Target 1: Connect villages with ICTs and establish community access points[1]

Introduction

Although Target 1 does not explicitly mention "rural" populations, it is implicit from the use of the word "village"[2] that the focus is on connecting people living in rural areas. In most countries, especially developing countries, there is a large gap in the availability of information and communication technologies (ICTs) between urban and rural locations, and Target 1 is important for ensuring that rural areas are not excluded from the information society. Because of their isolation, rural areas arguably stand to derive even more benefit from connectivity, since ICTs can deliver health, education and other services that might be less widely available there.

There are two activities associated with this target: 1) connecting villages with ICTs, and 2) establishing community access points. The second underpins the first, in that one of the most practical methods of providing ICTs in rural areas in many developing countries is through shared access. Given that incomes tend to be lower in rural locations compared to urban areas, and many rural households simply cannot afford ICTs, shared access is a cost-effective means of providing rural connectivity. The establishment of community access points is also related to Target 4 on connecting public locations that can be used for shared access, such as libraries and post offices, and likewise to Target 10, which sets the goal of ensuring that more than half the world's inhabitants have access to ICTs within their reach. About half of the world's inhabitants live in rural areas, and one way of getting ICTs to them is through community access.

Insofar as the majority of the population in developed countries lives in urban areas and, moreover, rural areas in those countries are in any case fairly well equipped in terms of connectivity (ITU estimates that 95 per cent of rural areas in developed countries are covered by a mobile cellular network signal), the main focus of this chapter is necessarily on developing nations. It does not, however, address exclusively developing countries, since even developed nations still face some of the challenges of bringing ICTs to rural areas, particularly in terms of Internet and broadband access.

Target 1 is related to all the WSIS action lines, since connecting the places where people live with ICTs is one of the most basic requirements for creating an information society. In some cases, there is a direct linkage:

- Action Line C2 (Information and communication infrastructure: an essential foundation for the information society) highlights that "*infrastructure is central in achieving the goal of digital inclusion, enabling universal, sustainable, ubiquitous and affordable access to ICTs by all, … to provide sustainable connectivity and access to remote and marginalized areas at national and regional levels*."[3] This action line also calls on governments to provide ICT connectivity for schools, libraries, post offices, community centres and other institutions accessible to the public. This is directly related to the establishment of community access points, which is part of the target. The action line further calls for strengthening national broadband network infrastructure, which is critical for rolling out high-speed Internet access to rural areas. It also advocates national e-strategies to cater for disadvantaged and vulnerable groups, who are often found in rural areas, and refers to unused wireless capacity, including satellite, for providing access in remote areas.

- Action Line C3 (Access to information and knowledge) is directly linked to Target 1 as it states that "*Governments, and other stakeholders, should establish sustainable multipurpose community public access points, providing affordable or free-of-charge access for their citizens to the various communication resources, notably the Internet. These access points should, to the extent possible, have sufficient capacity to provide assistance to users, in libraries, educational institutions, public administrations, post offices or other public places, with special emphasis on rural and underserved areas....*"[4]

- Action Line C4 (Capacity building) is directly linked to Target 1, in that basic ICT literacy skills are essential for making use of the connectivity supplied to villages and via community access. Indeed, it explicitly refers to this potential: "*Promote e-literacy skills for all... taking advantage of existing facilities such as libraries, multipurpose community centres, public access points*"... It also calls for the empowerment of "*local communities, especially those in rural and underserved areas, in ICT use and promote the production of useful and socially meaningful content for the benefit of all*."[5]

Another important issue is to ensure that once villages are connected with ICTs, they deliver relevant applications and content for people in rural areas. The availability of relevant applications and content is addressed in Action Lines C7 (ICT applications) and C8 (Cultural diversity and identity, linguistic diversity and local content), as well as C9 (Media), which makes reference to the need to reduce regional imbalances in infrastructure and to use "*traditional media to bridge the knowledge divide and to facilitate the flow of cultural content, particularly in rural areas*."[6]

Measuring Target 1 — Proposed indicators[7]

Like other WSIS targets, Target 1 is vague in terms of the type of ICTs to which it refers. Five indicators are proposed for measuring and tracking Target 1 (Table 1.1). Three of these will help track the availability of ICTs in rural areas,

Table 1.1: Indicators for measuring Target 1

Aspect measured	Proposed indicator	*Partnership* core indicator
Rural connectivity	1. Percentage of rural population covered by a mobile cellular telephone network, broken down by technology (2G, 3G)	A7
	2. Proportion of rural households with a telephone, broken down by type of network (fixed and/or mobile, mobile only, fixed only)	HH3
	3. Proportion of rural households with Internet access, broken down by type of access (narrowband, broadband)	HH6
Community connectivity	4. Percentage of localities with public Internet access centres (PIACs), broken down by size of locality, or by urban/rural	A10
	5. Location of individual use of the Internet in the last 12 months	HH8

and two will serve specifically to track the prevalence and use of community access. All of these indicators are being collected by ITU, directly from countries, under the *Partnership on Measuring ICT for Development*.[8] They include mobile cellular and Internet technologies, and cover both access to and use of these ICTs.

Measuring rural connectivity

As mentioned, "Connect villages with ICTs" is essentially aimed at rural areas. However, the use of the word villages poses statistical challenges, since the term "village" is rarely used as a unit of measurement in national statistical systems. When data are presented by administrative division, it is usually at the second administrative level (e.g. region, province or state).

In order to measure this target based on villages, the number of villages would have to be determined. There is no international standard defining what constitutes a village. Some countries report the number of localities broken down by population size. However, such information is not widely available, and even if it were it does not solve the problem of what size of locality should constitute a village. It would be logical to associate a village with a certain population size considered as rural, but definitions vary widely. In many instances, other factors besides population size are used to define "urban" and "rural," such as administrative divisions or employment outside agriculture.[9] In the European Union, "rural" is not defined by the size of localities but by the population density (number of inhabitants per km^2).[10]

Apart from the methodological issue of what constitutes a village, not all countries publish the number of localities they contain. In addition, factors such as migration, nomadic populations, civil war and resettlement also have an impact on the ability to determine precisely where people live and how many localities there are in a country.[11] Although, in 2008, ITU did estimate the number of localities based on several proxy indicators (for example the number of enumeration areas used by statistical offices for census and surveys), in order to track the availability of ICTs in villages [ITU, 2008], it seems very difficult to track this information on a regular basis. Even for countries that publish some information on the number of villages, there are large gaps in continuity and data are often only updated every ten years, at the time of a census.

Another methodological challenge with Target 1 is that it refers to *connectivity*, which is a broad term. The target does not specify which technology should be available in villages. Fixed-line telephony is the service for which data, when available, have historically been gathered, and most universal service plans remain geared to the provision of fixed telephone lines. Yet many countries do not produce data on the availability of fixed-line telephone service according to size of community (of any magnitude, including cities) or population covered. Also, globally, the number of fixed lines is stagnating and even decreasing in many countries, as fixed lines are increasingly replaced by mobile telephony. It therefore does not seem appropriate to include an indicator for fixed lines to track Target 1.[12]

It would, however, be very useful to track Internet — and, specifically, broadband — access in villages, since these are critical ICTs for full participation in the information society. Therefore the *number of villages with Internet access* (broken down by urban/rural locality and narrowband/broadband access) is an important indicator. This is largely covered by a very similar indicator, on public Internet access centres (PIACs), which will be discussed later in this chapter, in the section on *Measuring community connectivity*.

If Target 1 cannot be tracked with "villages" as a denominator, it is analytically useful to present other indicators based more broadly on rural areas, measuring for example rural access, coverage and use. Although these indicators may not conform strictly to the letter of the target in terms of the exact wording ("villages"), they certainly convey information that reflect its intent, which is to monitor ICT connectivity in rural areas. Furthermore, they are arguably more relevant, since they cover popular technologies such as mobile cellular, and units of measurement directly related to universal service (which refers to ICTs in households). Another major advantage is that indicators of rural access and coverage are widely available, may be more comparable and feature historical data upon which to gauge trends. Finally, indicators based on population coverage and households provide greater statistical reliability and are usually more up-to-date.

Today, mobile communications has become the most prevalent form of communications in almost every country in the world. Mobile networks support voice communications as well as text messaging and Internet access (at increasingly higher speeds, including broadband). Therefore, it is indispensable to factor in mobile networks in any analysis of rural access to ICTs. Considering that a single mobile antenna may serve numerous localities depending on how far they are apart, more localities enjoy mobile service than fixed telephone access. Although the availability of mo-

bile coverage could be analysed by locality, this kind of data are not widely available. Instead, the common way of expressing mobile coverage is in terms of population (or territory) within range of a signal. This indicator has been adopted by the international statistical community as a core indicator: *percentage of population covered by a mobile cellular telephone network*. The indicator refers to "*the percentage of a country's inhabitants that live within areas served by a mobile cellular signal, irrespective of whether or not they choose to use it*."[13] It therefore refers to the theoretical ability to use mobile cellular services if a person has a cellular telephone and a subscription. It also refers to terrestrial mobile coverage.[14]

National mobile population coverage figures are available for many countries and published by both regulators and operators. Mobile population coverage could be dissected into urban and rural coverage, though data are not typically compiled in this manner. For the purposes of this report, *the percentage of rural population covered by a mobile cellular telephone network* has been calculated on the assumption that at least all urban areas are covered, with any remaining coverage assigned to rural areas.[15]

Another way of measuring rural ICT accessibility is at the household level. Household telephone penetration is the basic measure of *universal service* and is an unambiguous measurement, since a household is a well-defined statistical concept and the maximum penetration level is 100 per cent. Household penetration is also useful for gauging how theoretical access in localities or mobile coverage translate into practical ICT use.

