekistan, where fixed (wired)-broadband penetration is less than 1 per cent (although it shows the highest growth rate region-wide, at 36 per cent), while wireless-broadband penetration is relatively high, at 21 per cent at end 2012.

Europe

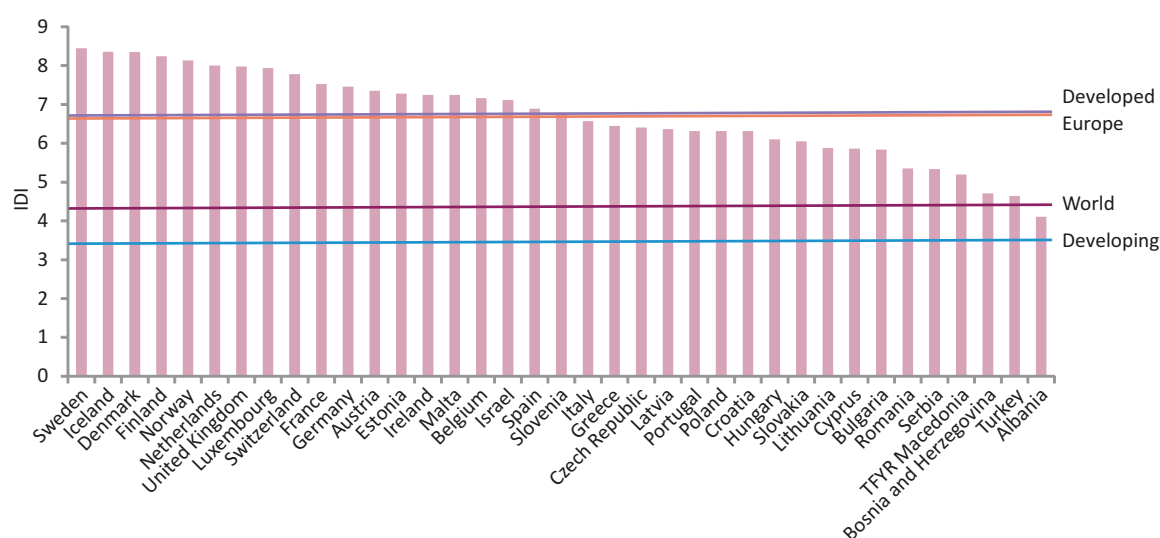
Europe boasts the highest regional IDI of 6.73, and a generally high level of ICT development. All European countries, with the exception of Albania, have an IDI value above the global average (4.35), and about half have an IDI above the developed-country average (6.78) (see Chart 2.17).

Eight European countries rank within the top ten of the IDI 2012. The southern and eastern European countries rank lowest. Estonia and Israel improved their IDI values significantly from 2011 to 2012, and in the IDI 2012 Estonia

had overtaken Ireland, Malta and Belgium. With most countries in the region already having achieved a very high level of ICT development, there was very little movement in the upper half of the European ranking (see Table 2.17).

In the lower half of the European ranking, the majority of the countries lost ground in the global IDI. Poland and Serbia each fell a full five places. Serbia regressed in the global IDI on account of below-average increases in its access sub-index. In these countries, no major improvements were registered on the indicators included in the access sub-index, and fixed-telephone penetration is declining. In Serbia, which lost five places from 2011 to 2012 and is the only country globally whose IDI value has actually dropped, fixed-telephone penetration went down from 37 per cent in 2011 to 30 per cent in 2012, and mobile-cellular penetration decreased from 125 per cent to 93 per cent in the same period. However, it should be noted that there is a break in comparability in the 2011 to 2012 data on mobile-cellular subscriptions for Serbia, since in 2012 the regulator enforced the activity criterion for all prepaid subscriptions. Data from before 2012 effectively included non-active mobile-cellular subscriptions.

Chart 2.17: IDI values compared with the global, regional and developing/developed-country averages, Europe, 2012



Source: ITU.

