International Telecommunication Union

Measuring Information and
Communication Technology
availability in villages
and rural areas

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1. Introduction

The first World Summit on the Information Society (WSIS) was held in Geneva, Switzerland in December 2003. It brought together leaders from governments around the world to discuss and adopt strategies for creating an inclusive Information Society. One outcome of the Summit was a Plan of Action enunciating ten targets to be achieved by 2015 of which the first is:

> "...to connect villages with ICTs and establish community access points..." [1]

This report describes research to measure the target. It is based on questionnaires sent to developing country telecommunication administrations as well as review of relevant reports issued by government statistical and Information and Communication Technology (ICT) related agencies and other sources. The sources are identified in the "References" section.

It is noteworthy that the target goes beyond the traditional "teledensity" measure (i.e., telephones per 100 inhabitants) to incorporate the wider aspect of community access. Instead of measuring per capita access to ICTs, the target is oriented towards their availability in a locality where many could use them. This is more relevant for many developing nations where individual ownership of telephones, computers and Internet subscriptions is low.

The WSIS Plan of Action does not provide additional information regarding exactly how this target might be measured. This results in ambiguity about the target:

- There is no standard definition of *village*, especially for statistical purposes, although the word has rural connotations. For example, one definition of village is "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." [2] <u>This suggests that that the focus should be on rural connectivity</u>.

- Village is rarely used as a unit of measurement. Most national statistical systems do not disseminate data at the locality level. Instead, data are expressed in overall quantities or in per population or per household ratios. If data are presented at the locality level, it is usually at the second administrative level of provinces.

- The term "ICTs" in the target is unspecified. This could incorporate broadcasting such as radios and televisions, telephones (both fixed and mobile) or computers and the Internet. Given that explicit ICTs are not specified, it is not clear whether emphasis should be given to one, several or all.

- There is no guidance on how many villages to connect. There is an inverse relation between the number of localities and population: most people in a country reside in a few localities. Therefore, monitoring a village indicator in isolation can be misleading.

- The term "Community access points" is also undefined in the Plan of Action although there has been subsequent research carried out in this area.

In order to measure the WSIS target, the number of villages must be determined. As noted, village implies rural but there is a wide range of what size a locality should be to be considered rural or called a village. There is no international standard about what constitutes a village. Some countries report the number of localities broken down by population size. However this is not widely available, and even if it were, does not solve the problem of what locality size should constitute a village. It would be logical to associate a village with a population size considered to be rural but definitions vary widely. Not only is there not a standard population size to be considered a village, but in many instances, other factors are considered such as administrative divisions or employment outside agriculture (Table 1-1). Another

Table 1-1: Differing concepts of rural

Criteria	Note	Number of countries
Administrative	Boundaries of state or provincial capitals, municipalities or other local jurisdictions	83
Population size	Concentrations ranging from 200 to 50'000 inhabitants	57
Economic	Proportion of the labor force employed in non-agricultural activities	25
Infrastructure	Presence of paved streets, water supply systems, sewerage systems, or electric lighting	18
No rural	Entire population is considered urban	6
No definition		25

Source: Adapted from Markandey Rai. "Operational Definitions of Urban, Rural and Urban Agglomeration for Monitoring Human Settlements."

Table 1-2: Distribution of localities in Jordan

Size of locality by population	Localities	Population	% of localities	% of population
>100'000	10	1'875'060	1%	37%
10'000-99'000	63	1'889'943	6%	37%
5'000-9'999	68	442'408	7%	9%
2'000-4'999	150	487'655	15%	10%
500-1'999	316	325'662	31%	6%
<500	420	82'911	41%	2%
Total	**1'027**	**5'103'639**	**100%**	**100%**

Source: Adapted from Jordan Population & Housing Census 2004.

concept of rural is population density; in the European Union, rural is not defined by the size of localities but by the number of inhabitants per square kilometer.

The WSIS village target can be difficult to completely accomplish considering the demographics of localities. There is an inverse relationship between the number of villages and population typified by data from Jordan, where 29 percent of localities account for 92 percent of the population and 41 percent of small localities only account for two percent of the population (Table 1-2).

Another challenge is that the lowest level of *administrative division* in some countries tends to be several levels before villages. This is often the case where there is no local government or administration beyond a certain level. For example in Malawi, statistical data stop at the fourth level, a step above villages and there are no official data on the number of localities smaller than the 250 "Traditional Authorities" (Figure 1-1).

Countries use a variety of local terms to refer to administrative divisions so often it is not clear what term corresponds to village. The European Union has harmonized this by mapping national administrative units to a five level hierarchy (Table 1-3).[3] However, even this classification stops before the locality level for some countries.

Apart from the methodological issue of what constitutes a village, not all countries publish how many localities they have. In addition, factors such as migration, nomadic populations, civil war, resettlement, etc. also impact the ability to precisely determine how many localities there are in a country. Given these constraints, a number of techniques and sources have been used to estimate the number of localities in a country in the absence of official data:

Figure 1-1: Administrative Divisions in Malawi
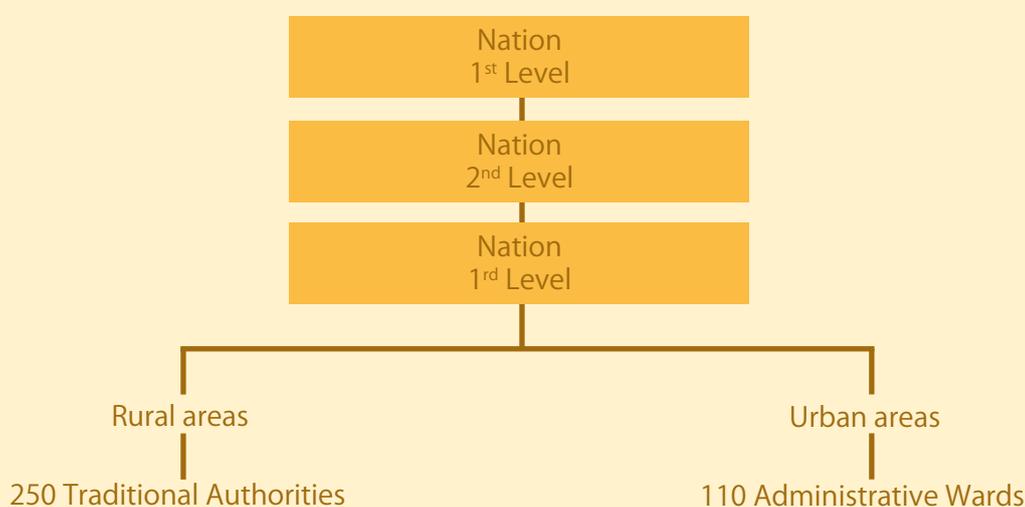
Source: Malawi: An Atlas of Social Statistics.

Table 1-3: Correspondence between regional levels and national administrative units

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Bulgaria	RAJON (2)	RAJON ZA PLANIRANE PLANNING REGION (6)	OBLASTI (28)	OBSHTINI (262)	NASELENI MESTA (5340)
Croatia	HRVATSKA	REGIJA (4)	ŽUPANIJA(21)		
Romania	n.a.	REGIONS (8)	JUDET + BUCURESTI (42)		COMMUNES+ MUNICIPIU +ORAJSE (2951)
Turkey	BÖLGELER (12)	ALT BÖLGELER (26)	ILLER (81)	ILCELER (923)	KÖY (37 675

Source: EUROSTAT.

- Locality data can sometimes be derived from electric utilities, health surveys or information on local government and elections. [4]

- The number of enumeration areas used by statistical offices for census and surveys.

- Geo-coded information. Geo-coded data containing the coordinates for locations around the world has grown tremendously with the availability of inexpensive Global Positioning System (GPS) devices. As a result, many of the places where people live have been geo-coded. [5]

Given the divergence over what constitutes a village, this document refers to localities meaning the total number of inhabited places in a country. In any case, most localities would tend to be rural locations. Global estimates of the number of localities and rural population for different regions are provided in Table 1-4.