A growing number of countries measure the availability of at least some ICTs in households. In addition, data are increasingly disaggregated by urban and rural location. This makes household ICT penetration an attractive complement to other indicators for measuring rural access. Tracking household penetration is increasingly relevant to middle-income nations that are making the transition from universal access to universal service. In low-income countries, policies should be more focused on universal access aimed at enhancing coverage and providing community services. It should be noted that a country's income level need not be the sole criterion influencing whether emphasis should be placed on universal access or universal service. The link between income level and some types of ICT penetration has become increasingly tenuous over the years, particularly for mobile telephony, which has low barriers to entry (e.g. declining handset prices, prepaid).

In the context of the target, relevant household indicators would be

1. *Proportion of rural households with a telephone, broken down by:*
    - *fixed and/or mobile telephone*
    - *mobile only*
    - *fixed only*

2. *Proportion of rural households with Internet access, broken down by:*
    - *narrowband access*
    - *broadband access*

These indicators have been adopted by the *Partnership on Measuring ICT for Development.*[16]

Measuring community connectivity

While deploying ICT infrastructure to villages or rural areas is a first step, rural inhabitants then need a way to actually use those ICT services in practice; hence the importance of "establishing community access points." Target 1 recognizes the importance of providing shared services where citizens do not have access to ICTs at home, as is the case in many low-income countries, especially LDCs.

The *Partnership* has defined the following type of community access point, which can be used to measure this target:

A *public Internet access centre (PIAC) is a site, location, or centre of instruction at which Internet access is made available to the public, on a full-time or part-time basis. PIACs include telecentres, digital community centres, Internet cafés, libraries, education centres and other similar establishments, whenever they offer Internet access to the general public. All such centres should have at least one public computer for Internet access*.[17]

The *Partnership* proposes the indicator A10: *Percentage of localities with public Internet access centres* (PIACs). The indicator is computed by dividing the number of localities with at least one PIAC by the total number of localities in

the country, and then multiplying by 100. The indicator should be broken down by size of locality, or by urban/rural localities. It reflects how many (urban/rural) localities in a country have a PIAC.

A related indicator would be the *Partnership* indicator HH8: *Location of individual use of the Internet in the last 12 months*, since two of the proposed range of locations are a "*Community Internet access facility*" or a "*Commercial Internet access facility*." This indicator is useful for measuring the demand side of public Internet facilities.

The community access target is also related to Target 4, particularly in regard to connectivity in public locations such as libraries and post offices, which can serve as public access locations. The establishment of community access points can also help to achieve Target 10, namely ensuring that half of the world's inhabitants have access to ICTs within their reach.

Status of Target 1

Given the problems with defining the term "village" and the lack of data on village connectivity, it is very difficult to track the target in terms of the proportion of villages with ICTs. In 2008, ITU published some data on the percentage of localities with different ICTs, by region. It found that in sub-Saharan Africa, for example, only 12 per cent of localities had telephone access and 1.4 per cent had access to the Internet [ITU, 2008].

One of the problems is that the data on which these estimates are established date back to between 2000 and 2006, and only very few countries in the world collect data by locality. Two exceptions are China and India. China recently announced that by the end of 2009, "*voice telephony services were available to 99.86% of the country's administrative villages (up from 98% a year earlier), while internet access covered 91.5% (up from 89%), according to data from the regulator MIIT*."[18] India has pursued a longstanding goal of providing its reported 593 485 villages with a telephone. By December 2008, no fewer than 539 448 villages (91 per cent) had a telephone [TRAI, 2008]. While this means that the world's two largest developing nations — China and India — have largely attained Target 1 when measured by telephone access in villages, most other countries do not track village connectivity, even though many have initiated projects to connect rural areas. [19]

Nor is the success of fixed lines likely to be replicated in many of the world's least developed countries. Fixed telephone line growth has stagnated in most countries, overtaken by wireless communications. The cost of installing wireless systems in rural areas is far less than that of fixed telephony, so it does not make economic sense to equip villages with fixed telephone lines.

Given the rapid growth of wireless communications, a more appropriate indicator for measuring progress towards Target 1 is the percentage of rural population *within reach of a mobile cellular signal*. Existing data on the percentage of the rural population covered by a mobile cellular telephone network suggests that almost three quarters of the world's rural inhabitants were covered by a mobile cellular signal by the end of 2008 (Table 1.2). The highest coverage is in Europe, where practically all inhabitants of rural areas enjoy a mobile signal. Although the lowest rural coverage is in Africa, 2008 was a watershed year, with over half of the continent's rural citizens now covered by mobile telephony. Africa also recorded the biggest increase in rural mobile population coverage between 2000 and 2008 (Chart 1.1).

Based on recent trends, it seems possible that almost all regions will achieve full mobile coverage of rural populations before 2015. The one exception is Africa, but even there rural coverage could exceed 90 per cent by 2015. Complete mobile coverage of all rural areas around the world by 2015, or even earlier, would appear achievable with the right policy emphasis.

Given the increase in the number of wireless broadband networks and subscriptions, the indicator should be broken down by technology (2G, 3G, and eventually 4G). Many operators and an increasing number of regulators, including France's ARCEP and the United Kingdom's Ofcom (Table 1.3), are tracking 3G population coverage, particularly in order to track network coverage commitments.[20] ITU is planning to add a new indicator to track 3G/4G mobile population coverage to its list of indicators.

While an increasing number of developing countries are starting to collect data on the *proportion of households with a fixed and/or mobile telephone* through official household surveys, some developed countries do not (or no longer)

Table 1.2: Rural population covered by a mobile cellular signal, 2008

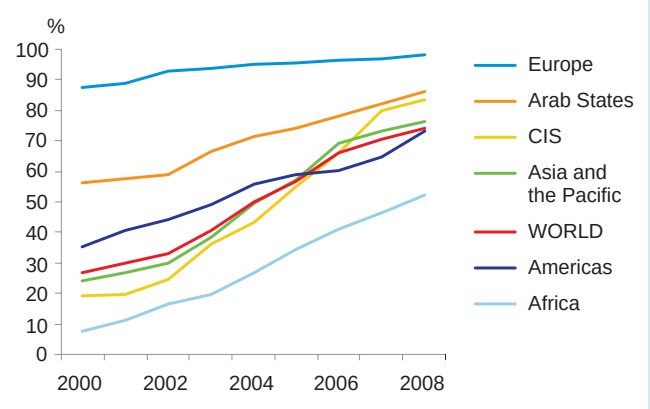
	Overall mobile cellular coverage (%)	Rural population covered (%)	Rural population covered (millions)	Rural population not covered (millions)
Africa	69	52	253	230
Americas	93	73	136	50
Arab States	94	86	115	18
Asia and the Pacific	85	76	1 720	533
CIS	94	83	83	17
Europe	99	98	159	3
WORLD	**86**	**74**	**2 466**	**852**

Note: The rural population covered by a mobile cellular signal is calculated by the following formula:

$$\text{Proportion of rural population covered by a mobile cellular signal} = \frac{(\text{Proportion of total population covered by a mobile cellular signal} \times \text{Total population}) - \text{Urban population}}{\text{Rural population}}$$

Source: ITU.

Chart 1.1: Rural population covered by a mobile signal, 2000-2008, by region



Source: ITU.

track this indicator. The European Union collected data on households' share of main telephone lines for a number of years, but discontinued the series as far back as 2006. It has never collected data on rural household access to telephones.

The latest available household survey data suggest that in most countries there are more rural households with mobile phones than fixed lines. The exceptions are Canada, Kyrgyzstan and Bosnia and Herzegovina, where more households have a fixed telephone than a mobile phone (Charts 1.2 and 1.3). One explanation is that fixed telephone calls in these countries are relatively cheap or even free, as is the case in Canada, so people have a strong incentive to keep their landline. In several countries from the Americas region, including Paraguay, El Salvador, Chile, Guatemala, and Nicaragua, household access is dominated by mobile phones, and less than five per cent of households have a fixed telephone. The mobile phone is also very dominant in a number of low-income developing countries in Africa, including Burkina Faso, Uganda and Cameroon, and in Asia and the Pacific, confirming that mobile cellular technology is playing a crucial role in expanding communication networks (Box 1.1).