Table 2.17: IDI – Europe

Economy	Regional rank 2012	Global rank 2012	IDI 2012	Global rank 2011	IDI 2011	Global rank change 2011-2012
Sweden	1	2	8.45	2	8.41	0
Iceland	2	3	8.36	4	8.12	1
Denmark	3	4	8.35	3	8.18	-1
Finland	4	5	8.24	5	7.99	0
Norway	5	6	8.13	6	7.97	0
Netherlands	6	7	8.00	7	7.85	0
United Kingdom	7	8	7.98	11	7.63	3
Luxembourg	8	9	7.93	9	7.76	0
Switzerland	9	13	7.78	12	7.62	-1
France	10	18	7.53	19	7.26	1
Germany	11	19	7.46	17	7.33	-2
Austria	12	21	7.36	21	7.10	0
Estonia	13	22	7.28	25	6.74	3
Ireland	14	23	7.25	22	7.10	-1
Malta	15	24	7.25	24	6.85	0
Belgium	16	25	7.16	23	6.85	-2
Israel	17	26	7.11	26	6.70	0
Spain	18	27	6.89	27	6.65	0
Slovenia	19	28	6.76	28	6.60	0
Italy	20	30	6.57	29	6.43	-1
Greece	21	32	6.45	33	6.21	1
Czech Republic	22	34	6.40	31	6.30	-3
Latvia	23	35	6.36	37	6.00	2
Portugal	24	36	6.32	35	6.07	-1
Poland	25	37	6.31	32	6.22	-5
Croatia	26	38	6.31	34	6.14	-4
Hungary	27	42	6.10	39	5.91	-3
Slovakia	28	43	6.05	40	5.85	-3
Lithuania	29	44	5.88	41	5.79	-3
Cyprus	30	45	5.86	43	5.71	-2
Bulgaria	31	46	5.83	47	5.50	1
Romania	32	55	5.35	54	5.05	-1
Serbia	33	56	5.34	51	5.38	-5
TFYR Macedonia	34	57	5.19	55	4.93	-2
Bosnia and Herzegovina	35	67	4.71	64	4.49	-3
Turkey	36	69	4.64	66	4.47	-3
Albania	37	80	4.11	80	3.80	0
Average*			6.73		6.51	

Note: *Simple average.

Source: ITU.

Bosnia and Herzegovina, the Czech Republic and Poland managed only very small (and below-average) increases in their use sub-index, and have thus lost ground in global comparison between 2011 and 2012. In all three countries, wireless-broadband penetration – the most dynamic indicator globally – progressed little. In both the Czech Republic and Poland, wireless-broadband penetration has stood at around 50 per cent since 2011. In Bosnia and Herzegovina, wireless-broadband penetration has grown only marginally, from 11 to 12 per cent between 2011 and 2012 (Chart 2.18).

Most countries in the region already possess a very well-developed ICT infrastructure, and increases in the access sub-index are thus less dynamic. European countries with strong growth in the access sub-index are for the most part those at the bottom of the regional ranking, such as Albania, Bulgaria, Bosnia and Herzegovina, Romania and TFYR Macedonia, all of which made significant progress with regard to ICT household connectivity. Bosnia and Herzegovina logged the highest absolute increase, from 32 per cent of households with Internet access at end 2011 to 40 per cent at end 2012. Romania registered a 12

Chart 2.18: Wireless-broadband subscriptions, Europe, 2011 and 2012

Source: ITU World Telecommunication/ICT Indicators database.

per cent increase in the proportion of households with a computer, up from 51 per cent in 2011 to 57 per cent in 2012. The top-ranked European countries have a very high proportion of households with a computer and with Internet access. In the Netherlands, virtually all households have a computer (97 per cent) and Iceland has the second highest proportion of households with Internet access globally, at 96 per cent. At the same time, the European Union's Digital Agenda aims at bringing fast broadband (> 30 Mbit/s) to all, and achieving 50 per cent of households with superfast broadband (> 100 Mbit/s) subscriptions by 2020. This will be achieved through increased investments in broadband (including EU financing as well as funding from national and private sources), increased competition between broadband providers and regulatory initiatives (see Box 2.3).

Wireless broadband is the indicator showing the highest growth rates across the European region. Penetration is highest in Finland (107 per cent) and Sweden (101 per cent), both very mature mobile markets, where wireless broadband was launched early on. Albania (18 per cent), Turkey (16 per cent), Bosnia and Herzegovina (12 per cent) and Lithuania (12 per cent) have the lowest penetration rates in Europe. While penetration in the latter two countries has

stagnated since 2011, in Albania 3G was launched only in January 2011⁹⁵ and penetration is on the rise. In comparison with other European countries, Turkey was relatively late in launching mobile-broadband services, in mid-2009,⁹⁶ and continues to improve its wireless-broadband penetration (see Chart 2.18).

Fixed (wired)-broadband penetration is already at a high level – the regional average of 25.8 per cent is by far the highest of all regions, with the result that penetration has registered relatively small increases throughout the region, with growth rates below 10 per cent. Albania had the highest annual growth rate of 24 per cent but fixed-broadband penetration remained just below five per cent (see Box 2.13). TFYR Macedonia and Poland – where fixed (wired)-broadband penetration reached 15 per cent and 17 per cent, respectively, in 2012 – registered double-digit growth rates (of 16 and 13 per cent, respectively) between 2011 and 2012.

