Telecom Regulatory and Policy Environment in Indonesia
Results and Analysis of the 2008 TRE Survey

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***Abstract:**

With its economy has largely recovered from the Asian financial crisis of the 1990s, Indonesia's telecom markets are growing, but at a slower rate compared to most of its South East Asian neighbors.

Given the size of its population, Indonesia has a significantly low broadband user base than countries in the region. According to ITU statistics Indonesia has more than 13 million Internet users, but the vast majority use narrowband. The growth of broadband has been hindered by the lack of adequate infrastructure.

Following a similar exercise in 2006, the 2008 Telecom Regulatory Environment (TRE) survey asked informed direct and indirect stakeholders in the Indonesian telecom sector to assess the regulatory and policy environment along seven dimensions (market entry, access to scarce resources, tariff regulation, universal service obligations, regulation of anticompetitive practices and quality of service), on a Likert scale of 1 to 5 (1 being highly unsatisfactory, 5 being highly satisfactory, with 3 being considered average). The respondents are selected from 3 categories: those directly impacted by the sector's performance (operators, equipment vendors), those who broadly follow the sector (consultants, lawyers), those who represent the public interest in the telecom sector (consumer groups, other government officials, journalists, etc). The study analyses the results in the light of recent regulatory incidents.

***Keywords:** TRE Survey, Indonesia

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List of Abbreviations

ACEs:	PT ACEs – Indonesian Telco operator (satellite)
ABWINDO:	Asosiasi Wireless Broadband Indonesia (Indonesia Wireless Broadband Association)
Antara:	Kantor Berita Antara (Indonesian National News Office)
APJII:	Asosiasi Penyelenggara Jasa Internet Indonesia (Indonesian Association of Internet Providers)
ASEAN:	South East Asian Countries' Organization
Axis:	PT Natrindo Telepon Seluler – Indonesian telco operator (cellular)
BKPM:	Badan Koordinasi Penanaman Modal (Indonesia Investment Coordinating Board)
BOT:	Build-Operate-Transfer
BPS:	Biro Pusat Statistik (National Statistic Agency)
BRTI:	Badan Regulasi Telekomunikasi Indonesia (Indonesian Telecommunications Regulatory Body)
BTel:	PT Bakrie Telekomunikasi – Indonesian telco operator (fixed)
BTIP:	Balai Telekomunikasi dan Informatika Perdesaan (Authority for Rural Telecommunication and Information Technology)
BTS:	Base Transmitter Station
BWA:	Broadband Wireless Access
DGPT:	Directorate General of Post and Telecommunication (Direktorat Jenderal Pos dan Telekomunikasi)
FTP:	Fundamental Technical Plan (Rencana Teknis Fundamental)
GDP:	Gross Domestic Product
ICT:	Information Communication Technology
ID-SIRTII:	Indonesia Security Incident Response Team for Information Infrastructure
IMF:	International Monetary Fund
Indosat:	PT Indosat Tbk – Indonesian telco operator (fixed and cellular)
ITU:	International Telecommunications Union
KPPU:	Komisi Pengawas Persaingan Usaha (Committee for Anti-Monopoly and Unfair Business Practice)
KRTI:	Komite Regulasi Telekomunikasi Indonesia (Commissioner of Indonesian Telecommunication Authority)
KSO:	Kerja Sama Operasi (Joint Operation)

MASTEL:	Masyarakat Telematika Indonesia (The Indonesian Infocom Society)
Mobile-8:	PT Mobile-8 – Indonesian telco operator (cellular)
NTT:	Provinsi Nusa Tenggara Timur (Eastern Tenggara Islands Province)
QoS:	Quality of Service
Palapa:	Satelit Palapa (name of several Indonesian Satellites)
Palapa Ring Consortium:	Indonesian cyber optic network in Eastern Indonesian done by a consortium of telco operators
PBH:	Pola Bagi Hasil (Joint Venture)
Papua:	Propinsi Papua (Papua Province)
PSN:	PT Pacific Nusantara – Indonesian telco operator (satellite)
PT:	Perseroan Terbatas (Private Limited)
Sampoerna:	PT Sampoerna Telekom – Indonesian telco operator (cellular)
Satelindo:	PT Satelindo (a former and later absorbed subsidiary company of Indosat)
SMART:	PT SMART Telkom – Indonesian telco operator (cellular and fixed)
ST Telemedia:	Singapore Technologies Telemedia
STT:	Singapore Technologies Telemedia
Telkom:	PT Telkom Indonesia – Indonesian telco operator (fixed)
Telkomsel:	PT Telkomsel Indonesia – Indonesian telco operator (cellular)
USO:	Universal Service Obligation
VAT:	Value Added Tax
Warnet:	Warung Internet (Internet Café)
XL:	PT Excelcomindo Pratama – Indonesian telco operator (cellular)

1.0 Executive Summary

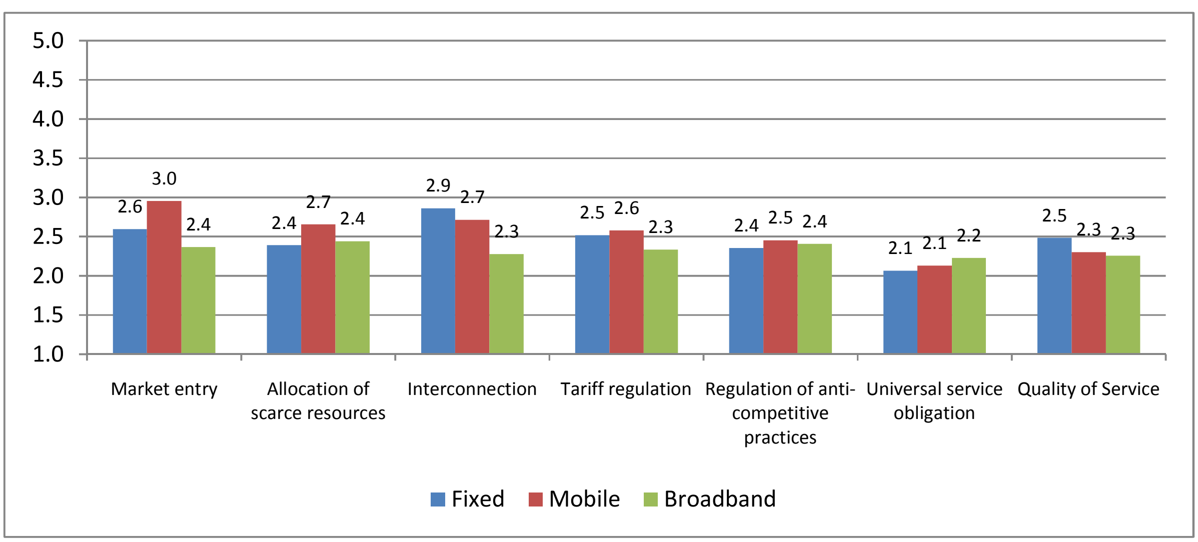
With its economy has largely recovered from the Asian financial crisis of the 1990s, Indonesia's telecom markets are growing, but at a slower rate compared to most of its South East Asian neighbors.

The growth is best seen in the mobile sector, with a 5 year compound annual growth rated (CAGR) of 34 percent. Competition exists. Nine national level operators had issued 82 million SIMs by 2007 end (35 SIMs per every 100 people). The fixed sector lags behind in growth (12 percent CAGR for the last five years) as well as in competition. Five vendors offer fixed wireless service while the wire-line market remains a virtual monopoly of the incumbent. Number of fixed connections in 2007 was only 15 million, and penetration was 6.5 phones per 100 people. Wire-line has not grown since 2004; fixed wireless is growing at a rate lower than that of mobile growth.

Given the size of its population, Indonesia has a significantly low broadband user base than countries in the region. According to ITU statistics Indonesia has more than 13 million Internet users, but the vast majority use narrowband. The growth of broadband has been hindered by the lack of adequate infrastructure.

Following a similar exercise in 2006, the 2008 Telecom Regulatory Environment (TRE) survey asked informed direct and indirect stakeholders in the Indonesian telecom sector to assess the regulatory and policy environment along seven dimensions (market entry, access to scarce resources, tariff regulation, universal service obligations, regulation of anti-competitive practices and quality of service), on a Likert scale of 1 to 5 (1 being highly unsatisfactory, 5 being highly satisfactory, with 3 being considered average). The respondents are selected from 3 categories: those directly impacted by the sector's performance (operators, equipment vendors), those who broadly follow the sector (consultants, lawyers), those who represent the public interest in the telecom sector (consumer groups, other government officials, journalists, etc). The study analyses the results in the light of recent regulatory incidents. TRE scores by sector and by dimension are shown below:

Figure 1: Sector scores - Summary



Below-average scores received in all sectors and across dimensions reflect general dissatisfaction. Most scores have also declined (albeit slightly) from 2006. However, this does not mean the respondents have ignored recent developments. The relatively healthy growth in mobile sector is reflected in the higher TRE scores received by the sector for most dimensions, when compared to the fixed sector. On average, the mobile sector scores best, with fixed and broadband following.

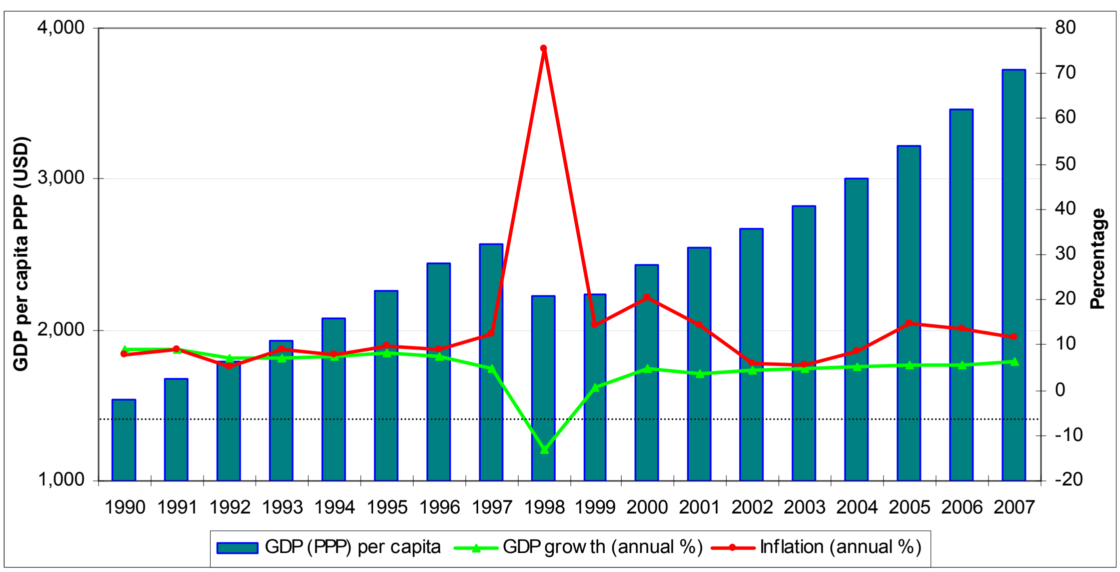
The results call for action from the regulatory authorities and the government. Backbone infrastructure especially outside the key cities should take priority. Access to resources must be improved with greater transparency. Interconnection requires review as the separation between fixed and mobile no longer seriously matters. Repeated unsuccessful USO initiatives raise the question of its efficacy as a means of bridging urban-rural gaps. Finally better communication among agencies involved in telecom regulation will surely help.

2.0 Introduction

Indonesia, a South East Asian archipelago of nearly 17,500 islands, has the fourth largest population in the world. However, the Indonesian telecom market, even with recent advancements, does not adequately serve its vast population.

Indonesia was considered an Asian tiger of the second wave till its economy was badly hit by the Asian crisis in late 1990s. Weaknesses in the legal structure hidden by high economic growth from the mid 1980s to the mid 1990s were fully exposed during hard times. After unsuccessful moves to float the Rupiah, Indonesia finally sought the assistance of the International Monetary Fund (IMF) to ensure macroeconomic stabilization. The economy has been gradually recovering since then. (Figure 2)

Figure 2: Selected Economic Indicators of Indonesia



Sources: World Bank, World Development Indicators database[1] and IMF World Economic Outlook database[2]

[1] http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers
[2] http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

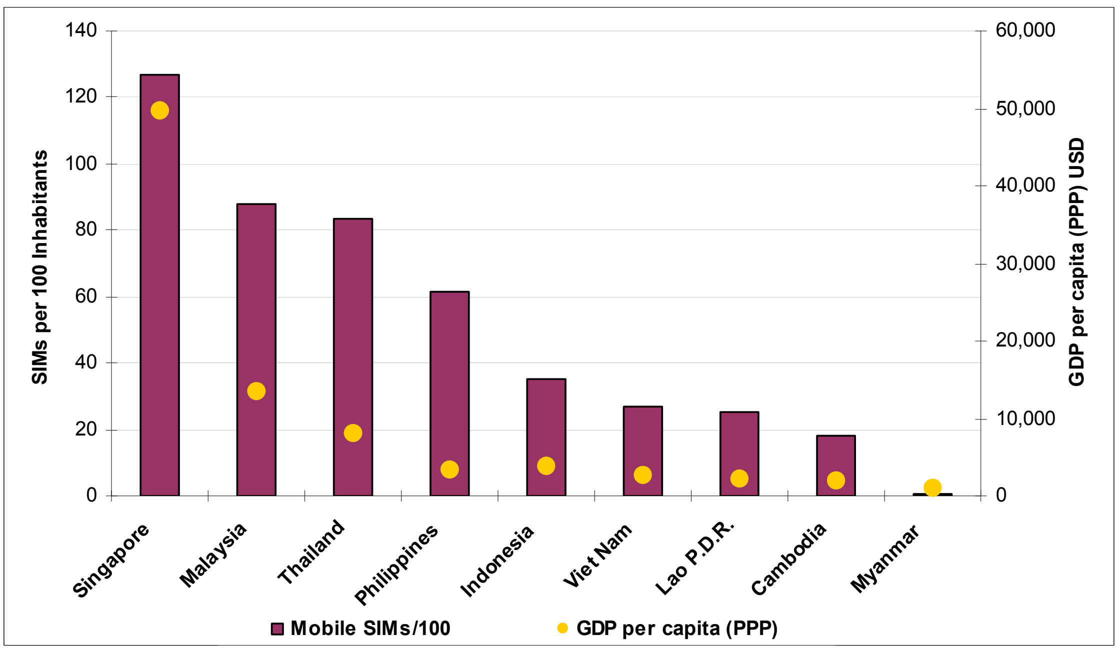
In recent years Indonesia has suffered from a range of problems caused by terrorist activity, regional unrest and natural disasters.

In this context, the growth rates in all sub sectors of the telecom industry are impressive. But when compared with the growth rates of peers they are less impressive.

2.1 Mobile sector

Of the fixed, mobile and broadband subsectors, mobile demonstrates the healthiest growth, with five-year CAGR of 34 percent. However, this pales when compared with South East Asian neighbors. (Figure 3)

Figure 3: SEA Mobile penetration, 2007,



Source: ITU, 2007, Asian ICT indicators Database and IMF World Economic Outlook database[3]

SIM cards per 100 persons have increased to 35 by 2007 (Figure 3) with a total of 81.8 million SIM cards issued. Voice services still dominate, but non-voice services, particularly SMS based ones, are catching up. 3G services have been introduced recently.

The reason for the expansion of mobile industry was the introduction of competition.

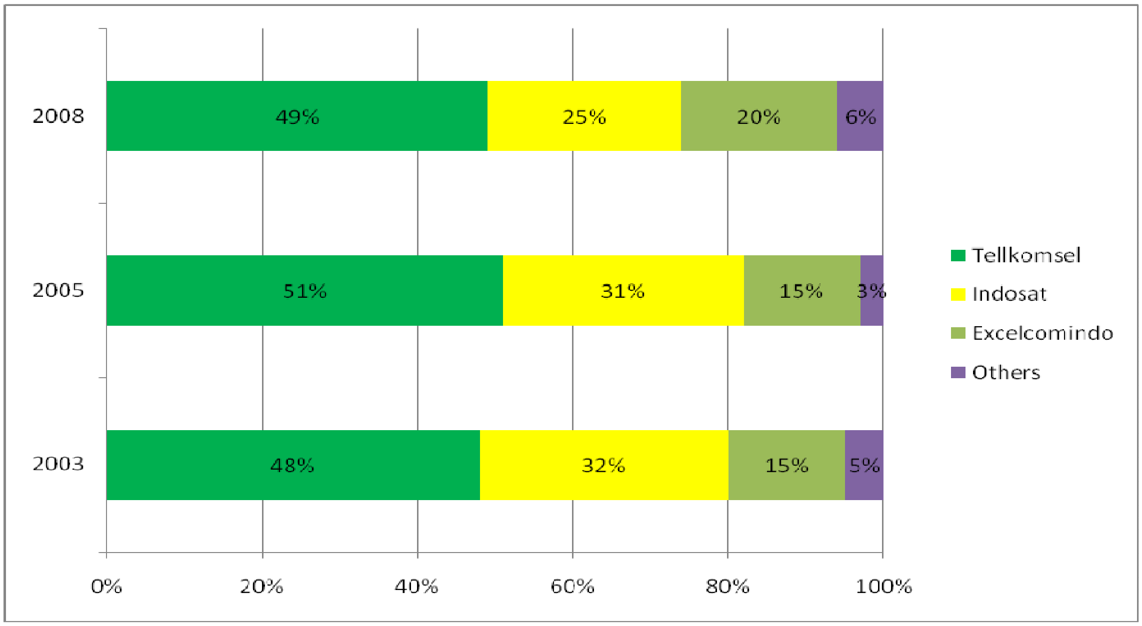
There are three dominant players in the market. Telecomsel, the mobile arm of the fixed incumbent PT Telkom is the largest with 58 million SIMs issued (49 percent) It claims to be the only operator that provides services to all of Indonesia's 440 local regencies. Next is Indosat with 30 million SIMs (25 percent). Excelcomindo comes third with 23 million (17

[3] http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

percent). Together these three account for 110 million mobile SIMs[4] with a combined market share of about 94 percent. Other players account only for 6 percent. (Bisnis Indonesia, 2008)

The market shares have not shown any significant changes since 2003, except for the six percent decrease in Indosat and five percent increase in Excelcomindo. Other players have failed to expand market shares (Figure 4).

Figure 4: Mobile market shares, 2003 to 2008



Source: Zita, 2005, Goswami, 2006b and Bisnis Indonesia, 2008

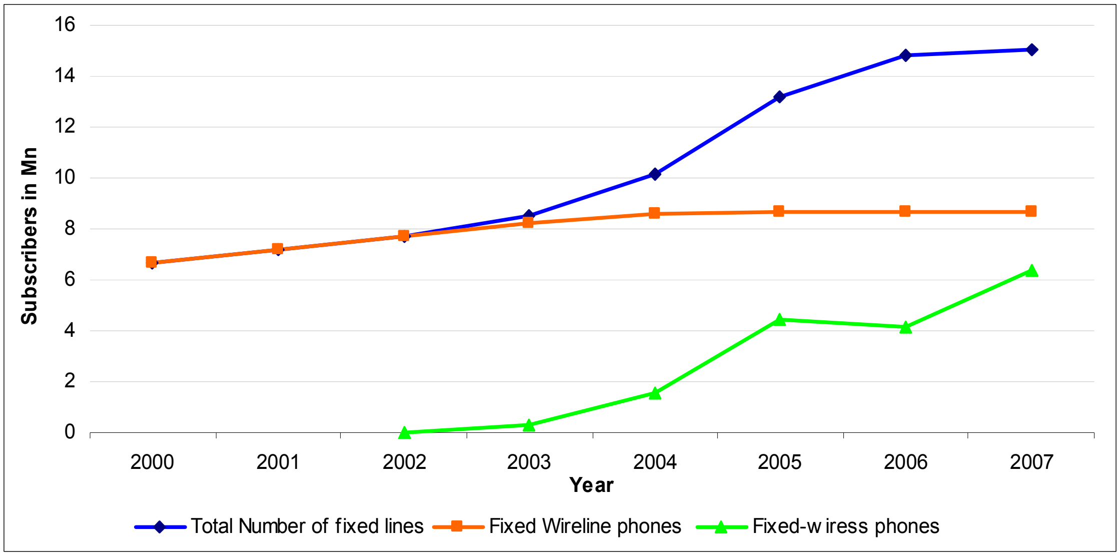
Despite the growth however, mobile services are still largely concentrated around major cities.

2.2 Fixed sector

The size and growth in the fixed sector, as a whole, were significantly lower than in the mobile sector. (Figure 5) Total fixed connections in 2007 were only 15.04 million, and penetration was 6.5 phones per 100 people. The number of wire-line connections has not shown any noticeable change since 2004. Five year CARG for fixed wire line is 11% while for fixed wireless it is 82%.

[4] This is the mid 2008 figure which is a significant improvement from the ITU figure of 81 million. Not officially confirmed by the regulator.

Figure 5: Growth of fixed access paths from 2000-2007



Source: ITU 2007, Asian ICT indicators database

2.3 Broadband

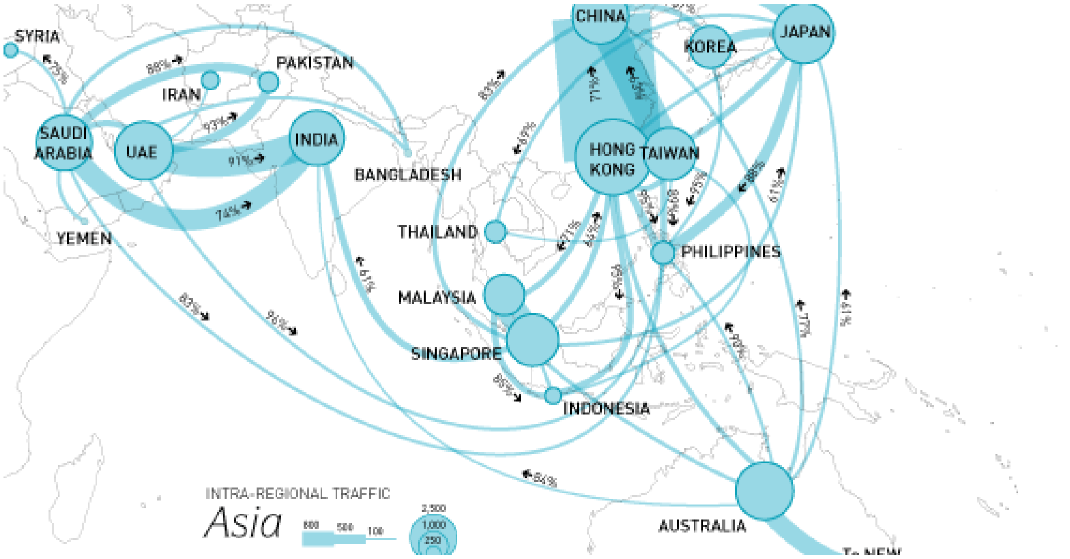
Prices have significantly come down since 2005 (when a 2MBps 2km dedicated line cost was 48 times that what it cost in India), they still remain high. For example, according to 2008 data made available to authors by BTRI the price for a leased line of 2km remains about USD 250 per month in Java, while in India it is less than four times that.