Table 1-4: Rural population and localities

	Population (millions)	Rural population (%)	Rural population (millions)	Number of localities (000s)	Average size
Developing	**5'108**	**56%**	**2'850**	**2'961**	**1'826**
East Asia & Pacific	1'717	58%	1'000	956	1'795
Europe & Central Asia	446	33%	148	285	2'841
Latin America & Caribbean	529	21%	113	349	1'645
Middle East & North Africa	308	42%	129	107	2'961
South Asia	1'354	72%	977	868	1'560
Sub-Saharan Africa	754	64%	484	396	1'904
Developed	**1'013**	**22%**	**228**	**248**	**4'092**
World	**6'145**	**50%**	**3'102**	**3'059**	**2'009**
Developing as % of world	**84%**		**93%**	**92%**	

Note: For composition of regional groups see http://siteresources.worldbank.org/DATASTATISTICS/Resources/CLASS.XLS.
Source: ITU/BDT research.

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[1] World Summit on the Information Society (WSIS). December 2003. *Plan of Action*. http://www.itu.int/wsis/docs/geneva/official/poa.html.
[2] See Cambridge Advanced Learner's Dictionary at http://dictionary.cambridge.org/.
[3] Wikipedia has a similar classification for a number of countries going to the fourth administrative level. See "Table of administrative country subdivisions by country" available
    from http://en.wikipedia.org/wiki/Table_of_administrative_country_subdivisions_by_country.
[4] There are occasional contradictions about the number of localities in a country depending on the source. For example, in one country, the number of villages with electricity
    exceeds the number of villages reported by the government.
[5] For example, see http://www.geonames.org for listings of populated places by country.

2. ICTs in localities

Figure 2-1: Localities with telephone service, Mexico

Localities with telephone service

Localities (> 99 and < 500 inhabitants) with telephone service by type of technology

Satellite 41%

Trunking 0.2%

Multiple radio access 4%

Cellular 55%
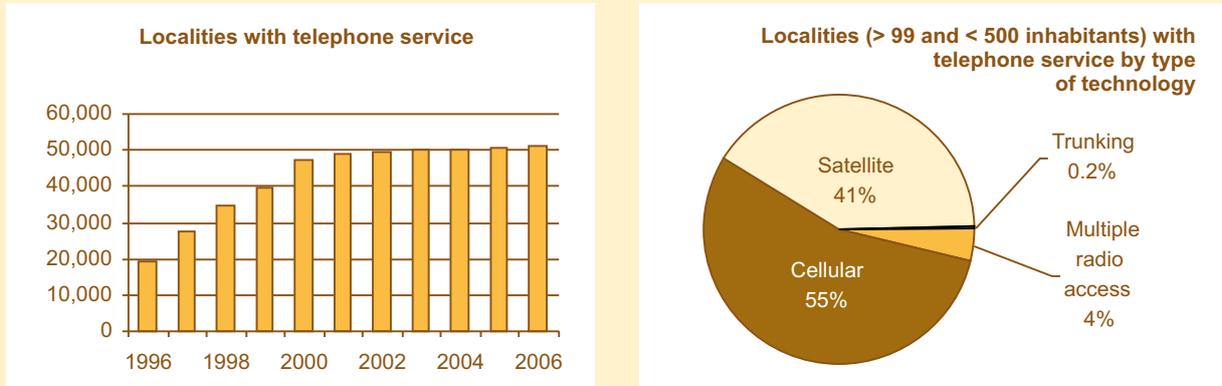
Source: Adapted from SCT.

The exact ICTs to measure at the village level are not specified in the WSIS Plan of Action. Some ICTs such as telephone service or public Internet facilities lend themselves to locality analysis whereas others such as the availability of broadcasting or use of computers are better analyzed by other indicators and at other levels.

A common ICT collected at the locality level is fixed telephone service. [1] Mexico collects this information and publishes it on a regular basis (Figure 2-1, left). One issue is that it is not always possible to distinguish between fixed line telephone and mobile cellular. For example, the Mexican data are broken down by technology for localities with a population of between 100 and 499 inhabitants and none of the connections are from traditional fixed line telephony (Figure 2-1, right).

Few countries collect data on the number of localities with telephone service and no data could be found on the breakdown of telephone service availability by locality sizes and population covered. In the absence of data on the number of localities with telephone service, various proxies have been used to make estimates. This includes the number of post offices (on the assumption that they would have telephone service) or the number of telephone exchanges (on the assumption that each locality with telephone service would have an exchange). These proxies are not perfect—each post office is not necessarily in a different locality, a post office may not have a telephone and a locality does not necessarily require an exchange to be provided with telephone service. Nevertheless, until actual data become more available they are useful proxies that likely do not deviate much from the actual situation.

Figure 2-2: Importance of rural electrification

- Increases country's GDP
- Reduces poverty and improves development progress
- **Income** – increases rural entrepreneurships: jobs, agricultural productivity and hence reduces poverty
- **Education** – increases school enrolment and retention rates: enables students to study at night
- **Health** – powers pumps for safe water; improves health levels and powers rural clinics
- **Gender** – reduces women's labour intensive household work
- **ICT** – improves access to information, television, mobile phones and computers
- **Environmental** – changes in pattern of fuel use
- **Security** – powers lights and increases villagers' sense of well being

Source: Adapted from Richard Leete (2007), *Rural Electrification and Development*.

Figure 2-3: Rural electrification in Bhutan and Bangladesh
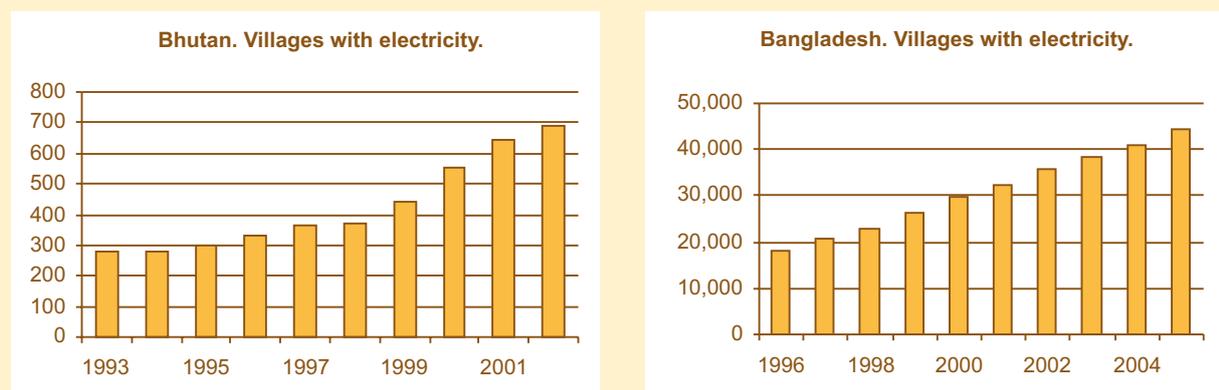
Source: Adapted from Department of Energy (Bhutan) and Rural Electrification Board (Bangladesh).

Given the importance of electricity for poverty alleviation as well as its necessity for supporting ICTs (see Figure 2-2), the level of electrification in localities is also included. [2] The number of localities with electricity is sometimes compiled by energy utilities or government agencies responsible for energy in developing nations (see Figure 2-3 for examples).

The term "establish community access points" is mentioned in the WSIS Plan of Action but not defined. However, ITU has done pioneering work in this area and the *Partnership on Measuring ICT for Development* has identified indicator A10 as a core indicator:

- Percentage of localities with public Internet access centres (PIACs) by number of inhabitants (rural/urban)

Table 2-1 shows how this indicator can be expressed, using data from Peru. As explained earlier, it is critical to include locality size disaggegration. As the data from Peru show, although only one percent of localities have a public Internet facility, over half the population resides in localities with a public Internet facility.

A few countries such as Brazil provide data on the types of services available at a local government level (Figure 2-4).

