LIRNEasia
Learning Initiatives on Reforms for Network Economies

TRAI

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Workshop on ICT Indicators

for Benchmarking Performance in Network and

Services Development

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The background material presented in this document has been prepared by LIRNE*asia* for the Workshop on ICT Indicators for Benchmarking Performance in Network and Services Development, held in New Delhi from 1-3 March 2006.

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1. Introduction

The rapid development of Information and Communication Technologies (ICTs) and the pervasive impacts of its deployment in many areas of society, emphasizes the need to develop new, improved and, most importantly, standardized indicators to measure performance of the ICT sector.

Standardization of such indicators both on a national and international level is a necessary to make comparisons accurate and meaningful. This includes more traditional indicators to measure the investment climate, utilization (via the use of basic indicators such as tele-densities), as well as indicators to gauge the value chain benefits of ICT diffusion. While the ITU, and the UN have identified many indicators, it is necessary that these be contextualized within the developing world so that the indicators are adopted in a systematic and phased manner to address the most relevant and pressing issues.

1.1 Background

There are numerous efforts to quantify the effects of the ICT sector on individuals, businesses and at a national level, household and business surveys and e-indices. These include traditional telecommunication indicators derived from administrative sources which measure access and infrastructure and household and business surveys which give a more comprehensive assessment of access levels; and composite e-Indices and e-readiness assessments which aim to give a holistic view of the status of ICT use and impact. Such initiatives have been led by international organizations such as United Nations (UNCTAD and UNDP), World Bank, International Telecommunications Union (ITU) and the Organization for Economic Cooperation and Development (OECD), now all working through the Partnership on Measuring ICT for Development. [1]

1.2 Relevance of the Workshop

The Partnership on Measuring ICT for Development has initiated a process of collecting relevant indicators in a systematic and standardized manner to enable more meaningful and accurate international comparisons. However it is important to realize that the policy interventions required for network expansion and enhanced access vary from country to country.

In the context of developing countries and specifically South Asia, the exercise of collecting relevant and standardized indicators needs to be undertaken with a prioritized and systematic approach so as to give policy makers the tools to target the most pressing needs in a specific region or country. Within this regional context there is also a need to go beyond baseline indicators and measure the direct and indirect value chain benefits of the ICT sector, for example the growth of the ITES sector (BPO/KPO). At the same time it can be argued that the very nature of policy interventions required for developing countries necessitates effective indicators to measure regulatory performance.

[1] Refer to Annex 2a: Partnership on Measuring ICT for Development

In the context of South Asia, we can prioritize the list of indicators classified as:

- Supply-side indicators
- Demand-side indicators
- Indicators to measure value chain benefits
- Regulatory Performance Indicators

It is essential that these indicators be developed through a participatory process with various stakeholders, both national and international, to ensure that a representative set of indicators is identified and adopted for the current ICT sector environment in South Asia. These stakeholders include national regulatory authorities, national statistical organizations, operators and ICT sector related associations. These indicators must be harmonized within the region so that accurate and meaningful comparisons are possible.

This document intends to introduce some indicators and especially supply side indicators necessary for the region. This list is not comprehensive, but is intended to serve as a reasonable starting point as we think about the subject.

1.3 Objectives of the workshop

LIRNE*asia* and the Telecommunications Regulatory Authority of India, with the assistance of the International Development Research Centre (IDRC) of Canada, are co-sponsoring the Workshop on ICT Indicators for Benchmarking Performance in Network and Services Development in New Delhi from March 1-3, 2006 to highlight the need for accurate, standardized and comparable indicators for the region and to initiate action to develop good indicators.

The workshop is intended to elicit the cooperation of representatives from National Regulatory Authorities (NRAs), National Statistical Organizations (NSOs) and network operators from Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, in the collection of standardized and comparable indicators.

Long term Objectives:

Establish a sustainable system for measuring and benchmarking ICT sector input and output indicators for South Asia that can be extended to developing Asia.

Short-term Objectives (6-9 months):

(a) Prepare a draft comprehensive report and indicators manual similar to the European Commission Methodological Manual for Telecommunication Services [http://forum.europa.eu.int/irc/dsis/bmethods/info/data/new/embs/telecommunications1439.doc] that will provide a coherent framework for the producers of telecommunications statistics;

(b) Facilitate the application of indicators and concepts developed under (a) in six country studies conducted with IDRC and other support that will inform the work of (a); and

(c) Finalize the outputs of (a) and (b) at a WDR expert forum attended by regulators, stakeholders and experts, to be held in late 2006.

This first meeting is intended to agree on a set of actions to be undertaken by attendees of the meeting to achieve the short and long-term objectives of LIRNEasia with regards to the creation of a sustainable system of data collection with standardized and comparable methodologies within the region.

2. Defining the ICT Sector

The definition and relevance of ICT indicators is a challenging task, especially against the background of a rapidly changing industry with frequent technological advances that is converging products, services and delivery channels.

Much work has been done in incorporating the ICT sector into international classification systems such as the UN's International Standard Industrial Classification (ISIC)[2] and the World Customs Organization's Harmonized Commodity Description and Coding System, commonly referred to as Harmonized System (HS). The OECD's Working Party on Indicators for the Information Society (WPIIS) has sought to promote incorporation of relevant ICT classifications. WPIIS has itself produced definitions of ICT goods, services and industry which been used as input into the primary classifications systems mentioned above. An overview of these classification systems is beyond the scope of this document. However, a brief overview of OECD's efforts in this defining the sector is given below. The OECD publication, "Guide to Measuring the Information Society[3]" gives a more detailed overview.

OECD ICT Goods and Services Classification[4]

The OECD's classification of ICT goods was finalized in December 2003, and is grouped into the broad categories of telecommunications equipment, computer and related equipment, audio and video equipment, and other ICT goods. It is based on the World Customs Organization's Harmonized System (HS) 1996 classification. Due to limitations in the HS categories, like limited recognition of to software a key component of the Information Society, WPIIS had incorporated classifications for software as well.

OECD ICT Sector Definition[5].

The OECD's Working Party on Indicators for the Information Society (WPIIS), has produced definitions for the ICT sector based on the UN's International Standard Industrial Classification (ISIC) Revision 3.1[6]. These industrial classifications are related to the manufacture of ICT goods and the services industry selling or renting ICT related goods. As such it does not encapsulate the entire ICT sector. The OECD is currently reviewing the definitions to move towards an activity based definition from the current institutional based definition.

[2] http://unstats.un.org/unsd/cr/registry/regct.asp?Lg=1
[3] http://www.oecd.org/dataoecd/41/12/35654126.pdf
[4] OECD (2005), Guide to Measuring the Information Society, DSTI/ICCP/IIS(2005)6/FINAL, pp15-23, 88-97, http://www.oecd.org/dataoecd/41/12/35654126.pdf
[5] OECD (2005), Guide to Measuring the Information Society, DSTI/ICCP/IIS(2005)6/FINAL, pp98-103, http://www.oecd.org/dataoecd/41/12/35654126.pdf
[6] The complete ISIC Revision 3.1 document can be found at http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1

3. Supply Side Indicators

Supply side indicators describe the supply of ICT infrastructure and services. The following list includes some indicators that are already available; however, it is necessary to improve the nature of some of these indicators. In other cases they are mentioned to underscore the importance of regular reporting. This list is not exhaustive and constitutes a starting point for the discussion of relevant supply side indicators for developing countries.

Investment Indicators

Telecommunication infrastructure investment figures (absolute and as a percentage of GDP) help to reflect the growing importance of the sector for national economic growth. While such measures are already in existence, they need to be reported in a regular and transparent manner.

Market Share Indicators

Market share indicators for fixed, mobile and leased line operators are an important measure of the level of competition in a market. While such information is annually reported in developed countries, it is not easily available in developing countries where incumbents are still traditionally partially if not fully state-owned and private operators have adopted expansive definitions of confidentiality. Irrespective of the individual economic polices within the country, market share indicators are essential tools for regulators and policy-makers and need to be reported in a regular (annual) and transparent manner. In large countries with fragmented markets, it is necessary to achieve consensus on the appropriate definitions of markets for market share data to be of optimal value.

The publicly available European Electronic Communications Regulation and Markets report[7], published annually by reported Commission of the European Communities (also known as the EU Implementation Reports) provides market share information in the fixed market as well as the mobile (including providers of 2G and 3G services) and also includes information on public ownership in the incumbent fixed operator.

Tele-densities

- Fixed (Rural, Urban, Household and Total)
- Mobile (Rural, Urban and Total)

The phenomenal growth of telecom usage, especially mobile penetration is beginning to shift to rural areas. Separate indicators for urban and rural tele-density are hence necessary to identify the gap between urban and rural penetration levels, and thus the level of intervention necessary to increase telecom usage in rural areas where rollout by operators is usually deficient.

[7] The 11th report on the implementation of telecommunications regulatory package for 2005 is available at: http://europa.eu.int/information_society/policy/ecomm/implementation_enforcement/annualreports/11threport/index_en.htm

Because tele-densities in developing countries currently lag behind those in developed countries, utilization of measures such as household tele-density will help accurately reflect the level of access by users.