Frequencies for Broadband Wireless Access (BWA) are yet to be assigned, resulting in a delay in provision of WiMax services. Fearing interference to its satellite communications, PT Telekom opposes awarding the 3.5 GHz band for BWA. Meanwhile Indonesia The Wireless Broadband Association (ABWINDO) and prospective WiMax operators demand the 3.5 GHz Band, because the alternative 5.8 GHz (used in the USA) is more expensive. WiMax has a reach of up to 50 km and expected to substitute for ADSL.

Allocation of the 3.5 GHz band both for satellite and WiMax communications is being considered. If not, 3.5 GHz band will be reserved for satellite communications, while another will be given for BWA. In this event, BWA operators expect the government to cover part of their investments in infrastructure building. (Donny & Mudiardjo, 2007)

Dearth of International bandwidth is a serious problem for Indonesia. Traffic maps of telegeography.com proportionately depict the amount of traffic by the thickness of the links. (Figure 6)

Figure 6: Comparative Internet traffic from selected Asia-Pacific countries



Source: www.telegeography.com

2.4 Internet

Internet development in Indonesia, as in many other Asian countries, was initiated by the academic and research community in the early 1990s. Initial access was limited to a small circle of scholars and 'techies' based at universities connected to UniNet, the first Indonesian inter-university network. The Internet became 'public' only after the launch of Indonesia's first commercial Internet service provider (ISP), IndoNet in 1995, and the subsequent spread of public Internet access points, commonly known as warnet. (Iqbal & Purbo, 2008)

Figure 7: Indonesia Internet developments 1995-2007 (Estimated)

Error! Not a valid link. *Source: Iqbal & Purbo, 2008*

Table 1: Indonesia Internet developments 1995-2007

	1990	1995	2000	2005	2007
1. Internet Subscribers	0	31,000 (1996)	384,000	1,500,000	2,543,600[5]
2. ISPs	0	2	74[6]	132[7]	176[8]
3. Internet hosts	0	2,351	26,727	112,630	
4. Internet users		50,000	1900,000	10,000,000	13,000,000[9]
5. Internet users per 100 inhabitants	0	0.01	0.19	0.69	5.61[10]
6. PC penetration		0.50	1.05	3.68	2.0[11]

[5] ITU, 2007 http://www.itu.int/ITU-D/icteye/Indicators/Indicators.aspx
[6] Historical data amended according to data from APJII http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng
[7] Historical data amended according to data from APJII http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng
[8] APJII Accessed on http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng
[9] ITU, 2007 http://www.itu.int/ITU-D/icteye/Indicators/Indicators.aspx
[10] ITU, 2007 http://www.itu.int/ITU-D/icteye/DisplayCountry.aspx?countryId=114
[11] Computers per 100 inhab. (2006) http://www.itu.int/ITU-D/icteye/DisplayCountry.aspx?countryId=114

	(2006)

Source: Iqbal & Purbo, 2008

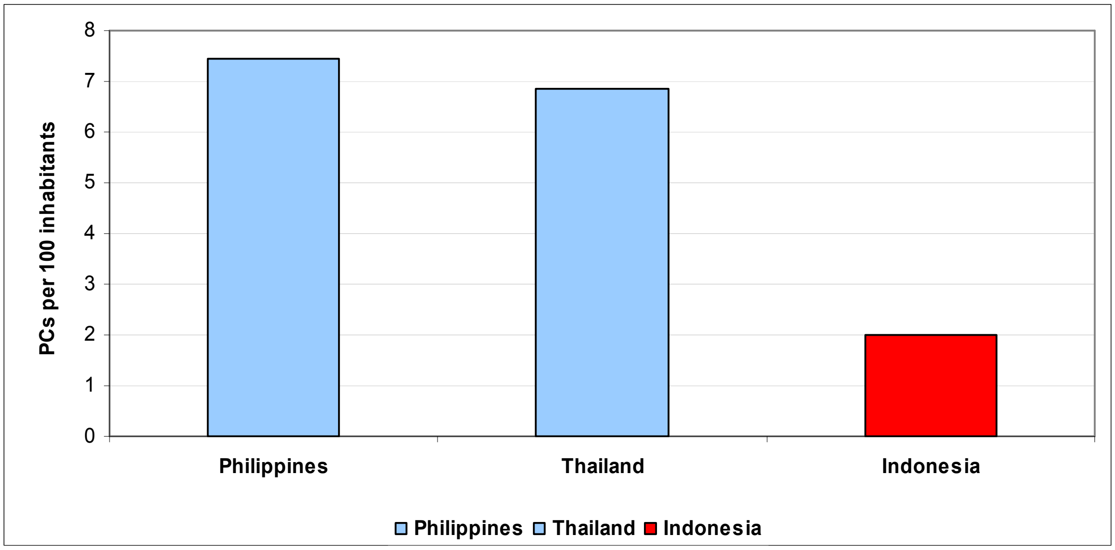
Though not shown in the table above, there are mismatches in the Internet related statistics in Indonesia it is possible that different agencies make their own estimates in the absence of a single reliable source.[12]

Gaps become evident particularly when the ITU data are compared with data from local sources such as APJII and even the regulator. For example, instead of the 13 million estimate by ITU for Internet users in 2007, APJII offers a figure of 25 million. The highest is from BRTI, which puts it at 30 million.

There can be multiple reasons for relatively low Internet penetration. Iqbal and Purbo (2008) attribute it to the lack of adequate infrastructure which was a direct result of restrictive government policy and ineffective regulation by DGPT and BRTI. Fixed infrastructure, on which Internet services depend, is dominated by the state owned incumbent, PT Telkom, who along with PT Indosat, another state owned operator, control international gateways. Telephone and computer penetration have gradually increased over the years, but these figures still remain low in comparison with the Philippines and Thailand – two peers in the region. (Figure 8)

Figure 8: PC use in Indonesia compared with two peers - 2007

[12] Whenever there are different sets of data, the paper will present them all. However we try to indicate what could be the most realistic figure based on the relative credibility of the sources and other related information.



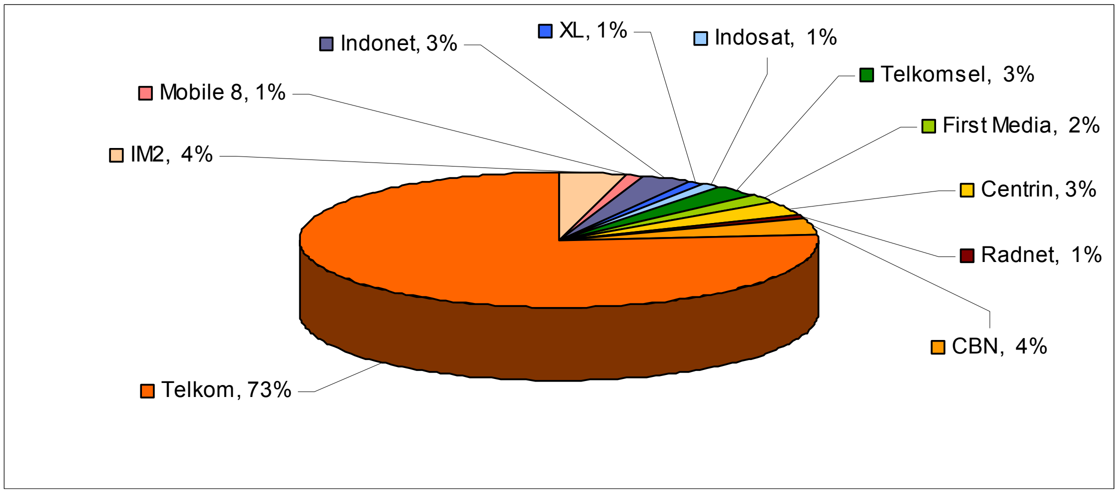
Source: ITU, Database, 2007

Another factor contributing to low use of ICTs is limited knowledge and use of English in Indonesia. The national language of Indonesia, Bahasa Indonesia, is used in education, government, and business; other local languages are still very important in the relevant regions. As such the ability to use the Internet is limited. (Iqbal & Purbo, 2008)

Meanwhile Goswami points out that Indonesia's geographical structure and license conditions, which permit only a handful of large network operators, not all ISPs to build infrastructure, ICT development has been concentrated in the metropolis (in urban centers like Jakarta, Bandung, Bali, and Surabaya) while rural areas lack access to even the most basic telecom infrastructure. (Goswami, 2008)

One of the biggest barriers to Internet development has been the high cost of connectivity to the international backbone. The infrastructure expenses constitute 60 to 80 percent of an ISP's total monthly cost. Heru Nugroho, former Secretary General of Indonesia's ISP Association – APJII, estimated that on an average, ISPs spent about USD 50,000 for international Internet bandwidth per year before the Internet Exchange was established (Bisnis Indonesia, 2004). According to him, bandwidth and networking costs typically represent 25 percent of the total costs of ISPs in other countries. (Goswami, 2008). At present, Telkom accounts for nearly 75 percent of the ISP market share (Susatyo, 2008).

Figure 9: ISP market share in Indonesia - 2007



Source: Susatyo, 2008

Purbo (2004) attributes most of the limited Internet developments to the civil society and private sector rather than the government. Around 2004 he noted that 60-70 of Indonesian users accessing the net using cyber cafes (warnets) instead of individual connections. This percentage might have probably dropped by now; but the role of the warnets cannot be ignored.

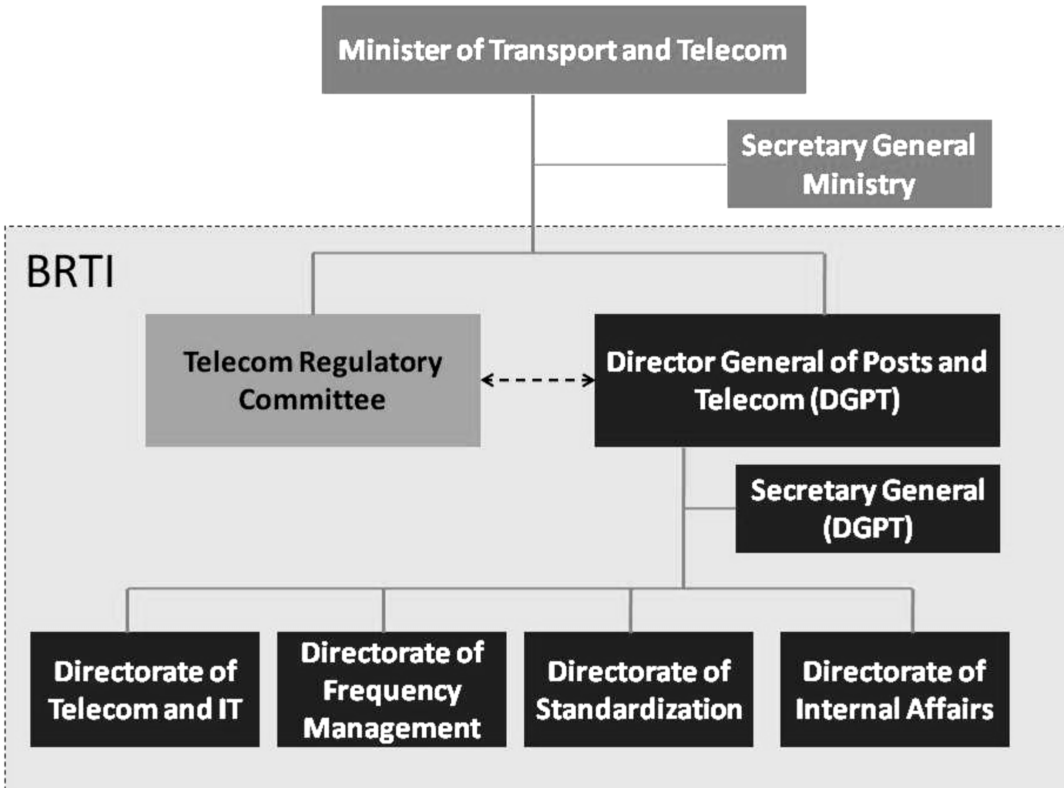
Establishment of national Internet exchanges in Jakarta has partially addressed the problem of local Internet traffic. They provide passage for local traffic among ISPs without any charge. This resolves the problem of local Internet traffic unnecessarily burdening the international links. Similar Internet Exchanges were planned for cities like Surabaya, Bandung and Yogyakarta. (Purbo, 2005) However, the issue is still not fully resolved as many ISPs find it difficult to purchase leased lines to connect to the Internet Exchange due to their high price or unavailability.

3.0 Indonesia Regulatory Environment

Although the Telecommunication Law of 1999 provided the government the option to create an independent regulatory agency that was not exercised until 2003. A ministerial decree established the Indonesian Telecommunications Regulatory Body or Badan Regulasi Telekomunikasi Indonesia (BRTI) to be effective starting January 2004. The stated objective was to ensure transparency, independency, and fairness in telecommunication network and service operations. However, since its inception, BRTI was seen as a ‘transitional’ body that would become fully independent only at some undetermined time (Malik & Goswami, 2006).

Unlike in many countries where the setting up of a National Regulatory Authority (NRA) preceded the opening up of the market, in Indonesia, there was a reversal of sequence - the NRA came into being nearly 10 years after GSM licenses were issued.

Figure 10: Organisational structure of the key telecom policy and regulatory bodies in Indonesia



Source: Adiwiyoto, 2004

As Figure 10 shows, the 'broader' BRTI comprises of both the office of Director General of Posts and Telecom and the Telecom Regulatory Committee. The default BRTI Chairman is the Director General of Posts and Telecommunication. The other four members have to be professionals with Telecommunication & Information Technology, Legal, Economics, and Social Science backgrounds who are selected by an 'independent' team for three years, which can be extended for another term if necessary.

Regulatory committee members are expected to take decisions based on consensus, but if they cannot reach one, there will be a vote with everyone enjoying same voting rights. Theoretically the decisions should be taken after considering the alternative opinions and members should act sans any external pressure. Once arrived, the decisions are announced as a form of a Director General decree.

The stated role of the regulator is to:

1. Regulate:

- Granting licenses
- Monitoring performance of operations
- Monitoring quality of service

- Deciding interconnection tariff and
- Approving telecommunication tools and equipments

2. Supervise:

- Monitoring performance of operations
- Ensuring Competition
- Monitoring the utilization of telecommunication tools and equipment

3. Control:

- Settling disputes among operators
- Enforcing quality services

However, it is questionable how far BRTI is empowered and equipped to play this role as an independent body. Criticism has come from both insiders and outsiders. Adiwiyoto does a comprehensive analysis by listing out its possible strengths and weaknesses. (Adiwiyoto, 2004).

Strengths:

- BRTI can use professionals from various fields of expertise and sectors (public, private, academics, and practitioners) in the board
- Decisions are expected to be taken 'collegially'
- It is possible to continue the work initiated by DGPT so start from scratch is not needed
- BRTI is claimed to be an independent agency

Weaknesses:

- BRTI does not have a strong legal basis
- BRTI's budget comes from treasury as a part of DGPT allocations which seriously questions its independency
- BRTI Chairman is the Director General of Post and Telecommunication
- DGPT still have to endorse some regulatory decisions

Komisi Pengawas Persaingan Usaha (KPPU) is the competition authority with jurisdiction over many industries including telecommunication. The responsibility of KPPU is to ensure competitive behavior in any industry. It is supposed to take ex-post regulatory action based on competition law, after determining that there has been anti-competitive behavior in the market.

Meanwhile, the DGPT was moved from the Ministry of Tourism, Post and Telecommunication to the Ministry of Transportation in 1998. In 2005 it was moved to the Ministry of Communication and Information (Kominfo). The move was seen as creating a one-stop-for-all converged Ministry.

The most recent reforms started in 2005 under the government of Yudhoyono. However the impact was not as good as expected. Informal interviews with industry players revealed their fear that the government not recognizing the strategic importance of the telecommunications sector.

Three operators were granted licenses to provide 3G services in February 2006, in a competitive bidding process. This is in addition to the two 3G licenses awarded in 2003 to PT Natrindo and Hutchison CP Telecommunications (formerly Cyber Access Communications). Telkomsel and Excelcomindo have already built 3G infrastructure to cover several cities, with investments of USD 300 million and USD 50-100 respectively. PT Indosat plans to spend USD 200-300 million. (Donny & Mudiardjo, 2007)

Indonesian government in July 2007issued a new presidential instruction that limits foreign ownership in new cellular phone companies to a maximum of 65 percent, reduced from the previous 95%. Foreign ownership of new fixed operators was reduced to a maximum of 49%. However, this ruling did not apply to existing players. Thus,it will not affect investments like Maxis' 95% ownership of PT Natrindo. This protectionist move was perceived negatively by some international analysts. (The Brunei Times, 2007)

The USO tender was cancelled in December 2007. Eleven Indonesian telecom companies submitted their bids and two were declared eligible (PT Telkom and PT ACES). At the last minute both were declared ineligible. The tender process was halted indefinitely. PT ACES took legal action against DGPT but was not successful. BRTI claims the USO plan will be implemented before end 2009. (Antara News, 2007, BRTI, 2008)

In April 2008, the Minister of Communication and Information signed new regulations on Telecom towers. Only 100% locally owned companies can own and manage towers. Telecom companies with foreign investment such as PT Telkom, PT Indosat, PT Hutchison Indonesia and PT Excelcomindo Pratama were affected by this ministerial decree as they have built and managed their towers since the beginning of their operations. However, as a compromise, companies publicly listed in Indonesian Stock Exchange were to be considered locally owned.

PT Hutchison Indonesian sold its towers to an Indonesian company the day after the effective date of Ministerial regulation.

4.0 Analysis of TRE scores

The TRE instrument was developed by LIRNEasia and documented in detail in Samarajiva et al 2007. It asks informed stakeholders to rate (on a Likert scale of 1 to 5, 1 being highly unsatisfactory, 5 being highly satisfactory) the Telecom Regulatory and Policy Environment in a country along 7 dimensions. 5 of the 7 dimensions are based on the GATS fourth protocol on telecom services. QoS and Tariff Regulation dimensions have been included, given their importance.

Potential respondents come from 3 different categories:

- Category 1: those directly involved in the sector such as operators, equipment vendors.
- Category 2: those indirectly impacted by the sector or those studying/observing the sector with broader interest such as consultants and lawyers.

- Category 3: those who represent the broader public interest such as media personnel, other government officials, retired regulators, civil society organizations.

Though multiple modes were available including an online survey, the two methods used in Indonesia were e-mail and face-to-face interviews. The numbers of responses received from the categories were 16, 17 and 17 respectively.

The methodology specifies that each category should contribute equally to the final TRE score. Therefore, weights are used to equalize the contributions made per category. Anyway, with the 2008 data the differences were not significant because the sample sizes were almost same across categories.

A similar survey was conducted in Indonesia in 2006 but only with six dimensions (without QoS) and in two sectors (fixed and mobile) only. The 2008 TRE scores are compared with 2006 ones wherever possible.

4.1. Market Entry

There are nine mobile operators, with seven of them active at the national level.[13] The HHI in 2008 was 0.13, lower than what it was three years ago (0.18), indicating moderate competition.

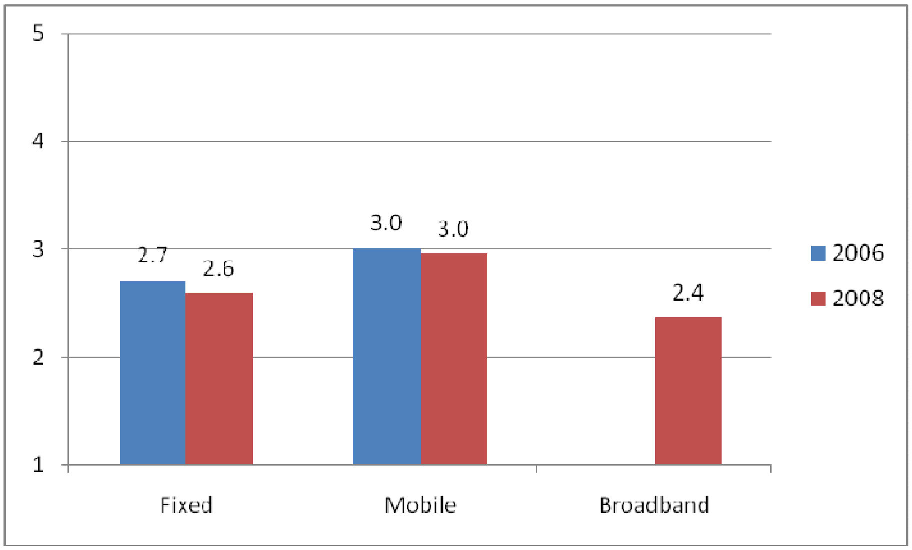
The scenario in the fixed sector is somewhat different. Fixed wireless is partially competitive with 5 licensees providing services. Two are PT Telkom and PT Indosat. The other two are locally-owned operators who only operate in specific regions. Wire-line remains a virtual monopoly of the incumbent. Under the current set-up, changes are unlikely.

Competition in the broadband sector depends on how one looks at it. There are no restrictions to providing Internet services. This had created a large number of ISPs.[14] However, they have to purchase international bandwidth from the monopoly provider PT Indosat and local infrastructure from PT Telkom, both being competitors in the broadband market. As a result, the market is dominated by PT Indosat and PT Telkom.[15]

Figure 11 shows the TRE scores for market entry for 2006 and 2008. Both mobile and fixed sector remain essentially unchanged 2006. One may argue the slightly higher score for mobile sector reflects the competition and relatively easier market entry while lower scores for fixed and broadband reflect the perception about entry barriers.

[13] Not all of them are active. There are three dominant players as highlighted in the introduction.
[14] According to APJII, 202 ISPs are registered with at least 169 of them are still operational.
[15] Almost all ISPs depend on PT Telkom's extensive infrastructure. Though it is theoretically possible for them to have their own infrastructure, they do not normally take that option because it is easier to purchase already built facilities than creating one's own.

Figure 11: TRE scores for Market Entry 2006 and 2008



4.2. Access to Scarce Resources:

At least one observer has noted that DGPT gives high priority to spectrum management (Zita, 2005). What the researchers found in interviewing stakeholders was a different opinion. According to them frequency allocation is getting more and more confusing.

Lack of a framework, let alone firm coordination by the Government has made spectrum refarming difficult. A Ministerial team for creating a telecommunication infrastructure blue-print was created in 2008.