In almost half of the Europe region countries, over 75 per cent of the population was using the Internet by end 2012. To have 75 per cent of the population using the Internet regularly is one of the goals of Europe's Digital Agenda to be achieved by 2015 (see Box 2.3). It is a promising trend

that those countries that are still below the target added the highest proportion of Internet users in 2012: penetration increased, for example, by 11 per cent in TFYR Macedonia, from 57 per cent in 2011 to 63 per cent in 2012. Other countries displaying strong growth rates above 10 per cent include Portugal (11 per cent), Romania (14 per cent) and Serbia (14 per cent).

The Americas

The America's regional IDI ranking is headed by the United States (7.53) and Canada (7.38), the only two developed countries in the Americas region. Both have IDI values well above the developed-country average of 6.78. Just over half of the countries in the region have an IDI value below the global average of 4.35. Nicaragua ranks last regionally and 114th globally, with an IDI of 2.54 (Chart 2.19).

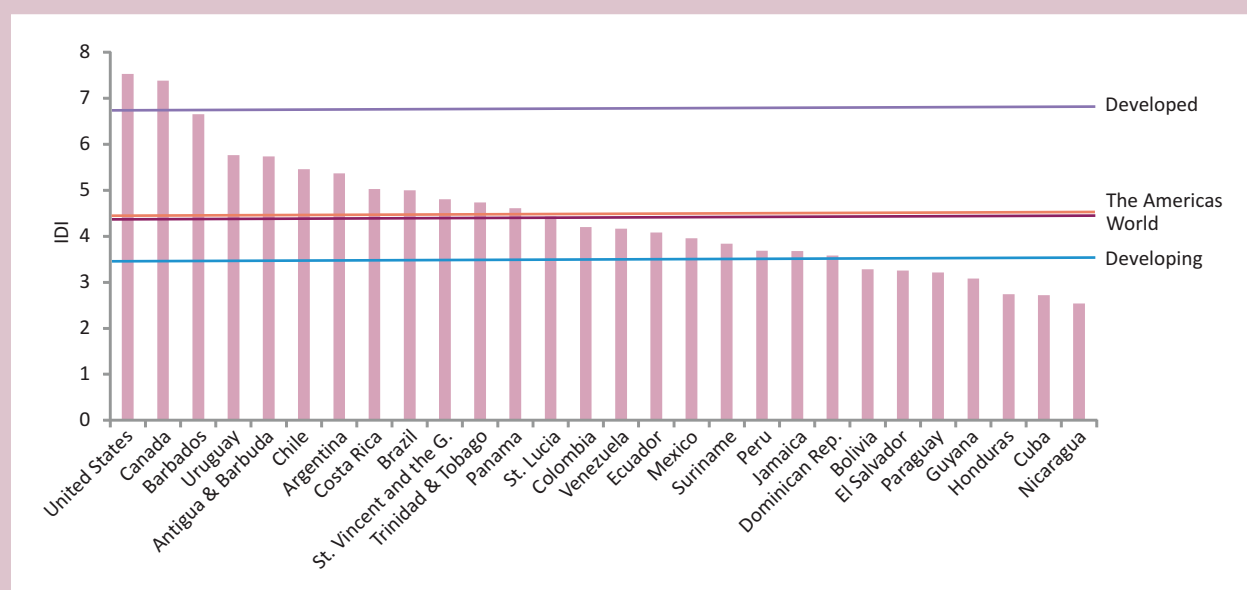
The Americas region is quite dynamic (both upwards and downwards), with almost all countries changing positions in the global rankings between 2011 and 2012. Only four countries (Argentina, Brazil, Canada and Jamaica) have the same ranking in the IDI 2012 as in 2011. Barbados, Costa Rica and Brazil have significantly increased their IDI values,

and the former two also stand out for improvements in their IDI ranking.

Of the countries in the Americas region, Antigua and Barbuda saw the highest decrease in global ranking, from 44th in 2011 to 49th in 2012, having achieved only a marginal increase in both the access and the use sub-indices. The country's use sub-index in particular showed very little progress, with an increase in value of just 0.01, one of the lowest worldwide. Trinidad and Tobago lost three places in relation to 2011, also on account of very little growth in the use sub-index. Neither of these two countries are keeping up with the rapid increase in wireless-broadband penetration globally and across the Americas region. This is also the case in Suriname and Paraguay, as well as Saint Vincent and the Grenadines and Saint Lucia. The latter both remained without a mobile-broadband network in 2012, and are thus falling behind in international comparison (see Table 2.18).