Overall, the proportion of rural households that have a mobile telephone ranges from as low as four per cent in the Democratic Republic of the Congo to 95 per cent in Japan (Chart 1.2). Existing data, which are available for almost 40 countries at very different stages of development and across all regions, show that while low-income developing countries tend to have relatively few households with a mobile telephone, many developing countries, including Armenia, Egypt, Ecuador, the Dominican Republic, Ukraine and the Philippines have reached penetration levels above 50 per cent. Fixed telephone penetration, on the other hand, remains very limited in most rural households, with

Table 1.3: Population covered by a mobile signal in 2008 across the United Kingdom and nations

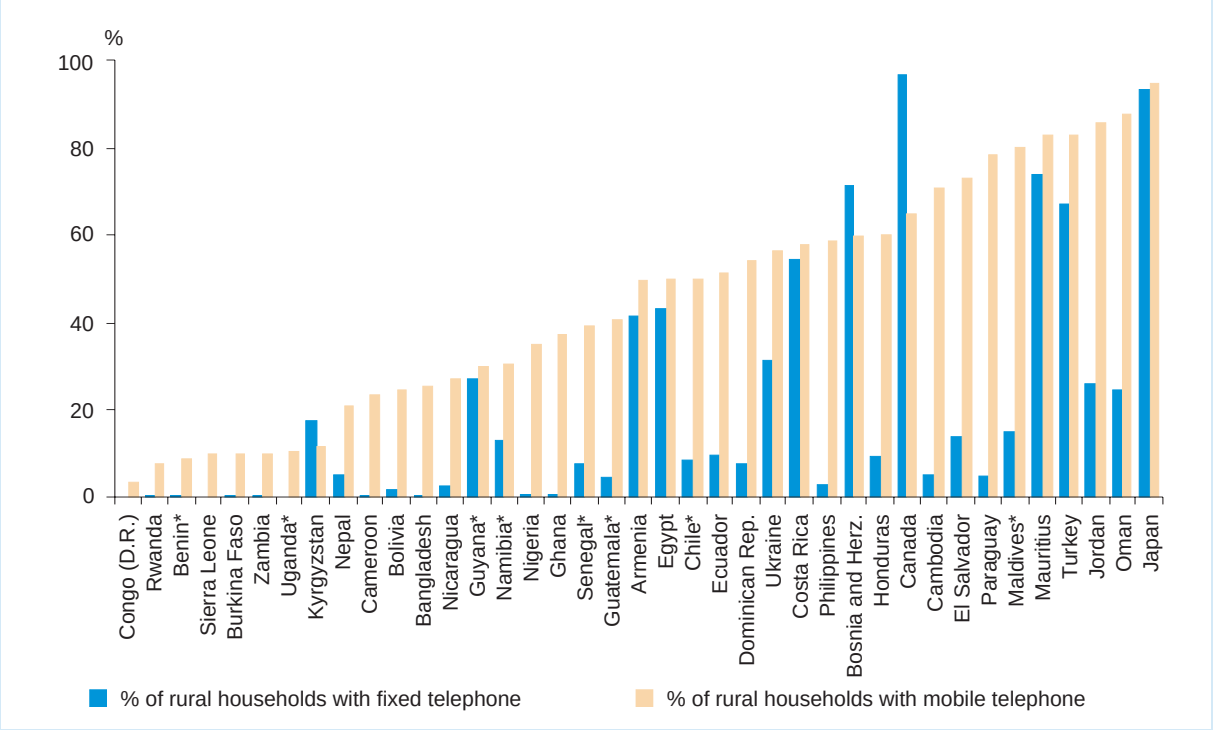
	2G %	3G%
United Kingdom-wide	98	87
England	99	91
Wales	92	67
Scotland	89	67
Northern Ireland	92	43

Note: Figures show the percentage of population within postcode districts where at least one or more operators had at least 90% 2G and 90% area coverage.
Source: Ofcom. Mobile Evolution. Ofcom's mobile sector assessment. December 2009.

penetration levels as low as 0.1, 0.4 and two per cent in the Democratic Republic of the Congo, Burkina Faso and Nicaragua, respectively.

Chart 1.3, which shows the proportion of rural households that have only *either* a mobile phone *or* a fixed telephone confirms these findings. Except for Canada, Kyrgyzstan and Bosnia and Herzegovina, rural households tend to rely more on mobile telephony as their sole means of communication. Compared to Chart 1.2, it also highlights that in

Chart 1.2: Proportion of rural households with telephone by type, 2007-08

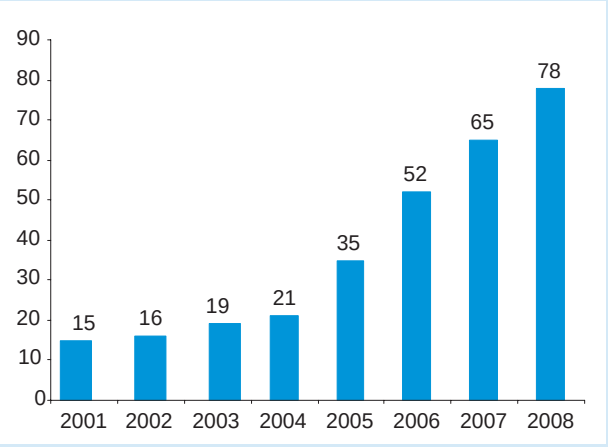


Note: * Data refer to 2006.
Source: ITU World Telecommunication/ICT Indicators database.

Box 1.1: The spread of mobile telephony in rural areas: an example from Paraguay and Jordan

Arguably the biggest ICT success story is the continuing spread of mobile cellular networks into rural areas. This has been driven by liberalization of the telecommunication sector worldwide, with particular emphasis on developing competition in the mobile cellular market. In the developing world, the far greater reach of mobile cellular networks compared to fixed-line networks would most likely not have been possible without competition. Indeed, traditional monopoly fixed-line networks in most developing countries have far less population reach than mobile networks, even though they have been in operation for much longer. Likewise, although a number of countries have created universal service funds to stimulate investment of mainly fixed lines in rural areas, for the most part they have been far less successful in expanding access than mobile cellular companies.

Chart 1 Box 1.1: Percentage of rural households with a mobile telephone, Paraguay



Note: Data between surveys have been estimated.
Source: Adapted from DGEEC (Encuesta Permanente de Hogares).

Although there are numerous examples of this mobile revolution in rural areas, two in particular serve to illustrate the impact of mobile communications on rural universal service. Paraguay is a landlocked South American nation with 6.2 million inhabitants, 41 per cent of whom live in rural areas. It launched its first mobile network in 1992, with a second following in 1998 and a third in 1999. By the turn of the millennium, Paraguay had more mobile subscriptions than fixed lines. A fourth operator entered in 2001, making Paraguay one of the most competitive mobile markets in Latin America. This high level of competition has led to widespread infrastructure investment in mobile networks, boosting population coverage. By the end of 2008, a mobile signal was available in practically all inhabited areas of the country.

The manner in which mobile has penetrated into rural households is astounding given that a third of the country's population lives below the poverty line, with many in small towns and villages. By 2008, over three quarters of rural households had a mobile telephone compared to 15 per cent in 2001 (Chart 1 Box 1.1). Only five per cent of rural households have a fixed line. Wireless is moving beyond voice in Paraguay, with the operators having launched 3G broadband mobile service. One of the mobile operators has launched a wireless WiMAX network and has the largest market share in the broadband market.

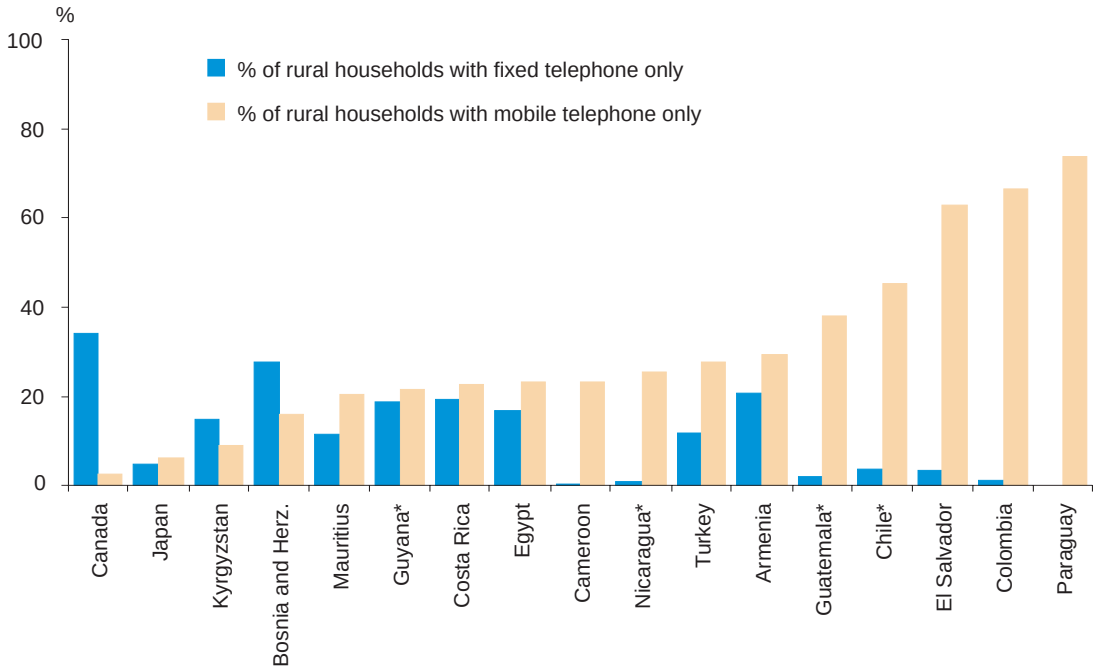
Another example is Jordan, a Middle Eastern country with 5.7 million inhabitants. In 2002, only two in five rural households had a mobile phone. By 2007, this ratio had risen to more than four in five. Like Paraguay, Jordan is characterized by a highly competitive market with four mobile operators.