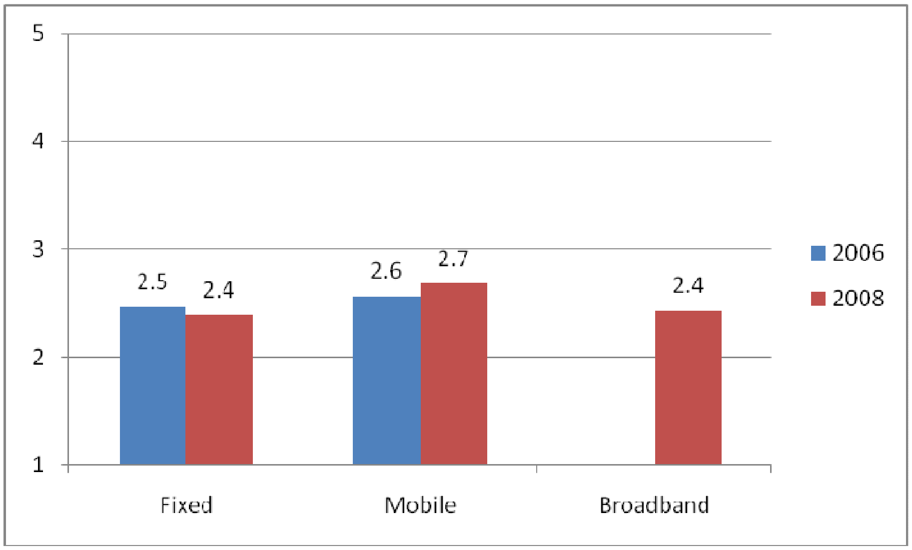
Though the 1999 law envisaged a methodical spectrum assignment process, what initially occurred was case-by-case assignment. The regulator increased market risk by not specifying its future plans for frequency allocation. A good example is about 3G. Initially, in 2003, 3G blocks were awarded to PT Cyber Access (Later Hutchison) and PT Natrindo, both 'greenfield' operators. Due to public outcry about their failure to rollout networks for 3 years, DGPT called tenders for the next block. PT Telkomsel, PT Excelcomindo and PT Indosat were granted licenses in 2006. (Zita, 2005)

Infrastructure sharing is another key concern. According to a new government ruling, all wireless operators are encouraged to share their infrastructure. Only 'domestic' companies can build their own towers, others should lease from third parties. The 'foreign' companies are expected to remove their existing towers. Discontent is brewing because of this uncoordinated regulation.

Both these issues impact mobile and fixed wireless but not wireline. However that does not explain why satisfaction level is lower in fixed, compared to mobile. (Figure 12)

The reason for the low scores in broadband may reflect the difficulties they face in using the incumbent's infrastructure.

Figure 12: TRE scores: Access to Resources 2006 and 2008



The marginal improvement seen in the mobile sector since 2006 may be because of the award of new 3G licenses.

4.3. Interconnection

The law requires the incumbent operator to propose interconnection terms that are non-discriminatory and transparent. That proposal requires the regulator's approval. Once approved, incumbent published it.

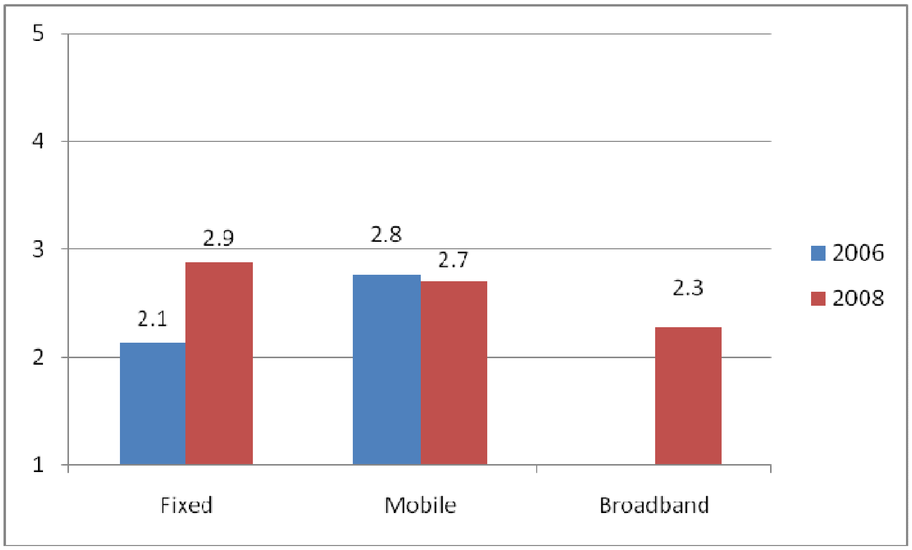
Interconnection costs are divided into three categories: originating cost, transit costs and termination costs. Origination cost is what the originator keeps for itself; the termination fee is paid by the originating network to the terminating party. Transit costs are applicable when an intermediate operator carries a call over its infrastructure to a terminating operator. The calculation of interconnection costs is based on a formula set out in the ministerial decree.

As explained in Annex I, the new interconnection regime introduced in April 2008 has reduced domestic interconnection charges but not international charges.

Still the dissatisfaction is clear with all scores lower than the average. (Figure 13)

Compared to 2006 values, the mobile score stays almost the same, while there is a clear improvement in the fixed sector, although the score is still below average. This can be the impact of the new regime, which benefits both, but is more favorable for fixed than mobile operators in many cases.

Figure 13: TRE scores: Interconnection 2006 and 2008



4.4. Tariff Regulation

There is no strict tariff regulation in any sector, but neither is there forbearance from tariff regulation. The environment is complicated.

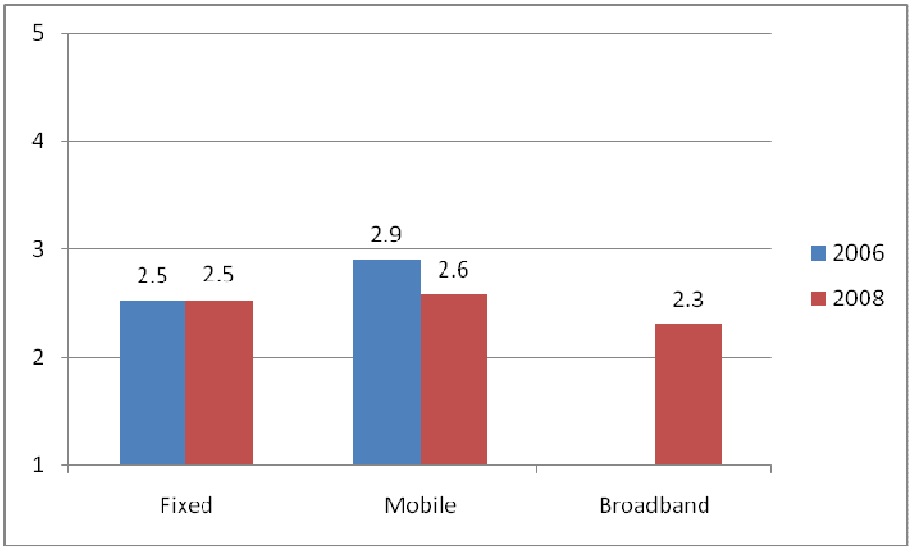
The formula by which PT Telkom is supposed to calculate prices was decided by DGPT in 2002 and approved by Parliament. PT Telkom's initial plan was to increase its charges in stages. However subsequent price increases were vehemently objected to by the public. On the other hand, Parliament wanted Telekom to follow its original plan. After 2004, the public outcry has subsided, but Telkom prices still remain lower than what it should have been had the original plan be followed.

Mobile, as well as fixed wireline/wireless sectors now set their prices largely based on the interconnection charges stipulated by BRTI / DGPT. While broadband is still not regulated, industry expects Internet tariffs to be regulated in near future.

There were several instances wherein the regulator(s) thought intervention necessary to modify the prices of telecom services either directly or indirectly. The most significant recent intervention by KPPU alleged that six mobile operators constituted a SMS cartel. The judicial process is still underway because one of the operators took KPPU to Civil Court – a lengthy process that may take years.

The survey participants have responded to this complicated situation. The response is near 2.5 (Figure 14) in fixed and mobile and 2.3 in broadband with all three sectors below average. Interestingly the sub-sector that has no regulation gets the lowest score.

Figure 14: TRE scores: Tariff regulation 2006 and 2008



The decline from 2006 in case of the mobile sector is a curiosity that has to be explored further.

4.5. Anti Competitive practices

Two major interventions of KPPU, Indonesia's Business Competition Commission, happened within the last two years.

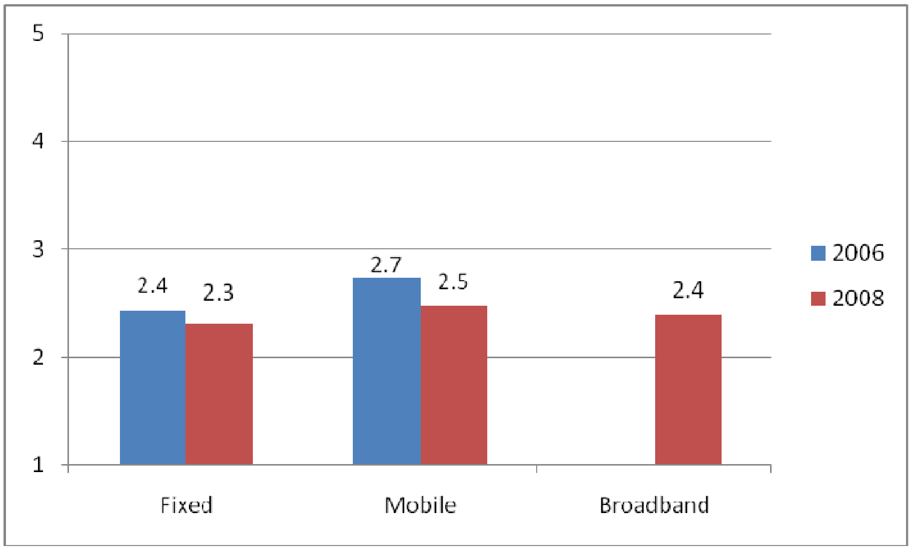
In June 2007 Singapore Telecommunications came under the scrutiny of KPPU over allegations of monopolistic practices. SingTel Mobile Pte Ltd and SingTel were called before KPPU. Temasek Holdings Pte Ltd, a Singapore's investment company was alleged to have engaged in overpricing. Temasek's lawyers pointed out that PT Telkom is majority owned and controlled by the Indonesian government, which also continues to have shares in Indosat, so there is no question of monopolistic behavior. They also claimed non involvement of Temasek in operational decisions of the companies they invest in. Business Competition Agency assetrted that majority is not the foundation for any anti-monopolistic allegation, but that influence is. (SIIA online 2007 & SingTel 2008)

Then in mid 2008, KPPU alleged cartel practices related to Short Message Service (SMS) by six mobile operators namely PT Excelcomindo Pratama Tbk (XL), PT Telkomsel, PT Telkom, PT Bakrie Telecom Tbk, PT Mobile-8 Telecom Tbk and PT Smart Telecom. KPPU claimed using the results of its studies that this practice had caused an estimated loss of about USD 3 billion during the 2004 - April 2008 period to consumers.[16]

The KPPU interventions could be the reason for lower scores compared to those of 2006. Particularly the industry is dissatisfied over KPPU's approach, as revealed in informal interviews with authors. The dissatisfaction in the fixed sector can be the reflection of general resentment toward the largely monopolistic nature of the market. (Figure 15)

[16] According to KPPU, a clause in a joint agreement of the cellular phone operators prohibited the imposition of a lower tariff than the US cents 2.5 – 3.5 rate, while former's calculations show it can be as low as US cents 1. This competitive rate referred to the original interconnection SMS service rate at USD 0.004 plus a 40 % of the retail service activities cost (RSAC) and a 10 % profit margin.(Reference)

Figure 15: TRE scores: Anti-competitive practices 2006 and 2008



4.6. Universal Service Obligations

Government funds were rarely made available for provision of universal services. Even though the telecom sector generates significant income for the state, the Ministry of Finance, not the DGPT, has always had the power to allocate funds for the provision of universal service.

Until the early 1990s the incumbent was expected to make a minimum of 20% investment to cover rural/remote areas. However this did not happen as anticipated following the collapse of the KSO schemes and the failure to implement tariff rebalancing. (Zita, 2005)

In the early days of market liberalization, government attempted to take this forward by matching the incremental costs as a subsidy in the last mile. The technologies supported under this were Portable Fixed satellite, VSAT, Radio, Terrestrial, Cellular, and IP-based. The objective was to provide a minimum of one telephone per village. (Sura, 2007)

In 2003, Government built telephone units in about 3,000 villages using satellite technology, at a cost of of approximately USD 4.77 million. In 2004, Government had built 2,620 SSTs for 2,341 villages.

However, by 2004 only 15% of the target was achieved. There were many reasons why the scheme was unsuccessful. Most significant were the unavailability of funds and lack of skilled human resources for maintenance, and difficulties in revenue collection. These factors made the project non-sustainable. Adverse operator incentives arising from low demand and high operational costs made matters worse.

There were unsuccessful proposals to provide subsidies based on operational costs rather than capital expenditure. They were supposed to be performance-based rather than one-time payments (Sura, 2007).

The USO Master Plan of 2005 proposed a Universal Services Fund to which each operator was supposed to contribute 0.75% of its Gross Revenue. Subsidies for operational costs (and not capital expenditure – the operators were supposed to build the infrastructure) were to be offered through the USF for providing telecom access and services in areas where the demand was too low to be addressed by the market. The solutions had to be technology neutral and the contracts based on the performance of the operators.

Balai Telekomunikasi dan Informatika Perdesaan (BTIP) or the Authority for Rural Telecommunication and Information Technology, a nonprofit public service institution has been established to manage the USO Fund. Monies were collected by State Treasury through Non-Tax State Revenue collection mechanism to be disbursed to operators though the state budget mechanism.

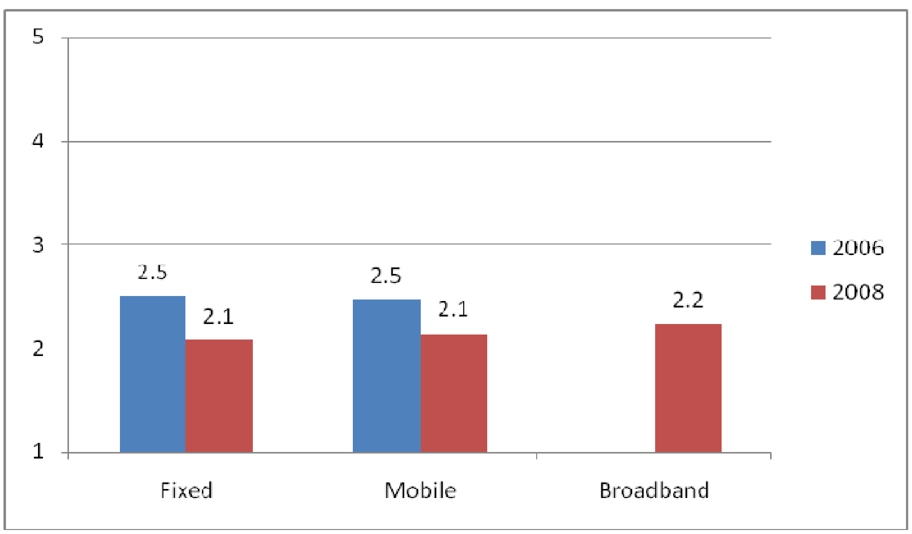
The operators were supposed to provide 24 hour public phone services on non-exclusive basis, and according to the contract they were to be rewarded on performance. The expected Average Revenue per User (ARPU) was approximately USD 5.3. Operators were expected to make 15% return on investment. The other incentives were the licenses to provide fixed and wireless services continuously in the said areas.

The new services were meant to cover about 40,000 villages.

USO tenders were called in December 2007. Out of 11 bidders, two were declared eligible. However, it was a dead end as the tender was cancelled and one party took legal action against DGPT. The judgment was issued later to the advantage of the government (BRTI, 2008). Still the operators contribute 0.75% of its revenue to the government, but none of those monies are being used to provide Universal Service Access/Services.

Perhaps this is the dissatisfaction shown by the survey participants. The average responses for all categories were around 2. (Figure 16)

Figure 16: TRE scores: Universal Service Obligations 2006 and 2008



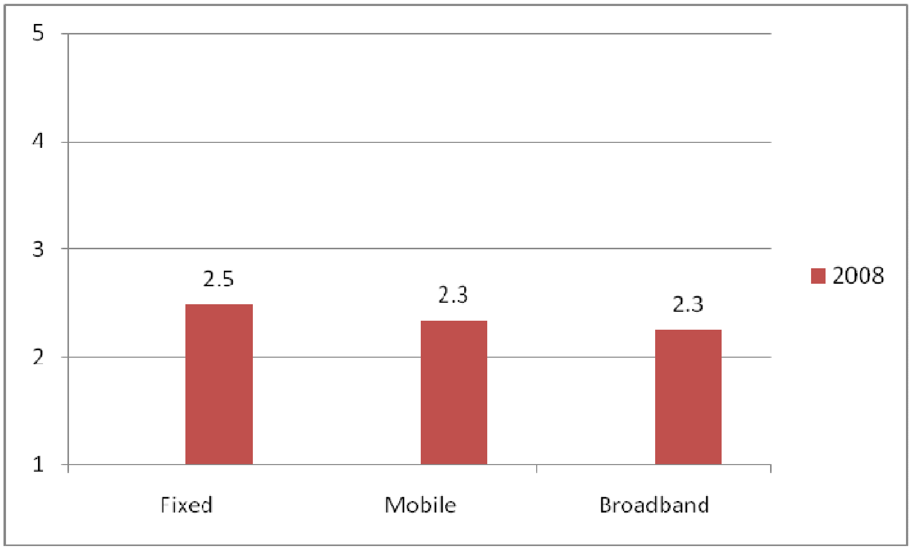
The drops from respective 2006 scores indicate increasing dissatisfaction.

4.7. Quality of Service

Government had issued guidelines on the minimum requirement for the Quality of Service for basic telephony services for fixed wire-line – for local, domestic long distance and international, mobile and fixed wireless. (BRTI, 2008) However these are still not strictly enforced. QoS is increasingly becoming an issue in the fixed and mobile sectors after tariff reductions due to lower interconnection charges, and expansion of the subscriber base.

Among the three categories only the score for fixed was average; the other two were below average. This can be a reflection of general dissatisfaction over regulation – or in this case lack of it. The dissatisfaction is highest in case of broadband where obviously the quality is lowest, compared to the other two.

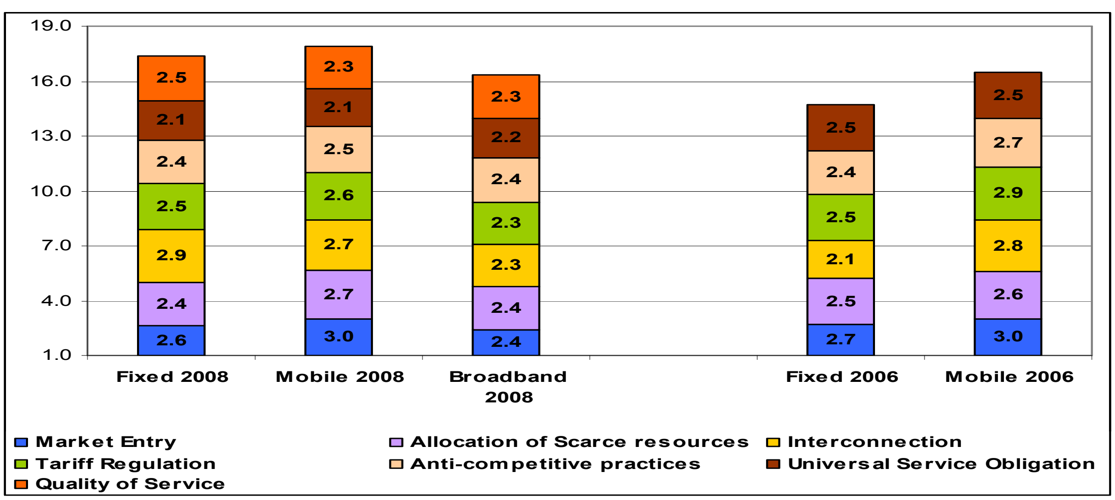
Figure 17: TRE scores: Quality of Service in 2008



4.8 Sector Summary

A summary of scores (Figure 18) shows the perception of industry and non industry players about the telecom regulatory environment is below average, without the score for even a single sub category above average. Interestingly, there is no visible difference between the total scores of 2006 and 2008. (Note the additional dimension in 2006).

Figure 18: Sector scores – Comparison 2006 and 2008



5.0 Conclusion

All TRE scores are sub-average. This might be the most salient feature of survey results. On a scale of 1 to 5, the averages changed from 2.3 (in broadband) to 2.6 (in mobile). Only one sector within a dimension (Fixed – interconnection) has shown significant improvement since 2006. One dimension (USO) has shown a significant decline from 2006 scores in both sectors that allow comparison while others remained more or less same (less than 0.3 changes). This shows a clear and possibly increasing dissatisfaction with the regulatory environment, in spite of the relatively higher telecom growth in recent years.

That does not mean the respondents have ignored progress. For example, where the mobile sector shows a healthy growth under a moderately competitive environment the score for market entry is just below 3.0, the highest in the survey. Overall, the scores for mobile have been relatively better, except for USO and QoS.

Taken together low scores in QoS and access to scarce resources indicates a need for better infrastructure provision, including new infrastructure being called for in some cases. Multiple previous studies have emphasised the need to build infrastructure capacity. Infrastructure limitations have become the single most critical barrier to broadband development – even in cities, where mobile and fixed penetration is relatively satisfactory. In rural areas, lack of infrastructure hampers growth in all three sectors.

Infrastructure and demand is a chicken and egg problem. A significant demand for broadband still goes unmet. One reason could be strict regulatory practices that create no incentives for broadband service providers to build their own infrastructure. A key expectation of the regulator is that the right environment for building infrastructure would be created.

The general perception is that utilisation of resources is suboptimal. The master register of frequency assignments is not available in the public domain. Given the ad hoc manner by which frequencies have been assigned (sometimes, but not always through a process of auctions) there is hardly anything to suggest otherwise. Spectrum allocation should be a transparent process. The auction for 3G frequencies is a model that should be followed.

Interconnection stands out, because except for QoS, it is the only dimension where the fixed sector has scored higher than mobile. A casual look at the new interconnection regime explains why: it is more beneficial for the fixed players. This anomaly adds to prices differences as the telecom prices are to affected by interconnection charges. It is strange that mobile is treated differently from fixed, particularly when the former is key to telecom growth. It would have been more rational to have a simplified interconnection charges chart that would reduce differences between the two sectors.