Figure 2-5 shows estimates of the availability of electricity, telephone service and public Internet facilities in localities by developing region. Except for Sub-Saharan Africa, the level of electrification has reached over half of localities including almost all localities in Europe and Central Asia. The country averages for localities with telephone service reached just over half and almost half in Europe and Central Asia and East Asia and the Pacific respectively. In the remaining regions, with the exception of Sub-Sahara Africa, around two out of five localities have telephone service. The country averages for the availability of Internet

Table 2-1: PIAPs in Peru, 2004

	Locality by population size	Number of localities	Population	Locality with PIAP	Population covered by PIAP	Percent with PIAP	
						Locality	Population
Urban	>500'000	1	582'975	1	582'975	100%	100%
	50'000-499'999	122	12'501'916	88	9'212'782	72%	74%
	10'000-49'999	228	3'891'678	153	3'100'222	67%	80%
	2'500-9'999	255	1'259'256	126	553'183	49%	44%
Rural	1'000-2'499	565	831'928	75	86'548	13%	10%
	500-999	1'933	1'273'209	67	40'002	3%	3%
	100-499	19'809	4'292'805	462	135'093	2%	3%
	<100	46'194	1'290'252	48	2'812	0.1%	0.2%
	Total	**69'107**	**25'924'019**	**1'020**	**13'713'617**	**1%**	**53%**

Note: PIAP = Public Internet Access Point.
Source: OSIPTEL (2004), *El Acceso Comunitario a las TICs*.

Figure 2-4: Brazil. Percentage of municipalities with services for attending the public, 2004
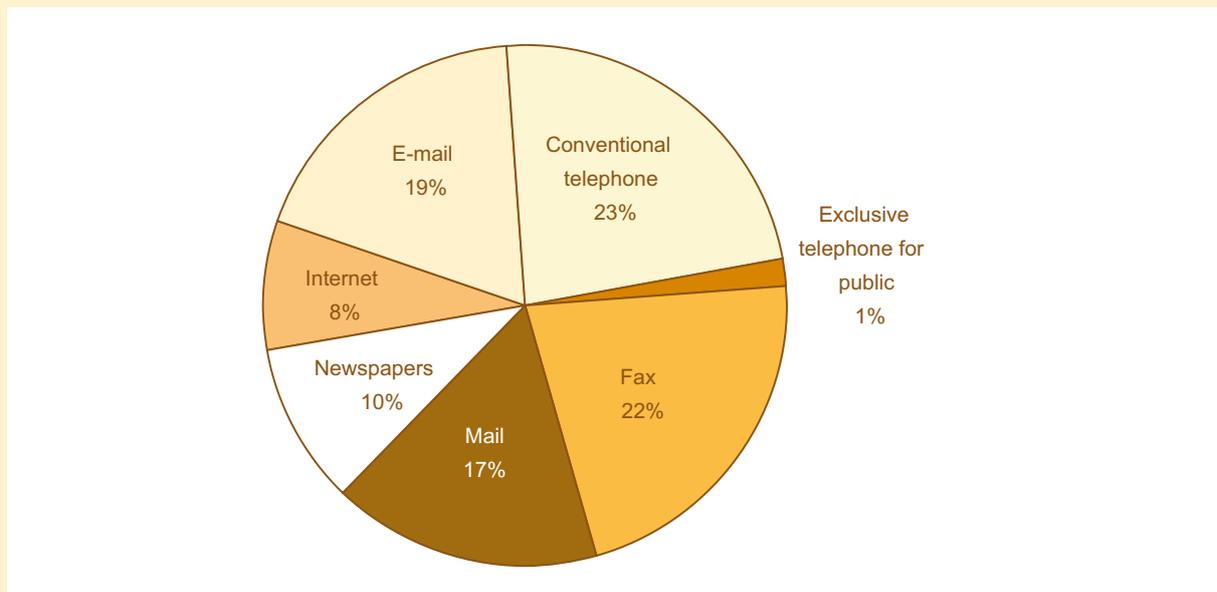
Source: Adapted from IBGE, *Diretoria de Pesquisas, Coordenação de População e Indicadores Sociais, Pesquisa de Informações Básicas Municipais 2004.*

Figure 2 5: Percentage of localities with electricity, telephone and Internet, by region, latest available data
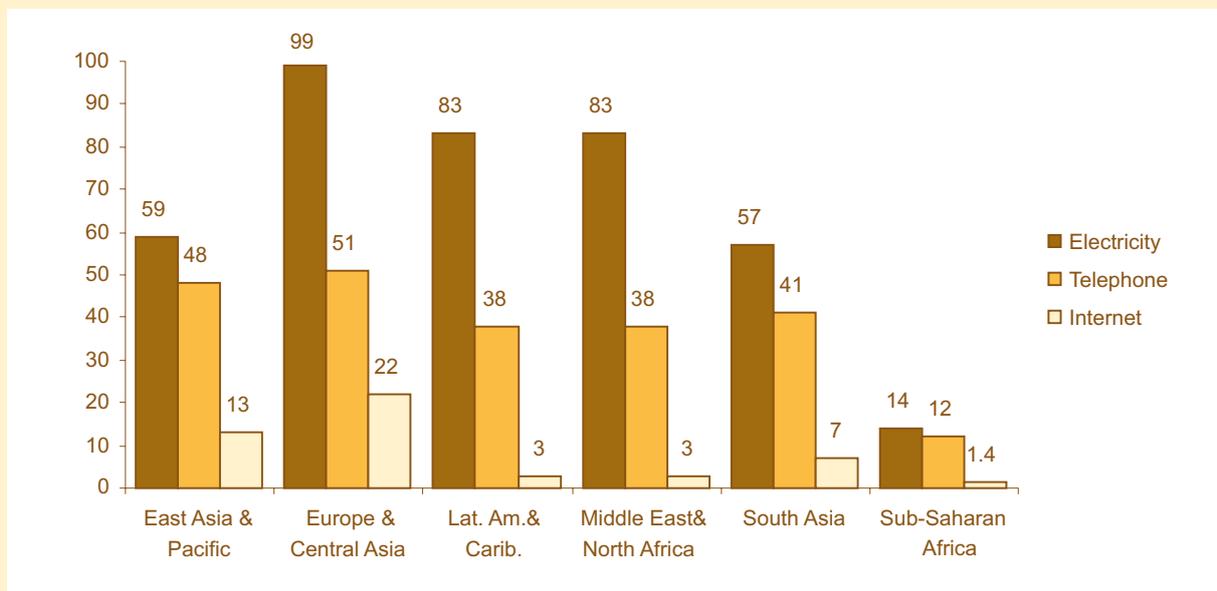
Note: Based on data between 2000-2006. Simple averages.
Source: ITU/BDT research.

service in localities is very low. In Europe and Central Asia, around one in five localities has Internet access, in East Asia and the Pacific just over one in ten. In the other regions, the country averages are less than one in ten localities having Internet access. Sub-Saharan Africa stands out with very low levels of locality access to ICTs.

[1] Preferably, this should refer to the existence of a public telephone facility since the availability of telephone service in a locality does not necessarily imply it is for use by the general public.

[2] The Partnership on Measuring ICT for Development also includes electricity as a reference indicator: Proportion of households with electricity.