Source: ITU.

several (mainly high-income) countries, only very few households have only a fixed or a mobile phone. In Japan, for example, only five and six per cent of rural households have only a fixed or only a mobile phone, respectively, whereas overall Japanese households have over 90 per cent household penetration for both phones. Mauritius also has relatively few households (11 per cent with fixed only and 20 per cent with mobile only) that have only one telephone. Although this might be surprising since Mauritius is a developing country, it has a relatively high GNI per capita level, particularly compared to other African nations.

Another indicator proposed to monitor Target 1 is the *proportion of rural households with Internet access*. What is striking about the data for this indicator is the complete lack of Internet access in rural homes in many of the developing countries, including for example Niger, Nicaragua, Mongolia and Colombia (Chart 1.4). In other countries, including Bhutan, Armenia, Egypt, Chile and Thailand, home Internet access in rural areas remained below five per cent by the year 2007-08. While these data are somewhat outdated, given that the Internet continues to spread rapidly, including to rural areas, they suggest that Internet connectivity in rural areas remains very limited. Although the reasons why so few rural households have Internet access are not known, these findings suggest that public access in rural areas is very important in these countries. The proportion of rural households with Internet access at home exceeds the 50 per cent mark only in developed and high-income economies, including New Zealand, Israel and Japan. The Republic of Korea displayed the highest penetration rate, at 90 per cent. Two countries, Israel and

Chart 1.3: Proportion of rural households with only a fixed or only a mobile telephone, 2007-08



Note: * Data refer to 2006.
Source: ITU World Telecommunication/ICT Indicators database.

Mauritius, stand out for actually having relatively more rural than urban households with Internet access. Mauritius is a very rural country, with 94 per cent of the population living in rural areas.[21] In Israel, on the other hand, only seven per cent of the population live in rural areas, yet household Internet access stood at 69 per cent, compared to 59 per cent in urban areas.

A comparison of urban versus rural households shows that, in developing countries, home Internet access levels remain much higher in urban areas. In Mongolia, 4.9 per cent of urban households have Internet access, compared to only 0.1 per cent of rural households. In Colombia, the difference is 16.4 per cent of urban households as against 0.4 per cent in rural areas. The rural digital divide is much less pronounced in developed countries, as highlighted by Japan, Canada and New Zealand (Chart 1.4).

Fewer countries collect Internet household data broken down by type of access, but existing data suggest that broadband access in rural households remains very limited in developing countries and by 2007-08 did not exceed ten per cent in any developing country for which data are available (Chart 1.5). At the same time, there are important differences between the developed and high-income economies, with penetration levels ranging from a relatively low 22 per cent in New Zealand to 71 per cent in the Republic of Korea. More and more developed and developing countries, including the United States, Europe and Malaysia (Box 1.2), are recognizing the importance of high-speed Internet access and have modified (or are in the process of modifying) universal service and access frameworks to include the provision of broadband services in rural areas.

Chart 1.5 also compares the difference between home broadband access in urban versus rural areas and shows that there are important variations in penetration rates. In Chile and in Thailand, for example, the penetration rate is around nine times as high for urban as for rural areas and in Egypt urban broadband penetration in households stood at twelve per cent compared to only two per cent in rural areas. Differences remain relatively high, even in devel-

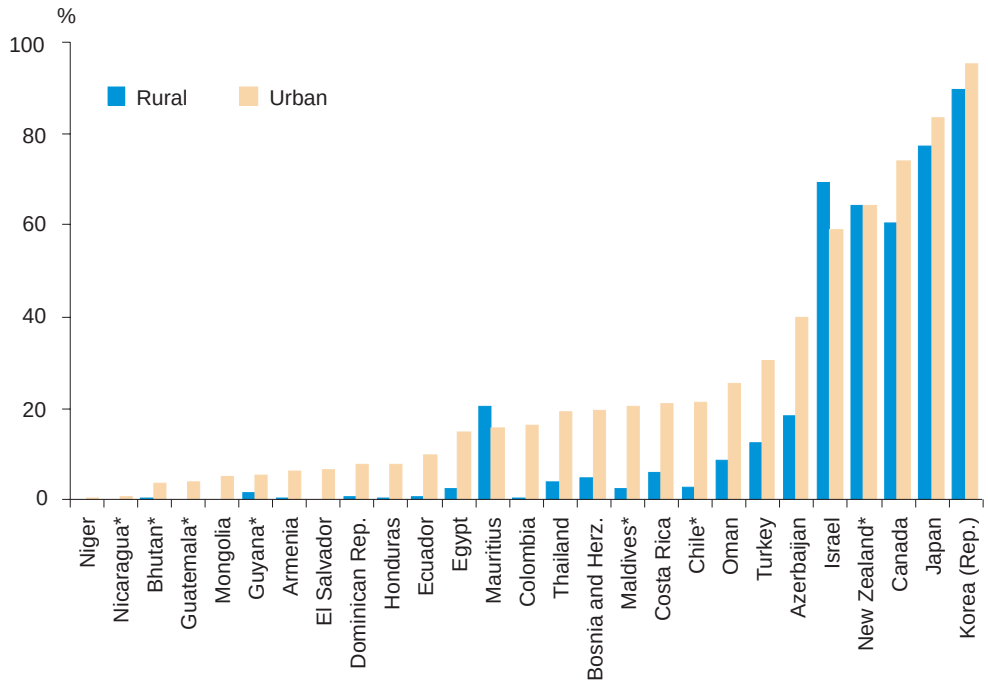
oped countries, such as Canada and Japan. In New Zealand, household broadband penetration in urban areas in 2008 stood at 35 per cent, compared to 22 per cent in rural areas. These data confirm the need to address the urban-rural broadband divide in both developed and developing countries.

Indeed, extending broadband access in rural areas remains a policy focus even in developed nations, where low population density, landscape topography and vast geographic areas can often pose an ongoing challenge.[22] The United States, for example, recently allocated billions of dollars for expanding rural broadband as part of the economic stimulus Recovery Act[23], and one of the conclusions of the US National Broadband Plan reads as follows: "*Broadband, … is a modern necessity of life, not a luxury. It ought to be found in every village, in every home and on every farm in*