Not surprisingly, lowest scores in the survey across all sectors were received for USO. The cause of dissatisfaction could be the 0.75% contribution to the fund, which goes unused, while the the urban-rural gap still remain significantly wide. Having experimented with multiple models of USO provision with no success, this is the time for Indonesia to seriously appraise the value of pursuing an unsuccessful USO plan for the sake of having one, against not having any. There can be other regulatory measures like developing competitive market environment and stimulating investment that could bring the same or better results.

Finally, intra-government communication can improve. The negative impact of most regulatory actions like the new rules of tower sharing etc could have been minimized if the relevant agencies had been fully consulted. Close communication will enhance industry confidence.

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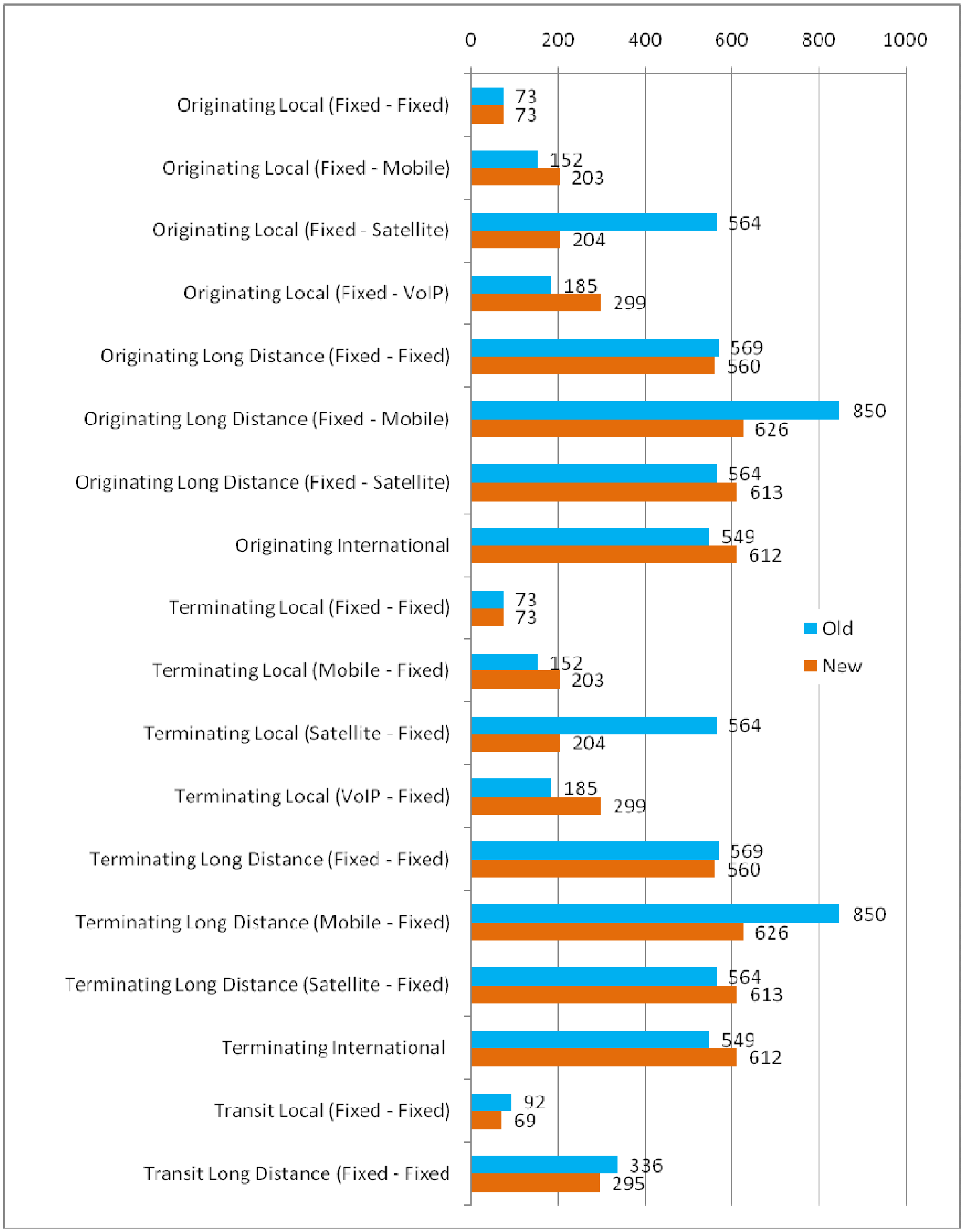
Annex I: Interconnection

A new interconnection regime was introduced in 2008 April. This has generally lowered the interconnection charges by 20-40%, except in few cases in long distance and international where it has actually increased.

Figure 19: Interconnection fees applied for fixed operators (both wire-line and wireless) in Rupiah (IDR) per minute

(1 USD = 9,425 IDR)[17]



Source: BRTI data

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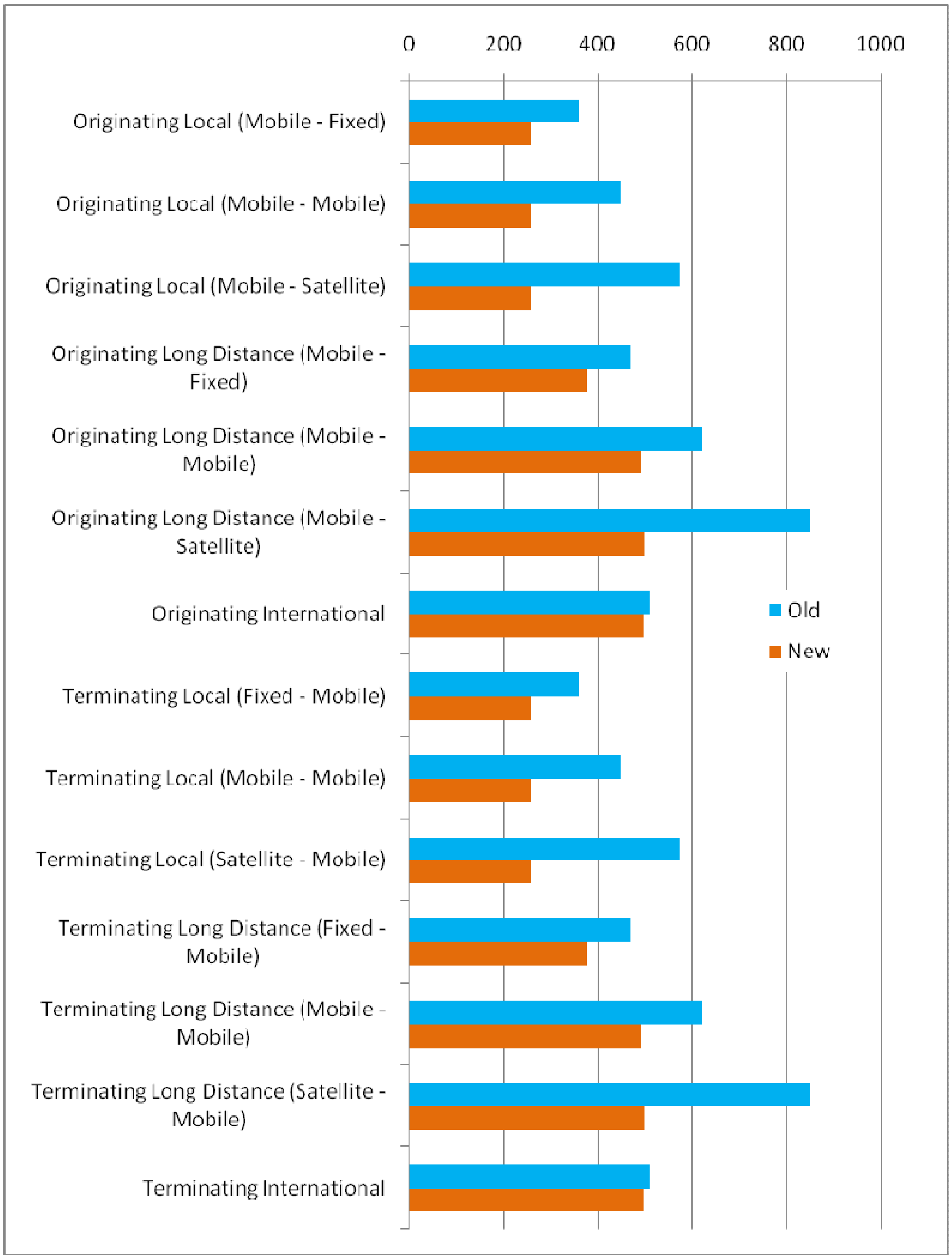
[17] Conversion rate as of 17/09/2008, obtained from http://www.xe.com/ucc/convert.cgi

Figure 20: Interconnection charges applied for mobile operators in Rupiah (IDR) per minute

(1 USD = 9,425 IDR)[18]



Source: BRTI data

The rationale offered by BRTI for this modification of interconnection charges is the decrease in the cost of providing telecom services. BRTI has noted the investment per a

[18] Conversion rate as of 17/09/2008, obtained from http://www.xe.com/ucc/convert.cgi

subscriber has dropped from USD 100 in 2003 to USD 35 in 2008. This was the combined impact of the expansion of mobile user base which subsequently led to more efficient network utilization and reduced overhead costs as a result of better business strategies. The regulator's implied intention is to pass the benefits to the end user.

Annex II: Urban Rural Disparities

Urban rural disparities are evident in telecom services penetration. According to the National Statistics Bureau's National Socio Economic Survey of 2005, 7.7 million (13%) own a fixed and 11.7 million (20%) own a mobile phone out of 58.8 million households. Out of the households with fixed phones 86% (6.6 million) are in urban areas. Mobile phone penetration looks marginally better with only 77% (9 million) households with a mobile phone in urban areas. (Donny & Mudiardjo, 2007)

Figure iii paints a general picture about the urban-rural disparities of telecom services penetration. It shows serious imbalances between the two sectors.

Figure 21: Telecom penetration in urban and rural Indonesia

Source: Sura, 2007

According to the National Statistics Bureau's National Socio Economic Survey of 2005, 2.2 million houses (or 3.68%) of the 58.8 million households had a computer, with 2 million of those are in the city. 27% of the computers were found to have Internet connection of some sort. (Donny & Mudiardjo, 2007)

Annex III: Satellite and fiber backbones

Given its geographical constrains, no doubt Indonesia needs to look for different solutions than most of its neighbours. Pure terrestrial networking will not work in an archipelago. It has to be complimented with networks such as satellite networking. PT Telekom launched the Telkom-2 satellite in November 2005. This adds capacity to an already established satellite communication channel previously established with the assistance of NASA[19]. However this too is hardly adequate to cover the entire nation, especially its sprawling 17,508 islands, with 43,000 villages. It is estimated that 3-6 more satellites with 24-transponder capacity are required to provide full coverage with 64k connections to every village. The third satellite is planned in 2009. (Donny & Mudiardjo, 2007)

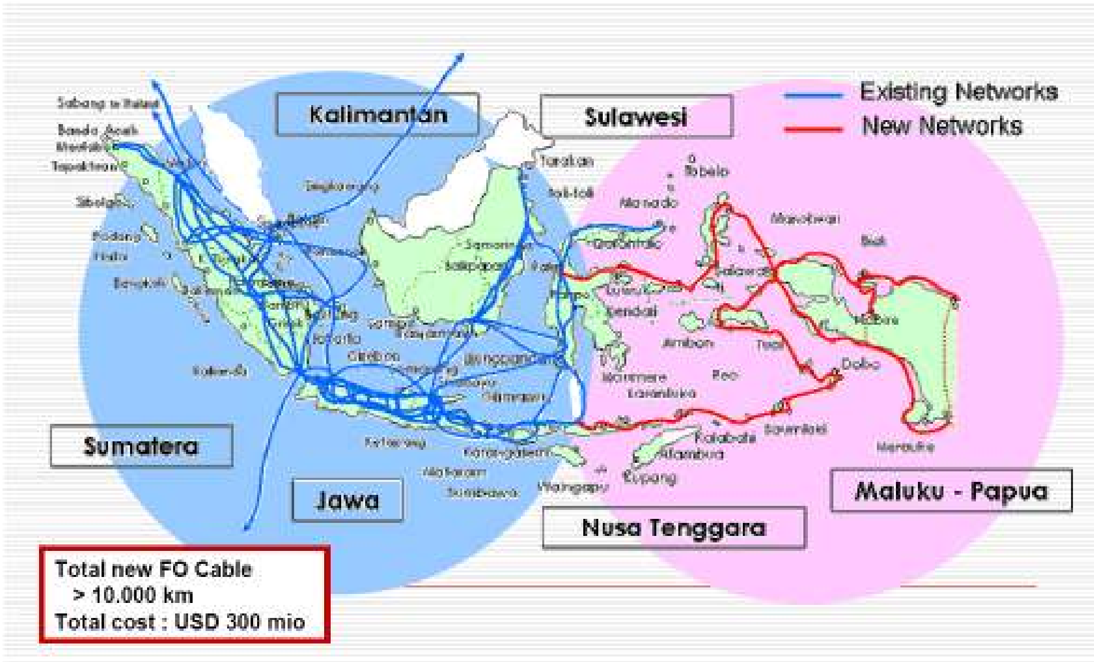
PT Indosat too awarded a contract to Thales Alenia Space to build and launch the Palapa-D communications satellite to replace its Palapa-C2 which is scheduled to end its operations in 2011. Doubts about its operation beyond 2009 have been expressed. This has most probably forced PT Indosat investing USD 200 – 300 million in a new satellite immediately to retain its current license. Palapa-D, scheduled to be placed in orbit in 2009, will offer more capacity than its predecessor with 24 standard C-band, 11 extended C-Band and five Ku-band transponders covering Asia, the Middle East and Australia. (Antara, 2008 & Satellite Today, 2007)

The estimated aggregate length of fiber optic backbone was 12,000 km in 2006. This is about 35,000 km less than required to serve the entire nation. The proposed solution is 'Palapa Ring' – a USD 500 million to 1 billion investment on building fiber. This too will not serve the needs completely, but link at least 25,000 km as an undersea cable network in an integrated ring shape extending from Sumatra to West Papua. The capacities of rings will vary from 300 - 10,000 Gbps. (Donny & Mudiardjo, 2007)

However, Palapa ring operation Eastern Indonesia, perhaps where it is needed the most, is planned to begin only in 2013. The eastern section of the backbone will be as long as 10,000 km, crossing Nusa Tenggara, Maluku, Papua through to the Celebes. Seven companies initially joined the Palapa Consortium project (PT Telkom as the coordinator, PT Bakrie Telecom, PT Excelcomindo Pratama, PT Macca System Infocom, PT Indosat, PT Infocom Elektrindo - a network provider of PT Mobile-8 and PT Powertek Nusantara) but before signing, PT Powertek Nusantara withdrew. Total estimated investment will be USD 325 million. Its backbone cable will stretch 11,000 km in Eastern Indonesian archipelago. (Indotel)

[19] In March 1997, NASA launched 'Palapa B2P', a communication satellite to be used by Indonesia and five other nations in Southwest Pacific. Indonesia spent $50 million on this. (New York Times, 1987)

Figure 22: Palapa Ring Development – Existing and Planned



Source: BRTI

Annex IV:

TRE Summary of Regulatory Events

Key Regulatory Events for Indonesia; 2007 May -2008 April

2007	
May 16	Cellular operator PT Mobile-8 Telecom gets principle permit for wireless fix network operation. Its shareholders are PT Telekomindo Selular Raya (Telesera), PT Metro Selular Nusantara (Metrosel) and PT Komunikasi Selular Indonesia. It is a public listed company.
May 25	BRTI sends a letter to PT Telkom to unblock IDD access code 001 and 008 (owned by PT Indosat) by their retail kiosks selling telecom facilities. BRTI considers PT Telkom's blocking as breaching the Law of Anti Monopoly Practice and Unfair Business Competition.
June 29	Singapore Telecommunications is under scrutiny by Indonesia's business competition commission over allegations on monopolistic practices. SingTel Mobile Pte Ltd and SingTel are called before KPPU. Temasek Holdings Pte Ltd, a Singapore's investment company is alleged for overpricing.
July	House of Representative's Commission I which oversees telecommunications tells government to provide public cheap telecom service through industry reforms. The Minister of Communication and Information responds by asking cellular operators to disclose their cost structure.

September	KPPU claims tariff-fixing practices among telecom operators. KPPU orders PT Telkomsel to lower tariff and considers Temasek holding monopoly over Indonesian telecommunications sector through its shares in PT Indosat and PT Telkomsel. Temasek and nine other parties (sub-companies) are fined Rp 250 billion (USD 27 million).
September 19	PT Bakrie Telecom wins new international license tender by beating PT Excelcomindo Pratama and PT Natrindo. Bakrie is obliged to develop SGI. Bakrie says it will invest Rp 184 billion (USD 20 million) in 2008 to develop international network line infrastructure.
November	Palapa Ring Consortium – a mega broadband project initiated by government plans to develop telecommunications in Eastern Indonesia. It uses submarine cable for backbone. Last mile will be provided by the operators. Seven companies initially joined the Palapa Consortium project (PT Telkom (coordinator), PT Bakrie Telecom, PT Excelcomindo Pratama, PT Macca System Infocom, PT Indosat, PT Infocom Elektrindo - a network provider of PT Mobile-8 and PT Powertek Nusantara) but before signing, PT Powertek Nusantara withdrew. Total estimated investment will be Rp 3 trillion (USD 325 million). Its backbone cable will stretch 11,000 km in Eastern Indonesian archipelago.
November 1	ID-SIRTII begins its operations after two years of preparation. It is under DGPT and set up Telecommunications Law. Its key task is to maintain an internet monitoring and security system database. It also acts as contact point for domestic and international agencies on internet security.
November 5	BRTI disseminates their findings on the requirement to amend Indonesian telecommunications law.
December	Cancellation of USO tender. Eleven Indonesian telecom companies have submitted their bids and two are declared eligible (PT Telkom and PT ACES). Last minute decision declares both ineligible. Tender process is halted indefinitely. PT ACES takes legal action against DGPT.
2008	
March 25	Indonesia introduces cyberlaws. Electronic Information and Transaction Act provide additional legal foundation for ID-SIRTII.
April 4	BRTI is successful in having PT Telkom and PT Indosat opening their access codes. This comes under fourth Amendment to FTP.
April 7	Minister of Communication and Information orders APJII to block sites that hosts ‘Fitna’ - a video movie made by a Dutch MP and considered offensive to Moslem majority. YouTube is blocked for 7 days. Minister also requests YouTube to drop ‘Fitna’.

April 9	Minister of Communication and Information signs new regulations on Telecom towers. Now only 100% locally owned companies can own and manage towers. Industry asks for clarifications as BKPM's negative list allows foreign companies to own and manage buildings/towers. Telco companies with foreign investment such as PT Telkom, PT Indosat, PT Hutchison Indonesia and PT Excelcomindo Pratama are affected by this ministerial decree as they have built and manage their towers since the beginning of their operation. However as a compromise, BKPM allows telco companies publicly listed in Indonesian Stock Exchange can be considered local owned.
April 9	To avoid consumer confusion, BRTI sends letters to all operators requesting them to be clear in advertising tariffs/packages. This comes after a BRTI's public hearing.
April 14	BRTI releases set of rules regarding leased lines. Point to point interconnection charges are expected to decrease by these new rules.

Telecom Regulatory and Policy Environment in the Maldives
Results and Analysis of the 2008 TRE Survey

Helani Galpaya

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***Abstract:** The Maldivian telecom sector has gone through partial liberalization in the mobile and broadband sectors in the past few years. The incumbent Dhiraagu (a joint venture between the government of Maldives and Cable & Wireless of the UK) faces competition from the newcomers Wataniya in the mobile sector and Focus Infocom in the broadband sector. The fixed sector is a monopoly, but Dhiraagu's exclusivity is scheduled to end in 2008.

Overall the mobile sector receives the highest scores, indicating a positive regulatory and policy environment. Maldives has seen significant growth of subscribers and reduction of prices with the two competitors competing head-to head to attract customers in the populated islands. Growth in mobile has far surpassed the growth in fixed. Broadband is still at a nascent stage, with only the major islands having a choice of broadband providers.

***Keywords:** TRE Survey, Maldives

Telecom Regulatory and Policy Environment in the Maldives Results and Analysis of the 2008 TRE Survey

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List of Acronyms

AMPS	Advanced Mobile Phone System
ARPU	Average Revenue per User
C&W	Cable and Wireless
EBITDA	Earning before Interest Tax and Depreciation Allowance
GDP	Gross Domestic Product
GoM	Government of Maldives
GSM	Global System of Mobile
ICT	Information and Communication Technology
ISM	Industrial Scientific and Medical (radio bands)
ITU	International Telecommunication Union
Kbps	Kilobits per second
MNP	Mobile Number Portability
RIO	Reference Interconnection Offer
SIM	Subscriber Identity Module

TAM	Telecom Authority of the Maldives (the regulator)
TRE	Telecom Regulatory Environment
USO	Universal Service Obligation
WiMax	Worldwide Interoperability for Microwave Access

1. Executive Summary

The Maldivian telecom sector has gone through partial liberalization in the mobile and broadband sectors in the past few years. The incumbent Dhiraagu (a joint venture between the government of Maldives and Cable & Wireless of the UK) faces competition from the newcomers Wataniya in the mobile sector and Focus Infocom in the broadband sector. The fixed sector is a monopoly, but Dhiraagu's exclusivity is scheduled to end in 2008.

The 2008 Telecom Regulatory Environment (TRE) survey asked informed stakeholders of the Maldivian telecom sector to assess the regulatory and policy environment along 7 dimensions (market entry, access to scarce resources, interconnection, tariff regulation, universal service obligations, regulation of anti-competitive practices and quality of service regulation) for the three (sub) sectors of telecom (fixed, mobile and broadband) , on a Likert scale of 1 to 5 (1 being highly unsatisfactory, 5 being highly satisfactory, with 3 being considered average). The respondents were selected from 3 categories: those directly impacted by policy and regulatory actions of the government (operators, equipment vendors), those who broadly follow the sector (consultants, lawyers) and those who represent the public interest in the telecom sector (consumer groups, other government officials, journalists, etc). The scores given by them are summarized in Table 1:

Table 1: Summary of scores, 2008 TRE survey in the Maldives

Dimension	**Fixed**	**Mobile**	**Broadband**	**Average for Dimension**
Market entry	2.9	3.8	3.5	**3.4**
Allocation of scarce resources	3.6	3.6	3.8	**3.7**
Interconnection	3.4	3.5	3.0	**3.3**
Tariff regulation	3.2	3.4	3.2	**3.3**
Regulation of anti-competitive practices	2.8	3.1	2.8	**2.9**
Universal service obligation	3.6	3.5	2.9	**3.3**
Quality of Service	3.6	3.8	3.5	**3.6**
Average for Sector	**3.3**	**3.5**	**3.2**	**-**

Overall the mobile sector receives the highest scores, indicating a positive regulatory and policy environment. Maldives has seen significant growth of subscribers and reduction of prices with the two competitors competing head-to head to attract customers in the populated islands. Growth in mobile has far surpassed the growth in fixed. Broadband is still at a nascent stage, with only the major islands having a choice of broadband providers.