3. Other ways of measuring rural ICT access

Figure 3-1: Main telephone lines in rural and urban areas, Moldova

Distribution of main telephone lines by area, 2005

Rural 41%

Urban 59%

Main lines per 100 inhabitants

Urban   Rural
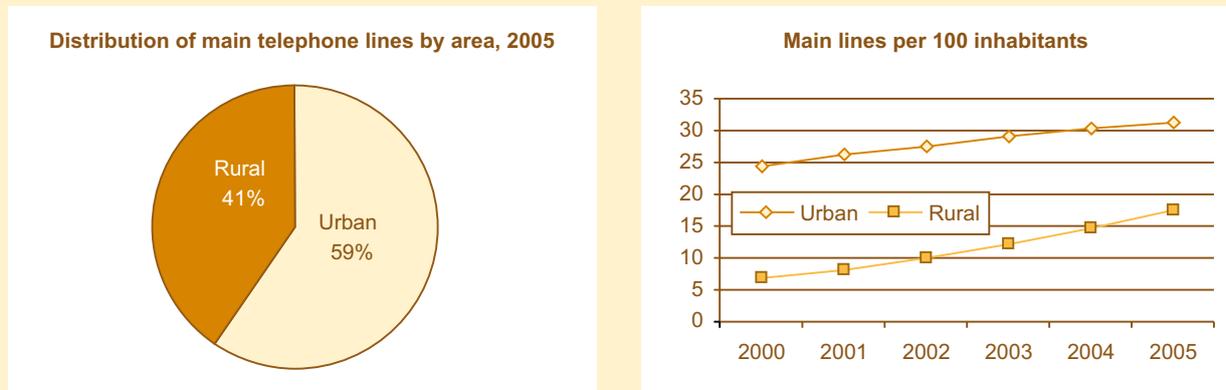
Source: National Bureau of Statistics, Moldova.

3.1 Overview

Given the limitations of locality data, it is useful to complement the analysis with other methods of measuring ICT access, particularly in rural areas. The classical method has been to express telecommunication access in quantity or per capita terms, along urban and rural divisions. Nations of the Commonwealth of Independent States (CIS) often use these types of indicators. For example, data from Moldova show the distribution and penetration of telephone lines by urban or rural location (Figure 3-1).

The biggest advantage of the quantity and teledensity data are that they are available for some countries. It can illustrate the contrast in availability of telephone service between urban and rural areas. However, these types of indicators do not give a feel for how many people have access to ICTs.

Another method has been to show access in terms of *distance* or *time* from the ICT service. A couple of examples from Asia illustrate these types of indicators. Figure 3-2 (left) shows the distances that Bangladeshi women who have been married travel to a telephone service, broken down by urban or rural location. There is not a significant difference among locations—the overwhelming majority is less than five kilometers from telephone service regardless of residing in urban or rural areas. This is due to Bangladesh's high population density; the analysis might

Figure 3-2: Distance and time from telephone facilities

Bangladesh, % distribution of ever-married women by distance to telephone service, 2004

- >10 km
- 5-9 km
- 1-5 km
- < 1 km

Urban   Rural

Nepal. % distribution of households by time to nearest telephone booth, 2004

> 60 minutes

30-60 min.

< 30 minutes

Urban   Rural
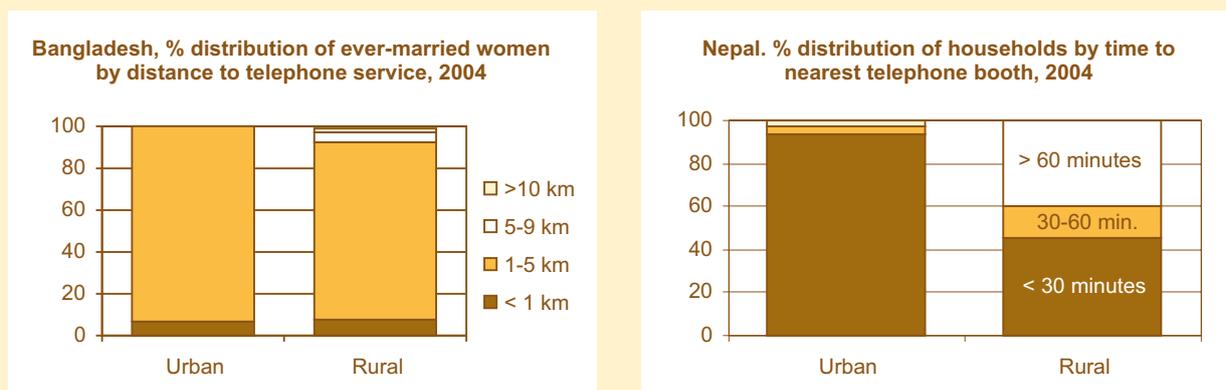
Source: Adapted from National Institute of Population Research and Training, Mitra and Associates, et al. *Bangladesh Demographic and Health Survey 2004*; and Central Bureau of Statistics. *Nepal Living Standards Survey 2003/04*.

Figure 3-3: Ugandan communities reporting access to various services, 2006, %
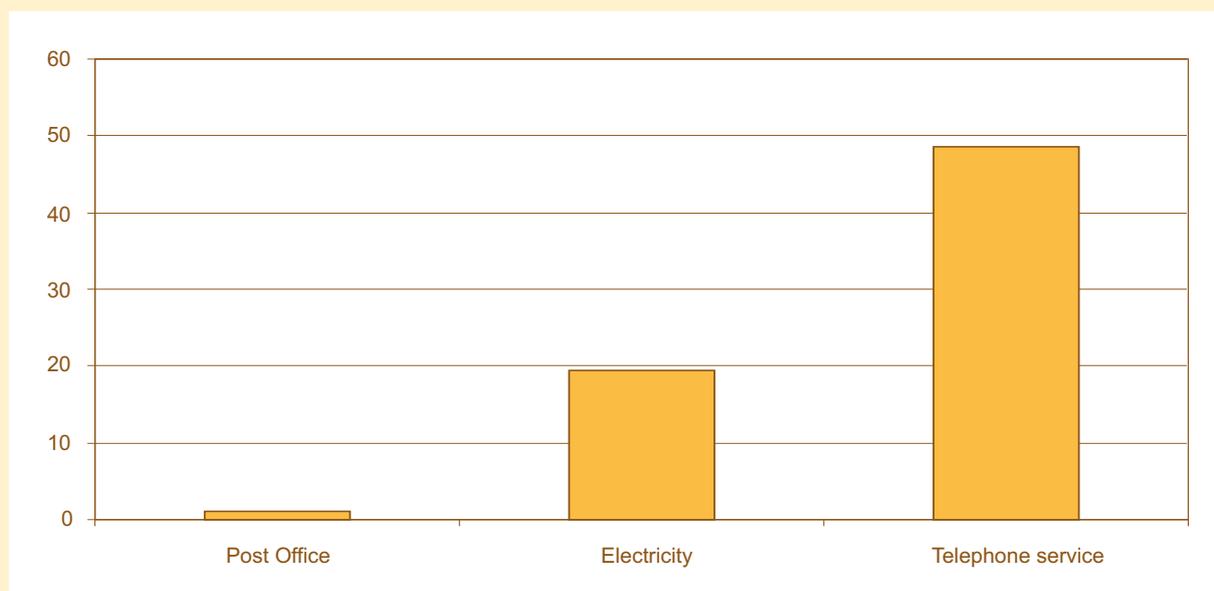
Source: UBOS, *Uganda National Household Survey 2005/06.*

be improved by using smaller ranges for the distances. Figure 3-2 (right) shows the amount of time it takes urban and rural households in Nepal to get to a telephone booth. The average time to a telephone booth was calculated as 2 hours and 13 minutes for a rural Nepalese household, another interesting indicator.

The advantage of time and distance indicators is that they are more specific than data showing the simple existence of an ICT. For example, the availability of an ICT in a locality does not tell you how far away inhabitants are from the ICT. [1] The biggest drawback with these indicators, is that they are not widely compiled by most countries. Second, the ranges of time or distance vary where they are collected. Indeed, it may not be useful to standardize them since being five kilometers from a telephone may be much more significant in a country with a high population density than one with few inhabitants per square kilometer. Nonetheless, there may be some scope for trying to standardize on at least some parameters to enhance comparability as well as to reduce the ranges. For example, in the case of time, it might be the percentage of the population less than half an hour from an ICT facility. In the case of distance, it might be the percentage of the population less than one kilometer from an ICT facility. Alternatively, averages, as mentioned in the example above for Nepal, could be used. Third, distance and time are relative without details about how people get to an ICT facility (e.g., walk, bicycle, motorcycle, bus, automobile, etc.).