Colombia, Costa Rica, Paraguay and Venezuela achieved more than 100 per cent mobile-cellular penetration in 2012, bringing the total number of countries with more subscriptions than population in the region to 17. The highest

Chart 2.19: IDI values compared with the global, regional and developing/developed-country averages, the Americas, 2012



Source: ITU.

increase occurred in Costa Rica, where penetration went up from 92 per cent in 2011 to 128 per cent by end 2012, after the liberalization of the country's mobile market in 2011. With this increase in mobile-cellular penetration and impressive improvements in the proportion of households with Internet access, Costa Rica is among the countries which made most progress in the access sub-index (see Box 2.5).

Further countries that secured strong increases in their access sub-index values include Argentina, Brazil, Colombia and Panama, which improved significantly in ICT household connectivity and in particular increased the percentage of households with Internet access (see Chart 2.20). Both Brazil and Colombia have plans in place that aim to bring affordable broadband to more households. The goal of Brazil's *Programa Nacional de Banda Larga* is to bring broadband access to 40 million of the country's households by 2014, in particular in rural areas, in cooperation with

Brazilian operators.⁹⁷ Colombia's Vive Digital aims to connect 50 per cent of the country's households to the Internet by 2014. One of the key infrastructure projects under this initiative is the establishment of a national fibre-optic network under a public-private partnership.⁹⁸

In line with the global trend, it is wireless-broadband penetration that has seen the strongest growth rates in the region. Several countries registered a growth of more than 100 per cent between 2011 and 2012. These include Barbados, which launched mobile only in late 2011⁹⁹ and achieved a penetration of 37 per cent by end 2012. In Bolivia, Ecuador and the Dominican Republic, networks and coverage were further expanded and penetration reached 7 per cent, 23 per cent and 16 per cent, respectively, by end 2012.¹⁰⁰ In Costa Rica, competition intensified with the entry of new operators, and wireless-broadband penetration climbed to 28 per cent by end 2012.¹⁰¹