Box 1.2: More broadband, please: Malaysia adapts universal service regulation

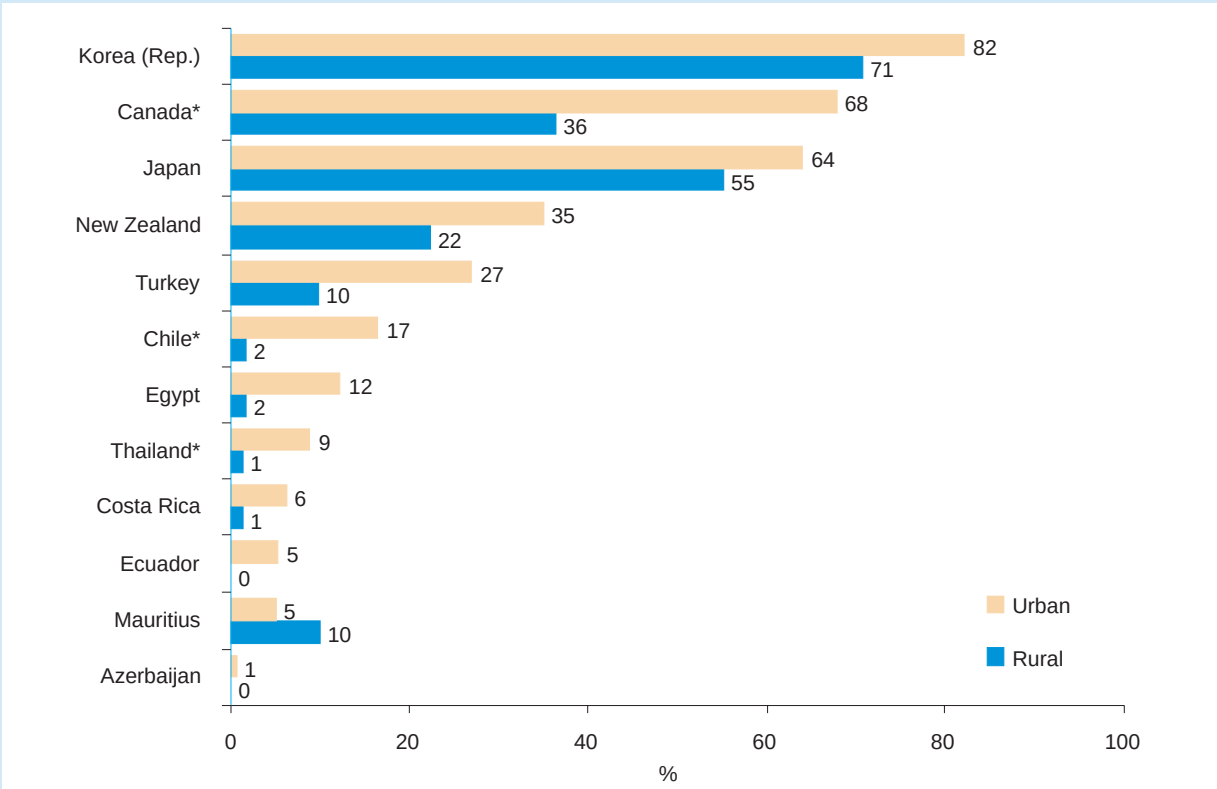
Malaysia's universal service framework requires the country's ICT regulator, the Malaysian Communications and Multimedia Commission (MCMC/SKMM), to designate areas of the country which are to benefit from government assistance for developing infrastructure through the universal service fund. MCMC/SKMM has designated areas where telephone penetration is 20 per cent below the national average, and other localities where it finds that services are not widely available to the community. Its most recent analysis identified 86 localities as deficient in access compared to other regions of the country.[25] The universal service regulations have been modified to incorporate broadband, with the aim of reaching a household broadband access penetration of 50 per cent by 2010. By the end of 2008, these initiatives had resulted in the establishment of 85 community broadband centres and 105 community broadband libraries. In addition, 42 rural Internet centres have been established through another programme. Mobile cellular coverage has also been included in universal service, whereby operators are given assistance for the roll-out of networks to rural areas. This will raise mobile population coverage from 92 per cent to 97 per cent by the end of 2010. [26]

Chart 1.4: Proportion of rural and urban households with Internet access, 2007-08



Note: * Data refer to 2006.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.5: Proportion of rural and urban households with broadband Internet access, 2007-08**



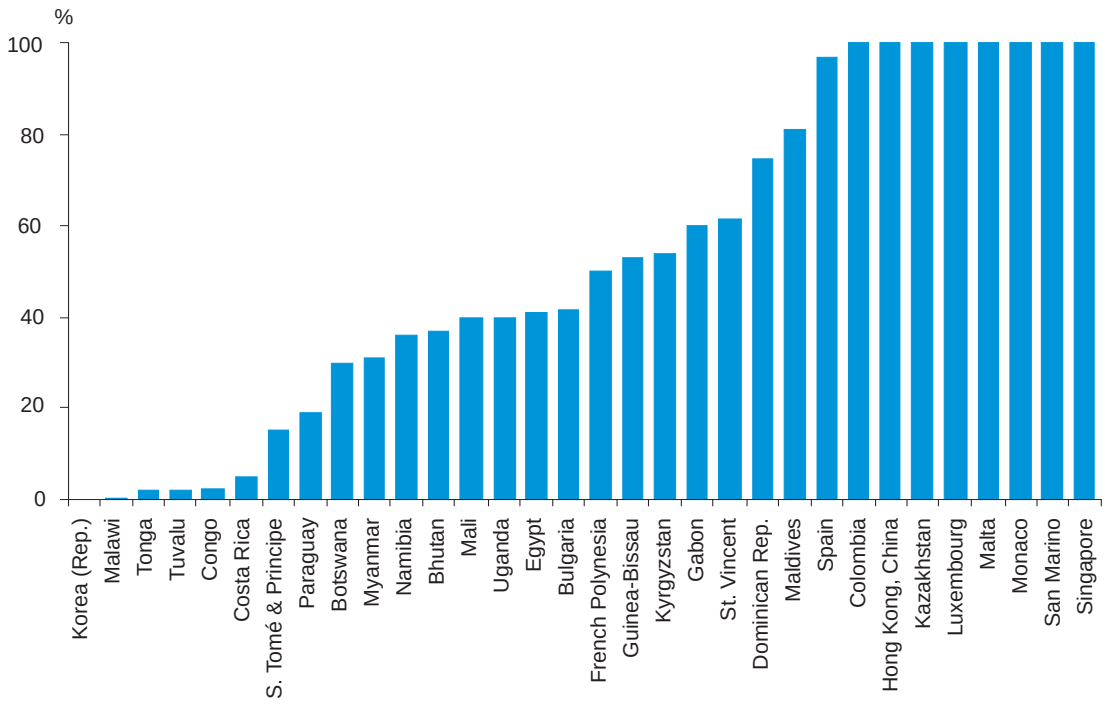
Note: * Data refer to 2006. ** Broadband refers to both wireless and fixed (wired) broadband access.
Source: ITU World Telecommunication/ICT Indicators database.

every part of the United States" [FCC, 2010]. Similar proposals exist in Europe, and the European Commission recently announced plans to update the current telecom universal services law from 2002, which ensures access to fixed telephone and Internet services for all European Union citizens, regardless of their location. A revised law would expand these services to include broadband access.[24]

The relatively low proportion of rural households in developing countries that have Internet access and the even lower broadband penetration rates highlight, first, the importance of connecting more homes and, second, the need to provide public Internet access — preferably high-speed — in rural areas. While the main reasons why people do not have Internet access at home are not clearly known, it is likely that people cannot afford the home Internet connection, or the computer, which continues to be the most popular access device. Since people in rural areas tend to live on relatively lower incomes, the high price of Internet services, and particularly broadband, is obviously a barrier to higher penetration levels.[27] Depending on national circumstances, including geographic and demographic conditions, many rural areas also lack the basic infrastructure. The recent growth of mobile broadband is expected to have a major impact on broadband connectivity, particularly in rural and previously underserved areas. To track the uptake of mobile broadband it is therefore suggested that countries collect data on households with broadband access, both mobile and fixed.

There are insufficient data to provide a comprehensive picture of the current spread of community access centres in localities or villages. According to data received by ITU from 60 respondents to a questionnaire in 2004, some 37 per cent of localities had a community access point. In rural localities, however, where public access is arguably most needed, the figure dropped to under five per cent. ITU also carried out research on the number of localities with Internet. The data were compiled in 2008 from a number of sources, such as government records, projects for installing community Internet access and the number of points-of-presence of large ISPs, using data from between 2000 and

Chart 1.6: Proportion of localities with public Internet access centres (PIACs), 2007-08



Source: ITU World Telecommunication/ICT Indicators database.

2006. Except for Europe and the CIS, country averages for Internet access were very low. In the Americas, around one in six communities had Internet access, compared to one in ten in the Asia and the Pacific region. Elsewhere, the country average was below five per cent. Africa stood out with very low levels of access. For the developing world as a whole, ITU estimated that eight per cent of localities had Internet access. Considering that this covered any type of Internet access, the figure for localities with broadband access is lower.[28] The data used to make these estimates were from between 2000 and 2006, and it is not possible to track more recent changes. Secondly, most developed countries and some developing countries are more focused on pushing Internet access into the home (universal service) rather than to localities (universal access). Thirdly, the growing use of mobile cellular networks to access the Internet has an impact on the analysis: as already discussed, a mobile signal can span multiple localities and coverage is typically expressed in terms of population or land area covered rather than localities.

Some countries do track data on the proportion of localities with PIACs, and while these more recent (2007-2008) data do not show the number of localities by population size or broken down by urban/rural area, they provide some indication of the availability of public Internet access services nationwide (Chart 1.6). There are large differences in terms of the proportion of localities with PIACs. Most developed or high-income economies have public access in all localities. In a number of countries, including Tonga, the Republic of the Congo and Costa Rica, public Internet access is not widely available, with five per cent of localities, or less, covered. Public access is particularly important in countries and regions with low household penetration rates, since for some people it may be the only way to access the Internet.

A number of governments of developing countries, including Colombia (Box 1.3), have created programmes aimed at providing Internet access through community centres in rural areas. Specific government projects, but also grassroots initiatives, typically supported by non-governmental organizations and the academic sector, have had a major impact on Internet access in some countries. There are also projects to leverage growing mobile coverage in order to provide Internet access using cellular networks.