Another example is information from so-called *community* surveys. In these surveys, leaders such as mayors, village elders, social workers, etc. are queried about various issues affecting their community. Although subjective, community surveys provide perhaps a more humanistic view of connectivity than dry statistics and better reflect the actual "on the ground" situation. Uganda carried out a community survey at the village level in 2006. [2] Knowledgeable opinion leaders, teachers, medical personnel and agricultural extension workers were asked about various issues affecting their community. Results relating to access to post offices, telephone service and electricity are shown in Figure 3-3.

3.2 Mobile coverage

Wireless communications is the most prevalent form of communications in most countries. Furthermore, wireless communications not only support voice communications but also text messaging and Internet access (at increasingly higher speeds including broadband). Therefore, it is essential to consider mobile indicators when analyzing rural and community access to ICTs. Considering that a single mobile antenna could serve numerous localities depending on their distance from each other, the number of localities with mobile service is undoubtedly higher than those with fixed telephone access. While the availability of mobile coverage might be analyzed at the locality level, data are not widely available. Instead, the common way of expressing mobile coverage is at the level of the population (or territory) within range of a signal.

Table 3-1: Mobile population coverage, 2006

	Total (%)	Population covered (000s)	Rural (%)	Rural population covered (000s)	Population not covered (000s)
Developing	**76**	**3'996'225**	**61**	**1'793'479**	**1'180'019**
East Asia & Pacific	89	1'530'867	83	826'405	183'661
Europe & Central Asia	91	430'921	79	136'462	23'129
Latin America & Caribbean	87	460'128	42	46'874	68'777
Middle East & North Africa	79	245'036	69	88'383	33'622
South Asia	62	909'249	47	488'979	550'441
Sub-Saharan Africa	56	420'024	42	206'375	320'390

Source: ITU/BDT research.

Overall mobile population coverage at the national level is available for many countries. Mobile population coverage could be dissected into urban and rural coverage though it is not typically compiled in this manner. For the purposes of this report, rural mobile population coverage has been calculated on the assumption that at least all urban areas are covered with any remaining coverage estimated to be in rural areas. A summary of mobile coverage with estimates of rural population coverage is provided in Table 3-1.

At the end of 2006, three out of four people were covered by a mobile signal in developing regions. This includes an estimated 1.8 billion rural dwellers or three out of every five. There were still 1.2 billion people not within range of a mobile signal, almost all in rural areas.

3.3 Households

Another measure of ICT accessibility is household availability. Indeed, household telephone penetration has historically been used as the basic measure of *universal service.* [3] Household penetration is a more telling measure than per capita measurements since there is less ambiguity. A household is a well-defined statistical concept and the maximum penetration level is 100 percent. This is unlike teledensity where per capita measurements do not accurately reflect individual ownership due to multiple subscriptions spread across both business and personal categories. Household penetration is also useful to gauge how theoretical access in localities or mobile coverage actually translates into ICT ownership.

A growing number of countries measure the availability of at least some ICTs in households. In addition, the data are often disaggregated among urban and rural household location. This makes household ICT penetration an attractive complement to other indicators for measuring rural access. While household availability of more advanced ICTs such as computers or the Internet is low in many developing nations, others such as broadcasting (i.e., radio and television) or electricity are above 50 percent in many developing nations. In addition, tracking household penetration is increasingly relevant to middle income nations that are making the transition from universal access to universal service.

Figure 3-4 shows the average availability of different ICTs in rural households by developing country region.

The data show a wide variation among regions as well as among ICTs. Except for Sub-Saharan Africa, on average, more than half of rural households have an electrical connection. At least 50 percent of households have a radio although this percentage is certainly higher considering that in some regions, television availability is higher than radio. There appear to be definitional issues with the availability of radio. No region has an average of more than half of rural households with a fixed line telephone. In Europe and Central Asia, over 60 percent of rural homes have a mobile phone and rural homes with a mobile outnumber those with a fixed line in all regions except Middle East and North Africa. Computer and Internet availability in rural households is very low at less than ten percent in all regions except Europe and Central Asia. This attests to the importance of shared access through public facilities.

Figure 3-4: Percentage of rural households with ICTs, by region, latest available data
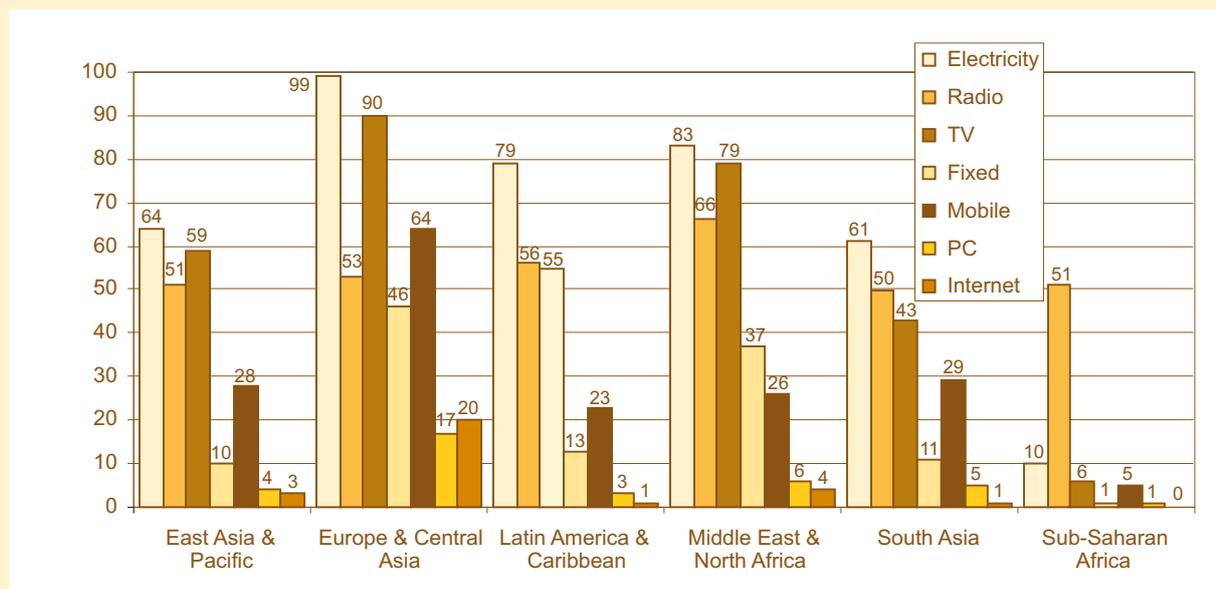
Note: Regional figures refer to country averages (i.e., not weighed by number of households). Data are based on household surveys conducted between 2000 and 2006.
Source: ITU/BDT research.

[1] The improvement in people's lives by having an ICT facility closer is illustrated by an example from China: "Su Xiaoyan, a Guantang local, uses the ISC to scan local employment-information Web sites. Su graduated from college in 2006 and is currently unemployed. She has been visiting the ISC in Guantang almost daily since it opened to search for a job online, something that previously required her to travel 18km to Datang town. 'Not only is the ISC closer to my home, the Internet speed here is fast, the computer desktops have useful Web sites saved on them, and if I meet a technical problem there is a staff member on duty to help me,' said Su." See "Outlook Series" available from: http://www.outlookseries.com/news/Infrastructure/2454.htm.

[2] Uganda Bureau of Statistics. 2006. *Uganda National Household Survey 2005/06*.

[3] "The number and percentage of households that have telephone service represent the most basic measures of the extent of universal service." See: Alexander Belinfante. 1998. *Telephone Subscribership in the United States.* Federal Communications Commission: Washington DC.

4. Regional analysis

4.1 East Asia and the Pacific

Table 4-1: List of countries in East Asia and the Pacific

American Samoa
Cambodia
China
Fiji
Indonesia
Kiribati
Korea, Dem. Rep.
Lao PDR
Malaysia
Marshall Islands
Micronesia, Fed. Sts.
Mongolia
Myanmar
Northern Mariana Islands
Palau
Papua New Guinea
Philippines
Samoa
Solomon Islands
Thailand
Timor-Leste
Tonga
Vanuatu
Vietnam

East Asia and the Pacific is a diverse region ranging from China to smaller populated Pacific islands. Locality data are generally available from national statistical offices for China, Mongolia and the Association of South East Asian Nations (ASEAN). China's large size impacts the regional analysis as it accounts for two thirds of the rural population.