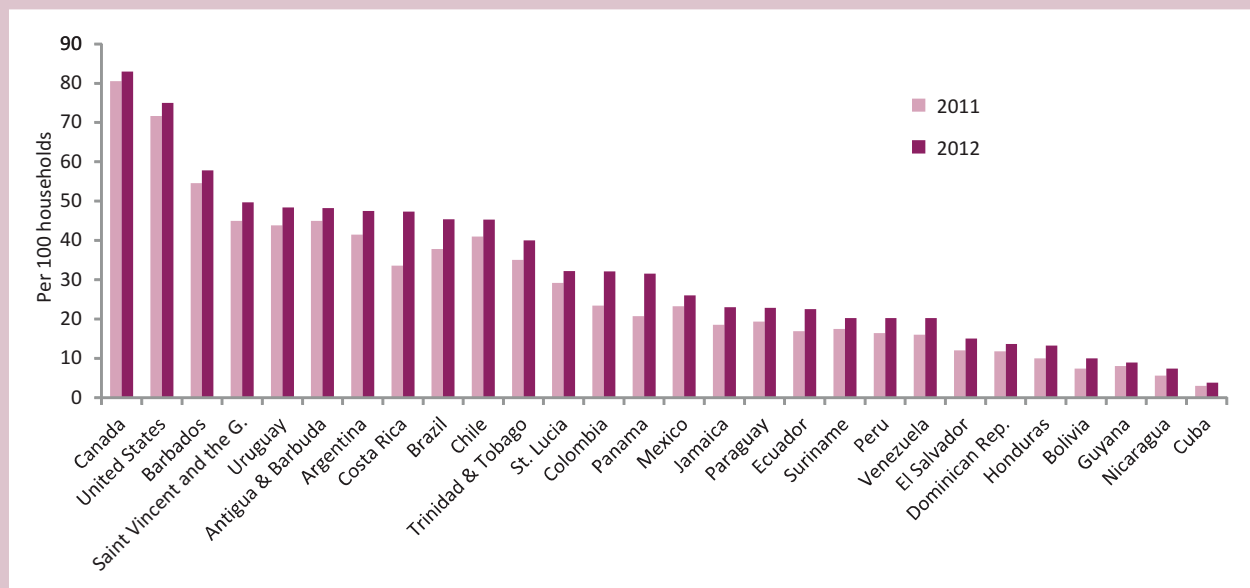
Table 2.18: IDI – The Americas

Economy	Regional rank 2012	Global rank 2012	IDI 2012	Global rank 2011	IDI 2011	Global rank change 2011-2012
United States	1	17	7.53	16	7.35	-1
Canada	2	20	7.38	20	7.14	0
Barbados	3	29	6.65	36	6.01	7
Uruguay	4	47	5.76	50	5.38	3
Antigua & Barbuda	5	49	5.74	44	5.70	-5
Chile	6	51	5.46	52	5.08	1
Argentina	7	53	5.36	53	5.06	0
Costa Rica	8	60	5.03	65	4.47	5
Brazil	9	62	5.00	62	4.59	0
St. Vincent and the Grenadines	10	63	4.81	59	4.71	-4
Trinidad & Tobago	11	66	4.73	63	4.54	-3
Panama	12	70	4.61	68	4.38	-2
Saint Lucia	13	75	4.43	72	4.28	-3
Colombia	14	77	4.20	78	3.89	1
Venezuela	15	79	4.17	76	4.00	-3
Ecuador	16	81	4.08	83	3.73	2
Mexico	17	83	3.95	82	3.78	-1
Suriname	18	87	3.84	84	3.73	-3
Peru	19	92	3.68	91	3.58	-1
Jamaica	20	93	3.68	93	3.54	0
Dominican Rep.	21	94	3.58	95	3.36	1
Bolivia	22	99	3.28	102	3.08	3
El Salvador	23	100	3.25	103	3.06	3
Paraguay	24	103	3.21	100	3.10	-3
Guyana	25	105	3.08	106	2.96	1
Honduras	26	110	2.74	109	2.70	-1
Cuba	27	111	2.72	110	2.66	-1
Nicaragua	28	114	2.54	113	2.39	-1
Average*			4.45		4.22	

Note: *Simple average.

Source: ITU.

Chart 2.20: Households with Internet access, the Americas, 2011 and 2012



Source: ITU World Telecommunication/ICT Indicators database.

A number of countries had a higher fixed (wired)-broadband than wireless-broadband penetration, including Colombia, Venezuela and Peru. While Saint Lucia and Saint Vincent and the Grenadines do not (yet) have a 3G network, their fixed (wired)-broadband penetration is relatively high, at 14 per cent and 12 per cent, respectively.

By far the highest fixed (wired)-broadband penetration rates are found in the region's developed countries, namely Canada (33 per cent) and the United States (28

per cent). Both countries also have the highest proportion of individuals using the Internet regionally: 87 per cent of Canadians were using the Internet by end 2012, as against 81 per cent of people in the United States. Antigua and Barbuda (84 per cent) and Barbados (73 per cent) likewise had a relatively high proportion of the population using the Internet. El Salvador (26 per cent) and Nicaragua (14 per cent) have seen the highest increases in the number of Internet users, with over 25 per cent growth since 2011.