Across the dimensions, the regulation of anticompetitive practices receives the lowest scores – perhaps reflecting perception that the incumbent uses its dominant position (and historical relationships with the government and the regulator) to unfairly stifle the competition.

Stakeholders in seven other emerging Asian countries who completed similar TRE surveys during the same time period in 2008 have given lower (lower than 3.0, often closer to 2.0) scores for many dimensions, even when their sector performance (on objective terms, such as subscriber growth) is better than in the Maldives. In this context, the highs scores given by Maldivian stakeholders (where six of the seven dimensions and all three subsectors receive above average or above 3.0 scores) are unusual. The duopoly (i.e. less competitive) nature of each sub-segment, the small market size and island culture (where stakeholders know each other professionally and personally) may explain the "positive" perceptions among stakeholders. But these hypotheses need testing in future research. This behavior poses challenges to the feasibility of using TRE surveys to compare microstates with other countries.

However this does not prevent the use of the TRE scores as diagnostic tool *within* a country. In the case of the Maldives, the same set of stakeholders give significantly lower scores in one dimension (regulation of anti competitive practices) compared to the other six. The low scores are partly a result of problems with the regulatory rulemaking procedure, as opposed to a problem with the rules themselves (i.e. a problem with the "how", and not so much with the "what"). Regulatory decisions are made on an ad-hoc manner, with decisions often handed out when requested by the operators, as opposed to pro-actively and in anticipation of emerging market changes (or even to avoid upcoming roadblocks, before they actually take place). The rationale behind the rulings that are issued are not explicitly documented and publicized. There is a lack of documented basic set of regulations related to the key areas under the regulator's purview – as a result every decision allows the regulator absolute discretion. On top of all this, the regulators legal standing is and independence are in some doubt due to the lack of legislation. Based on these observations, our recommendations are:

1. Getting legislative approval for a new Telecommunications Act that gives legal and financial independence to the regulator
2. Adopting transparent and consultative procedures for rule making. The procedure could have characteristics such as the pre-publication of future rules for consultation, providing channels for stakeholders to give their input to the proposed rules (through public hearings, written submissions), clearly establishing the conditions and procedures for appealing against issued rulings and so on.
3. Following such processes, draft subordinate regulations and rules on key regulatory areas such as the regulation of tariffs, issuance and renewal of licenses, issuance of spectrum and other resources, regulation of anti-competitive behavior.

Next we make recommendations related to regulatory substance (the "what" of regulation, or the content of the decisions themselves). Here the primary goal is make the playing field equal for the incumbent and new entrants. At a minimum, this can start with ending the exclusivities enjoyed by the incumbent, thereby enabling the other 2 players to enter those segments of the market, should they so wish. Going further, the regulator could allow new market entry, and even make it attractive to new entrants through actions such as mandating non-discriminatory access to the backbone. However in a small, already saturated market where economies of scale are unlikely to come into play, the possibility of entry, followed by exit is real. Exit cannot and should be prevented, but rules should exist to deal with stranded customers and other problems that will remain after an operator exits. In this context, we make the following recommendations:

4. Not renewing exclusivities currently granted to the incumbent (an example is the current exclusivity on fixed service provision, and the exclusivity to bring in international traffic and terminate on any network. Both these are up for renewal/expiry in December 2008)
5. Moving towards a unified licensing regime that enables at least the existing operators (and possibly new operators) to enter other (sub) segments of the market.
6. Establishing conditions and rules for market exit (e.g. how to deal with stranded customers and so on)
7. Create conditions to encourage competition for the market and competition in the market. Illustrative actions could include:
    - Mandating non-discriminatory access to the backbone by new entrants
    - Working pro-actively with the tourism authority and the incumbent to allow new entrants access to the resort island (currently Dhiraagu has a de facto monopoly on the towers at most of the resorts, and new entrants are left out of the most lucrative segments of the market).

2. Development of the Telecom Regulatory and Policy Environment

2.1 Country Background

Maldives is a country of around 1,200 small islands. It is located in the Indian Ocean near Sri Lanka and India. Its population of 309,575 is spread across roughly 200 inhabited islands. About 33 per cent of the population lives in the densely populated capital, Male. Maldives is a member of the South Asian Association for Regional Corporation (SAARC). It is wealthier than its SAARC peers, with a GDP per capita of US$ 2,992 in August 2008.[1]

Many uninhabited islands (around 92 of them, by June 2008) are leased to internationally popular holiday resorts that attract a significant number of high-end tourists each year. Tourism is the most important part of the Maldivian economy, contributing around 27% of the GDP (Table 2). The third and fourth largest contributors to the GDP (communication and transport) are also heavily dependent on tourism.

Table 2: Contributions to Maldives GDP by Sector

Sector	**% contribution to GDP**		
	2006	**2007**	**2008**
Tourism	27.4	27.8	27.4
Government Administration	14.8	15.8	17.6
Communication	8.9	9.1	9.6
Transportation	9.6	9.7	8.7
All other sectors	39.4	37.6	36.7

Source: Ministry of Planning and Development, Maldives

2.2 Development of the Telecom Sector

Until 1988 the Government of Maldives (GoM) and Cable & Wireless (C&W) of the UK provided all telephony in the Maldives. Only fixed line services were available. C&W operated the international telephony network through a franchise/approval of the government. Phone services were difficult to obtain (fewer than 4,200 fixed lines were operational in 1988) and penetration was low (2.1 fixed phones per 100 inhabitants), as per ITU data.

Partial Privatization: In 1988, a new, public-private monopoly "Dhiraagu" was created. 51 percent of the new firm was owned by Cable & Wireless while 49 percent was owned by the GoM. Later, GoM's share

[1] *Maldives at a Glance August 2008*, Ministry of Planning and National Development, Maldives, http://planning.gov.mv/en/images/stories/publications/mag/august2008.pdf, last referenced 22 Sep 2008

was increased to 55% and C&W's share brought down to 45%[2]. The move resulted in investment in the network and the installation of new technology. But penetration was well below acceptable levels, with 7.7 fixed lines per 100 inhabitants by the year 1998, 10 years after the restructuring. Dhiraagu's exclusivity to provide fixed telephony was renewed in 1995, and continues until December 2008.

Introduction of Mobile Services: In 1997, mobile services were introduced through Dhiraagu, under the brand name DhiMobile. Initially offered on AMPS (Advanced Mobile Phone System), the limited network soon reached capacity and the company had to stop taking new customers by May 1998[3]. Investment was made in a GSM network, and GSM based mobile phone services were introduced in 1999 and resulted in growth in the number of mobile subscribers. Subscriber growth was further increased due to the introduction of pre-paid services, per-second billing and free SMS in 2001 and 2002 respectively (Figure 1). Per second billing was mandated by the GoM which also acted as regulator.

Sector Status, pre-2003: Universal access was achieved around 1999 – 2000, mainly by installing public phone boxes in inhabited islands. Take up of fixed phones was low. Huge price disparities existed between Male (and the other big, populated islands) and the other populated islands further away from the capital. For example the monthly rental in 11 most populated islands was USD 2.3, while it was USD 270 in the other inhabited islands. The installation charges in the former set of islands was USD 134, while it was anywhere between USD 234 – 988 in the latter set (i.e., the majority) of islands. As a result, the majority of the population could not afford telephone services. According to the ADB, International calls were 7-8 times the prices in comparable countries.[4]

Lack of Independent Regulator: Not only were phone services not affordable, but a conflict of interest between regulator, policy maker and incumbent operator also existed. The Director General of Post and Telecommunication Department (DG) was the "regulator"; but the department itself came under the Ministry of Communication Science and Technology, the then policy maker. To complicate matters further the DG was a member of the Dhiraagu board of Directors. The Chairman of the Dhiraagu board was the Minister of Foreign Affairs; this meant the DG served under one of the most senior and important government officials. It is no surprise that the regulator was not in a position to insist on lower prices, increased network rollout and higher quality.

Telecom Policy 2001-2005 and ADB involvement: It is in this environment that Asian Development Bank started policy discussions with the GoM about the need for establishing an independent regulatory body, liberalizing value added and non-basic services and enacting a telecoms law to support these first two objectives. The resulting Telecom Policy that was announced in August 2001 called for reducing all

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[2] In 1993 GoM's transferred to Dhiraagu's the ownership of certain network assets that were previously rented out to Dhiraagu. The value of this capital infusion increased GoM's share of Dhiraagu by 6%

[3] Dhiraagu Marketing Communications & Public Relations, *Dhiraagu Stops Providing Service to Any New Mobile Customers*, Press Release, 12 May 1998, http://www.dhiraagu.com.mv/beta/media_centre/press_releases.php?id=143&cat=pressreleases

[4] Asian Development Bank, *Report & Recommendation of the President to the Board of Directors on a Proposed Loan to the Republic of Maldives for the Information Technology Development Project*, November 2001.

telecom charges, expanding service and narrowing the cost of service between Male and other islands, providing legal powers to strengthen the role of the regulator, opening up the market for competition, making government telecom less dependent on the profit of the sector[5] (i.e., Dhiraagu). In November 2001, ADB provided USD 9.5 million in funding to achieve these and other (ICT for Development related) goals.

Establishment of the Regulator: As a result of these initiatives started in 2000-2001, a separate regulatory body, the Telecom Authority of Maldives (TAM), was established in 2003. It was authorized to regulate the telecom sector through a decree, the Maldives Telecom Regulation of 2003. Though the envisioned Telecom Law has not passed yet, the Regulation and the direct support of the Office of the President provided sufficient grounds for TAM to conduct its activities.

Introduction of ISP competitor: In 2003, the first ever competitor in the telecom sector was allowed entry with the granting of an ISP license to a new player, Focus Infocom. Until then, all internet access was through Dhiraagu's NetLink service (later rebranded DhivehiNet), and was mostly dial-up. After making an initial investment of Rufiyaa 10 million, Focus started providing services under the brand-name *Raajje Online* in January 2004, offering a 256 Kbps connection for Rf. 1500 per month (about USD 117 per month) after a modem for Rf. 3,900 (USD 305) was purchased. [6] Focus Infocom was competitively selected out of 4 bidders that were interested in entering the Maldivian ISP market.

Introduction of Mobile Competitor: The first and only competitor in the mobile sector entered in February 2005 with the issuance of a mobile license to Wataniya Telecom Maldives, a subsidiary of Wataniya Telecom International[7]. There were 3 other bidders for this 2nd mobile license. Wataniya was selected based on its proposed investment in new services and fast network rollout plans. Figure 1 shows how the incumbent Dhiraagu dropped its mobile prices in anticipation of Wataniya's entry.

Start of WiFi: In 2006 TAM gave permission to Dhiraagu to run WiFi on the 2.4G ISM band. As a result, 42 islands were connected and converted to wireless internet zones (WiFi hotspots), bringing to 54 the number of islands with broadband (around 70% of the population).[8]

The 2006-2010 Telecom Policy: A new telecom policy was introduced by the new policy maker, the Ministry of Transport and Communications. It called for limiting Maldives' dependence on satellite connectivity to reach the global internet. By the end of 2006, all 3 operators had access to two submarine cables that connected them to the world. It also called for legal and financial autonomy for

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[5] Ministry of Communication, Science and Technology, *Maldives Telecommunication Policy 2001-2005*, 1 August 2001.

[6] Haveeru Online, *Focus Info Com starts service as second ISP in Maldives*, 2004-01-18, http://www.haveeru.com.mv/english/?page=details&id=9877 (last referenced 22 Sep 2008)

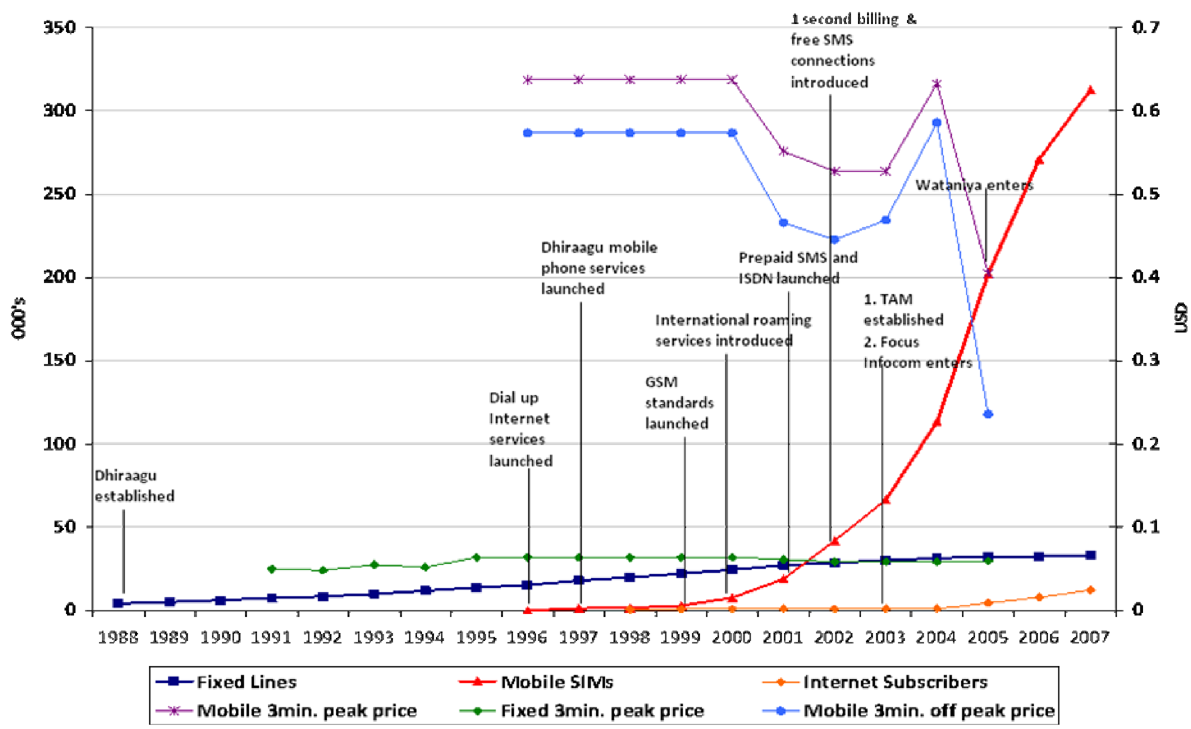
[7] Wataniya was the first private telecom operator in Kuwait. 51% of Wataniya is now owned by Qatar Telecom (Qtel). http://www.wataniya.com/AboutUsPortal/AboutUs.portal?_LANG_=en

[8] Dhiraagu, *Dhiraagu extends Wireless Zone Service to additional 27 Islands*, http://www.dhiraagu.com.mv/beta/media_centre/press_releases.php?id=593&cat=pressreleases (last referenced 22 Sep 2008)

TAM, through the passing of a Telecom Law by 2007. The policy also called for the diffusion of ICTs across the country and the use of ICTs to develop all sectors of the economy. Maldives has undertaken e-government initiatives and the installation of telecenters (community internet access kiosks) in recent years.

Through the market is only partially liberalized, we see from Figure 1 that regulatory action from around 1999 to 2005 has resulted in increased connectivity and lower mobile prices.   After 2005, there are no significant regulatory actions, but momentum has been maintained. This is a result of competition between the two mobile operators.

Figure 1: Penetration of the phones & internet, with key market or regulatory events



2.3 Current market dynamics

The operators: Today the Maldivian telecom market consists of 3 major players: Dhiraagu, Wataniya and Focus Infocom. Fixed telephony is provided exclusively through Dhiraagu the partially government owned incumbent. Dhiraagu's fixed monopoly as well its exclusivity to terminate incoming international traffic on any network expires in December 2008.

The mobile and broadband sectors are duopolies. Mobile services are provided by Dhiraagu and Wataniya; Broadband services are provided by Dhiraagu and Focus Infocom.

Dhiraagu was the only provider of leased line services until recently. In the third quarter of 2008 Wataniya was granted permission to use its excess microwave capacity to provide leased line services.

Below we look at some of the indicators that describe the level of competition, health and size of the telecom market in the Maldives. However due to the duopoly situation in each of the markets, companies appear to be reluctant to disclose detailed financial data and sometimes even subscriber numbers. The new mobile entrant Wataniya (through its parent company) discloses more than Dhiraagu.

Market Size: The statistics related to the fixed, mobile and broadband market size, according to TAM, are shown in Table 3. Mobile penetration is higher than 100%, reflecting the common practice of using multiple SIMs from the two operators by many consumers to take advantage of different on-net pricing

Table 3: Mobile SIMs, Fixed connections, ADSL connections and penetration, as at August 2008

	Total, as at August 2008	**Penetration (per 100 people), as at August 2008**
Mobile SIMs	398,962 (89% prepaid; 11% postpaid)	129
Fixed Phones (including payphones)	33,592 (74% in Male, Villingili, Aarah, Hulhule and Hulhumale)	11
ADSL lines	9,973	3

Source: Data from TAM (August 2008); calculated by author using August 2008 population estimates from Ministry of Planning and National Development

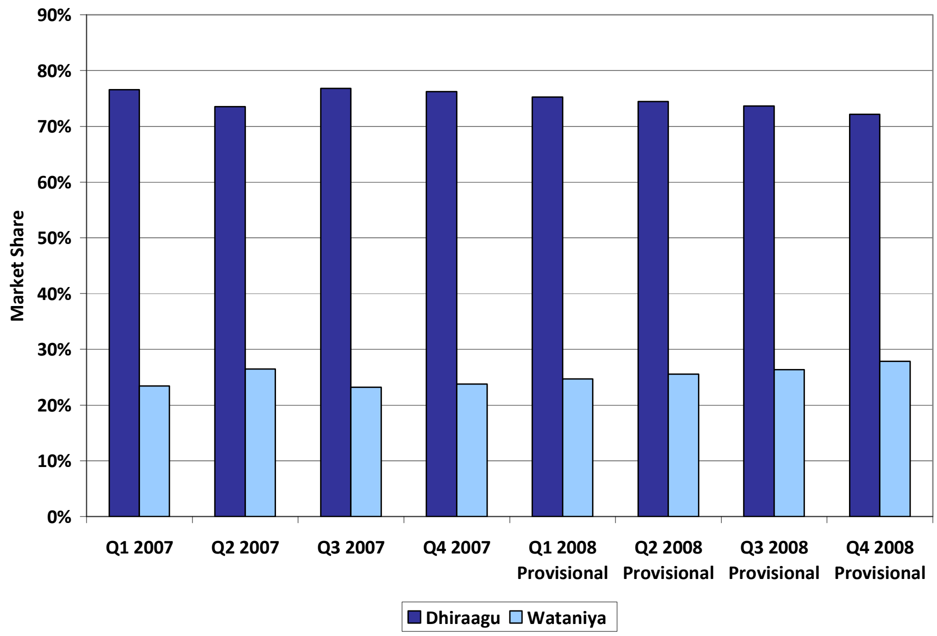
Market Shares: Given the duopoly in mobile and broadband, there is significant unease about disclosing publically market share or revenue information. TAM also does not officially disclose disaggregated data.[9] However it is commonly accepted that the mobile market is split roughly 25 percent vs. 75 percent between Wataniya and Dhiraagu. The broadband market also appears to be split 25-30 percent to 70-75 percent between Focus Infocom and Dhiraagu. Market shares calculated by the GSM Association in Figure 2 show that there has been no significant movement in market shares recently – Dhiraagu is holding onto its dominant position in the mobile sector, even as projected for 2008.

There is no mobile number portability in the Maldives . The charges for on-net vs. off-net calls were significantly different - i.e., Dhiraagu charges less when its customers call Dhiraagu numbers than when they call Wataniya numbers. Wataniya charges less when its customers call Wataniya numbers than when they call Dhiraagu numbers. Therefore carrying 2 SIMs (from the two operators) and using phones capable of accommodating two SIM cards is popular in Maldives. Given these conditions,

[9] This is not surprising, because even in Sri Lanka where competition and regulation have been in place for longer the regulatory website does not make disaggregated data available. This does not make it right, of course.

Wataniya is unlikely to increase its market share significantly unless it introduces significant price reductions or offers very innovative calling plans. That may already be happening – around the 3rd quarter of 2008, Wataniya started pricing its customers' calls to Dhiraagu numbers at the same on-net rate that Dhiraagu is offering its own customers. This means a consumer can use a Wataniya SIM to call Dhiraagu number and enjoy the same rate that would be enjoyed if the consumer used his/her Dhiraagu SIM to call a Dhiraagu number. Through the offer, Wataniya is attempting to eliminate the consumer's incentive to maintain a Dhiraagu connection. The impact of this offer is yet to be seen; but it is likely that market shares will be influenced.

Figure 2: Evolution of Market shares (based on subscribers) for Dhiraagu and Wataniya.

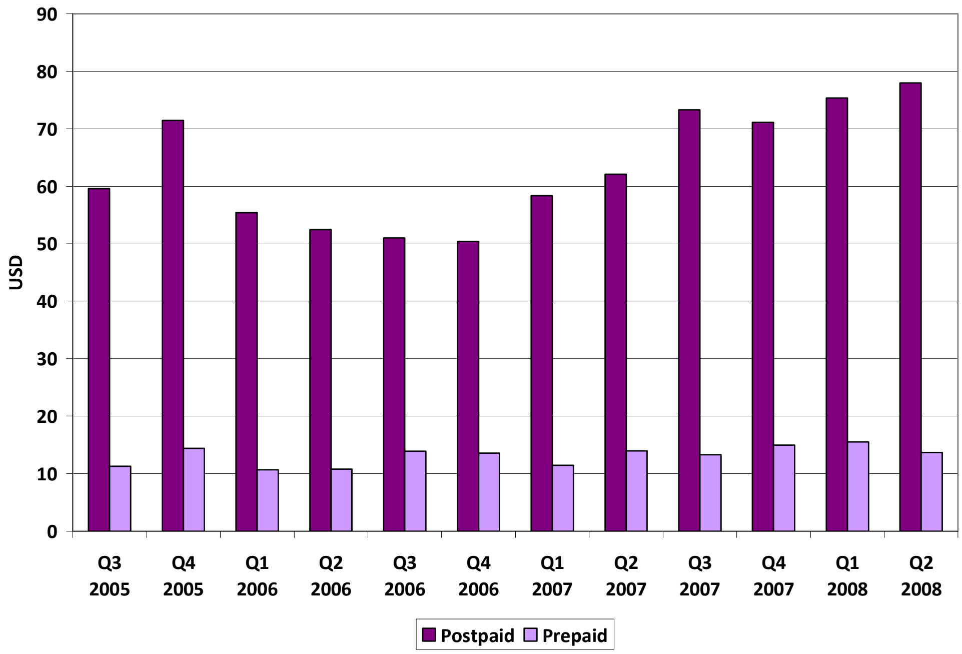


Source: GSMA, April 2008[10]

ARPU: While other South Asian operators are often operating on the ARPUs of under USD 5 per pre-paid SIM, Maldivian pre-paid SIM cards earn the operators in the range of USD 12 – 13. Postpaid ARPUs are around USD 70. Figure 3 shows the changes in ARPU for Wataniya has not faced significant downward pressure in the prepaid segment, as one would expect with increased competition. Indeed postpaid ARPUs are increasing slightly. Dhiraagu does not publish its ARPU data.