At a more basic level there is a requirement for a standardized definition of "mobile subscriber", "fixed subscriber", etc. With prepaid being the market driver in voice, measuring subscribers is a difficult task since many countries do not require registration. Counting the number of SIM cards sold introduces errors due to individuals possessing multiple SIM cards as well as inactive accounts. Such problems require a transparent and standardized definition and a common methodology which will reduce the relative errors in comparing subscriber volumes. Usage of statistical sampling techniques may complement simple counting methods to give a more accurate estimate of actual subscribers. For example mobile subscribers can potentially be gauged by measuring the average loads on a base station. A similar technique was utilized in Sri Lanka to gauge mobile penetration in a study to extend rural connectivity[8].

Public access points

A recent study[9] has revealed that around 60 percent of telecom users with monthly income less than USD 100 in India and Sri Lanka do not own the phones that they use. Sixty six per cent of the 3,199 respondents reported that they used public access, with 37 per cent solely relying on public access. This suggests that greater emphasis needs to be placed on collecting data on different forms of public access such as number of payphones, Public Call Offices (PCOs) and internet-cafes, as well as on equivalent average tariffs charged by each type.

Internet penetration (dialup, broadband) & Internet Tariffs (dialup, broadband; based on basket methodologies)

Statistics on internet usage are limited at present; greater prominence needs to be given to these indicators as more countries formulate internet and broadband policies to stimulate usage. Measuring internet penetration using dialup is difficult due to the usage of prepaid internet cards which makes obtaining exact figures difficult, if not impossible. However usage of standardized statistical sampling techniques in conjunction with more traditional census techniques can minimize the error rate.

Utilization of basket methodologies for measuring internet tariffs helps to capture the actual cost of internet access. This is especially relevant in the context of dialup tariffs where a user may have to bear line rental charges and phone charges in addition to an internet access charge. The Core ICT Indicators[10] include an internet tariffs indicator which measures the cost for 20 hours of

[8] Network Strategies. (2004). Proposed Measures for Rural Connectivity: Recommendations for subsidy payments. Consultancy report for Ministry for Economic Reforms, Science and Technology, Sri Lanka. report number 23035, 10 January 2004.

[9] Zainudeen, A., Samarajiva, R. & Abeysuriya, A. (2006) Telecom Use on a Shoestring: Strategic Use of Telecom Services by the Financially Constrained in South Asia. WDR Dialogue Theme 3rd cycle Discussion Paper WDR0604, Version2.0. Available at: http://www.lirneasia.net/wp-content/uploads/2006/02/Zainudeen%20Samarajiva%20Abeysuriya%202006%20teleuse%20strategies.pdf

[10] Partnership on Measuring ICT for Development (2005), Core ICT Indicators. Available at: http://www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf

use per month and accounts for monthly line rental, line usage charge and internet access charge. Such basket methodologies are already utilized by OECD.

Tariffs (Mobile and Fixed) using basket methodologies

The limitation of the commonly used ITU indicators for fixed and mobile tariffs is that they do not provide an accurate picture of all the costs associated with using the service. The OECD basket methodology[11] provides a more holistic view by accounting for connection and rental charges as well as taking into account the disparate tariffs that exist for calls between mobile-fixed, mobile-mobile and fixed-fixed networks.

The methodology not only incorporates the above components into its calculations, but also differentiates between the low user, medium user and high user to give a more realistic view of the costs incurred by various user groups (based on calling volume). A recent preliminary study of Indian, Pakistani and Sri Lankan mobile tariff packages has produced surprising results, revealing that prepaid is relatively cheaper than post-paid in Sri Lanka and India[12].

In addition it may be useful to consider composite baskets for residential and business users separately to gauge telecom usage, similar to those reported by OECD.

Number of Leased Lines & Leased Line Tariffs (Domestic & International)

Measuring the number of domestic and international leased lines as well as the respective available bandwidths provides a measure of the existing supply of this important infrastructure element. Leased lines are important not just for operators (for the purposes of interconnection) but also for large and small businesses and for ISPs and hence indirectly, the general public.

By the same logic the associated costs for the provision of leased lines are important. Separate tariff indicators are required for different bandwidths for different standardized distances. The short-distance tariffs constitute the costs associated with local tail circuits. At present such statistics are limited and in most cases not publicly available. The findings from a preliminary study on measuring domestic leased line tariffs in India, Pakistan and Sri Lanka[13] using the OECD basket methodology has shown the disproportionately high costs of tail circuits in Sri Lanka

[11] OECD (2000), OECD Telecommunications Basket definitions. Available at http://www.oecd.org/dataoecd/52/33/1914445.pdf

[12] Lokanathan, S., Iqbal, T. (2006), A Preliminary Methodology for Comparisons of Mobile Tariffs. Available at: http://www.lirneasia.net/2006/03/where-is-talk-cheap/

[13] Lokanathan, S. (2005), A Preliminary Methodology for the Comparative Analysis of Domestic Leased Line Tariffs in the South Asian region. Available at: http://www.lirneasia.net/2005/08/comparative-analysis-of-leased-line-tariffs/

Interconnection charges (Fixed-Fixed, Fixed-Mobile, Leased Line interconnection charges)

Again such information is virtually non-existent but can be easily collected. Interconnection charges present a huge hurdle in the expansion of the telecom sector and the collection of such data will help formulate benchmarked cost-based prices with supporting non-discriminatory practices.

The EU Implementation reports[14] annually publish interconnection charges for fixed-fixed, fixed-mobile and leased lines, with average prices for each showing a downward trend from year to year.

Quality of Service related to Network Congestion at the Point of Interconnection

Network congestion at the point of interconnection can occur due to limitations in the provided interconnection bandwidth and may indicate anti-competitive practices. To ensure that interconnection is provided in a transparent and non-discriminatory basis and to measure the quality of services, it is important that measures of such congestion are available. TRAI already requires such measures with a congestion benchmark of less than 0.5%.[15]

Quality of Service Indicators related to fixed, mobile & data

The high demand for telecommunication services and the rapid expansion of infrastructure to cater to this increased demand, has meant that at times the quality of services provided have degraded with increased demand. Quality of Service (QoS) indicators are essential in such an environment. QoS indicators are required not just to measure the performance of the mobile and fixed voice networks but also of data circuits (dial-up, broadband and leased lines).

TRAI already reports quality of service indicators[16] for fixed, mobile and internet on a quarterly basis. On the other hand, similar reporting in Sri Lanka occurs infrequently. A regular (preferably on a per quarter basis) reporting schedule of standardized quality of services indicators ensure that consumers are properly informed, in a timely and transparent manner, of the quality of services.

[14] The 11th report on the implementation of telecommunications regulatory package for 2005 is available at: http://europa.eu.int/information_society/policy/ecomm/implementation_enforcement/annualreports/11threport/index_en.htm

[15] TRAI. (2005). Report on QoS Parameters related to Congestion on Point of Interconnections (POIs) of CMSPs. Available at: http://www.trai.gov.in/report1dec.pdf

[16] Refer to Annex 1 for a complete list of QoS indicators utilized by TRAI for fixed and mobile operators and ISPs.

Employment Indicators[17]

The explosive growth of ICTs has beneficial side effects such as increased employment in the ICT value chain both upstream and downstream. While it may be the case that employment in incumbents may have remained static, or even fallen due to liberalization and privatization of the sector, this is more than compensated for by increased employment provided in the sector as a whole. Such growth occurs not just by the direct employment creation in new operators by also by the creation of indirect employment in the form of vendors, distributors, franchisees etc. of telecom companies. The Pakistan Telecom Authority (PTA) for example estimates that the telecommunications sector growth in Pakistan will create a further 370,000 new jobs (both direct and indirect) by 2008.[18] This employment growth, though visible throughout the South Asian region, has not yet been documented in a standardized and systematic manner.

Measures to quantify the direct and indirect employment created by sector growth need to be implemented, as they can help to gauge the socio-economic benefits of sector growth.

[17] Also refer to Section 5

[18] PTA. (2005). PTA & Telecom Sector Growth. Available at www.pta.gov.pk

4. Demand side indicators

While supply-side indicators can help estimate the level of "supply" of ICT services, the measurement of the demand and usage levels of ICT goods and services is also a required pre-requisite step in tailoring effective policies and actions geared towards improving ICT access for all.

Indicators need to be captured to gauge the demand level of usage of ICTs by business and residential users. Captured primarily through surveys, these demand side indicators are necessary to find out the actual utilization of ICTs and identify the actual needs that can be addressed by regulation and improved supply. It is foreseen that National Statistical Organizations will play a key role in this process possibly by modifying existing household income and expenditure surveys to incorporate questions to answer the following:

- Household telecom penetration
- Household internet penetration
- ICT usage patterns (location and frequency).

For businesses too we can identify some useful indicators to gauge business demand for ICTs. Surveys will be required to answer the following:

- Business telecom penetration
- Business internet penetration
- ICT usage patterns
- Level and frequency of utilization of e-commerce

OECD's Guide to Measuring the Information Society[19], provides sample household and business surveys, which can be adapted for use in developing countries.