Some 79 percent of localities in the region have a telephone. This is masked by China's rate of 94 percent. The Indochinese countries of Cambodia, Laos and Myanmar have less than five percent of localities with fixed telephone access. Electrification of localities in the region is 89 percent; again China's high rate hides the low levels of locality electrification in Indochina. There are insufficient data to make an estimate about the number of localities with Internet access.

Overall mobile population coverage is an average of 89 percent in the region with rural mobile population coverage estimated at 83 percent. Some 184 million rural inhabitants are estimated to be outside the range of a mobile signal including 57 million in China, almost 40 million in Myanmar, 25 million in Vietnam and 22 million in Indonesia. Despite the large number of rural inhabitants not covered by a mobile signal in China, there

is nonetheless over 90 percent coverage of the rural population. Malaysia and Thailand also have high rural coverage.

Some 64 percent of rural households have electricity on average in countries that have carried out surveys. Radio penetration is over half of rural households and 63 percent of rural households have a TV. Average fixed line telephone penetration in rural households is ten percent. Mobile penetration in rural homes is almost three times higher at 28 percent. The average availability of computers and the Internet in rural homes is very low at four and three percent respectively.

Most countries have initiatives for enhancing community access to ICTs with varying levels of implementation and accomplishment. One of the more successful initiatives has been the Tambon Internet project in Thailand. [1] It was launched in 2001 by the Department of Local Administration of the Ministry of the Interior with the goal of providing Internet access to all 7'500 tambons (a tambon is a sub district one level above a village). The goal was accomplished in March 2006.

4.2 Europe and Central Asia

Table 4-2: List of countries in Europe and Central Asia

Albania
Armenia
Azerbaijan
Belarus
Bosnia and Herzegovina
Bulgaria
Croatia
Czech Republic
Estonia
Georgia
Hungary
Kazakhstan
Kyrgyz Republic
Latvia
Lithuania
Macedonia, FYR
Moldova
Poland
Romania
Russian Federation
Serbia and Montenegro
Slovak Republic
Tajikistan
Turkey
Turkmenistan
Ukraine
Uzbekistan

This diverse region includes central and eastern European nations which are now part of the European Union (EU) as well as members of the Commonwealth of Independent States (CIS). The EU members tend to be more urban than the CIS countries. [2] The overall rate of rural population is 36 percent, ranging from 74 percent in Tajikistan to 27 percent in Belarus, the Czech Republic and Russia.

It is estimated that 59 percent of localities are served by conventional telephone service. Electrification is high with almost all localities assumed to have electricity. On the basis of the available data, only ten percent of localities have public Internet access. However, the overall population coverage is much higher given the relatively large urbanization in the region. Around nine out of ten overall and four out of five people in rural areas are covered by a mobile signal. Nonetheless, some 23 million people are estimated to be outside the range of mobile coverage.

Electrification of rural households is high with the country average for the region equal to 99 percent. Almost nine out of ten rural households have a television on average in the Europe and Central Asia region. Regarding telephony, the country average is 43 percent of rural households with a fixed telephone and 62 percent with a mobile. Among the countries that reported the data, computer and Internet access in rural households is low at around ten percent. Ironically, Internet penetration in rural households is higher than computer ownership, a consequence of access through mobile phones. [3]

There are numerous initiatives to reduce the digital divide between rural and urban areas in the region. These initiatives are generally part of pan-European initiatives or e-government actions. The Baltic nations have been particularly active in this regard. In Estonia, the so-called Village Road 3 is an Information Society initiative targeted specifically at enhancing Internet access in rural areas. It follows the first two Village Road programs aimed at computerizing local governments and providing Internet in public libraries. Village Road 3 aims to bring broadband connectivity to rural areas so that the level of access becomes the same as in urban areas. In Lithuania, almost 500 Public Internet Access Points have been established with the goal that no rural dweller be more than 10 kilometers away from the Internet.

4.3 Latin America and Caribbean

Latin America and the Caribbean is the most urban region with only 21 percent of inhabitants residing in rural areas. There are at least 350'000 localities with significant differences over the level of what constitutes a locality among the countries. Nations such as Argentina, Brazil (see Box 4-1) and Chile generally consider administrative divisions down to the municipal level whereas Mexico and

Table 4-3: List of countries in Latin America and Caribbean

Argentina
Barbados
Belize
Bolivia
Brazil
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines
Suriname
Trinidad and Tobago
Uruguay
Venezuela

13

Peru have a more detailed classifications that encompasse all inhabited places. As a result, locality data are not really comparable across this region.

Around a third of localities have a fixed telephone line. Costa Rica and Uruguay estimate that all of their localities have a public telephone whereas in some Central American nations and Peru the rate is much lower. Around three quarters of localities have electricity in the region. Only two percent of localities have Internet access among countries that reported this data. However, as the example from Peru shows (Table 2-1), the level of Internet coverage amongst population is estimated to be much higher. Chile has the highest rate of *Internetization* at 90 percent of its 342 communes. [3b]

Some 96 percent of households have electricity in the region including 87 percent of rural homes. Color TV reaches 75 percent of households overall and just under half of rural ones (46 percent). Fixed telephone is available in 36 percent of households but only 12 percent of rural homes. Mobile has a similar overall penetration as fixed (33 percent) but many more rural households have mobile phones (21 percent on average) including over half of rural homes in Paraguay. Home computer penetration is just

Box 4-1: Localities in Brazil

Brazil illustrates the difficulty of analyzing ICTs in localities. The lowest official political administrative unit in Brazil are the 5'564 municipalities. [6] There are thematic data available at the level of municipality including some ICT information. [7] All municipalities in Brazil are reported to have telephone service and 2'125 have data service infrastructure. However, there are populated places at a level lower than municipality in Brazil. The problem is, because there are no official data, estimates regarding the number of localities vary. [8] So while the telecommunication regulator, ANATEL, is able to report that there were 33'432 localities being served by telephone service in December 2006, [9] it is not known what percentage of the total this amounts to. It also means that ICT in locality information for Brazil, compiled at the level of municipality, presents a more positive figure than one presented at the level of populated places.

13 percent overall and only 3 percent in rural households while Internet penetration is 7 percent overall and only one percent in rural homes.

Most countries have some sort of plan for expanding Internet access to rural areas. For example, the e-Mexico project is installing Digital Community Centers (DCCs) in rural localities; at the end of 2006 there were 7'888 DCCs in 2'456 localities. [4] Peru is noteworthy in that it has developed a thriving Internet café culture without much government involvement. According to the national statistical agency, 75 percent of all users accessed the Internet from the over 30'000 *cabinas públicas* ("public cabins") in the country during the quarter ending in June 2007. This includes at least one household member in 14 percent of rural households. [5]

4.4 Middle East and North Africa

Table 4-4: List of countries in Middle East and North Africa

Algeria
Djibouti
Egypt, Arab Rep.
Iran, Islamic Rep.
Iraq
Jordan
Lebanon
Libya
Morocco
Oman
Syrian Arab Republic
Tunisia
West Bank and Gaza
Yemen, Rep.

Some two out five persons or 129 million people reside in a rural location in the Middle East and Africa (MENA) region. The region has an estimated 180'000 localities with significant deviations in definitions. Although Egypt and Iran have the highest population in the region at 73 and 70 million respectively, the former reports only 4'617 villages whereas the latter states there are 68'122. These wide discrepancies, which result in villages sizes of 9'017 versus 327, impact the locality analysis for this region.

Over half of localities have fixed telephone line service and electricity. The percentage of localities with public Internet access is estimated at around one percent.

Overall mobile coverage is estimated at almost four out of five people. The corresponding rural figure is about 10 percent lower. Some 88 million rural inhabitants are estimated to be within range of a mobile signal and 34 million outside the range. Well over half of those not covered live in Iran where the mobile market has only recently been liberalized and where coverage is expected to improve rapidly. Some seven million rural Yemenis are also estimated to be outside the range of a mobile signal. On the other hand, Egypt, Morocco, Syria, Tunisia and Jordan have mobile population coverage rates of over 90 percent in rural areas.