[10] GSM Asia Pacific. (2008). Retrieved online on 1 September 2008 from http://www.gsmap.org/information/statistics/country/.

Figure 3: Wataniya ARPU

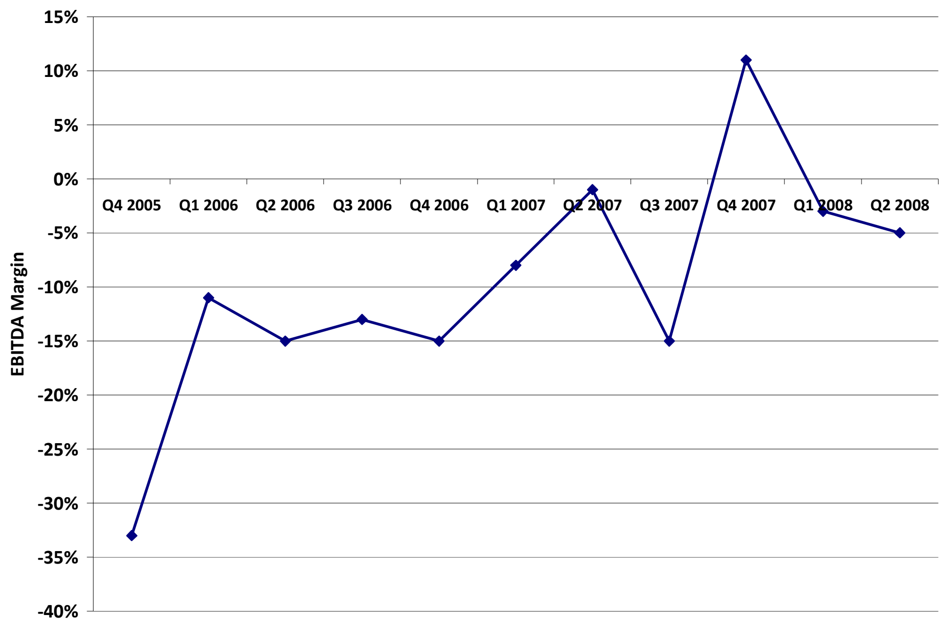


Source: Wataniya Telecom International 2008 quarterly reports [11]

Profitability: The new mobile entrant Wataniya entered the market in 2005 and had to invest in building out the backbone as well as the access network. As a result it is still not making a profit, with the latest EBITDA margins around –5%. However as the Figure 4 shows, the firm appears to be increasingly close to making a profit, as seen by the EBITDA margins at least approaching zero over time.

[11] Wataniya Telecom International. (2008). Annual Reports. Retrieved online on 18 September 2008 from http://www.wataniya.com/AboutUsPortal/AboutUs.portal;jsessionid=L18y2jS6MgLjfywwKTGXD9NLLZY4CGJybdY0phmVP4LJXyvpw1nP!-367353131?_nfpb=true&_pageLabel=Reports_page&_LANG_=en

Figure 4: EBITDA margins for Wataniya



Source: Wataniya Telecom International Quarterly Reports[12]

Dhiraagu does not publish EBITDA data. However we can quite easily see that Dhiraagu has positive (and high) profits by looking at how much profit C&W and the GoM separately make from their share of ownership [13](Table 4).

Table 4: Profits from Dhiraagu to owners, USD millions

	2005	2006	2007	2008
C&W's profits from Dhiraagu (reported for financial year ending in March)	28[14]	21[10]	23	24
GoM's profits from Dhiraagu (reported for financial year ending in December[15])	19	22	28	15[16]

[12] Wataniya Telecom International. (2008). Annual Reports. Retrieved online on 18 September 2008 from http://www.wataniya.com/AboutUsPortal/AboutUs.portal;jsessionid=L18y2jS6MgLjfywwKTGXD9NLLZY4CGJybdY0phmVP4LJXyvpw1nP!-367353131?_nfpb=true&_pageLabel=Reports_page&_LANG_=en

[13] The two figures cannot be simply added to get total profits. The financial years for the two entities (C&W and GoM) are different. C&W profits reflect profit after taxes in the UK as well as Maldives (if any). It is also unclear if C&W receives management/other fees on top of the dividend.

[14] Original amounts reported are 15 and 12 Sterling Pounds for 2005 and 2006 respectively. Converted to USD based on March 31 2005 and March 31 2006 exchange rates as reported by www.oanda.com

[15] Original figures given in Rufiyaa. Converted to USD based on exchange rates published by the Ministry of Planning and National Development Yearbooks for respective years.

Importance of the Telecom Sector: As with many developing economies that have gone through at least partial liberalization, Maldives too is seeing the increasing importance of the telecom sector in its economy. As shown in Table 1, the "communications" sector contributes nearly 10% of the GDP. Nearly all of this 10% is from telecoms. Telecom is the third largest contributor to the GDP. This percentage has been increasing over time.

Dividends from Dhiraagu are also a significant part of the GoM budget. From a low of about 4%, Dhiraagu's share of all non-tax revenues rose to 9.4% by 2007, as shown in Table 5.

Table 5: Dhiraagu's contribution to GoM revenues, in millions of Rufiyaa

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Non tax Revenue earned by GoM	443	567	609	788	861	1081	1189	1248	1486	1668	1684	2031	2867	3782
Contribution from Dhiraagu	20	26	30	36	50	55	67	97	106	186	166	248	281	355
Dhiraagu contribution as % of non-tax Revenue	4%	5%	5%	5%	6%	5%	6%	8%	7%	11%	10%	12%	10%	9.4%

Source: Ministry of Planning and Economic Development, Maldives

Technology and Resources: The geography of the Maldives poses challenges to the provision of telecom services. Undersea cables or costly microwave or satellite connectivity are required to connect the widely dispersed islands. For example, it takes more than 24 hours to go from one end of the Maldives to another by boat.

The operators however have met the geographic challenge and have succeeded in providing connectivity to each of the 200 or so inhabited islands. Male (the capital island) has fiber rings laid by Dhiraagu (the incumbent) and at least one other cable company (MediaNet). Focus Infocom has access to this fiber in Male (for a fee, obviously) and uses them to provide broadband services.

Traffic among islands and atolls is hauled predominantly using microwave. As shown in Figure 5, the two operators Dhiraagu and Wataniya run nearly parallel microwave connections between islands.

The southernmost islands and Male also have satellite connectivity via 2 satellite earth stations operated by Dhiraagu.

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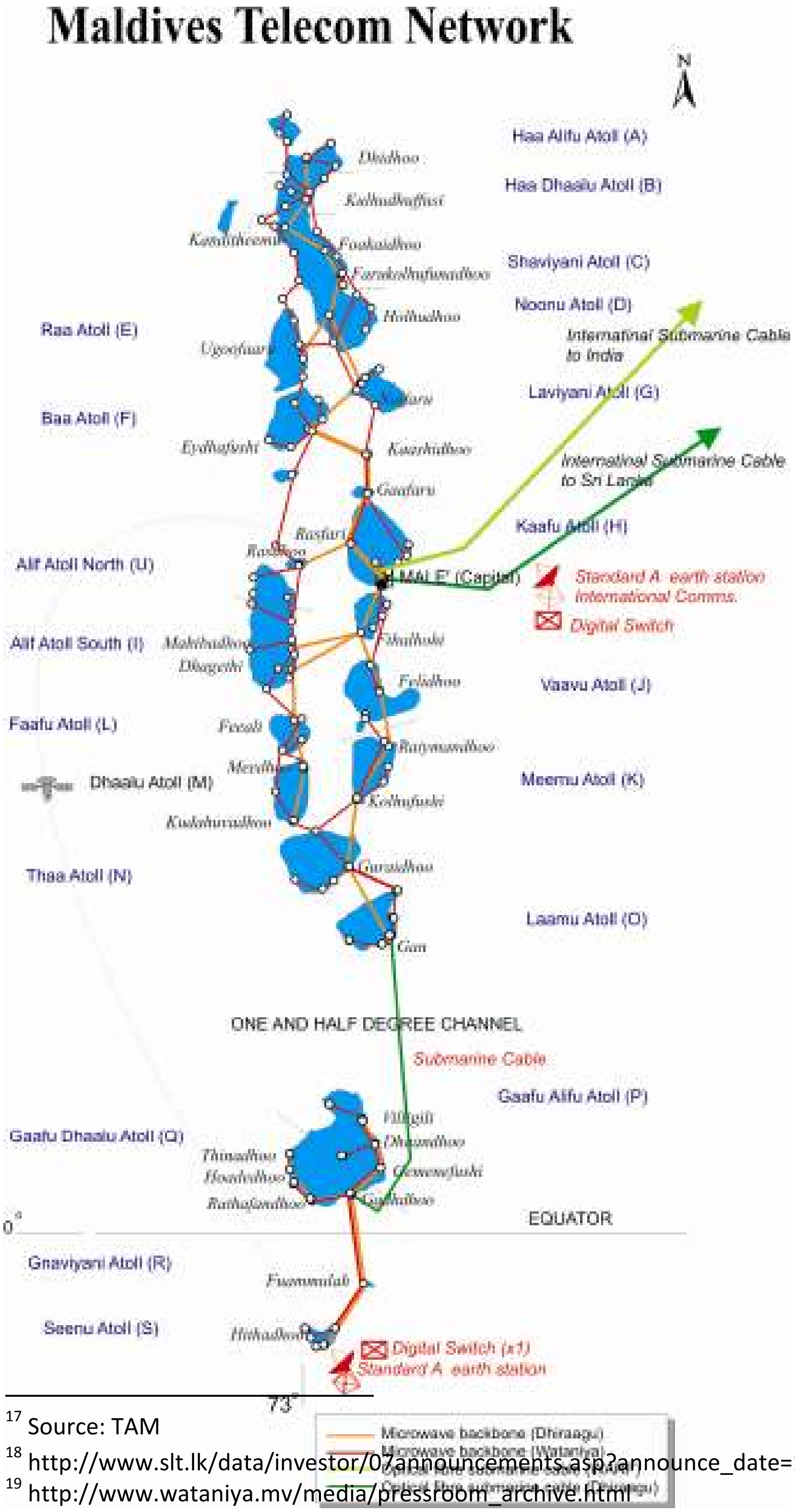
[16] Estimates by the GoM. Converted to USD using exchange rate as of 24 September 2008 published by www.oanda.com.

Figure 5: Maldives Telecom Network[17]



For a small market of around 300,000 people, Maldives boasts access to 2 separate submarine/undersea cables that provide international connectivity. This is more than what Bangladesh, a country with over 140 million people has. The first is used by Dhiraagu to connect to Sri Lanka and beyond (it was installed through a partnership between Sri Lanka Telecom and Dhiraagu)[18]. The second cable is used by Wataniya and Focus Infocom (referred to as WARF, it was installed through a consortium of Wataniya, Focus Infocom of the Maldives and Reliance of India's FLAG business unit, and connects to India and Sri Lanka).[19]

While redundancy is a good idea in the backbone or the international cable, one could argue that one cable or one microwave backbone with mandated sharing among all operators might have proved more economical at least in the short term, given the small size of the Maldivian market. The argument is similar for the backhaul microwave links.

[17] Source: TAM
[18] http://www.slt.lk/data/investor/07announcements.asp?announce_date=12/12/2006
[19] http://www.wataniya.mv/media/pressroom_archive.html

Furthermore, unless prices are set independently, a comfortable duopoly pricing situation could develop in each of the markets, at least in theory.

WiFi is used to create hotspots in many of the populated islands as well as resort islands.

At present 2^{nd} generation technology dominates the mobile networks. However at the time of writing (3Q 2008), Wataniya was about to introduce HSPA based broadband connectivity using third generation technology. WiMax is also currently being implemented, on an experimental basis, by Dhiraagu and it is reasonable to assume that commercial rollout will take place soon.

2.5 The Regulator and Regulatory Instruments

The Telecom Authority of the Maldives (TAM) was established in 2003, and was authorized to regulate the telecom sector through a decree (the Maldives Telecom Regulation of 2003). The policy maker is the Ministry of Transport and Communication, and issues policy direction based on government priorities. However in practice, it is TAM that takes the lead in drafting policies because it is the only body with sector expertise.

Even though multiple Telecom Policies have called for regulatory independence (financial and legal), it has not yet been achieved. TAM cannot decide on the allocation of funds – for example royalty fees earned from operators are given directly to the government and staff salaries are in line with government pay scales. A Telecom Act that would have given autonomy to TAM was drafted several years ago but has not been approved yet. But due to support from the executive (directly from the office of the president) TAM has been able to carry out its duties without too much (obvious) interference from various parties.

Among stakeholders, opinions differ about the level of independence exhibited by TAM. The connection between government and Dhiraagu is obvious (GoM owns 55% of Dhiraagu, and depends to a degree on Dhiraagu dividends to fund its activities). In parallel, TAM is financially dependent on government, and is supported by it. As such it is perhaps not surprising that the two new entrants feel that some of TAM's decisions/actions tend to have the effect of safeguarding Dhiraagu revenues. On the other hand, TAM's moves to open the market have not made Dhiraagu happy.

Even more relevant to perceptions about regulatory legitimacy is perhaps the manner in which regulation is done. Apart from the Telecom Regulation of 2003 (which established TAM and gave it powers), there are few rules or subordinate regulation. Ironically, several sub-regulations have been drafted, and are even used as guidelines by TAM. But most of them have not been formally made available to the operators and hardly any are available to the public. In the absence of documented and forward looking rule making, things are done on an ad-hoc basis, often when requests for various approvals are made by the operators themselves. The level of discretion allowed to TAM is high, and the level of regulatory certainty is low.

However all this (the lack of legal independence as well as the *perceived* lack of independence) could soon change. In August 2008 Maldives adopted a new constitution for the first time in its history. As a result, all existing decrees (including the 2003 decree that granted TAM regulatory authority) were nullified. In order to ensure that TAM could continue uninterrupted operations, the decree giving TAM its powers to regulate was grouped together with other decrees related to other government activities/organizations and collectively granted given an extension of 1 year. TAM therefore has one year to ensure that the necessary legislative authority is obtained. A Telecom Bill is currently in circulation and awaiting approval. Though not much different from previous drafts, it does call for more independence for TAM. Stakeholders appear confident that the new Act will be passed, though there is disagreement on when the approval will happen and on how much independence TAM will really have even after the passage.

At the time of writing, Maldives was approaching a new era of democratization, with multi-party elections held for the first time in the country's history. After 2 rounds of voting, Mr. Mohammad Nasheed has emerged victorious and is the new president in October/November 2008. Private TV stations have been allowed to operate[20], also for the first time (TAM assigns frequencies for all broadcasters as well). The overall trend leading up to the elections appeared to be towards greater media freedom and increased scrutiny of public institutions. Whether this trend will continue remains to be seen.

At the moment, until a new telecom law or regulations are adopted, the Telecom Policy of 2006-2010 serves as a roadmap of regulatory priorities in the country.

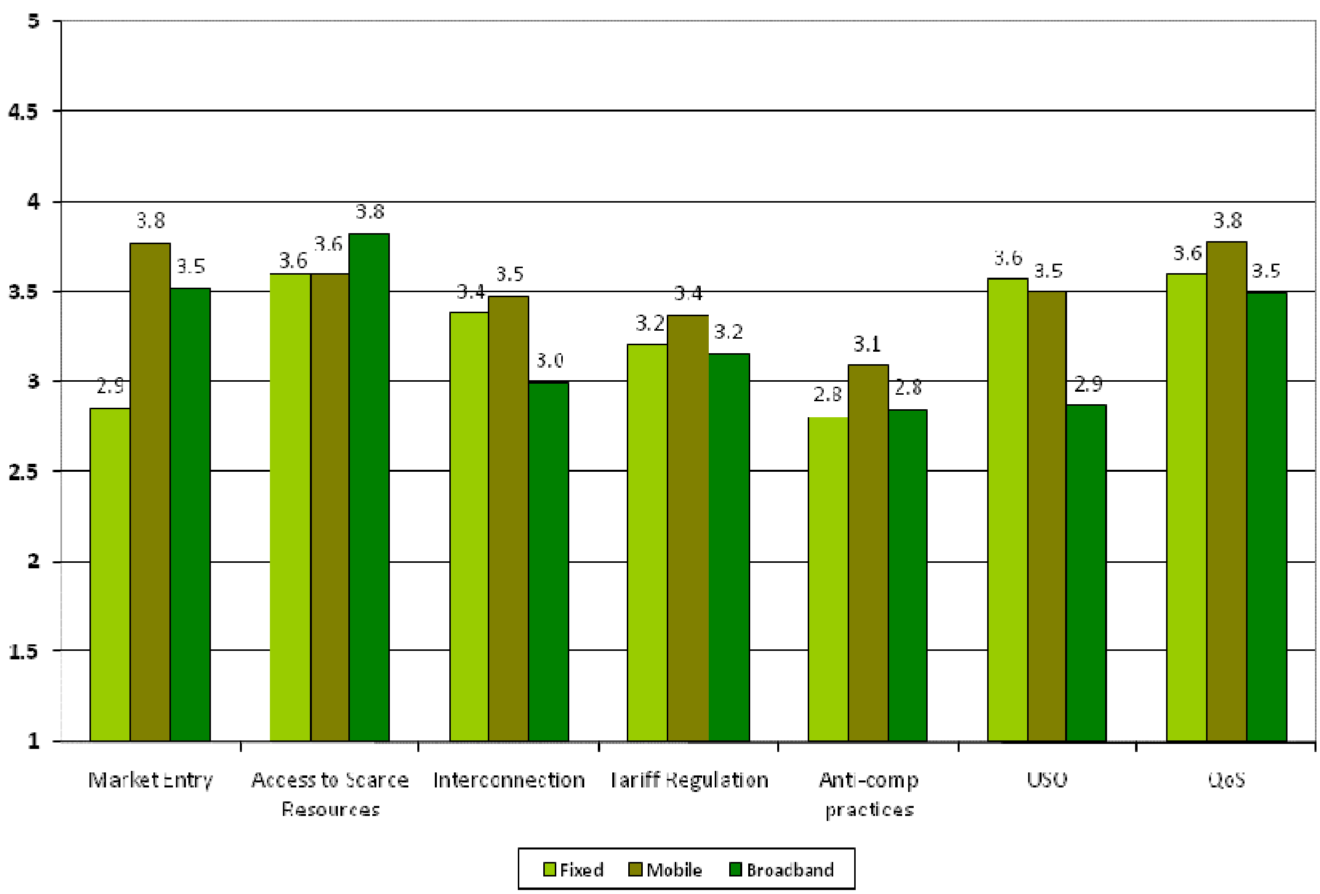
[20] From http://www.minivannews.com/news/news.php?id=4666

3. Results and analysis of the 2008 TRE survey for Maldives

3.1 Overall Scores

Figure 6 depicts the overall scores by sector for the 2008 Maldives TRE Survey.

Figure 6: 2008 TRE Scores for the Maldives



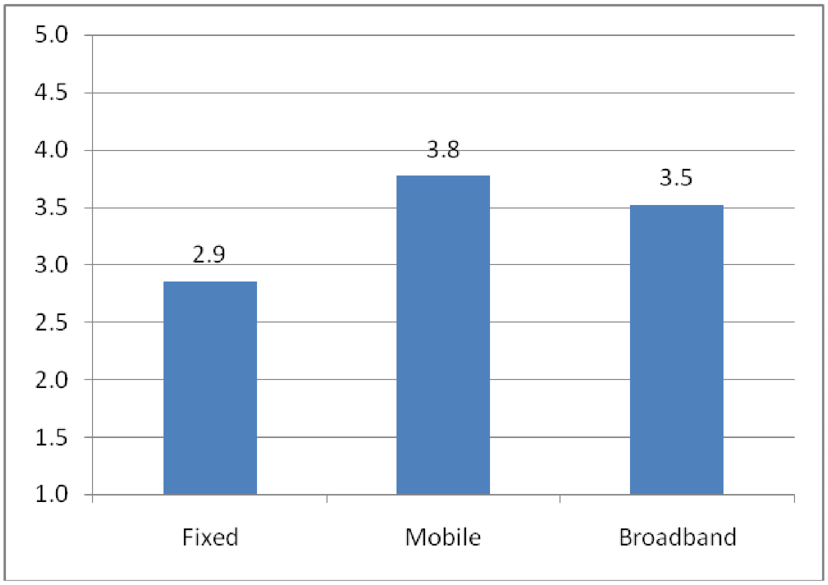
Average scores in each sector (3.2, 3.5 and 3.2 for Fixed, Mobile and BB, respectively) are above the level of average performance (i.e. above the midpoint of 3.0). In most cases (except in USO) we see the mobile sector receiving higher scores than fixed. We also see mobile receiving higher scores than BB, except in the case of access to scarce resources.

Looking at individual dimensions, the lowest scores are overall in the regulation of anti-competitive practices. Highest scores are seen in the regulation of quality of service dimension.

In the following sections we analyze scores in the context of historical and current regulatory and market activity.

3.2 Market Entry

Figure 7: TRE Scores for Market Entry



The fixed sector receives lowest Market Entry scores (Figure 7). This is not surprising since entry into the fixed sector is not an option for any other operator due to the exclusivity enjoyed by Dhiraagu, at least until December 2008[21].

In contrast, the mobile sector has allowed one new entrant (Wataniya) and the selection of that entrant was through a competitive process. These factors perhaps explain the high Market Entry scores received in the mobile sector.