[19] OECD (2005), Guide to Measuring the Information Society, DSTI/ICCP/IIS(2005)6/FINAL, pp106-142, http://www.oecd.org/dataoecd/41/12/35654126.pdf

5. Measuring Value Chain Benefits

The growth of the telecommunications sector and the accompanying economic growth through increased investment has generated derivative benefits along the value chain, which need to be measured in a systematic manner. This means that traditional investment measures[20] need to be supplemented with indicators that measure employment directly related to the telecommunications sector[21] as well as indicators that measure the derivate impacts of sector growth. Two such examples are the rapidly growing IT Enabled Services (ITES) sector and the burgeoning tax revenues generated for the government by the ICT sector.

Indicators to Measure Growth in the ITES Sector

Telecommunications is an essential input for ITES. The rise of South Asia, especially India, as one of the major Business Process Outsourcing (BPO) centres in the world, necessitates the utilization of indicators to document this impact.

For example India's National Association of Software and Services Companies (NASSCOM) estimates that the ITES sector in India will exceed USD 36 billion by the end of 2006 and account for 4.8% of GDP. Furthermore employment is estimated to grow to 1.28 million with BPOs accounting for 409,000 jobs[22].

The following self-explanatory indicators are proposed:

- Investment in the ITES sector
- Revenues in the ITES sector
- Employment in the ITES sector

The adoption of the above indicators will help capture the impacts of ICT sector growth, and help tailor relevant policy measures, which can either broadly target ITES sector growth or specifically target improved telecommunication services, a key ITES sector input.

Taxes

The ICT sector is fast becoming one of the major sources of tax revenue for the government. Some countries have resorted to taxing this sector heavily through direct and indirect means,. High taxes on handsets and other equipment, license fees, usage, etc can have a negative impact on adoption of ICT products and services

In order to comprehensively study the effects of taxes and to develop a useful tax model, it is necessary to collect data on the amounts of taxes that are generated by the sector as well as the amounts that are levied for licenses, etc.

[20] Refer to Section 3

[21] Refer to Section 3

[22] http://www.nasscom.org/artdisplay.asp?Art_id=4989

A recent study of the effects of taxes on the mobile industry, commissioned by the GSM Association,[23] calls for the reformation of mobile taxes; this, it argues will improve accessibility of mobile phones, whilst improving tax revenues for the government. The study, based on taxes and the digital divide, looks at tax regimes in emerging markets across the world and studies the economic impacts of a tax change in these markets. It finds taxes to be disproportionately high in some countries,with resultant perverse effects such as black markets in handsets. It also suggests that cuts in taxes on mobile handsets and services will attract new users, meaning greater tax revenues for governments in the long run.

Measuring the annual tax revenues can contribute to documenting the impacts of the sector in the creation of government funds. Supplemented by appropriate and accurate demand analysis these indicators can help tailor policies that not only increase ICT access but also improve tax revenues for governments.

[23] GSMA. (2005). Tax and the digital divide: How new approaches to mobile taxation can connect the unconnected, Mobile Tax Report, September 2005. Available at: www.gsmworld.com/documents/tax_report.pdf

6. Measuring Regulatory Performance

Increasing ICT usage and expanding the reach of the network depend heavily on policies and regulations that are implemented by the National Regulatory Authority (NRA). The regulatory authority plays a key role in providing incentives for businesses and operators to expand the network and hence increase uptake of ICTs by the public.

Providing qualitative and/or quantitative assessments of the performance of the NRA helps stakeholders identify adequacies and deficiencies in regulatory practices. This stimulates evidence based regulation that allows NRAs to tailor their processes to improve their functioning and effectively deliver services. The examples mentioned below can be considered as external evaluations of the regulatory process (which can compliment internal indicators within the NRA) to measure the NRA's progress towards desired outcomes as per its mandate.

The Telecom Regulatory Environment

Telecom Regulatory Environment (TRE) developed by LIRNE*asia* and already piloted in Sri Lanka, is a perceptual index which gauges the state of the regulatory regime.[24] The TRE is based on the perceptions of efficacy, by key groups, i.e., a set of *representative* and *informed* group of respondents. This group would include top-level management of operators, journalists, financial institutions and generally any organization or individuals with direct or indirect knowledge of the sector for the entire period of the study. The TRE is based on the elements of regulation identified by the Reference Paper of the GATS Protocol 4. The TRE has 5 dimensions to capture regulatory efficiency in the following areas:

- Providing competitive safeguards,
- Ease of Market entry,
- Tariff regulation,
- Allocation of scare resources, and
- Interconnection.

European Competitive Telecommunications Association[25] (ECTA) Regulatory Scorecard

First reported in 2003, the ECTA Regulatory Scorecard[26] evaluates the effectiveness of regulatory regimes in inducing competition and investment in the telecommunications sector by

[24] Samarajiva, R. & Dokeniya, A. (2005) Regulation and investment: Sri Lanka case study, with Sabina Fernando, Shan Manikkalingam & Amal Sanderatne, in *Stimulating investment in network development: Roles for regulators*, eds. A.K Mahan and W.H. Melody, pp. 141-76. Monte Video: World Dialogue on Regulation. http://www.regulateonline.org/content/view/435/31/

[25] ECTA was founded in 1998 to look after the regulatory and commercial interests of new entrant telecom operators and their suppliers. It currently has over 150 members from 16 European countries, including operators, service providers, suppliers and National Associations; see: http://www.ectaportal.com/en/

[26] See: http://www.ectaportal.com/en/basic276.html

systematically quantifying and measuring the powers and performance of NRAs and their overall regulatory processes. The latest scorecard (2005) assesses 16 EU states, with an addendum assessing the relative performance of USA against these 16 states.

The assessment is carried out by a performing a comparative analysis of the responses of ECTA's members to the questionnaire developed for scorecard. The latest iteration of the scorecard allocated 106 variables across 4 main categories:

- General NRA powers,
- Effectiveness of the dispute settlement body,
- General market access conditions, and
- Availability of key access products.

The underlying methodology was created using various inputs including Directives under the New Regulatory Framework[27] (NRF), the World Trade Organization (WTO) reference paper on telecommunications, the OECD, as well as inputs from carriers, economic experts, and third parties. The latest report assesses 16 EU member states

Benchmarking National Regulatory Authority (NRA) websites

The World Wide Web has already demonstrated the ability to bridge the communication gap between government and citizen via various e-government initiatives. The web can play a similar role in allowing NRAs to effectively deliver services in a transparent and open manner to all its key stakeholders.

In 2005, LIRNE*asia* conducted a survey to benchmark the websites of NRAs of countries in the Asia-Pacific region, using a transparent methodology and with countries clustered and compared like with like. The report is publicly available. More information about the survey can be found at http://www.lirneasia.net/projects/regulatory-web-survey/.

[27] The New Regulatory Framework governing the 25 EU Member States, went into effect from July 2003 and aims to stimulate competition and improve functioning in the electronic communications sector, reduce regulation in developed and competitive markets, while at the same time ensuring that a minimum set of services are available to all users at an affordable price. See: http://europa.eu.int/information_society/policy/ecomm/todays_framework/index_en.htm

7. Next Steps

The background material mentioned in this document is intended to introduce participants of the workshop to the work currently being done around the world in relation to measuring the ICT sector. The workshop is also intended to underscore the importance of standardization of definitions and methodologies and the increased emphasis being given to this at an international level to measuring the information society in an accurate and comparable manner.

The indicators mentioned in this document form a starting point for building a prioritized and relevant set of indicators for emerging Asia.

LIRNE*asia*, as a regional, non-profit, ICT policy and regulation research and capacity building organization, intends to facilitate the discussion on relevant capacity building activities, amongst the regional stakeholders in adopting a comparable set of indicators. The New Delhi ICT Indicators Workshop[28], and the subsequent follow-up workshop, which will be convened towards the end of 2006 to consider and approve the draft indicators methodological manual, underscore LIRNE*asia*'s commitment to building sustainable supply- and demand-side data collection procedures via a multi-stakeholder, participatory process. Through this process it is hoped that NRAs and NSOs from the region will adopt relevant indicators to ensure comparability and accuracy.

The centrepiece of LIRNE*asia*'s 2006-07 research cycle will be an integrated package of comparative research, including a thematic study on ICT sector and regulatory performance indicators; the New Delhi ICT Indicators Workshop constitutes the starting point for this work.

The New Delhi ICT Indicators Workshop also constitutes the first step in building a sustainable system for measuring and benchmarking ICT sector input and output indicators for South Asia that can be extended to developing Asia. As an integral part of this exercise, LIRNE*asia* will conduct 6 country studies that apply the conceptual work on indicators in 3 South Asian countries (India, Pakistan and Sri Lanka) and three South-East Asian countries (Indonesia, the Philippines and Thailand). These studies are not simply applications of the indicators work, but will extend and consolidate the regulation and reform-focused work completed in the 2004 cycle of WDR research on regulation and investment (Bangladesh, India, Sri Lanka)[29] as well as the shoestrings work[30] completed in the 2005 cycle.