Endnotes

- ¹ This section is based on the 2012 edition of *Measuring the Information Society*. The presentation of the conceptual framework and methodology of the IDI is maintained in each version of the report, to help the reader. The reader is also advised to consult the 2009 edition of *Measuring the Information Society*, which provides more information on the development of the IDI concept and methodology. Annex 1 to this report describes the methodology in more detail.
- ² Data on the indicators included in the skills sub-index are sourced from the UNESCO Institute for Statistics (UIS). See Annex 1 for more details on the definition of the indicators.
- ³ For more information on the EGTI online forum see: http://www.itu.int/ITU-D/ict/ExpertGroup/default_group.asp.
- ⁴ To join EGTI, visit: <http://www.itu.int/ITU-D/ict/ExpertGroup/default.asp>.
- ⁵ To join EGH, visit: <http://www.itu.int/net4/ITU-D/forum/expertgrouponhouseholds/forum/>.
- ⁶ In this context, the recommendations made by experts in relation to the development of the single index were taken into consideration. Between 2007 and 2008, ITU maintained an online discussion forum with more than 100 participants on the preparation of the “single index”.
- ⁷ The revision was part of the overall review of ITU's infrastructure indicators, and was carried out through its Expert Group on Telecommunication/ICT Indicators (EGTI). The definition adopted by ITU is in line with the OECD definition of wireless broadband. Active mobile-broadband subscriptions include (a) standard mobile subscriptions with use of data communications at broadband speeds (i.e. mobile-cellular subscriptions with advertised data speeds of 256 kbit/s or greater and which have been used to set up an Internet data connection) and (b) dedicated mobile data subscriptions at broadband speeds (i.e. subscriptions to dedicated data services over a mobile network which are purchased separately from voice services, either as a standalone service – e.g. using a data card such as a USB modem/dongle – or as an add-on data package to voice services requiring an additional subscription). For more information, see <http://www.itu.int/ITU-D/ict/handbook.html>.
- ⁸ By end 2012, Japan and Singapore also had mobile-broadband penetration rates above 100 per cent.
- ⁹ See OECD Broadband portal, at <http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm> and KISA, 2012.
- ¹⁰ See http://europa.eu/rapid/press-release_STAT-12-185_en.htm.
- ¹¹ See <http://www.pts.se/en-gb/News/Press-releases/2012/Half-of-households-and-businesses-in-Sweden-can-get-fast-broadband/>.
- ¹² See <http://www.lightreading.com/ip-convergence/teliasonera-first-to-go-live-with-lte/240111802>.
- ¹³ See http://www.hkcsf.com/en/pdf/2012/SKT_CSL_LTE_roaming_launch_ENG.pdf.
- ¹⁴ See http://www.pfs.is/upload/files/M7_Final_decision_Jan2012.pdf for Iceland and <http://www.pts.se/en-GB/Industry/Telephony/SMP---Market-reviews/> and http://www.telegeography.com/products/commsupdate/articles/2013/06/18/pts-issues-smp-decisions-on-mobile-termination-leased-lines-markets/?utm_source=CommsUpdate&utm_campaign=247fe6a1ea-CommsUpdate+18+June+2013&utm_medium=email&utm_term=0_0688983330-247fe6a1ea-8868625 for Sweden.
- ¹⁵ See <http://media.ofcom.org.uk/2012/06/18/boosting-business-telecoms-to-meet-growing-demand-for-data/>.
- ¹⁶ See <http://speedtest.ofca.gov.hk/index.html>.
- ¹⁷ See <https://ec.europa.eu/digital-agenda/telecoms-rules>.
- ¹⁸ See <https://ec.europa.eu/digital-agenda/node/641>.
- ¹⁹ See information by country: <http://ec.europa.eu/digital-agenda/en/progress-country>.
- ²⁰ See <http://ec.europa.eu/digital-agenda/en/single-telecom-market-growth-jobs>.
- ²¹ See http://www.tra.org.bh/en/pdf/1_LoveMyNumberCampaign_pressreleaseFinal_en.pdf and <http://www.ilovemynumber.bh/>.
- ²² See <http://www.tra.org.bh/EN/pdf/2012TelecommunicationsmarketsindicatorsvFforpublic.pdf>.
- ²³ See http://www.bh.zain.com/ZainPortal/Bahrain_News1_ar.jsp and <http://www.telegeography.com/products/commsupdate/articles/2011/04/12/zain-bahrain-upgrades-wimax-network/>.
- ²⁴ See http://www.btrc.gov.bd/jdownloads/Licensing%20Guidelines/btrc_license_summary_06-03-2013_.pdf.
- ²⁵ See <http://lrineasia.net/2013/01/graphic-evidence-of-consequences-of-not-paying-attention-to-redundancy-bangladeshs-international-connectivity/>.
- ²⁶ See <http://www.digicelbarbados.com/en/about/news/digicels-4g-network-goes-live> and <http://www.telegeography.com/products/commsupdate/articles/2011/11/25/digicel-barbados-launches-hspa-/index.html>.
- ²⁷ See <http://4g.digicelbarbados.com/en/pricing> and <http://www.time4lime.com/4G/bb/get-4g/plans.jsp>.
- ²⁸ See <http://www.mpt.gov.by/en/content/1928.22Mobile-broadbandsubscriptionsincludeGPRS>.
- ²⁹ See <http://www.telegeography.com/products/commsupdate/articles/2013/01/29/mts-belarus-reports-1-5m-mobile-internet-subscribers-in-2012/>.
- ³⁰ See <http://www.mc.gov.br/acoes-e-programas/programa-nacional-de-banda-larga-pnbl/252-temas/programa-nacional-de-banda-larga-pnbl/23723-termos-de-compromisso>.
- ³¹ See <http://www.mc.gov.br/acoes-e-programas/programa-nacional-de-banda-larga-pnbl>.
- ³² See http://www.teleco.com.br/3g_cobertura.asp.