Broadband scores are also high - higher than the mid-point of 3.0 and much higher than fixed scores. The sector also has competition (Focus Infocom) and the selection of that entrant was through a competitive process. This simple fact could perhaps explain the higher scores. Furthermore, it appears that that there are (or very soon will be) at least three (not two) different players in the broadband (or high speed data) market. While Dhiraagu and Focus Infocom are the usual competitors in the broadband sector, recently Wataniya was given approval by TAM to provide leased lines. Wataniya is also about to introduce high-speed mobile broadband through 3rd generation mobile networks using HSPA. In addition to this, Dhiraagu has been granted temporary WiMax frequency in order to test the technology, and it seems likely that a WiMax based broadband option will also be available in the market soon. Ability of the three operators to offer high speed data services through multiple

[21] This exclusivity will (hopefully) end by December 2008, if, as per “Action 4.1.5” of the Telecom Policy of Maldives 2001-2005, no exclusivity is be granted to any telecom operator after existing license expires

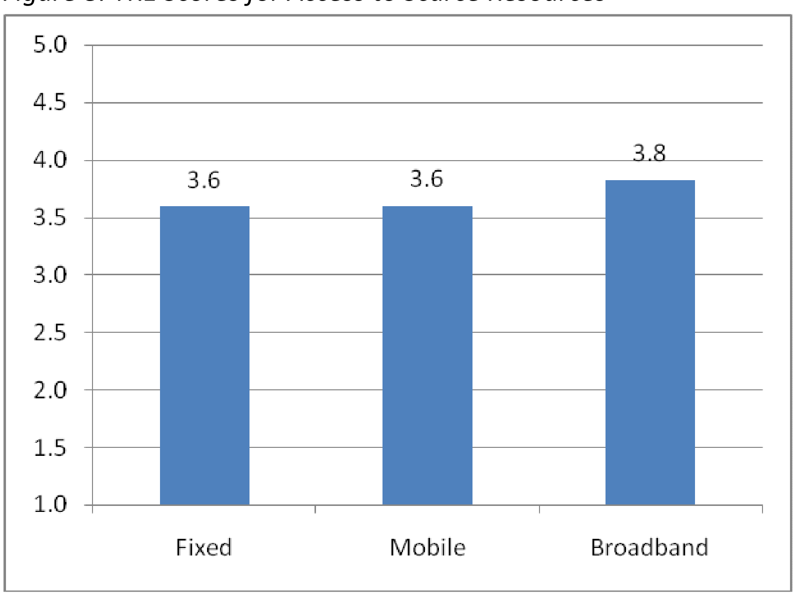
technologies (copper-based ADSL, dedicated leased lines, HSPA and WiMAX) are mostly recent developments, and signal relative ease of market entry in the broadband sector.

Market entry is not just about the ease of entering the market. It is about the conditions under which operators compete once in the market (i.e., competition *for* the market as well as competition *in* the market). When the latter (competition when in the market) is analyzed, there are certain moves by the regulator that can increase the level of competition. One is implementing mobile number portability (MNP). In a market like the Maldives where penetration of SIMs is already above 100%, the only way to acquire new customers is by getting them to switch from one operator to another. But most customers would prefer to do so while maintaining the same number. Obviously MNP has costs and it may not be economical for a very small market such as the Maldives. One could also argue that the value of a single (portable) number is slightly less in the Maldives because most consumers are already used to having two mobile numbers (one SIM from each operator). TAM recently conducted studies on MNP and deemed it not feasible for the Maldives.[22] Further, new pricing plans announced by Wataniya (where customers get same on-net rates offered by Dhiraagu, as pointed out earlier) may make the whole question of MNP irrelevant.

We will point out below at least 3 other dimensions (interconnection, access to scarce resources and anti-competitive practices) where regulatory action may be required to create a more even playing field.

3.3 Access to Scarce Resources

Figure 8: TRE Scores for Access to Scarce Resources



[22] Wataniya publically supported the implementation of MNP as per press releases, e.g. http://www.wataniya.mv/media/Press_release_Number_Portability_010707.pdf

The scores for the fixed and mobile sectors are practically equal. It appears that the operators are not faced with an undue lack of spectrum. Spectrum (including the latest 3G spectrum) is allocated by TAM when a request is made by the operators. Though not officially documented, TAM has a policy of automatically allocating spectrum when certain licenses (that require spectrum to operate) are issued – and example is that a GSM license automatically brings with it spectrum. So far it has been provided free of charge (though in effect there is a "royalty payment" of 5% of gross revenue (minus interconnection costs) charged to all license holders which takes the place of a license fee, spectrum charge and any other charges normally charged by regulators). It appears at least a nominal fee will be charged for WiMax spectrum when it is allocated in the future.

Moreover, in terms of access to international undersea cable and international gateways (a vitally important, yet often highly scarce resources to new entrants in markets that are still liberalizing), the playing field appears to be equal. Maldives has access to 2 separate submarine cables and gateways. Dhiraagu has access to one while Focus and Wataniya have access to the other.

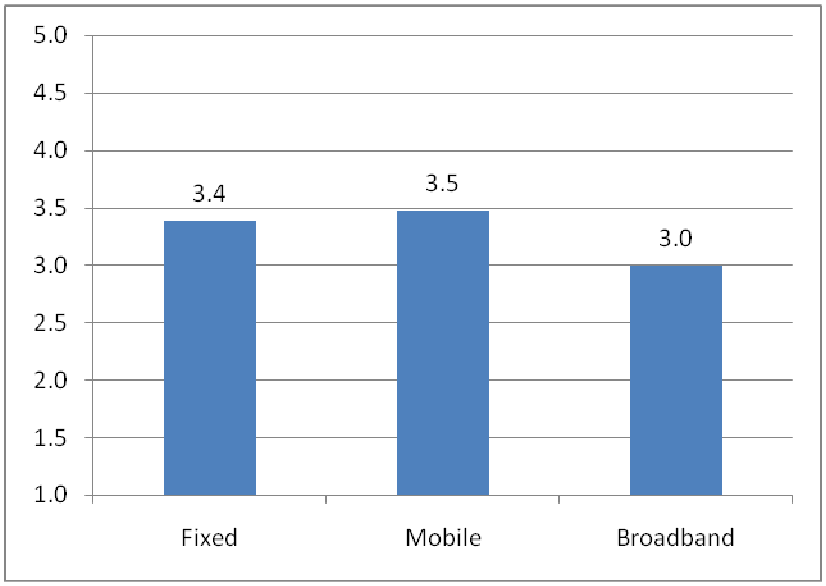
In the BB sector, the two main competitors (Dhiraagu and Focus) have access to microwave links to give data connectivity to the islands (Dhiraagu has its own links, while Focus purchases capacity from Wataniya). Within Male, both companies have access to fiber optic cable – Dhiraagu has its own optical fiber. Focus has access to the fiber owned by the cable operators.

Dhiraagu has recently been granted spectrum to test WiMax services. Wataniya is close to launching HSPA data services based on 3G spectrum. As such, accessing resources (fiber or spectrum, either in the market or through the regulator) for the provision of broadband services does not appear to be cumbersome. These facts perhaps explain the high marks obtained by the broadband sector TRE scores.

While scores are high, in one important aspect, accessing certain types of resources appears to be very challenging for Wataniya. In an economy dominated by high-end tourism, inward international roaming by tourists who are guests at the many resorts is a highly profitable business. Maldives has around 88 resort islands (with many new ones being developed and the total soon to be well over 100). Dhiraagu, the incumbent, had set up base stations and provided roaming services to tourists. Once Wataniya entered the market, they too attempted to set up operations in these islands in order to access the profitable roaming market. However, only eight resort owners approved Wataniya's application for setting up towers. The resorts did not want their luxurious islands visually marred by two unattractive towers instead of the one they already had. When space was requested to use Dhiraagu's existing towers, agreement to share was only reached for one tower. It was and is Dhiraagu's position that the towers in the remaining 80+ islands could not be shared because they were incapable of accommodating the weight of Wataniya's transmitters/equipment, or because Dhiraagu already has plans for using any extra space available on the tower. Requests to the regulator or the Tourism Ministry appear to have not been successful. The result is that Wataniya and Focus, which partners with it to provide data services, are able to operate only in the most competitive segment of the market (i.e. the 200 or so inhabited islands, where they face increasingly stiff price competition from Dhiraagu and faces a very cost-conscious consumer). They are essentially barred from competing in the lucrative inward international roaming market due to lack of access to the resort islands.

3.4 Interconnection

Figure 9: TRE scores for Interconnection



The scores for fixed and mobile are higher than the mid-point of 3.00 and are nearly equal.

When Wataniya was granted a license in 2005, Dhiraagu published a reference interconnection offer (RIO). Eventually the two operators negotiated and agreed upon rates. In practical terms, Wataniya does not appear to have faced undue difficulties or delays in interconnecting to Dhiraagu's network in Male when it first entered. Further both mobile operators receive an equal amount of money (Rufiyaa 0.46, around USD 0.036 at current exchange rates) when calls are terminated on their network. The fixed operator receives slightly more (Rufiyaa 0.49, or around USD 0.038) when calls are terminated on a fixed phone.

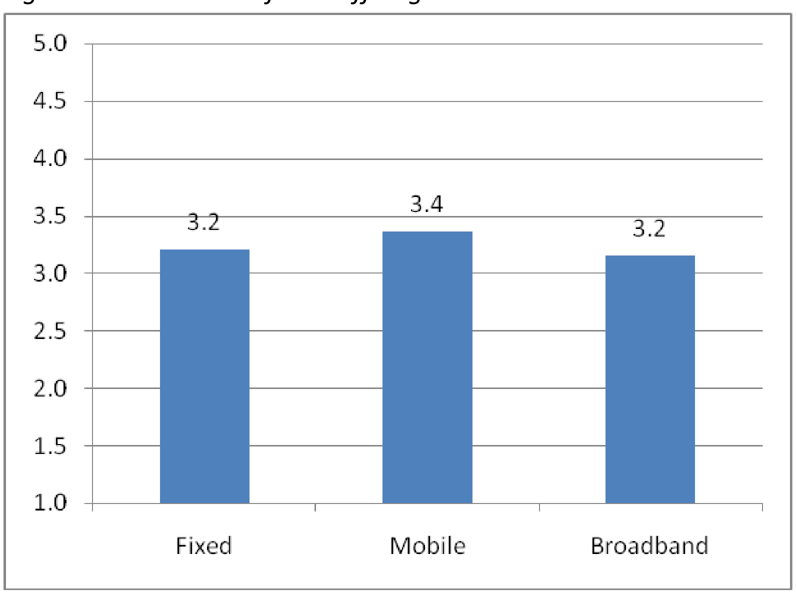
However in terms of international traffic, the rules are uneven. Wataniya is prohibited from carrying international voice traffic into the Maldives and then terminating it on Dhiraagu's network. This prevents Wataniya and Dhiraagu competing head to head for international incoming traffic. Moreover, when Dhiraagu terminates international calls on Wataniya's network, Wataniya states that it makes less money (only around USD 0.04 or 0.05, essentially local termination rates) than it could if it were to carrying its own inward traffic (around USD 0.12 – 0.18, depending on the country of origination). The difference is charged (retained) by Dhiraagu. It is possible (and hoped) that this will end when Dhiraagu's exclusivity runs out in Dec 2008.

There exist significant differences in on-net versus off-net pricing offering by both operators – for a Dhiraagu SIM owner it is significantly cheaper to call other Dhiraagu mobile numbers than to call Wataniya numbers, and vice versa. This is one of the reasons many Maldivians have SIM cards from both mobile operators and use dual-SIM phones. As a result, the situation is such that it's nearly impossible for the new entrant to poach customers from the incumbent. As mentioned already, Wataniya is attempting to eliminate this disparity by introducing calling plans that enable its customers to call Dhiraagu numbers using the Wataniya SIM at the same rate they would if they used their Dhiraagu SIM.

There is no internet exchange in the Maldives. The result is that packets from one ISP leave the country and are then routed back to reach the other ISP. At the moment, this may not be a significant issue since overall Internet traffic volume is low, there is sufficient international bandwidth and most accessed content is probably hosted outside of the Maldives. But usage will not be low forever and demands on international bandwidth will increase as a result (it will further increase if the GoM's plans to encourage off-shore call centers become successful). More and more content will also be locally generated and accessed. In this scenario, keeping local traffic local may be prudent.

3.5 Tariff Regulation

Figure 10: TRE scores for Tariff Regulation



The high scores in the mobile sector are attributable to the hands-off nature of mobile sector tariff regulation where TAM operates an "inform only" policy. The operators have to inform the regulator 5 days prior to introducing any new tariff plan. Unless the regulator raises an objection within 3 days, the operators are free to go to market with the proposed tariffs on the 5th day. In practice, most parties interviewed for this report claim that objections are rarely, if ever, raised for mobile tariffs. The reality is that prices have been dropping significantly, and the two mobile operators are competing head-to-head, each offering new tariff plans that match or beat the other's prices. Though not publicly announced, the regulator does state that no operator will be allowed to drop prices below a certain level – say, below termination rates, for example.

The fairness of applying the same tariff regulation methods to the incumbent as well as to the new entrant could be questioned. The incumbent has over 70% market share. It enjoys exclusivities (e.g. bringing in international traffic and terminating on either network) and has access to markets (e.g. resorts islands) that the new entrant does not. Having been in the market for longer and built out its network under monopoly conditions in the past, its most likely amortized much more of its capital expenditure (unlike the new entrant whose network was only recently built-out). It is reasonable to claim that the incumbent has significant market power. In such an environment, it can be argued that asymmetric regulation of the incumbent provider may be more appropriate, at least until the market shares come close to each other, if not become equal. Of course it is vital to first verify if there is cross subsidy from the fixed business of the incumbent to its mobile business. The 2006-2010 Telecom Policy called for accounting separation prior to the end of 2008. It is unlikely that this deadline will not be met. But TAM does state that it is a priority and that it is working towards account separation in the near future.

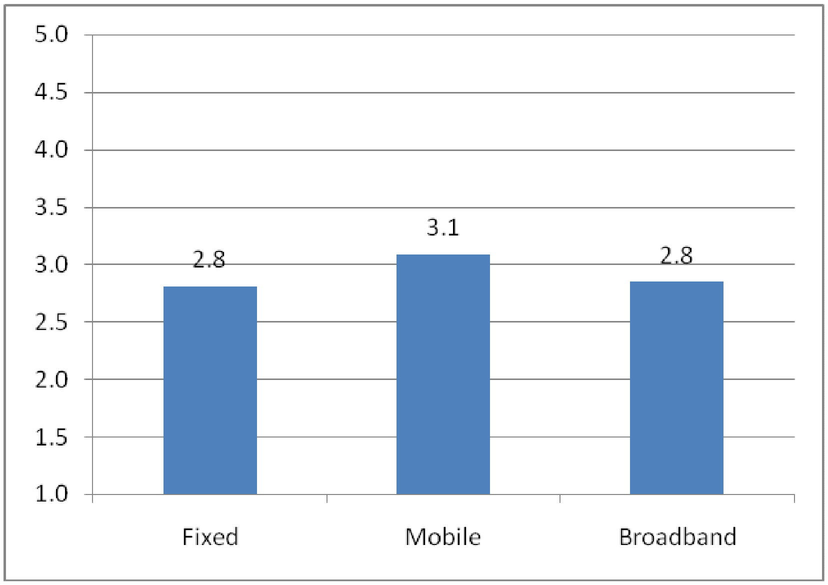
On the fixed sector, there is regulation of prices – Dhiraagu must first obtain TAM's approval before new tariffs can be introduced. However TAM appears to raise objections or call for justifications rarely – by some accounts it has been 6 to 8 months since TAM has even asked for detailed justification of a particular tariff.

Internet or Broadband tariffs also need TAM approval.

Proving that perceptions of negative or positive discrimination are subjective, Dhiraagu claims that they are asked to justify tariffs more often than Wataniya. Interestingly, a survey respondent stated in the questionnaire that "the confidentiality aspect is a problem" due to the "new tariffs being passed onto our competitors via the regulator".

3.5 Regulation of anti competitive practices

Figure 11: TRE scores for the regulation of anti competitive practices



The low scores in this dimension can perhaps be attributed to the perception that TAM (at best) treats the incumbent with market power and the newcomers equally, or (at worst) treats the incumbent more favorably than the new comers.

In the absence of a competition authority, it appears that TAM plays the role of mediator in case of disputes between two parties in the telecom sector. No law suits have been initiated by the 3 major players yet.

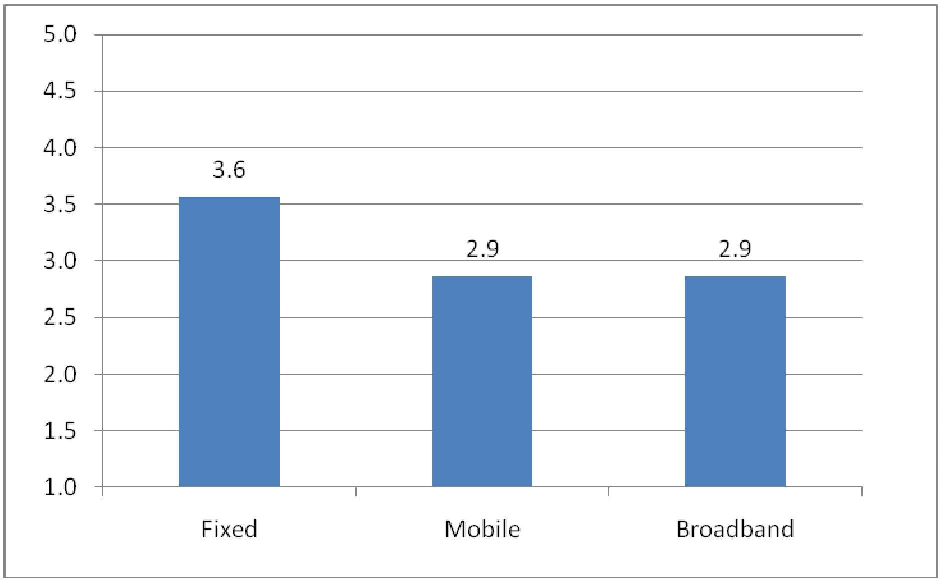
However some stakeholders point fingers at TAM and criticize it for being mandated with maximizing profit for the GoM (through the 55% ownership of Dhiraagu) and as such generally favoring Dhiraagu's profitability and growth over its rivals. However the incumbent too points fingers at TAM and claims that it discriminates against Dhiraagu, or that it makes decisions without keeping them informed.

The opportunity for anti-competitive cross subsidization of a competitive service (e.g. mobile) with revenues earned from a monopoly service (e.g. fixed), does exists in the Maldives. It is occasionally hinted at by industry observers. However in the absence of publicly filed accounts, conclusions cannot be drawn. The Telecom Policy 2006-2010, in aiming for best practice, has called for accounting separation by the end of 2008. Interestingly the Policy appears to call for accounting separation for all companies, not just for the incumbent, and TAM states that it will be implemented by 2008 as planned. Though accounting separation is not a cure for everything, once implemented it could help answer the question of cross subsidization. A cleaner solution may be separation of the backbone business from the access business, with Wataniya also being allowed to provide fixed service as it sees fit.

Apart from the 2003 Telecom Regulation which established TAM, there are no other laws pertaining to the sector. There is also an absence of subordinate regulations and standards – as such, there are few documented rules for operators on anything (be it on how tariffs will be regulated, on how quality of service will be measured or the multitude of other dimensions under the regulator's purview). Most decisions are therefore made on an ad-hoc basis, on demand. On the plus side, it is better to have no rules than to have rigid and/or bad rules. And the rules/decisions made by TAM so far have been by and large "good" ones. But the negative side, the regulator having so much discretion increases regulatory uncertainty.

3.6 Universal Service Obligations

Figure 12: TRE scores for Universal Service Obligations



The universal service obligations imposed on Dhiraagu and Wataniya on mobile services have been essentially met, with both operators covering 96% - 100% of the population. Take up is also high as evidenced by the mobile penetration of 129 SIMs per 100 people in August 2008[23].

On the fixed side, a phone is available within walking distance to every citizen, via public telephone booths installed by Dhiraagu[24]. However take up by citizens of residential fixed phones was low. This is perhaps due to the access network being under developed or non-existent in the most populated islands [25]. In 2007 attempts were made to bring fixed phone and broadband services to about 27 remote islands with over 1500 people by encouraging cooperatives (from the islands) to work on a risk and

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[23] Note that this number is calculated based on the total number of SIMs reported by the regulator for August 2008 and the total population reported by the Ministry of Planning and National Development for August 2008. The regulator calculates a higher number (of 133.44 SIMs per 100 people) based on the 2006 population reported by the MPND.

[24] Seventh National Development Plan 2006-2010: Creating New Opportunities, Government of Maldives, Ministry of National Planning and Development, 2007 (http://www.planning.gov.mv/en/images/stories/ndp/seventh_ndp.pdf)

[25] According to the Maldives Telecom Policy 2006-2010, published on 1 August 2006, access networks to provide fixed line services have only been developed in 13 out of the 200 populated islands.

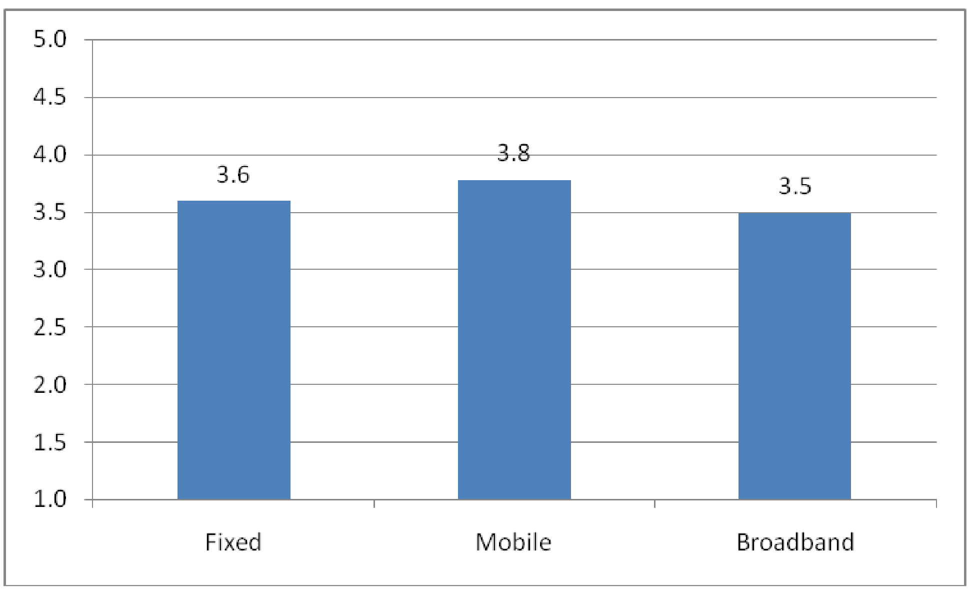
revenue share basis with Dhiraagu. The cooperatives were to build the access network within the island and provide residential connectivity. Dhiraagu was to sell access on its network. However the program has essentially been abandoned due to lack of interest and/or due to the inability of the island cooperatives to make sustainable profits. This is perhaps not surprising in light of the availability and convenience offered by mobile phones. Fixed lines are being substituted by mobile SIMs across emerging Asia.