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[28] *Workshop on ICT Indicators for Benchmarking Performance in Network and Services Development*, convened in New Delhi from March 1-3, 2006 by LIRNE*asia* and TRAI

[29] Mahan, A.K. & Melody, W.H., (Eds). (2005) *Stimulating Investment in Network Development: Roles for Regulators. Report on the World Dialogue on Regulation*. Uruguay: WDR. Available at: http://www.regulateonline.org/content/view/435/31/

[30] Zainudeen, A., Samarajiva, R. & Abeysuriya, A. (2006) Telecom Use on a Shoestring: Strategic Use of Telecom Services by the Financially Constrained in South Asia. WDR Dialogue Theme 3rd cycle Discussion Paper WDR0604, Version2.0. Available at: http://www.lirneasia.net/wp-content/uploads/2006/02/Zainudeen%20Samarajiva%20Abeysuriya%202006%20teleuse%20strategies.pdf and Zainudeen, A. (2006) Telecom use on a shoestring: The case of Bangladesh. Available at: http://www.lirneasia.net/wp-content/uploads/2006/02/Zainudeen%202006%20teleuse%20on%20a%20shoestring_bangladesh%20meta%202.0.pdf

The input obtained at the New Delhi ICT Indicators Workshop, will be an integral part of LIRNE*asia*'s activities after this workshop, culminating in the presentation of the draft methodological manual for approval at the follow-up workshop towards the latter part of 2006.

- Obtaining input from individual NRAs and NSOs to identify regional data sources and statistical capacities to complement the work done by the Partnership on ICT Indicators for Development.
- Development of an online prototype database for stakeholders from South Asia to input indicators data and obtain relevant and comparable statistics for the South Asian region.
- Development of a comprehensive draft indicators manual with concepts, definitions and methodologies that will be presented for approval at the follow-up workshop
- Carrying out of in-depth baseline studies of relevant supply side indicators data as part of the South Asian country studies (India, Pakistan and Sri Lanka). The findings will be presented at the follow-up workshop.

LIRNE*asia* recognizes the importance of participation in developing and adopting a sustainable system for data collection with accurate and comparable indicator methodologies. In this regard, LIRNE*asia* hopes that NRAs and NSOs from the region will contribute by:

1. Actively providing input for the methodological manual. This input would potentially be in the forms:
    a. Input on the statistical capacity of the individual NRAs and NSOs
    b. Input on national definitions and methodologies for indicators as well as primary data sources for each indicator.
2. Actively participating in the utilization of a prototype website to provide indicators data at regular time intervals.
3. Initiating relevant capacity building activities within individual NRAs and NSOs that prioritize the formulation and utilization of standardized and comparable indicators.
4. Adopting basket methodologies for tariff indicators.
5. Promoting the collection of indicators to gauge the value-chain benefits of telecommunications growth, specifically employment generation (direct and indirect), investment and economic growth both upstream and downstream of the telecommunications value chain.
6. Adopting the methodological manual (once adopted at the follow-up workshop) as a reference document within individual NRAs and NSOs working towards standardized and comparable indicators.

Annex 1: TRAI's Measures of Quality of Service for Basic Service Operators (BSOs), Mobile Operators and Internet Services Providers (ISPs)

The latest report for the quarter ending September 2005, can be found at http://www.trai.gov.in/report27dec05part1.pdf

Quality of Services performance of Basic Service Operators

- Provision of telephone within 7 days for exchange areas declared "On Demand" (100% in <7 days).
- Fault incidences per month per 100 telephones (should be less than 5 Faults per 100 phones per month)
- Percentage of faults repaired by next working day (should be >90%)
- Mean Time to repair (MTTR) (should be <8hrs.)
- Call Completion Rate in local network (should be >55%)
- Metering and Billing credibility (Not more than 0.1% of bills should be disputed over a billing cycle)
- Customer Care: Promptness in attending 95% of customers requests (Benchmarks for Shifts, Closures and providing additional facilities are <3 days, <24 hours and <24hours respectively)

Quality of Service performance of Cellular Mobile Service Providers

- Accumulated down time of community isolation (benchmark is <24 hours)
- Call Set-up Rate within licensee's own network (benchmark is >95%)
- Service Access Delay (benchmark is 9-20s)
- Blocked Call Rate - SDDCH Paging Channel Congestion (benchmark is <1%)
- Blocked Call Rate - TCH Congestion (benchmark is <2%)
- Call Drop Rate (benchmark is <3%)
- % of connection with good voice quality (benchmark is >95%)
- Response Time to the customer for assistance
- Complaints per 100 bills issued (benchmark is <0.1%)
- % of complaints resolved with 4 weeks (benchmark is 100%)
- Period of all refunds/payment due to customers from the date of resolution of complaints (benchmark is <4 weeks)

Quality of Service Performance of Internet Services Providers

- Services activation time (benchmark is 6hours)
- Time to access (benchmark is 30sec)
- Probability of Accessing the ISP Node (benchmark is 80%)
- ISP Node Unavailability (benchmark is <30 minutes a month)
- Grade of Service:
- Mean Time to Restore (MTTR)

Annex 2a: Partnership on Measuring ICT for Development

The first phase of the World Summit on Information Society (WSIS) held in Geneva in December 2003 underlined the importance of comparable and standardized benchmark indicators for the ICT sector. This resulted in the formation of global collaborative alliance called Partnership on Measuring ICT for Development[31], between the ITU, OECD, Eurostat, World Bank and various UN organizations inter alia UNCTAD and UNESCO. The core objectives of this global partnership were:

- the establishment of a core set of internationally comparable indicators;
- helping establish the statistical capacity of national statistical organization; and
- the creation of a global database to host these core ICT indicators.

As part of this partnership, a comprehensive global stocktaking exercise was undertaken to assess the status of available indicators and the statistical capacity of national statistical organizations. In South Asia, only 4 countries, namely India, Maldives, Pakistan and Sri Lanka responded to the questionnaire that was sent out as part of this exercise. Table 1 summarizes some of the findings of this metadata collection for the four countries named above.

Table 1: Some findings from the Partnership on Measuring ICT for Development Questionnaire responses from India, Maldives, Pakistan and Sri Lanka

	India	**Maldives**	**Pakistan**	**Sri Lanka**
Demand for ICT Household Indicators	High	N/A	No demand	Very high
Demand for ICT Business Indicators	High	No demand	No demand	No demand
Origin of funds for ICT Statistics collection	NSO's regular budget	No financing available		No financing available
Existence of a definition for ICT	Exits	No Definition exists	Exists	Exists
Most recent household ICT collection	Population and Housing Census; March 2001			Living conditions survey; 35 ICT variables; Jan-June 04
Most recent business ICT collection	• Enterprise Survey; Jul 01 – Jun 02 • SNAP survey (ICT sector); approx. 40 variables; conducted annually			

[31] http://www.itu.int/ITU-D/ict/partnership/index.html

	• Survey on Software exports; approx 50 variables; Jan - June 04			

This work of the partnership culminated in the presentation of a core list of ICT indicators[32] which was adopted by the participants at the WSIS thematic meeting on Measuring the Information Society in Geneva in February 2005.

[32] Refer to Annex 2b: Core ICT Indicators

Annex 2b: Core ICT Indicators

The Core ICT Indicators document[33] that arose out of this partnership, establishes a set of 41 indicators under 4 categories namely: indicators on ICT infrastructure and access, indicators on access to and use of ICT by households and individuals; indicators on use of ICT by businesses and indicators on the ICT sector and trade in ICT goods.

The list of indicators presented in the Core ICT Indicators document are listed below:

Core Indicators on ICT Infrastructure and access

Basic Core:

A1 Fixed telephone lines per 100 inhabitants
A2 Mobile cellular subscribers per 100 inhabitants
A3 Computers per 100 inhabitants
A4 Internet subscribers per 100 inhabitants
A5 Broadband Internet subscribers per 100 inhabitants
A6 International Internet bandwidth per inhabitant
A7 Percentage of population covered by mobile cellular telephony
A8 Internet access tariffs (20 hours per month), in US$ and as a percentage of per capita income.
A9 Mobile cellular tariffs (100 minutes of use per month), in US$, and as a percentage of per capita income
A10 Percentage of localities with public Internet access centres (PIACs) by number of inhabitants (rural/urban)

Extended Core:

A11 Radio sets per 100 inhabitants
A12 Television sets per 100 inhabitants

Core indicators on access to, and use of, ICT by households and individuals

Basic Core:

HH1 Proportion of households with a radio
HH2 Proportion of households with a TV
HH3 Proportion of households with a fixed line telephone
HH4 Proportion of households with a mobile cellular telephone
HH5 Proportion of households with a computer
HH6 Proportion of individuals who used a computer (from any location) in the last 12 months
HH7 Proportion of households with Internet access at home
HH8 Proportion of individuals who used the Internet (from any location) in the last 12 months

[33] The complete document on the core indicators and their corresponding methodological notes can be found at: http://www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf

HH9 Location of individual use of the Internet in the last 12 months: (a) at home; (b) at work; (c) place of education; (d) at another person's home; (e) community Internet access facility (specific denomination depends on national practices)4; (f) commercial Internet access facility (specific denomination depends on national practices)5; and (g) others

HH10 Internet activities undertaken by individuals in the last 12 months·

- Getting information: (a) about goods or services; (b) related to health or health services; (c) from government organisations/public authorities via websites or email; and (d) other information or general Web browsing
- Communicating
- Purchasing or ordering goods or services
- Internet banking
- Education or learning activities
- Dealing with government organisations/public authorities
- Leisure activities: (a) playing/downloading video or computer games; (b) downloading movies, music or software; (c) reading/downloading electronic books, newspapers or magazines; and (d) other leisure activities

Extended Core:

HH11 Proportion of individuals with use of a mobile telephone

HH12 Proportion of households with access to the Internet by type of access: Categories should allow an aggregation to narrowband and broadband, where broadband excludes slower speed technologies, such as dial-up modem, ISDN and most 2G mobile phone access. Broadband will usually have an advertised download speed of at least 256 kbit/s.