- ³³ See <http://www.americamovil.com/amx/cm/reports/Q1Q12EN.pdf>.
- ³⁴ See http://www.telegeography.com/products/commsupdate/articles/2013/01/25/sutel-to-choose-firm-for-mnp/?utm_source=CommsUpdate&utm_campaign=d99ad5b718-CommsUpdate+25+January+2013&utm_medium=email.
- ³⁵ See Soiela, 2013.
- ³⁶ See <http://estonia.eu/about-estonia/economy-a-it/e-estonia.html>.
- ³⁷ See <http://point-topic.com/press-and-events/2012/estonia-a-leader-in-mobile-and-superfast-broadband/>.
- ³⁸ See <http://www.ustr.gov/trade-agreements/free-trade-agreements/cafta-dr-dominican-republic-central-america-fta>.
- ³⁹ See <http://www.telecomsinsight.com/file/92741/costa-rica-telecoms-ready-to-reach-potential.html>, <http://www.telegeography.com/products/commsupdate/articles/2005/10/03/ice-gsm-lines-face-further-delays/> and <http://www.telegeography.com/products/commsupdate/articles/2005/06/16/first-come-first-served-in-queue-for-ice/>.
- ⁴⁰ See <http://www.bnamericas.com/news/privatization/market-liberalization-has-positive-effect-on-mobile-penetration-levels-sutel>.
- ⁴¹ See http://www.grupoice.com/wps/portal/gice/acerca_ice/acerca_ice_asi_somos/acerca_ice_asi_somos_historia!/ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os_gQL0N_D2cLEwN_Vy8XA08zY09TUzNTi1Bn6B8JK8QYCIK1De1dcyyMzVwMDAhBjdBjiAowE-3SbGaHajyBsEGJuQ5HJM0_Hr9vPlz03VL8gNDQ2NKFcEAKzrVkl/dl3/d3/L2dBISEvZ0FBIS9nQSEh/.
- ⁴² See http://www.prepaidmvno.com/wp-content/uploads/2013/01/Future_MVNOs_Latin_America_-_August_2012.pdf.
- ⁴³ See http://www.telegeography.com/products/commsupdate/articles/2013/01/25/sutel-to-choose-firm-for-mnp/?utm_source=CommsUpdate&utm_campaign=d99ad5b718-CommsUpdate+25+January+2013&utm_medium=email.
- ⁴⁴ See <http://www.telegeography.com/products/commsupdate/articles/2012/05/15/hot-golan-launch-3g-networks/>.
- ⁴⁵ See http://www.moc.gov.il/sip_storage/FILES/5/605.pdf.
- ⁴⁶ See TRA, 2011.
- ⁴⁷ See <http://www.crc.gov.mn/en/main.php?cid=1&do=5&did=0>.
- ⁴⁸ See <http://www.oxfordbusinessgroup.com/news/make-connection-small-population-spread-over-huge-area-creates-number-hurdles>.
- ⁴⁹ See <http://www.telegeography.com/products/commsupdate/articles/2012/06/18/nawras-plans-to-launch-lte-set-to-boost-3g-wimax/> and <http://www.telegeography.com/products/commsupdate/articles/2012/07/17/omantel-launches-lte-network/>.
- ⁵⁰ See <http://www.ita.gov.om/ITAPortal/ITA/strategy.aspx?NID=646&PID=2323&LID=115>.
- ⁵¹ See <http://www.omantel.om/OmanWebLib/MediaCenter/Press%20Release.aspx?LinkID=5&MenuId=183>.
- ⁵² See <http://www.nawras.om/nawras/mediacentre/pressreleases/tabid/250/vw/1/itemid/36/--nawras-network-turbocharging-programme-positively-impacts-the-customer-experience.aspx>.
- ⁵³ See <http://www.telegeography.com/products/commsupdate/articles/2012/06/13/tra-initiative-to-bring-telecoms-to-150-rural-villages/> and <http://www.oxfordbusinessgroup.com/news/unlocked-potential-evolving-regulations-and-continued-growth-mobile-broadband-are-fuel/>.
- ⁵⁴ See http://www.oman.om/wps/portal/index!/ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3hjA3cDA39LT1_vEF9HAYpJMDcVsx8zYxcXE6B8pFm8AQ7gaEBAzjlPrz6_Tzyc1P1C3lJDHqDfRUBGuNB1gl!/dl3/d3/L2dBISEvZ0FBIS9nQSEh/.
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- ⁵⁸ See <http://www.balancingact-africa.com/news/en/issue-no-586/telecoms/mtn-goes-green-in-za/en>.
- ⁵⁹ See <http://news.idg.no/cw/art.cfm?id=AA6ADFA1-AC08-48EC-3C5791B2DDD71EE3>.
- ⁶⁰ According to a document published by the Ministry of Transport, Works, Supply and Communication in July 2012.
- ⁶¹ See <http://www.zambialii.org/files/zm/legislation/statutory-instrument/2012/38/S.I.%20No.%2038%20for%202012.pdf> and http://www.parliament.gov.zm/index.php?option=com_docman&task=doc_view&gid=1007.
- ⁶² See http://www.parliament.gov.zm/index.php?option=com_docman&task=doc_view&gid=1007.
- ⁶³ See <http://allafrica.com/stories/201303121306.html?page=2>.
- ⁶⁴ See <http://www.balancingact-africa.com/news/en/issue-no-586/telecoms/mtn-goes-green-in-za/en>.
- ⁶⁵ See <http://www.itnewsafrika.com/2013/01/airtel-zambias-rural-investment-pays-off/>.
- ⁶⁶ See <http://www.telecel.co.zw/index.php/coverage> and <http://www.telegeography.com/products/commsupdate/articles/2012/09/19/telecel-to-deploy-200-new-base-stations-netone-roams-in-sa/>.
- ⁶⁷ See <http://www.telegeography.com/products/commsupdate/articles/2012/11/26/potraz-targets-improved-coverage-in-remote-areas/>.
- ⁶⁸ See <https://www.econet.co.zw/media-centre/general-news/ecocash-handles-100m-monthly>; <http://www.telegeography.com/products/commsupdate/articles/2012/10/02/ecocash-attracts-1-7m-users-in-first-year/> and <https://www.econet.co.zw/ecocash/>.