In contrast to the locality figure of just over half having electricity, household surveys for MENA suggest that 90 percent of all homes and over 80 percent of rural homes have electricity. Television penetration is also high with almost four out of five rural homes reporting owning one.

In terms of telephones, the rural household penetration for MENA is 37 percent for fixed and 26 percent for mobile. Iran stands out for fixed rural penetration with 58 percent of rural households having a fixed line. Conversely, only eight percent of rural Iranian homes have a mobile phone, confirming the low level of rural mobile coverage.

Penetration of newer ICTs is more limited in the region. Some 15 percent of households have a computer compared to six percent of rural households. Internet access is available in six percent of households and four percent in rural households. The large spread between computer and Internet suggests the scope for community access. Palestine shines within MENA with more than a quarter of rural households having a computer and over ten percent having Internet access.

Many of the countries have initiatives to expand community access. For example Jordan has some 130 *Knowledge Stations* throughout the country providing Internet access to the public. [10] In Tunisia, the *Publinet* program was launched by the government in October 1998. A Publinet is a public access facility to provide Internet access

particularly in rural zones as well as to provide employment to new university graduates. [11] The government offered investment incentives to entrepreneurs establishing the initial Publinets. By December 2006, there were some 241 Publinets scattered throughout Tunisia.

4.5 South Asia

> **Table 4-5: List of countries in South Asia**
>
> Afghanistan
> Bangladesh
> Bhutan
> India
> Maldives
> Nepal
> Pakistan
> Sri Lanka

The South Asia region has the second largest population and number of localities among developing regions and the largest rural population. Locality information is generally available through national statistical agencies and the data appear to be fairly consistent in terms of overall size per locality. [12] Weighted averages are distorted by India which accounts for 75 percent of the region's population.

Approximately three quarters of localities have telephone service across South Asia. India has connected 91 percent of its some 600'000 villages with payphones, an indicator that it has been tracking regularly since setting the goal of providing all villages with a payphone a number of years ago. Curiously, according to official statistics, more localities have phones than electricity in India. The Maldives has a payphone on each of its 194 inhabited islands, a feat accomplished in 2000. The availability of fixed telephone service in localities in Afghanistan and Bhutan is estimated to be very low.

Electrification in the region reaches 72 percent of localities. Data on the number of localities with Internet are limited but available figures suggest it is low. For example, around 1'000 localities have broadband service in India or only 0.2 percent. The Maldives leads the region with one third of its islands having Internet access.

Mobile population coverage is relatively low compared to other regions. A little over 60 percent of the region's inhabitants are covered by a mobile signal with just under half of rural inhabitants. The total is brought down by India which is estimated to have only 60 percent overall and 44 percent rural population coverage. Mobile coverage is low in Nepal. On the other hand, rural mobile population coverage is over 90 percent in both Bangladesh and the Maldives.

The country average of household electricity penetration is 66 percent overall and 61 percent in rural homes. Household access to ICTs show great variation across the region. In regards to television, the country average for rural household penetration is 43 percent. Fixed telephone availability in rural homes averages 11 percent. The country average for the availability of mobile phones in rural households is almost one third but disguises great variations. For example, 80 percent of rural Maldivian households have a mobile phone and there is a mobile phone in one quarter of rural Sri Lankan homes but corresponding figures for Bangladesh and Nepal are only six and two percent respectively (data on penetration of mobile phones in households are not available for other countries in the region including India and Pakistan). There are limited data on household PC and Internet penetration. Among countries that measure this, rural computer household penetration in the Maldives is 15 percent compared to less than one half percent in Bangladesh. Internet availability in rural Maldives households is 2.5 percent compared to practically zero in Bangladesh.

There are several wireless initiatives in the region to spread community access to the Internet. In the Maldives, broadband has been provided to 54 islands covering 70 percent of the population. [23] Access from the broadband distribution point is extended through Wi-Fi. There are plans to introduce broadband to all islands with a population of more than 900 people. In Bangladesh, Internet access via mobile phone networks with at least dial-up speeds is available to over 95 percent of the population covered by a signal. Building on its successful Village Phone program, Grameenphone started a project in 2006 to provide Internet access through Community Information Centers (CIC) using its nationwide EDGE network. [24] Some 500 CICs have been installed.

4.6 Sub-Saharan Africa

After South Asia, Sub-Saharan Africa is the least urbanized region in the world. Some two-thirds of people in Sub-Saharan Africa reside in rural areas. It is estimated that there are around 400'000 localities. Less than three percent have a fixed line telephone connection. Electricity availability is low among countries for which data are available, at just above ten percent of localities. It is estimated that less than one percent of African villages have a public Internet facility.

On the other hand, mobile communications has made huge inroads in providing connectivity to villages. Over 40 percent of rural dwellers in Sub-Saharan Africa were covered by a mobile signal in 2006. That still leaves over 300 million people in the region living in places not covered by mobile.

Over half of rural households have a radio. Only ten percent of Sub-Saharan Africa rural households have electricity

Table 4-6: List of countries in Sub-Saharan Africa

Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Comoros
Congo, Dem. Rep.
Congo, Rep.
Cote d'Ivoire
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia, The
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mayotte
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
Sudan
Swaziland
Tanzania
Togo
Uganda
Zambia
Zimbabwe

which consequently impacts the availability of ICTs. Only six percent of rural homes have a television. Fixed telephone penetration is one percent and mobile five percent in rural households. The availability of computers and the Internet is negligible among countries for which these data are available.

There have been numerous initiatives, primarily using wireless communications, to foster greater access to ICTs. In South Africa, the provision of community service telephones was written into the license conditions of the three mobile operators. By the end of 2006 there were close to 100'000 community service telephones. A recent development have been projects specifically geared to rural areas based on the GrameenPhone experience in Bangladesh. In this scheme, rural dwellers are offered loans from microfinance entities in order to buy a handset and airtime to provide mobile service to the village. The model has been successfully applied in Uganda where the MTN Village Phone project had 36'000 service providers in 2006, seven times more than initially projected. [15] There have been numerous projects driven by development partners to install community access centers in rural areas. However for the most part, they have not proven sustainable and eventually end up being closed when funding ends. The development of e-government in the region is providing a new impetus to rural Internet access. After all, what is the use of e-government services if the majority of the population has no access to it? In Kenya, the government is developing a Digital Village scheme in order to provide rural inhabitants with electronic access to government services. The plan is to install Internet connectivity in some 200 locations. From there, entrepreneurs will be assisted to extend access to more remote rural areas through kiosks that will have wireless connectivity back to the main centers.

[1] See "Internet Tambon Project (Thailand)" available from: http://www.dosite.go.jp/e/differ/tel/IntTambonjp.html.

[2] It should be noted that for the EU members, rural refers to people living in sparsely populated areas (less than 100 inhabitants/km^2).

[3] This is remarked on by the Central Statistical Bureau of Latvia which has the following comment in its footnote on household Internet penetration: "Since 2006 the total number of households with access to the Internet … exceeds the number of households with access to the computer. This can be explained by the fact that many households in Latvia could access the Internet only by the mobile phone."

[3b] It should be noted that this is the lowest level at which such information is compiled with a commune equivalent to a third level administrative division.

[4] SCT (2007). *Anuario Estadístico de Comunicaciones y Transportes*.

[5] INEI-Encuesta Nacional de Hogares, 2005-2007 (ENAHO Continua).

[6] See "Population Count 2007" available from: http://www1.ibge.gov.br/english/estatistica/populacao/contagem2007/default.shtm.

[7] See IBGE. 2006. *Perfil dos Municípios Brasileiros*. Available at: http://www.ibge.gov.br/home/estatistica/economia/perfilmunic/2005/munic2005.pdf.