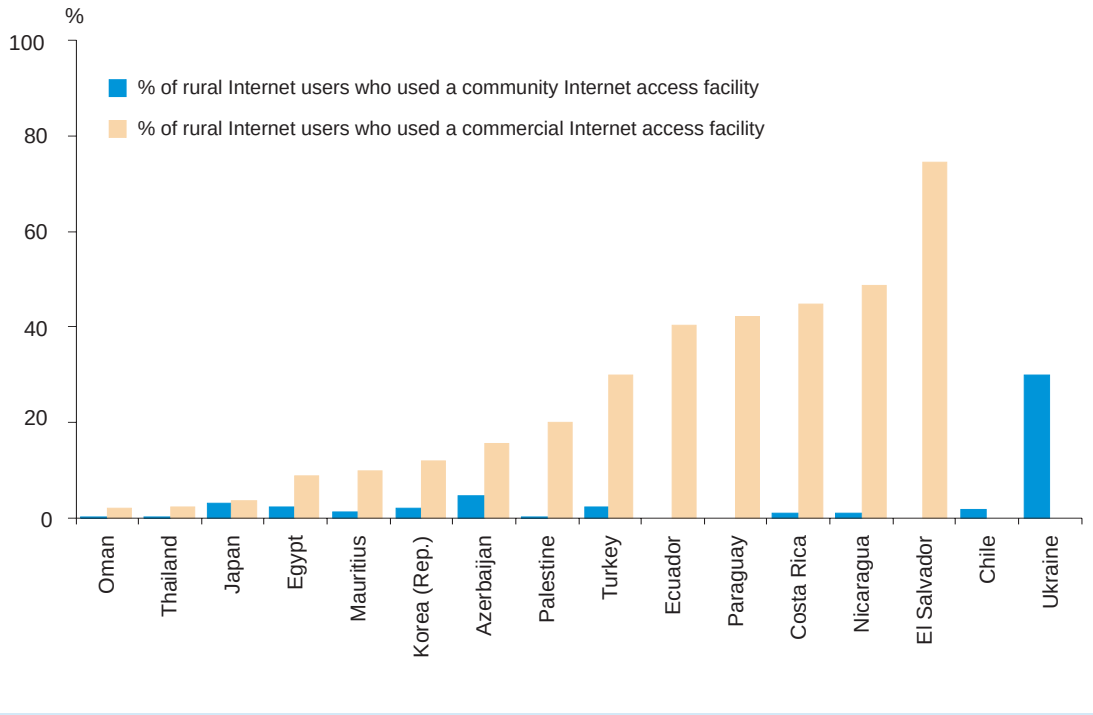
Box 1.3: Connect and inform every Colombian

Colombia's Compartel programme,[29] financed from telecommunication operator contributions to the universal fund, has a number of different projects for expanding access to ICTs and fulfilling the government's vision that every Colombian "*is to be connected and informed*."[30] The programme has expanded from its initial focus on rural telephony to the provision of Internet in community centres ("telecentres") and broadband connectivity in public institutions such as schools, municipal offices and libraries. The community telecentres also provide training and other services and are expected to receive a high degree of community input and support. There were 1 490 telecentres by mid-2008 serving some five million people, with plans for increasing the number to 10 000 by 2010.[31] Community access is also extended through 140 educational institutions that provide after-school Internet access to the general public and 221 public libraries with broadband Internet.

The importance of public access is also highlighted by available data on the percentage of rural Internet users of community and commercial Internet access facilities (Chart 1.7). In most of the developing countries in the Americas which track this indicator, including in El Salvador, Nicaragua, Costa Rica, Paraguay and Ecuador, 40 per cent or more of rural Internet users access the Internet at commercial or public Internet access facilities. Peru's *cabinas públicas* (public booths) have made a major contribution to expanding Internet access, especially to rural areas (Box 1.4). In the Ukraine, about one third of the rural Internet users go to public Internet access facilities.

Unfortunately, too few governments track this indicator and no official data are available from Africa. However, between 2007 and 2008, Research ICT Africa (RIA) carried out household surveys across 17 African countries, including

Chart 1.7: Proportion of rural Internet users who use the Internet at public access facilities, 2007-08

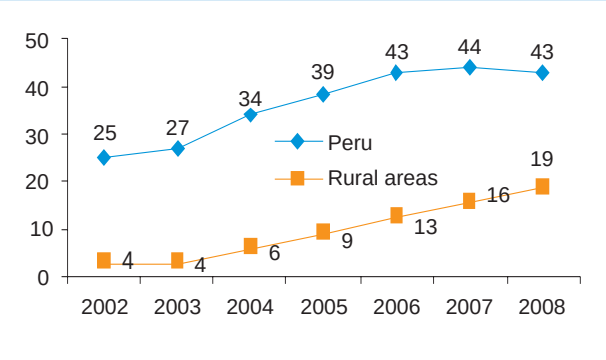


Note: Community Internet access facilities refer to public libraries, publicly provided Internet kiosks, non-commercial telecentres, digital community centres, post offices, other government agencies; access is typically free and is available to the general public.
Source: ITU World Telecommunication/ICT Indicators database.

Box 1.4: Public Internet access in Peru

The *Red Cientifica Peruana* (Peruvian Scientific Network) pioneered a public Internet access model that has been extremely successful. RCP was formed in 1991 as a non-profit organization to promote Internet access in Peru. It was one of the country's first ISPs, starting out by mainly providing access to the education sector and NGOs. Its founder, Jose Soriano, had the idea of creating a network of public Internet access facilities modelled on the country's public telephone booths. These Internet points thus became known as *cabinas públicas* ("public booths"). They developed rapidly, with RCP creating a franchise model, assisting with financing and providing training.[33] One measure of the success of this venture is that today *cabina pública* is the term used in Peru to refer to any public Internet facility, even though most have since developed outside the auspices of RCP. This critical mass of public Internet facilities has fed on itself, not only creating a "public booth" culture but also resulting in intense competition, leading to low costs (prices are USD 0.15 - 0.30 per hour[34]) with beneficial results for users and growth of the Internet in Peru.

Chart 1 Box 1.4: Percentage of households with at least one member who used a *cabina pública*, Peru



Source: Adapted from INEI.

The success of the public booths is reflected in Internet usage statistics. In 2008, some 20.4 per cent of the population used public booths to access the Internet, and they were the most frequent place of access.[35] The expansion of public booths beyond urban areas is also visible. In 19 per cent of rural households there was at least one member who used a public booth in 2008, up from just four per cent in 2002 (Chart 1 Box 1.4). It is worth noting that urban access from Internet cafés has been declining in the last few years, as more homes get their own Internet access. However, in rural areas it has continued to climb and the gap with the national average has shrunk between 2002 and 2008.

to collect data on the "points of access" used by Internet users. The survey clearly showed that the large majority of Africans access the Internet at cybercafés or Internet cafés. In Benin, Burkina Faso, Cameroon and Côte d'Ivoire, 85 per cent or more of Internet users used such facilities.[32]

Regardless of data constraints, there are developments that should increase the availability of Internet access in rural areas over the coming years. One barrier to greater Internet broadband usage in rural areas has been a lack of access to backhaul high-speed transmission networks. A number of countries are developing national backbones to connect to undersea fibre-optic cables. As a consequence, fibre-optic is reaching beyond metropolitan areas and passing underserved parts of countries, which can then be connected to the fibre to obtain broadband capacity. One example is East Africa (Box 1.5), where countries are extending backhaul transmission networks, bringing broadband connectivity to more rural areas.[36]

Another development that is expected to increase rural connectivity and bring ICTs to villages is the spread of wireless broadband access. Wireless technology is cheaper and faster to implement than fixed broadband. A number of developing nations are leveraging existing mobile networks to introduce broadband 3G Internet access. ITU reported that mobile broadband subscriptions overtook fixed broadband subscriptions in 2008, highlighting the huge potential for the mobile Internet.[40] The challenge will be to extend these benefits into rural areas, including through innovative projects as the Grameenphone's *community information centres* (Box 1.6).

Box 1.5: More bandwidth for rural areas in East Africa

The benefit of national fibre-optic backbones recently bore fruit with the launch of the SEACOM undersea fibre-optic cable in July 2009. A 1 500km fibre-optic cable links the SEACOM landing station in Mombasa, Kenya to Nairobi and on from there to landlocked Uganda.[37] Kenya Data Networks built the fibre link from Mombasa via the capital Nairobi to the Ugandan border. In Uganda, the ISP Infocom leases the electricity utility's spare fibre capacity from the border to the capital Kampala. Meanwhile, landlocked Rwanda can also access this international bandwidth via a 400 km fibre-optic cable running from the capital Kigali to the Ugandan border. Communities all along these fibre routes can theoretically tap into the high-speed capacity it provides. The role of the Kenyan government in facilitating the roll-out of fibre-optic cable was recognized by the GSM Association, which awarded it the annual Government Leadership Award.[38]

Kenya is leveraging the roll-out of its national fibre-optic backbone through plans to install thousands of rural community Internet access centres throughout the country. The Digital Villages Project or "pasha centres" (*pasha* means "to inform" in Swahili) will be operated by local entrepreneurs, who will receive training and financial assistance from the government. The first group of pasha centres was launched in August 2009 and will undergo an evaluation phase to fine-tune operations before proceeding with large-scale roll-out.[39]

Box 1.6: Grameenphone in Bangladesh: From (just) mobile to mobile broadband

Grameenphone, a mobile operator in Bangladesh, has had a widely successful and replicated experience with the provision of telephone services in villages using mobile phones. In December 2006 it embarked on a new initiative to install community information centres (CIC) in order to provide Internet access in rural areas. A CIC is designed to be commercially sustainable and is operated by village entrepreneurs as a type of franchise. They purchase a CIC "kit," consisting of a computer, a printer, a scanner and a wireless modem for Internet access. The initial investment in a typical CIC ranges between BDT 70 000 and 100 000 (US 1 000 to 1 425) with financing available from Grameen.[41] The CIC operator charges users and pays a small fee to Grameen. The Society for Economic and Basic Advancement has partnered with Grameen to select and train the CIC operators and handle marketing.