HH13 Frequency of individual access to the Internet in the last 12 months (from any location): (a) at least once a day; (b) at least once a week but not every day; (c) at least once a month but not every week; and (d) less than once a month.

Reference Indicator:

HHR1 Proportion of households with electricity

Core indicators on use of ICT by businesses

Basic Core:

B1 Proportion of businesses using computers

B2 Proportion of employees using computers

B3 Proportion of businesses using the Internet

B4 Proportion of employees using the Internet

B5 Proportion of businesses with a Web presence

B6 Proportion of businesses with an intranet

B7 Proportion of businesses receiving orders over the Internet

B8 Proportion of businesses placing orders over the Internet

Extended Core:

B9 Proportion of businesses using the Internet by type of access: Categories should allow an aggregation to narrowband and broadband, where broadband excludes slower speed technologies, such as dial-up modem, ISDN and most 2G mobile phone access. Broadband will usually have an advertised download speed of at least 256 kbit/s.

B10 Proportion of businesses with a Local Area Network (LAN)

B11 Proportion of businesses with an extranet

B12 Proportion of businesses using the Internet by type of activity

- Sending and receiving email
- Getting information: (a) about goods or services; (b) from government organisations/public authorities via websites or email; and (c) other information searches or research activities
- Performing Internet banking or accessing other financial services
- Dealing with government organisations/public authorities
- Providing customer services
- Delivering products online

Core indicators on the ICT sector and trade in ICT goods

Basic Core:

ICT1 Proportion of total business sector workforce involved in the ICT sector

ICT2 Value added in the ICT sector (as a percentage of total business sector value added)

ICT3 ICT goods imports as a percentage of total imports

ICT4 ICT goods exports as a percentage of total exports

Annex 2c: Digital Opportunity Index (DOI)

The first phase of the World Summit on the Information Society (WSIS) in December 2003, established a mandate, as part of the WSIS Plan of Action[34] to create a composite index called the Digital Opportunity Index (DOI), grounded on internationally recognized indicators, to measure the extent of the digital divide and the global progress of ICT integration and adoption. The DOI aims to rank countries based on a composite weighted index based on 3 sub-indexes which measure the ICT infrastructure, opportunity for access to ICTs, and the level of utilization of ICTs. These 3 sub-indexes are derived from a set of indicators from the list of Core Indicators identified by the Partnership on Measuring ICT for development (refer to BOX XXX for more information about this partnership). By utilizing internationally recognized indicators to construct the index, the DOI is unique from other popular e-indices like ITU's Digital Access Index (DAI)[35], the IDC Information Society Index (ISI)[36], the World Economic Forum Networked Readiness Index (NRI)[37] and the Orbicom Monitoring the Digital Divide[38]. Table 2 below summarizes the components of the DOI.

Table 2: DOI Components

Sub-Index	Variables
Infrastructure	1. Proportion of households with a fixed telephone line
	2. Mobile cellular subscribers per 100 inhabitants
	3. Proportion of households with Internet access at home
	4. Mobile internet subscribers per 100 inhabitants
	5. Proportion of households with a computer
Opportunity	6. Percentage of population covered by mobile cellular telephony
	7. Internet access tariffs (20 hours per month), in US$, and as a percentage of per capita income
	8. Mobile cellular tariffs (100 minutes of use per month), in US$, and as a percentage of per capita income
Utilization	9. Proportion of Individuals that used the Internet
	10. Ratio of Broadband Internet subscribers per 100 inhabitants among Internet subscribers per 100 inhabitants

The DOI was officially launched during the second phase of the WSIS held in Tunis in November 2005 and a sample DOI ranking was submitted at Tunis for 40 leading economies around the world. South Asia was represented only by India in this preliminary ranking and was ranked the last. The United Nations Conference on Trade and Development (UNCTAD) agreed in Tunis to collaborate with ITU in applying the DOI to the rest of economies.

For more information on the DOI please refer to http://www.itu.int/DOI

[34] http://web/dms_pub/itu-s/md/03/wsis/doc/S03-WSIS-DOC-0005!!PDF-E.pdf
[35] http://www.itu.int/ITU-D/ict/dai/index.html
[36] http://www.idc.com/groups/isi/main.html
[37] http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5CGlobal+Information+Technology+Report
[38] http://www.orbicom.uqam.ca/projects/ddi2002/ddi2002.pdf

Annex 3: ITU Key Indicators of the Telecommunications/ICT sector[39]

The fourth World Telecommunication/ICT indicators meeting (Geneva, February 2005) discussed the following key indicators. Please address any questions or comments to indicators@itu.int.

	ITU code[40]	Indicator	Definition
Fixed Telephone network			
1	112	Main (fixed) telephone lines in operation	A main line is a telephone line connecting the subscriber's terminal equipment to the public switched network and which has a dedicated port in the telephone exchange equipment. This term is synonymous with the term *main station* or *Direct Exchange Line (DEL)* that are commonly used in telecommunication documents. It may not be the same as an access line or a subscriber. Some countries include the number of ISDN channels; if so, this should be specified in a note. Fixed wireless subscribers should also be included.
2	117	Total capacity of local public switching exchanges	The total capacity of public switching exchanges corresponds to the maximum number of main lines that can be connected. This number includes, therefore, main lines already connected and main lines available for future connection, including those used for the technical operation of the exchange (test numbers). The measure should be the actual capacity of the system rather than the theoretical potential when the system is upgraded or if compression technology is employed.
3	1142	Percent of main lines connected to digital exchanges	This percentage is obtained by dividing the number of main lines connected to digital telephone exchanges by the total number of main lines. This indicator does not measure the percentage of exchanges which are digital, the percentage of inter-exchange lines which are digital or the percentage of digital network termination points. Respondents should indicate whether the main lines included in the definition represent only those in operation or the total capacity.

[39] Available at: http://www.itu.int/ITU-D/ict/material/IndDef_e_v2005.doc

[40] Code used by the International Telecommunication Union (ITU) to identify the indicator. This code appears in ITU questionnaires.

	ITU code[40]	Indicator	Definition
4	116	Percent of main lines which are residential	This percentage is obtained by dividing the number of main lines serving households (i.e., lines which are not used for business, government or other professional purposes or as public telephone stations) by the total number of main lines. Respondents should indicate the definition of households that is being applied.
5	1162	Percent of main lines in urban areas	This percentage is obtained by dividing the number of main lines in urban areas by the total number of main lines in the country. The definition of urban used by the country should be supplied.
6	1163	Number of localities with telephone service	Localities are cities, towns and villages in a country. This indicator reflects the number of localities that have telephone service. To enhance usefulness, the total number of localities should be provided as well as the population of localities covered by telephone service.
7	1112	Public payphones	Total number of all types of public telephones, including coin and card operated and public telephones in call offices. Publicly available phones installed in private places should also be included, as should mobile public telephones. All public telephones regardless of capability (e.g., local calls or national only) should be counted. If the national definition of "payphone" differs from that above (e.g., by excluding pay phones in private places) then respondents should indicate their own definition.
Mobile network			
8	271	Mobile cellular telephone subscribers (post-paid + prepaid)	Refers to users of portable telephones subscribing to an automatic public mobile telephone service that provides access to the Public Switched Telephone Network (PSTN) using cellular technology. This can include analogue and digital cellular systems but should not include non-cellular systems. Subscribers to public mobile data services or radio paging services should not be included. If this service has a name, please indicate in a note as well as the year the service commenced operation.
8.1	271p	Mobile cellular subscribers: prepaid	Total number of mobile cellular subscribers using prepaid cards. These are subscribers that rather than paying a fixed monthly subscription fee, choose to purchase blocks of usage time. Only active prepaid subscribers that have used the system within a reasonable period of time should be included. This period (e.g., 3 months) should be indicated in a note.