[8] For example the national statistical agency used 215'811 "setores censitários" or enumeration areas for the 2000 Census (http://www.ibge.gov.br/home/estatistica/populacao/defaulttab_agregado.shtm) while GeoNames lists around 33'000 populated places for its map of Brazil (http://www.geonames.org/statistics/brazil.html).

[9] See "Universalização" available from: http://www.anatel.gov.br/hotsites/relatorio_anual_2006/cap_05.htm.

[10] See "Knowledge Stations" available from: http://www.ks.jo/KS_network.htm.

[11] http://www.sospublinet.tn/publinet.htm.

[12] Exceptions are Bhutan with a very low average locality size and Nepal where average locality size is relatively high.

[13] Dhiraagu. "Dhiraagu extends Wireless Zone Service to additional 27 islands". *Press Release*. http://www.dhiraagu.com.mv/newsdesk/index.php?newsid=593 [Accessed October 9, 2007].

[14] Telenor. *Annual review 2006*. Available at: http://www.telenor.com/reports/2006/review/story/bangladesh.php.

[15] International Finance Corporation. "Replicating Village Phone from Uganda and Bangladesh." *Monitor*. May 2006.

5. Demand side

This report has examined availability of infrastructure at the level of localities, population coverage and households. It is also important to see how the infrastructure is used in order to identify and correct bottlenecks so that the benefits of the Information Society can spread to all. In the context of this report, it would be useful to identify how many people are using ICT facilities disaggregated by rural inhabitants. It would also be interesting to get an idea of the degree to which rural dwellers are using shared facilities.

The Partnership has identified several indicators that are relevant in this context and which could be broken down by individuals living in rural areas:

• Proportion of individuals who used a computer (from any location) in the last 12 months

• Proportion of individuals who used the Internet (from any location) in the last 12 months

• Location of individual use of the Internet in the last 12 months (including community and commercial Internet access facilities)

• Proportion of individuals with use of a mobile telephone

Though these data are not yet widely collected by developing countries, some are starting to do so, providing a glimpse into ICT demand side dynamics in the rural sector. For example, Thailand has indicators on the number of mobile, computer and Internet users in rural areas (Figure 5-1, left) while Paraguay compiles data on the place of Internet usage such as public facilities, from urban or rural locality (Figure 5-1, right).

Figure 5-1: ICT users in Thailand and location of Internet use in Paraguay, by urban or rural location, 2006
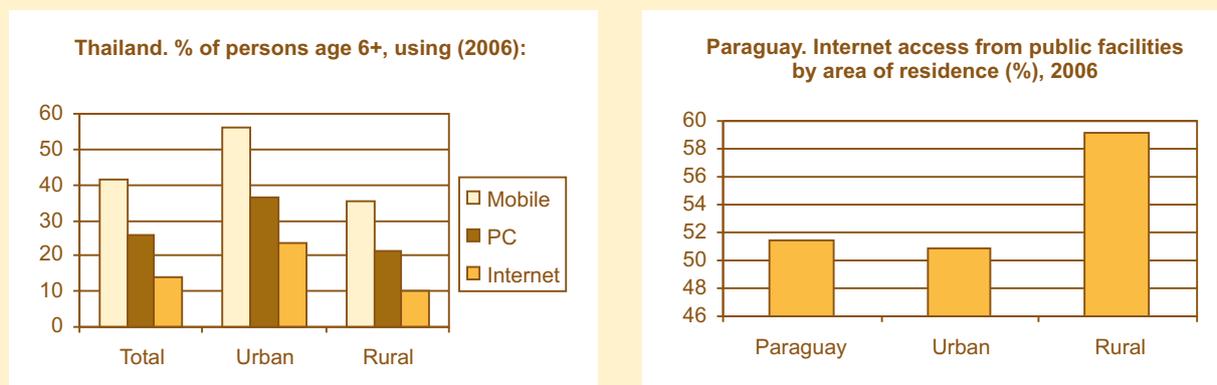
Source: Adapted from Thailand National Statistics Office and Paraguay General Directorate of Statistics, Surveys and Census.

6. Conclusions and recommendations

Research into measurement of the first WSIS target on village connectivity leads to several conclusions and recommendations:

Make the target more visible. Currently many governments do not appear to know about the WSIS targets. As a result, few countries are allocating resources to monitoring these targets. The targets need to be highlighted in global forums and an international dataset should be established for benchmarking. The village connectivity target is also just one of ten that countries need to track and achieve by 2015 (see Table 6-1).

Uganda and Lebanon provide examples of how some of these targets are being tracked in their countries (Figure 6-1).

Government agency responsible for ICT organizes and disseminates existing information. There is a variety of information available on ICT access in localities and rural areas, but it is too often scattered across different data sets and agencies, not aggregated at the appropriate level and sometimes available only in local languages. The government entity responsible for ICT should collate the information and make it available to a wide audience.

Locality data should be broken down by population. Overall data on the availability of ICTs in localities lead to erroneous conclusions because of the inverse relation between population and locality size. For example, although only one percent of Peruvian localities have a public Internet facility, over half the population is covered. A review of existing definitions shows that the most popular size to be designated as rural is locations with a population of 2'000 or less. Therefore, it is recommended that this be adopted as at least one interval to enhance international comparability.

Supplement locality data with other rural ICT indicators. While attractive for its connectivity flavor, the availability of ICTs in villages is not a completely satisfactory indicator. The wide differences in the way localities are defined, a lack of ICT locality data and the inverse relation between population and locality size impact the usefulness of this indicator at this time. This paper has introduced a variety of other indicators available at the rural level that can be used to complement locality data and provide a more robust perspective of rural and community connectivity. These indicators include:

- Rural mobile population coverage
- Availability of ICTs in rural households
- Distances and time from ICT facilities individuals and households in rural areas
- Community indicators on perception of ICT facilities in rural areas
- ICT users in rural areas
- Access to public ICT facilities by rural users

Compile the data. Countries need to collect and compile statistics on the availability of and access to ICTs from localities and rural areas. In that regard, governments need to involve their national statistical offices and determine how to measure the WSIS targets. Tables 6-2 through 6-5 provide examples of which data to collect.

Figure 6-1: WSIS targets adjusted to national circumstances

Source: Adapted from Uganda Communications Commission and American University of Beirut.

This paper has shown a way forward to monitoring the digital divide and offered examples of a variety of key indicators. A serious commitment by governments to compile community and rural ICT indicators will assist tremendously in the ability to monitor and evaluate progress towards the WSIS targets.

Table 6-1: WSIS Targets

Targets
1. To connect villages with ICTs and establish community access points
2. To connect universities, colleges, secondary schools and primary schools with ICTs
3 . To connect scientific and research centres with ICTs
4. To connect public libraries, cultural centres, museums, post offices and archives with ICTs
5. To connect health centres and hospitals with ICTs
6. To connect all local and central government departments and establish websites and email addresses
7. To adapt all primary and secondary school curricula to meet the challenges of the Information Society, taking into account national circumstances
8. To ensure that all of the world's population have access to television and radio services
9. To encourage the development of content and to put in place technical conditions in order to facilitate the presence and use of all world languages on the Internet
10. To ensure that more than half the world's inhabitants have access to ICTs within their reach

Table 6-2: Sample locality data format

Locality size	Population	Electricity	Telephone	Internet access
> 2'000				
2'000 and less				

Table 6-3: Sample wireless coverage format

	Total	Urban	Rural
2G mobile coverage			
Broadband mobile coverage (at least 256 kbps in one direction)			
Non-mobile network, wireless broadband coverage (e.g., WiMax)			

Table 6-4: Sample ICT in households format

	Total	Urban	Rural
Electricity			
Radio			
Television			
Fixed telephone			
Mobile telephone			
Either fixed or mobile telephone			
Computer			
Internet access (from the home)			

Table 6-5: Sample ICT use format

	Total	Urban	Rural
Proportion of individuals who used a computer (from any location) in the last 12 months			
Proportion of individuals who used the Internet (from any location) in the last 12 months			
Location of individual use of the Internet in the last 12 months (including community and commercial Internet access facilities)			
Proportion of individuals with use of a mobile telephone			