By 2008, there were 525 CICs installed in 425 *upazilas* (a sub-district, the lowest level of administrative government in Bangladesh of which there are 481 in total) and some 20 million people have potential access. According to one report:

> "*The services have really improved the lives of the villagers, who previously would have had to travel around 35 kilometres to use the Internet.*"[42]

Internet access for CICs uses Grameenphone's third-generation enhanced data rates for GSM evolution (EDGE) mobile network.[42] One advantage of EDGE is that it uses the operator's existing spectrum so it does not require a new licence. Grameenphone's EDGE network, launched in 2005, covers 98 per cent of the population, so almost every Bangladeshi has potential access to the Internet. Grameenphone has over 4.5 million EDGE subscribers, making the company the largest Internet service provider in the country.[44]

Conclusions and recommendations

Current data suggest that by the end of 2008 almost three quarters of the world's rural inhabitants were covered by a mobile cellular signal, which is a useful indicator to monitor rural connectivity. Complete mobile coverage of all rural areas around the world by 2015, or even earlier, should become a clear policy target and would appear achievable with the right policy emphasis. Nevertheless, despite the likelihood of a high level of mobile signal coverage, policy-makers cannot become complacent, since coverage does not equate with usage. While it is estimated that over half of rural areas in Africa are covered by a mobile signal, existing data suggest that only few rural households in the region possess a mobile subscription (let alone a fixed one). Governments must strive to ensure that solutions are found to make mobile service affordable for people living in rural areas.

Anecdotal evidence suggests that access to the Internet using mobile phones is a growing trend, including in many developing countries and regions such as Africa.[45] Providing mobile broadband access can be an attractive solution

for rural areas since it requires less investment than installing fixed broadband connections. Mobile broadband coverage, or the percentage of the population within reach of a 3G mobile cellular signal, will therefore be an important indicator to monitor.

The importance of mobile communication networks is also highlighted by data on the proportion of households with a fixed and/or mobile telephone. Data show that mobile telephony is playing a key role in expanding communication access to rural areas. Rural households in developing countries rely more on mobile than on fixed telephony, and while fixed telephone penetration in rural households often remains below five per cent, mobile penetration rates are much higher, reaching 50 per cent or more in a number of developing countries that collect this information.

Data on the availability of Internet access in rural households, on the other hand, paint a somewhat different picture. In many developing countries, there is still some way to go before rural households enjoy conventional access to the Internet. Whereas in many developed countries rural connectivity is on a par with urban connectivity, elsewhere Internet access in rural households is not available at all, and a number of low-income developing countries actually have zero per cent of rural households with Internet access. A lack of electricity and the high price of computers and Internet access are major barriers.

Only very few developing countries collect data on the proportion of rural households with broadband Internet access, but figures suggest that in most cases penetration levels remain extremely low in the majority of developing countries, and particularly in low-income economies. Measuring rural household access to the Internet and broadband is important not only in order to understand how well connected rural households are but also to enable policy-makers to make informed policy decisions. Especially where rural household Internet access is very low, governments need to focus on establishing community access points, which ideally should have broadband connectivity.

A growing number of countries are indeed moving ahead with the installation of public Internet facilities in rural areas, often financed through universal access contributions or licence conditions. Only a very small number of countries collect data on the availability of community access points, however, and even fewer provide a breakdown by population size or by rural and urban areas. This makes it difficult to draw definitive conclusions about progress in rural connectivity outside the home. By including a question on the location of individual use of the Internet as an item in household surveys, a number of countries are able to gauge the importance of public Internet access from the response category "community/commercial Internet access facilities." While there are still too few countries that track this indicator through official household surveys, existing data suggest that in many developing countries public Internet access facilities remain one of the most important access locations for people in rural areas. This finding highlights the need for governments to ensure that public access is provided throughout rural areas.

One difficulty in making recommendations for how countries can achieve Target 1 is the interrelationship between community access and home access. Over time, it is expected that, as incomes rise and electricity becomes available, households will opt for the convenience of using ICT services at home. Therefore, as household access increases, community access is expected to fall. Policy-makers need to keep this linkage in mind and policies to promote community access in rural areas need to move in tandem with facilitating home ICT access. As incomes rise, the emphasis should shift towards facilitating rural household access.

One development with widespread implications is the spread of mobile phone use and the deployment of 3G networks in rural areas. This has far-reaching repercussions for the future, given that, in addition to voice communications, mobile phone networks can also provide text messaging and Internet access.

Based on these findings, there are a number of strategies that countries can pursue to achieve greater mobile access and use in rural areas and to ensure that Internet and broadband access becomes more widely available:

- Introduce as much competition in the mobile sector as possible. The more operators the better, since they will compete to gain incremental customers and hence extend coverage into rural areas. In Thailand, where there is intense competition in the cities with up to five operators, mobile companies have been expanding into rural areas to gain new subscribers.[46]

- Modify universal service policies to incorporate mobile deployment. Although mobile operators typically contribute to universal service funds, they generally receive little of the funding for mobile network expansion, even though it is cheaper to deploy wireless networks than fixed lines in rural areas. Furthermore, most of

these funds have yet to be spent and sit unused. According to the GSM Association, if these unspent funds plus the funds to be collected by the end of the decade were spent on extending mobile networks, then nearly the whole world would have mobile coverage within four years.[47]

- Set targets in licences for the percentage of the population to be covered by a mobile cellular network. Some countries have not exploited the regulatory tool of imposing licence conditions on operators so as to expand coverage. This can be rectified when licences come up for renewal or when additional or new spectrum is awarded. Some countries have also been lax in enforcing coverage requirements, even though enforcement costs are far less than what it would cost to extend access through universal service funding schemes.

- Encourage local partnerships to develop mobile access and applications. The Bangladesh village phone model shows how the combination of microfinance banking and mobile operators can be leveraged to provide access to mobile communications in rural areas. This model can be widely replicated to support the link between coverage and access. The development of rurally relevant mobile applications such as information about commodity prices or transport schedules delivered via text messaging can help to drive demand.

- Build out electricity. A lack of electricity is arguably the biggest barrier to extending mobile coverage and increasing access to other ICTs, including the Internet. The Bangladesh village phone programmme is currently limited to villages with electricity. Furthermore, electricity shortages force many mobile operators to use expensive diesel generators, which drives up costs, making service less affordable for generally lower-income rural dwellers. At the same time, a lack of electricity makes it difficult to recharge phones. Though car batteries and other alternatives can be used for this purpose, they tend to be more expensive than grid electricity.

- Foster wireless broadband access. Many non-voice applications are available over mobile networks and can be delivered to mobile handsets without the need for a computer. Broadband wireless networks are also growing in developing countries — both fixed (WiMax) and 3G mobile. These developments can help boost Internet and broadband access in rural areas. Policy-makers should facilitate the development of wireless broadband and consider incentives for rural deployment. Indicators to measure and monitor supply (such as rural wireless broadband coverage as a percentage of the rural population) and demand (such as subscribers in rural areas or surveys on wireless broadband usage in rural areas) should be compiled to track this important development.

- In order to make services more affordable and increase the spread of the Internet and broadband, governments need to encourage greater market liberalization in the Internet market, and ensure particularly facilities-based competition. While many countries have encouraged the entry of Internet cafés or ISPs, true competition is constrained due to high prices for essential backbone infrastructure such as international gateways and leased lines. There are many rural households that would opt for Internet connectivity but cannot because of a lack of options and high prices.

- In countries where universal Internet service is not feasible, governments need to promote the installation of public Internet facilities in rural areas. These can be financed through universal access contributions or licence conditions. Another approach is to use funding from e-government programmes to install public facilities for citizens to access information. This is essential to avoid an e-government digital divide whereby the rural public are unable to use government-to-consumer applications. Given the right market conditions, cooperative models together with the private sector can help deliver community access. There are a number of examples, including the Bangladesh community information centres and the Peruvian *cabinas publicas* described in this chapter. Lessons may also be learnt from ITU's *Connect a School, Connect a Community* initiative[48], a public-private partnership effort to promote broadband school connectivity to serve both students and the community.

- Finally, policy-makers need to achieve the right mix between universal access and universal service strategies. Getting infrastructure to rural areas is just the first step. The population then needs to have access to services. While initially this might be through the public telephone service (whether mobile or fixed), eventually households will want to have their own access. Policy-makers must find the right balance between public access and facilitating home access.

Notes

1 Substantial inputs to this chapter have been provided by Michael Minges.

2 Villages have been defined as "a group of houses and other buildings, such as a church, a school and some shops, which is smaller than a town, usually in the countryside." See Cambridge Advanced Learner's Dictionary at http://dictionary.cambridge.org/.