	ITU code[40]	Indicator	Definition
9	2712	Digital mobile cellular subscribers	Total number of subscribers to digital cellular systems (e.g., GSM, D/AMPS (TDMA), CDMA). Should include both post-paid and pre-paid subscribers.
9.1	271h	Total number of subscribers to mobile networks	271h= 271L+271G. Sum of low and medium speed mobile subscribers and IMT-2000 (3G) subscribers. If data communications are available to voice subscribers without payment of an additional subscription charge, subscriber numbers would be those that have suitably equipped terminals AND have used the service at least once in a given period (e.g., the last three months).
9.1.1	271L	Number of subscribers to low and medium speed mobile networks	Number of subscribers to low and medium speed mobile networks (e.g., GPRS, WAP, iMode etc), regardless of whether they are using multimedia services, though with a capacity for data communications, via Internet. In this context, "low and medium-speed mobile" implies a speed that is less than 144 kbit/s in both directions. -*General Packet Radio Service* (GPRS) is a 2.5G mobile standard typically adopted by GSM operators as a migration step towards 3G (W-CDMA). -*Wireless Application Protocol* (WAP) is a free, unlicensed protocol for wireless communications that makes it possible to create advanced telecommunications services and to access Internet pages from a mobile telephone. -*iMode* is a packet-based means of wireless data transfer and uses *Compact Wireless Markup Language*(CWML) instead of WAP's WML for data display. i-Mode was introduced in 1999 and was the first method available to browse the Web from a cellular phone.

	ITU code[40]	Indicator	Definition
9.1.2	271G	Number of subscribers to IMT-2000 (3G) high-speed mobile networks	Number of subscribers to IMT-2000 (3G) high-speed mobile networks (e.g., CDMA2000 1X, WCDMA, CDMA2000 1xEV-DO, etc.) regardless of whether they are using multimedia services, though with capacity for data communications, via Internet. In this context, "high-speed mobile" implies a speed that is equal to, or greater than, 144 kbit/s in at least one direction. -*Code Division Multiple Access* (CDMA) 2000 1x is an IMT-2000 3G mobile network technology, based on CDMA, that delivers packet switched data transmission speeds of up to 144 kbps. -*Wideband CDMA* (W-CDMA) is an IMT-2000 3G mobile network technology, based on CDMA, that presently delivers packet switched data transmission speeds up to 384 kbps and up to 2 Mbps when fully implemented. Known as *Universal Mobile Telecommunications System* (UMTS) in Europe. -*CDMA2000 1xEV-DO* is an IMT-2000 3G mobile network technology, based on CDMA, that delivers packet switched data transmission speeds of up to 2.4 Mbps. -*Enhanced Data rates for GSM Evolution* (EDGE) is an intermediate technology that brings second-generation GSM closer to third-generation capacity for handling data speeds up to 384 kbits/s.
10	271land	Percent coverage of mobile cellular network (land area)	Mobile cellular coverage of the land area in percent. This is calculated by dividing the land area covered by a mobile cellular signal by the total land area.
11	271pop	Percent coverage of mobile cellular network (population)	Mobile cellular coverage of population in percent. Note that this is not the same as the mobile subscription density or penetration. The mobile population coverage measures the percentage of inhabitants that are within range of a mobile cellular signal whether or not they are subscribers. This is calculated by dividing the number of inhabitants within range of a mobile cellular signal by the total population.
Text/data network			
12	311	Telex subscriber lines	A telex subscriber line is a line connecting the subscriber's terminal equipment to the public telex network and which has a dedicated port in the telex exchange equipment.

	ITU code[40]	Indicator	Definition
13	412	Private leased circuits	Refer to a two-way link for the exclusive use of a subscriber regardless of the way it is used by the subscriber (e.g., switched subscriber or non-switched, or voice or data). Private circuits (also referred to as leased lines) can be either national or international in scope. In reporting this indicator, only the number of lines should be included, not the number of network termination points.
14	413	Total subscribers to public data networks	The number of subscribers to public data networks such as packet-switched networks, circuit-switched networks and dial-up data networks. Countries should specify in a note which networks they are including.
15	4213	Internet subscribers	The number of Internet subscribers including dial-up, leased lines and broadband. A distinction should be made between paying and free subscribers in countries where there are no Internet access subscription charges. It would also be useful to list only active subscribers.
15.1	4213d	Dial-up Internet subscribers	Number of Dial-up Internet subscribers. Dial-up is a connection to the Internet via a modem and telephone line, which requires that the modem dial a phone number when Internet access is needed. Dial-up modem speeds are generally limited to speeds of 28 kbit/s to 56 kbit/s.
15.2	4213tb	Broadband Internet subscribers	Broadband Internet subscriber refers to someone who pays for high-speed access to the public Internet (a TCP/IP connection). High-speed access is defined as being equal to, or greater than 256 kbit/s, as the sum of the capacity in both directions. The statistic is measured irrespective of the type of access, or the type of device used to access the Internet, or the method of payment.
15.2.1	4213cab	Cable modem Internet subscribers	Internet subscribers using modems attached to cable television networks. Speed should be equal to, or greater than 256 kbits, as the sum of the capacity in both directions.
15.2.2	4213dsl	DSL Internet subscribers	Internet subscribers using Digital Subscriber Line (DSL) technology. DSL is a technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines. Speed should be equal to, or greater than 256 kbit/s, as the sum of the capacity in both directions.

	ITU code[40]	Indicator	Definition
15.2.3	4213ob	Other broadband Internet subscribers	Internet subscribers using high-speed technology other than DSL and cable modem. This includes technologies such as Satellite broadband Internet, Fibre-to-the-home Internet access, Ethernet LANs etc. Speed should be equal to, or greater than 256 kbit/s, as the sum of the capacity in both directions.
16	4212	Estimated Internet users	The estimated number of Internet users. A growing number of countries are measuring this through regular surveys. Surveys usually indicate a percentage of the population for a certain age group (e.g., 15-74 years old). The total number of Internet users in this age group should be supplied and not the percentage of Internet users in this age group multiplied by the entire population. In situations where surveys are not available, an estimate can be derived based on the number of subscribers. The methodology used should be supplied, including reference to the frequency of use (e.g., in the last month).
16.1	4212f	Percent female Internet users	Share of females in the total number of Internet users. This is calculated by dividing the number of female Internet users by the total number of Internet users and multiplied by 100.
16.2	4212f%f	Female Internet users as percent of female population	Share of female Internet users in the total number of females. This is calculated by dividing the number of female Internet users by the total number of females and multiplied by 100.
17	424	PWLAN locations	The number of *Public Wireless Local Area Network* (PWLAN) locations (i.e., *hotspots*). PWLANs are based on the IEEE 802.1b standard, commonly referred to as WiFi.
18	28	ISDN subscribers	The number of subscribers to the Integrated Services Digital Network (ISDN). This can be separated by basic rate interface service (i.e., 2B+D, ITU-T Rec. I.420) and primary rate.
18.1	281	Basic rate ISDN subscribers	The number of subscribers to the basic rate interface service.
18.2	282	Primary rate ISDN subscribers	The number of subscribers to the primary rate interface service.

	ITU code[40]	Indicator	Definition
18.3	28c	ISDN voice channel equivalents	B-channel equivalents converts the number of ISDN subscriber lines into their equivalent voice channels, and is the sum of basic and primary rate equivalents. The number of basic rate subscribers is multiplied by two and the number of primary rate subscribers is multiplied by 23 or 30 depending on the standard implemented.
19	4214	International Internet bandwidth	Total capacity of international Internet bandwidth in Mega Bits Per Second (Mbps). If capacity is asymmetric (i.e., more incoming that outgoing), provide incoming capacity.
19.1	4214og	Outgoing	Total outgoing capacity of international Internet bandwidth in Mega Bits Per Second.
19.2	4214ic	Incoming	Total incoming capacity of international Internet bandwidth in Mega Bits Per Second.
Quality of service			
20	123	Waiting list for main lines	Un-met applications for connection to the Public Switched Telephone Network (PSTN) that have had to be held over owing to a lack of technical facilities (equipment, lines, etc.). It should be specified what is the normal period for responding to requests for a new line (for instance, no more than two weeks from the date of the request). If necessary, use the data of the largest operator measured by number of main lines.
21	143	Faults per 100 main lines per year	The total number of reported faults to main telephone lines for the year. Countries should specify whether faults due to faulty terminal equipment on the customer's premises are included in the indicator or not. Faults, which are not the direct responsibility of the public telecommunications operator, should probably be excluded. This is calculated by dividing the total number of reported telephone faults *for the year* by the total number of main lines in operation and multiplied by 100. If necessary, use the data of the largest operator measured by number of main lines.
22	141	Percent of telephone faults cleared by next working day	Percentage of PSTN faults reported that have been corrected by the end of the next working day. (i.e., not including non-working days (e.g., weekends, holidays)). If necessary, use the data of the largest operator measured by number of main lines.