- ⁶⁹ See http://www.potraz.gov.zw/files/POTRAZ_Quaterly_Sector_Statistics.pdf.
- ⁷⁰ See <http://www.telegeography.com/products/commsupdate/articles/2013/04/17/international-bandwidth-demand-is-decentralising/>.
- ⁷¹ See <http://www.telegeography.com/products/commsupdate/articles/2012/12/13/ntt-lands-ase-in-hong-kong-ahead-of-target-q1-launch/>.
- ⁷² See ITU, Broadband Commission for Digital Development and Cisco, 2013.
- ⁷³ See http://www.teams.co.ke/index.php?option=com_content&view=article&id=59&Itemid=53.
- ⁷⁴ See <http://broadbandtoolkit.org/Case/ke/6> and MIC, 2012.
- ⁷⁵ See <http://www.lion-submarinesystem.com/>.
- ⁷⁶ See http://www.orange-trl.co.ke/index.php?option=com_content&view=article&id=284:lion2-submarine-cable-goes-live&catid=1:latest-news&Itemid=28.
- ⁷⁷ Total used bandwidth increased from 278 329 Mbit/s in September 2012 to 328 641 Mbit/s by December 2012.
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- ⁸⁰ See http://www.itu.int/net/pressoffice/press_releases/2013/CM04.aspx#UcrdTfn0Geg.
- ⁸¹ ITU, 2012a.
- ⁸² ITU correspondence with Central African Republic's *Agence de régulation des télécommunications*.
- ⁸³ See <http://www.amc.al/en/latestnews/viewpressrelease/38> and http://www.vodafone.al/vodafone/Vodafone_Albania_202_2.php.
- ⁸⁴ See <http://www.telegeography.com/products/commsupdate/articles/2013/03/01/the-eagle-has-landed-incumbent-swoops-into-3g-sector/>.
- ⁸⁵ Information based on the draft version of the broadband strategy.
- ⁸⁶ ITU and Broadband Commission, 2012.
- ⁸⁷ The regions in this chapter refer to the ITU/BDT regions, see <http://www.itu.int/ITU-D/ict/definitions/regions/index.html>.
- ⁸⁸ The coefficient of variation (CV) measures the dispersion of a variable independently of the variable's measurement unit. The higher the CV, the greater the dispersion in the variable.
- ⁸⁹ See <http://www.lion-submarinesystem.com/>.
- ⁹⁰ See <http://www.nation.sc/index.php?art=27695>.
- ⁹¹ See <http://www.iam.ma/Groupe/Presse/CommuniquésDePresse/Pages/DetailDuCommuniquéDePresse.aspx?itemID=66>.
- ⁹² See <http://www.cellular-news.com/story/19503.php>.
- ⁹³ See <http://www.ftthcouncil.eu/documents/Presentations/20121016PressConfBBWF.pdf>.
- ⁹⁴ For an overview of MTR regulation in the European Union, see the list of countries applying ex-ante regulation to voice call termination on mobile networks (Market 7 under the 2007 EC Recommendation on Relevant Markets), available at https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/Market_overview_25_february_2013.pdf. For more information on the regulatory accounting principles applied to MTRs in Europe, see the European Commission's Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:124:0067:0074:EN:PDF>.
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- ⁹⁷ See <http://www.mc.gov.br/aco-es-e-programas/programa-nacional-de-banda-larga-pnbl>.
- ⁹⁸ See <http://www.mintic.gov.co/index.php/fibra-inicio> and <http://www.mintic.gov.co/index.php/vive-digital>.
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