3 See WSIS Geneva Plan of Action, 2003, at: http://www.itu.int/wsis/docs/geneva/official/poa.html#c2.

4 See WSIS Geneva Plan of Action, 2003, at: http://www.itu.int/wsis/docs/geneva/official/poa.html#c3.

5 See WSIS Geneva Plan of Action, 2003, at: http://www.itu.int/wsis/docs/geneva/official/poa.html#c4.

6 See WSIS Geneva Plan of Action, 2003, at: http://www.itu.int/wsis/docs/geneva/official/poa.html#c9.

7 This section draws substantially on [ITU, 2009].

8 The *Partnership on Measuring ICT for Development* is a multistakeholder partnership launched in 2004. To achieve its main objective — namely, to increase the availability and quality of internationally comparable ICT data — it has developed a core list of ICT indicators. For more information on the *Partnership* and its core list of indicators, see: http://www.itu.int/ITU-D/ict/partnership/index.html.

9 Markandey Rai. "Operational Definitions of Urban, Rural and Urban Agglomeration for Monitoring Human Settlements." http://www.scorus2006.ue.wroc.pl/modules/Downloads/presentations/Markandey_Rai.pdf.

10 The European Union follows the OECD definition, while noting that: "The OECD definition is based on the share of population living in rural communes (i.e. with less than 150 inhabitants per km^2). This is the only internationally recognised definition of rural areas. However, in some cases, it does not fully take into account the population living in more densely populated rural areas, particularly in peri-urban zones..." See: 2006/144/EC: Council Decision of 20 February 2006 on Community strategic guidelines for rural development (programming period 2007 to 2013) available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006D0144:EN:NOT.

11 Villages can also be uninhabited or "non-revenue generating." This is the case in India, where there are ongoing revisions to the figure reported in the 2001 census. See: [TRAI, 2008].

12 In 2008, ITU published a report on the availability of ICTs in villages and rural areas [ITU, 2008). This report included estimates on the number and proportion of villages with a fixed telephone line. In view of the data constraints for this indicator, various proxies were used to make estimates about the number of localities with a fixed telephone line, such as the number of post offices (on the assumption that they would have telephone service) or the number of telephone exchanges (on the assumption there is one per locality).

13 Partnership on Measuring ICT for Development, 2010.

14 There are several Global Mobile Personal Communications by Satellite (GMPCS) service operators providing worldwide coverage. One application they are used for is providing service in rural and remote areas, often where there is no terrestrial mobile cellular signal. In Mauritania, GMPCS licences were awarded at no cost but the service providers are obligated to provide payphone service in all localities with more than 1 000 inhabitants. See: M. Mohamed Salem OULD LEKHAL. "*Comment favoriser l'accès aux services de communications électroniques pour le plus grand nombre?*," 5th annual meeting of FRATEL, Montreux, Switzerland, 7 - 9 November, 2007. http://www.fratel.org/espace_public/IMG/presentation_ARM_.pdf.

15 Many regulators or operators provide national mobile population coverage. Assuming that urban areas are covered first, rural coverage can be estimated by subtracting the urban population from the total population covered by a mobile signal. The formula is:

$$\text{Proportion of rural population covered by a mobile cellular signal} = \frac{(\text{Proportion of total population covered by a mobile cellular signal} \times \text{Total population}) - \text{Urban population}}{\text{Rural population}}$$

16 The *Partnership* encourages countries to include "...geographic ... classificatory variables if they are able to, as the output can provide very useful policy information." See: ITU, *Manual for measuring ICT access and use by households and individuals*. [Geneva: ITU, 2009] at http://www.itu.int/ITU-D/ict/publications/hhmanual/2009/index.html.

17 Partnership on Measuring ICT for Development, 2010.

18 Telegeography, China improves rural coverage, January 2010, see: http://www.telegeography.com/cu/article.php?article_id=31529&email=html.

19 The e-Cambodia Development Plan foresees connecting all districts, communes and eventually villages with ICTs, including telephony, Internet, videoconferencing, radio and video. See, for example, slide 4 of the presentation *Regional Workshop on Community e-Centre for Rural development* by Mr Noy Shoung, Deputy Secretary General, National ICT Development Authority , Cambodia, at the the UN ESCAP Regional Workshop on Community e-Centres for Rural Development , 29-30 October 2009, New Delhi , India, at: http://www.unescap.org/idd/events/2009_Delhi_WS/index.asp, as well as: http://ifap-is-observatory.ittk.hu/node/7.

20 See, for example Telecompaper: *Orange France, SFR warned over 3G network coverage*, December 2009, at: http://www.telecompaper.com/news/article.aspx?cid=710603 and also the Austrian operator Optus' online information on its 3G population coverage, including a coverage map, at: http://www.optus.com.au/portal/site/aboutoptus/menuitem.26a56e3a0149a03327b868108c8ac7a0/?vgnextoid=0aa730ece1197010VgnVCM10000029867c0aRCRD.

21 For a definition of 'rural areas' in Mauritius, see the Mauritius Central Statistical Office, at: http://www.gov.mu/portal/site/cso.

22 See: http://www.oecdobserver.org/news/fullstory.php/aid/2663/Widening_broadband_s_reach.html.

23 See: http://wireless.fcc.gov/outreach/index.htm?job=recovery.

24 Total Telecom, EU to revise broadband law to guarantee access to all, 02 March, 2010, at: http://www.totaltele.com/view.aspx?C=0&ID=453595.

25 See: http://www.skmm.gov.my/link_file/what_we_do/usp/USP%20Notification2003.pdf.

26 See: http://www.skmm.gov.my/link_file/what_we_do/usp/pdf/keynote2.pdf.

27 The ITU's *Measuring the Information Society Report 2010* highlighted the relatively high price for basic broadband access in many developing countries [ITU, 2010].

28 See: [ITU, 2008], and http://www.itu.int/ITU-D/ict/newslog/Report+Measuring+ICT+Availability+In+Villages+And+Rural+Areas+Available+Now.aspx.

29 See: http://www.compartel.gov.co/.

30 Colombia, Ministry for Information and Communications Technologies, "The Colombian ICT sector and its perspectives: Bridging the digital divide while fostering private investment." Presented on 5 October, 2009. Geneva, Switzerland.

31 Colombia, Ministry of Communications: "Programa Compartel," July 2008.

32 Respondents had the possibility to choose several access points. See page 28 of [Gillwald, Alison and Stork, Christoph, 2008].

33 Elkin, Noah, "eMarketer: RCP bridges the digital divide in Latin America." *EIU ebusiness forum*, 8 March, 2001. http://globaltechforum.eiu.com/index.asp?layout=rich_story&doc_id=2669&categoryid=&channelid=&search=bridges.

34 [Curioso, *et al*., 2007].

35 See: http://www.inei.gob.pe/web/BoletinFlotante.asp?file=8175.pdf.

36 The World Bank is supporting a number of these initiatives through the Africa Regional Communications Infrastructure Programme, see: http://go.worldbank.org/1UNCU3TTM0.

37 See: https://communicationsdirectnews.com/do.php/120/37175.

38 See: http://www.gsmworld.com/newsroom/press-releases/2010/4641.htm.

39 See: http://newsroom.cisco.com/dlls/2009/prod_080409.html.

40 See: http://www.itu.int/ITU-D/ict/material/Telecom09_flyer.pdf.

41 See: http://www.telenor.com/en/resources/images/016-024_GrameenphoneCIC_tcm28-36855.pdf.

42 GSMA Development Association, *Case study: Grameenphone community information centres, Bangladesh*. (2008). http://www.gsmworld.com/documents/GrameenPhone_bangladesh_hires.pdf.

43 Although an ITU 3G mobile standard, actual speeds with initial EDGE implementation were less than broadband (<200 kbps). Improvements have seen speeds increase to around 200 kbps. A newer version of EDGE (Evolution) can achieve broadband speeds of up to 1 Mbps with average throughput of around 400 kbps.

44 Grameenphone, *Grameenphone launches new vision for the Internet*. Press Release, 11 February , 2009, at: http://www.grameenphone.com/index.php?id=474.

45 For example Opera, an Internet browser for mobile phones, reported that the number of its users grew 154% between November 2008 and November 2009, with triple digit mobile Internet usage growth in Africa. See: http://www.opera.com/smw/2009/11/.

46 Nokia Siemens Networks, *DTAC wins the rural market with Nokia Connect eRefill solution*. (2007). http://www.nokiasiemensnetworks.com/NR/rdonlyres/D13517E1-B3B2-4E4C-93A1-3648EBAC4A5B/0/DTAC_eRefill.pdf.

47 "If the unspent USD 4.4 billion universal service fund levies and the further USD 3.8 billion that will be collected between now and the end of the decade were spent on extending mobile networks, mobile coverage would be near 100% within 3.5 years." See: [GSM Association, 2006].

48 See: http://www.itu.int/ITU-D/connect/flagship_initiatives/connecting_children/index.html.

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