	ITU code[40]	Indicator	Definition
Traffic			
23	1311m	Local telephone traffic (minutes)	Local telephone traffic consists of effective (completed) fixed telephone line traffic exchanged within the local charging area in which the calling station is situated. This is the area within which one subscriber can call another on payment of the local charge (if applicable). This indicator should be reported in the number of minutes. If the indicator is reported in calls or meter units (pulses), then an appropriate conversion figure to minutes of traffic should be supplied.
23.1	1313wm	Fixed to mobile traffic (minutes)	Total incoming minutes to mobile cellular subscribers from a fixed network.
23.2	1311im	Internet Dial-up traffic (minutes)	The total volume in minutes of dial-up sessions over the public switched telephone network to access the Internet.
24	1312m	National trunk telephone traffic (minutes)	National trunk (toll) traffic consists of effective (completed) fixed national telephone traffic exchanged with a station outside the local charging area of the calling station. The indicator should be reported as the number of minutes of traffic.
25	132mb	International incoming and outgoing telephone traffic (minutes)	Sum of international incoming and outgoing traffic (i132m+i132mi).
25.1	132m	International outgoing telephone traffic (minutes)	This covers the effective (completed) traffic originating in a given country to destinations outside that country. The indicator should be reported in number of minutes of traffic.
25.2	132mi	International incoming telephone traffic (minutes)	Effective (completed) traffic originating outside the country with a destination inside the country. The indicator should be reported in number of minutes of traffic.
26		Public data traffic (non-Internet)	Traffic from public data services such as X.25 and frame-relay (but excluding Internet) measured in megabytes per second (Mbytes).
27	133wm	Outgoing mobile minutes	Total number of minutes made by mobile subscribers (including minutes to fixed and minutes to other mobile subscribers).
27.1.1	1331wm	Outgoing/originating mobile minutes to same mobile network	Number of minutes made by mobile subscribers to the same mobile network.

	ITU code[40]	Indicator	Definition
27.1.2	1332wm	Outgoing/originating mobile minutes to other mobile networks	Number of minutes made by mobile subscribers to other mobile networks.
27.1.3	1333wm	Outgoing/originating mobile minutes to international	Number of mobile minutes originating in a given country to destinations outside that country.
27.1.4	1334wm	Roaming minutes out (own subscribers)	Number of minutes made by own mobile subscribers to make and receive calls when outside the service area of his home network, e.g., when traveling abroad.
27.1.5	1332wmf	Outgoing mobile minutes to fixed networks	Number of outgoing minutes made by mobile subscribers to fixed networks.
27.2.1	1335wm	Incoming international minutes to mobile network	Number of incoming minutes (fixed and mobile) received by mobile networks from another country.
27.2.2	1336wm	Roaming minutes in (foreign subscribers)	The number of minutes made by foreign subscribers to make and receive calls when outside the service area of their home network.
27.3	133sms	SMS sent	Total number of mobile Short Message Service (SMS) sent.
27.4	133mms	MMS sent	Total number of mobile Multimedia Messaging Service (MMS) sent.
28		International outgoing telegrams	The number of charged outgoing full rate telegrams originating in a given country with a destination outside the country. Should be measured as the number of telegrams rather than the number of words.

Tariffs Because most countries now have some form of competition in at least one market segment, there may not be a standard tariff. In addition, tariffs within services may not be uniform (e.g., telephone subscription charges may vary across the nation). The following guidelines may be useful. It is preferable to use the tariffs of the operator with the largest market share (measured by subscribers or minutes). It is preferable to use the tariffs that the majority of consumers pay (e.g., if most of the customers are in urban areas, use urban tariffs). It is preferable to include taxes and provide a note specifying whether taxes are included and what the rate is. It is preferable to use the same operator each year to enhance chronological comparability. It is preferable to report tariffs in national currency. If this is not the case, it should be specified in a note.			
31.1			**Fixed local telephone service tariffs –residential**
31.1.1	151	Installation fee for residential telephone service	Installation (or connection) refers to the one-off charge involved in applying for residential basic telephone service. Where there are different charges for different exchange areas, the charge for the largest urban area should be used and specified in a note.
31.1.2	152	Monthly subscription for residential telephone service	Monthly subscription refers to the recurring fixed charge for subscribing to the PSTN. The charge should cover the rental of the line but not the rental of the terminal (e.g., telephone set) where the terminal equipment market is liberalized. Separate charges should be stated where appropriate, for residential and business subscribers or for first and subsequent lines. If the rental charge includes any allowance for free or reduced rate call units, this should be indicated. If there are different charges for different exchange areas, the largest urban area should be used and specified in a note.
31.1.3	153	Price of a 3-minute fixed telephone local call (peak rate)	Local call refers to the cost of a peak rate 3-minute call within the same exchange area using the subscriber's own terminal (i.e., not from a public telephone).
31.1.4	153o	Price of a 3-minute fixed telephone local call (off-peak rate)	Local call refers to the cost of an off-peak rate 3-minute call within the same exchange area using the subscriber's own terminal (i.e., not from a public telephone).
31.2			**Fixed local telephone service tariffs -business**
31.2.1	151b	Installation fee for business telephone service	Installation (or connection) refers to the one-off charge involved in applying for business basic telephone service. Where there are different charges for different exchange areas, the charge for the largest urban area should be used and specified in a note.

31.2.2	152b	Monthly subscription for business telephone service	Monthly subscription refers to the recurring fixed charge for subscribing to the PSTN. The charge should cover the rental of the line but not the rental of the terminal (e.g., telephone set) where the terminal equipment market is liberalized. Separate charges should be stated where appropriate, for residential and business subscribers or for first and subsequent lines. If the rental charge includes any allowance for free or reduced rate call units, this should be indicated. If there are different charges for different exchange areas, the largest urban area should be used and specified in a note.
32		National telephone call prices	This is the cost of a 3-minute direct dialed (i.e., without operator intervention) call within the country but outside the local exchange area. The rate should be supplied for peak rate time calls and off-peak (discount) rate calls (if applicable). The cost should be reported in national currency, with a statement on what taxes are applied.
33		International telephone call prices	This is the cost of a 3-minute direct dialed (i.e., without operator intervention) call from a destination within the country to a destination outside the country. The rate should be supplied for peak rate time calls and off-peak (discount) rate calls (if applicable). The cost should be reported in national currency, with a statement on what taxes are applied. If possible, international tariffs to all countries should be provided, but at a minimum, tariffs should be provided for the cost of call to the USA (as the largest source and origin of international traffic).
			Mobile cellular tariffs
34.1.1	151c	Mobile cellular connection charge	The initial, one-time charge for a new subscription. Refundable deposits should not be counted. Although some operators waive the connection charge, this does not include the cost of the Subscriber Identify Module (SIM) card. The price of the SIM card should be included in the connection charge. It is preferable to use the connection charge for pre-paid service to enhance inter-country comparability. A note should indicate whether taxes are included (preferred) or not.

34.1.2	152c	Mobile cellular monthly subscription	The monthly subscription charge for mobile cellular service. Due to the variety of plans available in many countries, it is preferable to use pre-paid tariffs. In that case, the monthly subscription charge would be zero. However in some countries, a monthly air time charge is applied even for pre-paid service. If so, that amount should be used. A note should indicate whether taxes are included (preferred) or not. The note should also specify the amount of free monthly minutes included if applicable.
34.1.3	153c	Mobile cellular - price of 3 minute local call (peak)	The price of a three minute peak rate local call from a mobile cellular telephone. If operators charge different prices depending on who is being called (e.g., same mobile network, fixed network, another mobile network) these should be listed separately. In order to enhance inter-country comparability it is preferable to use pre-paid tariffs. A note should indicate whether taxes are included (preferred) or not.
34.1.4	153co	Mobile cellular - price of 3 minute local call (off-peak)	The price of a three minute off-peak rate local call from a mobile cellular telephone. If operators charge different prices depending on who is being called (e.g., same mobile network, fixed network, another mobile network) these should be listed separately. In order to enhance inter-country comparability it is preferable to use pre-paid tariffs. A note should indicate whether taxes are included (preferred) or not.
34.1.5	153sms	Mobile cellular – price of SMS	Price of sending a national Short Message Service (SMS) message from a mobile handset.
34.2	153m	Mobile termination rate	Many telecommunications companies outside a country now impose substantial fees to complete telephone calls to mobile phones and other wireless devices including pagers, Personal Computers and Personal Digital Assistants. In order to recover these fees, the operator inside the country adds a mobile termination charge to all calls completed to wireless devices in the affected countries. The charge amount varies by country and applies to all calls that are placed to wireless device.
Other data tariffs			
35		Leased line charges	Connection charge and monthly rental charge. Costs should be specified for different speeds (e.g., 2.4, 4.8, 9.6, 19.2, 56/64 kbit/s and 1.5/2.0 Mbit/s) and different distances
36		Data communication charges	Connection, monthly rental charge and call set-up charges for packet-switched data communication.

37	**Internet tariffs**		Connection, monthly rental and usage charges for Internet access service. The tariff chosen for a particular country would be the package that is the cheapest, that is widely available (or, in the case of regional service providers, is available in the capital city) and is available to the general public without restriction (e.g., excluding in-company or limited time offers, and excluding offers that are bundled with some other service). If additional charges are payable for telephone usage for dial-up use, this and the amount should be specified in a note. A note should indicate whether the subscription includes free hours and/or is flat-rate.
37.1	4213c	Internet connection charge	The initial, one-time charge for a new subscription. Refundable deposits should not be counted. A note should indicate whether taxes are included (preferred) or not.
37.2	4213s	Internet monthly subscription	The monthly subscription charge for Internet service. A note should indicate whether taxes are included (preferred) or not. The note should also specify the amount of free monthly hours included if applicable.
37.3	4213p	Internet - price of per minute (peak) connection	Cost of per minute (peak) connection once the free Internet hours included in the subscription is used up. A note should indicate whether taxes are included (preferred) or not.
	4213po	Internet - price of per minute (off-peak) connection	Cost of per minute (off-peak) connection once the free Internet hours included in the subscription is used up. A note should indicate whether taxes are included (preferred) or not.
37.4	4213_t20	Internet access tariff (20 hours per month)	This indicator refers to the lowest price for 20 hours of Internet usage per month. It includes the tariff components of monthly line rental, line usage charge and Internet access charge, plus any tax that may be levied (as this is a service used by both residential and business consumers). The tariff chosen for a particular country would be the package for 20 hours per month that is the cheapest, that is widely available (or, in the case of regional service providers, is available in the capital city) and is available to the general public without restriction (e.g., excluding in-company or limited time offers, and excluding offers that are bundled with some other service).

STAFF			
38	51	Total full-time telecommunication staff	Full-time staff employed by telecommunication network operators in the country for the provision of public telecommunication services, including mobile services. Part-time staff should be expressed in terms of full-time staff equivalents. As far as possible, staff not working principally for the provision of telecommunications services (e.g., those working in postal services or broadcast operations) should be excluded.
38.1	51f	Female telecommunication staff	The number of full time telecommunication staff that are female.
38.2	51w	Mobile communications staff	Total number of staff employed by mobile cellular network operator. This refers to mobile operators building infrastructure and not staff employed by resellers.
REVENUE			
39	75	Total revenue from all telecommunication services	This is the total telecommunication revenue earned. This should exclude revenues from non-telecommunications services. Revenue (turnover) consists of telecommunication service earnings during the financial year under review. Revenue should not include monies received in respect of revenue earned during previous financial years, neither does it include monies received by way of loans from governments, or external investors, nor monies received from repayable subscribers' contributions or deposits.
40	71	Revenue from telephone service	Revenue received from fixed telephone connection, subscription and calls.
40.1	711	Income from telephone connection charges	Revenue received for connection (installation) of telephone service. This may include charges for transfer or cessation of service.
40.2	712	Income from telephone subscription charges	Revenues from recurring charges for subscription to the PSTN including equipment rentals where relevant.
40.3	7131	Income from local calls	Revenue from local calls.
40.4	7132	Income from national long distance calls	Revenue from national long distance calls.

40.5	7133	Income from international calls	This should include charges received from subscribers for placing outgoing calls, after deduction of the share of this income to be paid to other organizations for outgoing telecommunication traffic (operators of the incoming and possibility transit countries) and after inclusion of income received from foreign telephone operators for completing calls originating in a foreign country. Payments from and to foreign telecommunication operators should be listed separately.
41	731	Revenue from data transmission	Revenues from data services such as data communications (e.g., packet switching) and Internet access but not telegram or telex.
42	732	Revenue from leased circuits	Revenue from the provision of leased lines (circuits).
43	741	Revenue from mobile communications	Revenues from the provision of all types of mobile communications services such cellular, private trunked radio and radio paging.
43.1	741d	Mobile data revenues	Revenues from mobile data services such as text messaging, high-speed network access, WAP use, etc.
43.1.1	741m	Text and multimedia messaging revenues	Revenues from text messaging (e.g., SMS) and from non-text messaging based mobile data services such as high-speed access charges and WAP use.
44	74	Other revenues	Any other revenues not accounted for elsewhere for the provision of public telecommunication services. Responders should indicate in a note what are the main sources of "other" telecommunications revenues.
45		Value-added from telecommunications sector	Represents the revenue generated by telecommunication service sector out of which is paid wages and salaries, the cost of capital investment and financial charges, before arriving at a figure for profit.

INVESTMENT			
46	81	Total annual investment in telecom	The annual investment in telecom (including mobile service) for acquiring property and plant. The term investment means the expenditure associated with acquiring the ownership of property (including intellectual and non-tangible property such as computer software) and plant. These include expenditure on initial installations and on additions to existing installations where the usage is expected to be over an extended period of time. Note that this applies to telecom services which are available to the public, and excludes investment in telecom software or equipment for private use. Also referred to as *capital expenditure*.
46.1	83	Fixed telephone service investment	Annual investment on equipment for fixed telephone service.
46.2	841m	Mobile communication investment	Annual capital investment on equipment for mobile communication networks.
46.3	841f	Foreign investment	Annual investment in telecom coming from foreign sources.
COMMUNITY ACCESS INDICATORS			
47	PIAC1	Percentage of localities with PIACs	A public Internet access centre (PIAC) is a site, location, centre of instruction at which Internet access is made available to the public, on a full-time or part-time basis. This may 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. Localities refer to a country's villages, towns and cities. The percentage of localities with public Internet access centres (PIACs) is computed by dividing the number of localities with at least one PIAC by the total number of the country's localities and multiplying by 100. The indicator should be broken down by range of inhabitants.
48	PIAC2	Percentage of the population with access to a PIAC	Measures the number of inhabitants enjoying PIAC coverage as a proportion of the country's total population. When a locality (village, town, city) has at least one PIAC then the entire population living in this locality is considered to be served by that PIAC..

49	PIAC3	Number of localities with PIAC	Refers to all localities (a nation's villages, towns, and cities) that have at least one Public Internet Access Centre (PIAC). A 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.
50	PIAC4	Target population for DCC services	Refers to the potential population (the potential population refers to anyone of age 6 years or more) minus the number of non-community Internet users (non-community Internet users are those citizens that have Internet access from a point different from a PIAC, for example at home).
51	PIAC5	Total number of PIACs	Refers to the total number of Public Internet Access Centres (PIAC). A 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. This may 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.
51.1	PIAC6	Total number of DCCs	Refers to the total number of a nation's Digital Community Centres (DCC). A DCC is a place where the public can access Internet services from terminal facilities placed at their disposal. A DCC is an undertaking based on a government framework for universal access. It should offer equitable, universal and affordable access. There are some minimum requirements for a Public Internet Access Centre (PIAC) to be considered a DCC Every DCC should have at least one computer and one printer and a minimum connection speed of 64 kbit/s per centre to the Internet Service Provider (ISP). DCC users should also be provided with support and maintenance and it should be opened a minimum of 20 hours per week.
51.2	PIAC7	Total number of other PIACs	Refers to the total number of other Public Internet Access Centres (not PIACs and not DCCs). Other PIACs include cybercafés. Education Centres may be classified as a DCC or a PIAC, depending on the conditions they satify (see indicator 51 and 51.1)
52	PIAC8	Total number of computers in DCCs	Refers to the total number of computers available in all Digital Community Centres. A DCC is a place where the public can access Internet services from terminal facilities placed at their disposal. See Indicator 51.1 for the definition of a DCC.

53	PIAC9	Actual DCC usage percentage	To calculate the actual DCC usage percentage, countries should divide the actual number of DCC users by the DCC target population (see indicator 50 for definition) for DCC services and multiply by 100. A user is defined as a person who accesses the Internet at least once a month.
OTHER INDICATORS			
54	955	Number of radio sets	The total number of radio sets. A radio set is a device capable of receiving broadcast radio signals, using popular frequencies, such as FM, AM, LW and SW. A radio set may be a standalone device, or it may be integrated into another device, such as a Walkman, a car, or an alarm clock.
55	965	Number of TV sets	The total number of television sets. A television set is a device capable of receiving broadcast television signals, using popular access means such as over-the-air, cable and satellite. A television set may be a standalone device, or it may be integrated into another device, such as a computer or a mobile phone. It may be useful to distinguish between digital and analogue signal delivery and between TV sets receiving only a limited number of signals (usually over-the-air) and those that have multiple channels available (e.g., by satellite or cable).
56	965m	Total number of multi-channel TV	965m=965c+965s. This is the total number of multi-channel TV subscribers (both terrestrial and satellite).
56.1	965c	Number of terrestrial multi-channel TV subscribers	Number of terrestrial multi-channel TV such as cable TV, digital terrestrial TV, Microwave Multi-point Distribution systems (MMDS) and Satellite Master Antenna Television (SMATV) subscribers.
56.2	965s	Direct to Home satellite antennas	The number of home satellite antennas that can receive television broadcasting directly form satellites.
57	965cp	Homes passed by multi-channel TV	Number of households that have a multi-channel (both terrestrial and satellite) television connection whether they are subscribing or not.
58	422	Number of Personal Computers	The number of Personal Computers (PC) measures the number of computers installed in a country. The statistic includes PCs, laptops, notebooks etc, but excludes terminals connected to mainframe and mini-computers that are primarily intended for shared use, and devices such as smart-phones that have only some, but not all, of the functions of a PC (e.g., they may lack a full-sized keyboard, a large screen, an Internet connection, drives etc).