Given the wider geographic coverage of mobiles, the low TRE scores given to the mobile USO TRE are odd. But from a regulatory point of view, though no USO payments were levied on the mobile operators, mobile USOs appear to have been explicitly imposed, while fixed services were allowed to rollout at a slower scale. This perhaps explains the lower scores in mobile.

At present it is estimated that around 70% of the Maldivian population can obtain access to broadband coverage through Dhiraagu. There are no universal service obligations imposed on the broadband sector, but the new telecom policy places a narrow-band offering (of a minimum 250 MB download limit per month at 56 kbps speed) in the “basic telecom package” that the GoM hopes will be available to all households for a specified price.

3.7 Quality of Service

Figure 13: TRE scores for QoS



All three sectors receive above-average scores.

The voice operators report to TAM data against standard quality indicators (e.g., faults per line). But it is unclear if TAM uses the data in decision making.

However consumer complaints on QoS appear to be taken seriously by the regulator. When such complaints are received they contact the relevant operator(s) and request them to act on it, and follow through.

3.8 Conclusions and Recommendations

Maldives has taken important first steps towards liberalization by enabling limited competition in two of the three sub-segments of the telecom market. However it still has to contend with an incumbent whose historical advantages continue to give it a significant advantage over the competitors. It also has less-than-ideal duopoly situations in the mobile and broadband segments. The obvious connection between the incumbent and the government, together with a regulator with little independence from the government, has contributed to creating the perception that new entrants face a less than equal playing field. That this is a key area of concern for stakeholders is shown in the TRE survey - the lowest scores given by stakeholders for the Regulation of Anti-competitive Practices dimension when compared to the other 6. Procedural legitimacy is compromised by the fact that:

- the current Telecom Act is on its last legs and a new one hasn't been approved
- there is a lack of subordinate regulation or rules issued by TAM (though several have been drafted and are used internally for decision-making, they are not made available to operators).
- the manner in which regulatory decisions are made is ad-hoc, demand driven and without standardized or transparent procedure

The first set of recommendations based on the TRE survey therefore is to address these concerns by:

1. Passing a new Telecom Policy which gives financial and legal independence to TAM

Regulatory independence however is not an end in itself. It is quite possible to have an independent regulator who makes arbitrary and unsound regulatory decisions. Worse, independence might free the regulator from interference and deep oversight by the government, but enable it to carry out the orders of other private parties, be they operators or other influential personalities. In small markets where the stakeholder is personally and professionally connected to each other, there is plausible risk of this happening. The goal therefore is not just independence, but the removal of discretionary power along with it. A starting point for reducing discretion is therefore to :

2. To adopt transparent and standard procedures in the rulemaking process. For example, TAM could say that it will always follow certain steps before a decision is made. These steps will include the publication of consultation papers (which is effect an advance announcement of the decision TAM intends to make in the future, soliciting feedback from stakeholder on said consultation paper through formal written submissions and public hearings, altering of decisions based on input received through such submissions by stakeholders). These actions reduce the

opportunity for one stakeholder to unduly influence the rules, increase the chances of better rule-making because more broad stakeholder input has been incorporated in the final decision, and reduces regulatory risk (because the operators are aware of future rules/decisions that will affect them well before they come into force). More importantly, such steps increase the transparency of the rule-making procedure.

Once the procedures are established, TAM should move as fast as possible to identify key areas of regulation which require rule-making. Routine but important things such as tariff regulation and quality of service regulation require rules that don't impose undue burdens on the time of the regulator. Less frequent but other important activities such as rules on the allocation of frequencies, issuance of licenses, rights of way, numbering and so on can be more resource incentive in their implementation. In summary, the next recommendation is to:

3. Through a consultative process, draft and make available to all stakeholders subordinate regulations that cover the key areas under TAM's purview.

The above recommendations are aimed at addressing issues around independence and accountability of the regulator, the process (formal and informal) by which decisions are made, the transparency and predictability of decision-making and other matters related to regulatory governance, or the "how" of regulation.

The next set of recommendations are about regulatory substance, the "what" of regulation. They relate to the actual decisions made or to be made by the regulator and the reasoning behind those decisions. The recommendations are centered on making the competitive environments faced by the new entrants more equal to that faced by the incumbent. The opportunity for doing this is naturally presented when Dhiraagu's existing licenses come up for renewal in December 2008. The recommendations are therefore :

4. End Dhiraagu's existing exclusivities in all segments and sectors. This would

    a. Allow *at least* Wataniya and Focus (should they so wish) to enter each sub-segment of the market that they are not currently operating in. This means, for example, that both new entrants would be free to offer fixed phones. Ideally Maldives will move to a unified licensing regime to do this.

    b. Allow Wataniya to carry international traffic into the Maldives and terminate on any phone number, including those that belong to Dhiraagu.

Entry into a market that already has more than 100 percent penetration (in the mobile sector) is a challenge even for a new competitor with deep pockets. Access to backbone is the biggest challenge a new entrant will face. TAM therefore needs to avoid duplicate backbone having to be built (yet again, similar to what Wataniya did upon entry), and make market entry attractive to new comers by providing mechanisms for them to access backbone.

5. To make the market attractive to a new entrant and reduce investment in yet another backbone by:

    a. Mandating that existing operators share backbone with any new entrant into the sector on a non-discriminatory basis, or

    b. Separate the incumbent's backbone network and create a new company that operates the backbone. This would give a new entrant a choice of backbone providers between the two existing players, and only require that it invest in the access network. Further into the future (when the playing fields are more equal) TAM could even request that Wataniya also separate its backbone from the access network business.

If market entry allowed and is made attractive to newcomers through actions such as those listed in 4 and 5 above, it may attract new players into the market. However, even if a new entrant captured the whole market, it is still a small market in the Maldives. Therefore economies of scale are not likely to come into play. Anyway capturing 100% market share would be near impossible since (at least the mobile) market is already saturated. Therefore the chances of failure for a new entrant are high. In a large market like India, a failing company may have the opportunity to try to capture a different market segment, or focus on a different geographical region. In Maldives these are not options. The only option therefore is to exit. Exit is a natural part of a competitive market, and should not (and cannot) be prevented. However the regulator needs to ensure that:

6. Any firm wishing to exit the market is bound by a set of pre-defined conditions/rules that are clearly laid out prior to entry. At a minimum rules on how to deal with stranded consumers need to be included in these conditions. In addition, requirements such as entering into good faith negotiations with the government and other existing operators could be useful. A significant deposit could even be required of new entrants, with the understanding that these funds would be used to cover cost of exit.

Recommendations 1 – 6 above are important actions that often require changes in law or procedure. Such changes will take time. In the meantime, there is at least one area that TAM can address without too much effort: should and could address immediately.

7. Implement the accounting separation clause already listed in the Telecom Policy 2006-2010. At a minimum this will help prove or disprove the whispers about cross-subsidization and improve perceptions.

8. Play a more active (or forceful) role in getting Wataniya tower access in the resort islands. In order to do this, TAM needs to not only work with other government agencies (such as the Ministry of Tourism) but also think of creative solutions (perhaps running a competition among internationally renowned architects to design cell phone towers that "blend into" the resort island architecture, or create towers that are works of art in themselves. This way, the resort owners may look forward to installing them in their islands.

The above list is perhaps aspiration, and not all recommendations will pass feasibility tests. However these are all areas that need the attention of TAM in the short to medium term to ensure the vibrant telecom sector continues to grow, the operators remain profitable, and the communications needs of the citizens and business are met (affordable and high quality services, choice of service providers, innovative services made available).

4. Acknowledgements

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5. Annex 1: Methodology

The TRE instrument was developed by LIRNEasia and documented in detail in Samarajiva et al 2007[26]. It has been implemented in 2004 and 2006 in developing Asian countries. The TRE instrument asks informed stakeholders to rate (on a Lickert scale of 1 to 5, 1 being highly unsatisfactory, 5 being highly satisfactory) the Telecom Regulatory and Policy Environment in a country along 7 dimensions. 5 of the 7 dimensions are based on the GATS protocol. In addition, the QoS and Tariff Regulation dimensions have been included, given their importance.

Potential respondents come from 3 different categories:

- Category1: those directly involved in the sector such as operators, equipment vendors.
- Category 2: those indirectly impacted by the sector or those studying/observing the sector with broader interest such as consultants and lawyers.
- Category 3: those who represent the broader public interest such as media personnel, other government officials, retired regulators, civil society organizations.

Number of Responses: The minimum number of respondents per category for a micro-state such as Maldives is 5, as per the TRE methodology. The Number of respondents for Category 1, 2 and 3 were 7, 4 and 5, respectively. Given the small market size, and the very small number of operators, finding adequately informed respondents proved to be a challenge, perhaps not surprisingly. This proved to be particularly challenging for Category 2. The response rates for Category 1, 2 and 3 were 46%, 57% and 42% respectively.

Weighted scores: The methodology specifies that each category should contribute equally to the final TRE score. However in these types of surveys it is not possible to pre-plan how many completed questionnaires will be returned. As such, it is not always possible to obtain an equal number of respondents from each category. Therefore weights are used to equalize the contributions made per category. The weights assigned to Category 1, 2 and 3 were 0.7619, 1.3333, 1.3333 and respectively. The raw (un-weighted scores), weights assigned, and the final (weighted) scores for each dimension are shown in Table 5.

[26] Samarajiva R, Galpaya H, Goswami D, Ratnadiwakara D, *Telecom regulatory Environment Assessment: Methodology and implementation results from five emerging economies*. Available at http://www.lirneasia.net/wp-content/uploads/2008/05/lirneasia-tre-paper-for-tprc-v8.pdf

Table 5: Raw and weighted scores, Maldives TRE, 2008

Dimension	Dimension	Raw (un-weighted) score	Final (weighted) Score
Market entry	Fixed	2.8	2.9
	Mobile	3.8	3.8
	Broadband	3.5	3.5
Allocation of scarce resources	Fixed	3.4	3.6
	Mobile	3.7	3.6
	Broadband	3.7	3.8
Interconnection	Fixed	3.3	3.4
	Mobile	3.5	3.5
	Broadband	2.9	3.0
Tariff regulation	Fixed	3.1	3.2
	Mobile	3.5	3.4
	Broadband	3.1	3.2
Regulation of anti-competitive practices	Fixed	2.6	2.8
	Mobile	3.0	3.1
	Broadband	2.7	2.8
Universal service obligation	Fixed	3.3	3.6
	Mobile	3.3	3.5
	Broadband	2.7	2.9
Quality of Service	Fixed	3.4	3.6
	Mobile	3.8	3.8
	Broadband	3.4	3.5

Modes of completing the questionnaire: Though web and paper (in person or faxed) surveys were available, the primary mode (for 94% of respondents) preferred by the respondent was the web survey. Only 6% of the respondents used a paper-based survey.

Previous surveys: While TRE surveys were previously conducted in 2004 and 2006 in several emerging Asian countries, 2008 is the first time the survey was conducted in the Maldives. As such there is no time-series data to compare.

6. Annex 2: Summary of Regulatory and Policy Events for the Maldives

The following information was made available to all survey respondents in order to refresh their memory on recent regulatory and policy developments

Date	Event/Action

January 2007	**Regulation on the use of satellite phones passed:** Under the regulation, satellite phones need to be registered and used under license issued by TAM.
January 2007	**Carrier license issued to WARF:** Carrier license to WARF Telecom International Private Ltd, the company established to connect the Maldives to the international fiber optic backbone.
February 2007	**Guidelines on issuing frequencies for temporary use:** Guidelines issued for permitting the use of temporary frequencies for purposes like equipment testing, demonstrations and exhibitions etc.
April 2007	**Regulation for issuing frequencies for Terrestrial Broadcasting introduced:** The regulation was introduced in line with the announcement of the government intention of opening up of Broadcasting services in the Maldives to private parties.
August 2007	**Frequency Band identified for the use of WiMax Technology in Maldives:** After testing the use of WiMax on different bands, 3.3 GHz band was identified for the use of WiMax in the Maldives.
September 2007	**Regulation on satellite uplinking for broadcasting passed:** Regulation issued in line with the opening up of broadcasting services and the decision to facilitate broadcasters by permitting satellite uplinking for broadcasting purposes.
September 2007	**Broadcasting Station Licenses issued**: Station licenses issued to broadcasters to operate broadcasting stations and permit the use of assigned frequencies to transmit broadcasting signals.
October 2007	**Draft Telecom Bill prepared:** In accordance with the Telecom Policy which calls for the strengthening of the legal powers of the Regulator, a Telecom Bill was prepared and submitted to the President's Office and the Ministry of Legal Reform and Information for approval. It is expected that the Bill will be submitted to Parliament during 2008.
October 2007	**Feasibility study on Mobile Number Portability carried out:** In line with international precedents and as a means of ensuring relative competitiveness in the mobile market, introduction of Mobile Number Portability (MNP) was considered and a feasibility study was undertaken. The study concluded that the financial burden of implementing MNP was far higher than the consumer benefits to be gained.
October 2007	**Regulation on issuing 4-digit Short Codes for Important Public Services:** TAM to approve valid requests for Short Codes to provide important public services targeting a relatively large user base.

October 2007	**Arrangement with fixed line operator Dhiraagu on providing fixed line residential service to islands with no residential service:** Dhiraagu will enter into revenue share agreements with interested corporate entities belonging to island communities to provide fixed line residential service to the islands.
October 2007	**Approved provision of Wi-Fi internet services by Dhiraagu:** Regulatory Board approval for Dhiraagu to provide Wi-Fi internet services to Male' area use the 2.4GHz frequency band.
March 2008	**Amendment to Regulation for issuing Short codes:** Amended to included detail on classifying private and public short codes and fees to be charged.
June 2008	**Assignment of Frequency Band for Radio Linking:** 5.725 - 5.850 GHz frequency band assigned for establishment of radio links for broadcasting purposes.
June 2008	**Approved provision of satellite phone services by Dhiraagu:** Regulatory Board approved provision of satellite phone services by Dhiraagu using Thuraya satellite phones.

Telecom Regulatory and Policy Environment in Thailand
Results and Analysis of the 2008 TRE Survey

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***Abstract:** The average result of the TRE survey in Thailand (2.8 out of 5) reveals mixed performance of the National Telecommunications Commission (NTC), the Thai telecom regulatory body. Higher TRE scores for market entry (3.1), tariff regulation (2.8) and quality of services (2.9) are interrelated. That is, the NTC has clearly adopted a liberal licensing regime that has led to increased competition in many markets, in particular, the broadband and the international internet gateway markets. New entrants into the broadband market are guaranteed access to the local loop or can request for a WiMAX license. Abolition of the monopoly over the international internet gateway (IIG) was a major boon to the industry.

At the same time, its rather light-handed approach to tariffs regulation through the establishment of price ceilings that are mostly non-binding on operators, allow market mechanism to function without distortion. In general, greater competition in mobile, broadband, and IDD has resulted in lower costs and higher service quality that helped boost TRE scores in these categories.

***Keywords:** TRE Survey, Thailand

Telecom Regulatory and Policy Environment in Thailand

Results and Analysis of the 2008 TRE Survey

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List of Acronyms

ADSL	Asymmetric Digital Subscriber Line
AIS	Advanced Info Service PLC.
BTO	Build-Transfer-Operate
CAT	Communication Authority of Thailand
EGAT	Electricity Generating Authority of Thailand
HHI	Herfindahl-Hirschman Index
IC	Interconnection
IDD	International Direct Dialing
IIG	International Internet Gateway
ISP	Internet Service Provider
MEA	Metropolitan Electricity Authority
NBC	National Broadcasting Commission
NTBC	National telecommunications and Broadcasting Commission
NTC	National Telecommunications Commission
PEA	Provincial Electricity Authority
QoS	Quality of Service
SOE	State-owned Enterprise
TA	Telecom Asia Corporation
TAC	Total Access Communication PLC.
TBA	Telecommunications Business Act
TOT	Telephone Organization of Thailand
TRE	Telecom Regulatory Environment
USO	Universal Service Obligation
VoIP	Voice over Internet Protocol
WiMAX	Worldwide Interoperability for Microwave Access

1. Executive Summary

The average result of the TRE survey in Thailand (2.8 out of 5) reveals mixed performance of the National Telecommunications Commission (NTC), the Thai telecom regulatory body. Higher TRE scores for market entry (3.1), tariff regulation (2.8) and quality of services (2.9) are interrelated. That is, the NTC has clearly adopted a liberal licensing regime that has led to increased competition in many markets, in particular, the broadband and the international internet gateway markets. New entrants into the broadband market are guaranteed access to the local loop or can request for a WiMAX license. Abolition of the monopoly over the international internet gateway (IIG) was a major boon to the industry.

At the same time, its rather light-handed approach to tariffs regulation through the establishment of price ceilings that are mostly non-binding on operators, allow market mechanism to function without distortion[1]. In general, greater competition in mobile, broadband, and IDD has resulted in lower costs and higher service quality that helped boost TRE scores in these categories.

On the other hand, in areas where regulatory rules are required as market forces cannot deliver the desired outcome, such as interconnection, universal service and anti-competitive practices, TRE scores are slightly lower. They are 2.5, 2.6 and 2.7 respectively. This reveals NTC's limited capability in dealing with more complicated regulatory rules that require profound understanding of the issue at hand and clear and transparent rules to ensure fairness and predictability of the regulatory regime. At the same time, the lack of a comprehensive database on key regulatory variables such as cost, capital expenditure, price levels and quality of service, etc. does not bode well for regulations that require these data.

Several comments expressed through the questionnaires addressed concerns about unclear and broad rules or regulations or the lack of detailed implementation regulations ranging from licensing, tariffs regulation to universal service obligation.

It should be noted, however, that certain TRE scores reflect not only the performance of the NTC, but also other external factors that affect the regulatory environment. For example, the low interconnection score can be attributed to the legal battle surrounding the arbitrary access regime established during the telecom concession era that are inconsistent with NTC's current interconnection rules. As the Constitution upholds these concessions, it is beyond NTC's control to solve the problem. Similarly, the much delay in the establishment of a joint frequency allocation committee between the National Telecommunications Commission and the National Broadcasting Commission (NBC) due to political wrangling contributed to low access scores as the NTC was not able to proceed with the auctioning of the 3G licenses without proper legal clearance.

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[1] The exception would be the tariff regulation for (politically sensitive) local fixed line services that appears to be well below actual costs as the NTC chooses to maintain the prevailing rate that has not been adjusted in 20 years.

To sum up, although the NTC has contributed significantly to a more competitive telecom market with its relatively liberal licensing policy, unclear regulatory rules pose a major problem for telecom operators and absence of proper quality regulation has left consumers at the mercy of service providers. Nevertheless, the Thai experience shows that competition can go a long way in protecting consumers in the absence of proper regulatory oversight

Going forward, to improve the current regulatory environment, it is recommended that the Thai government and the NTC take the following key measures or steps;

The Thai Government

1. Devise a concession conversion scheme that will eliminate clauses that are consistent with NTC rules, in particular those concerning arbitrary access charges that are levied on certain mobile operators, price regulations by TOT and revenue sharing schemes between state enterprises and private concessionaires.

There has been no major progress in this area thus far since the last failed attempt back in 1999. Any conversion scheme would have to be perceived as transparent and fair, not only by the private concessionaires and the state owned enterprises, but also by the public. Past attempts at converting these concessions have become subject to alleged money politics and vested interests.

2. Urgently pass the draft amendment of the Frequency Allocation Act to establish the NTBC so that frequency allocation and assignment can be undertaken properly.

The NTC

1. provide clear definition of type 1 2 and 3 license in order to promote transparency in the granting of licenses.

2. urgently build up cost data base for key services that will allow effective cost-based price regulation, in particular for interconnection charges and fixed line services.

3. urgently build up industry's data base that contain detailed data about service providers, their revenues, output, prices, and quality of services.

4. clarify and pass clear rules regarding its anti-trust rules such as providing market share threshold for dominance and pre-merger notification requirement and provide implementing guidelines for vague prohibitions such as predatory pricing.

5. establish a clear and transparent accounting system that is publicly accessible for the use of universal service fund.

2. Introduction: The Development of the Thai Telecom Market

Telecommunications services in Thailand were once exclusively provided by two state-owned enterprises (SOEs): the Telephone Organization of Thailand (TOT), which held a monopoly over domestic telephony, and the Communication Authority of Thailand (CAT), which had the monopoly over international gateway services. The market division between the two SOEs held throughout the early development of telecommunications sector in Thailand, but in the early 1990s, it was recognized that the industry could grow further through the infusion of private capital.

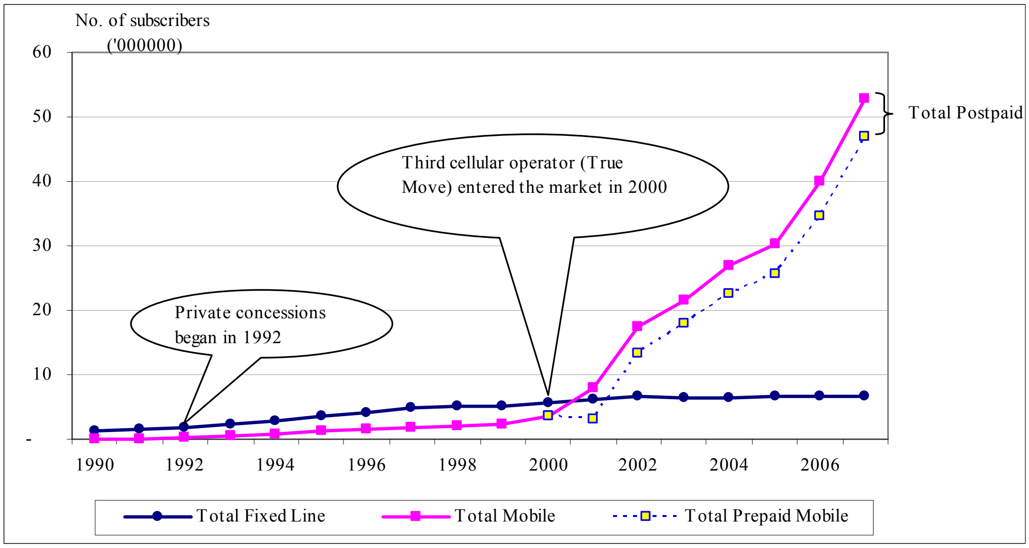
A unique scheme evolved to preserve the statutory monopoly of the two SOEs, while accommodating the private sector. Starting in 1992, TOT and CAT awarded concessions to private companies to undertake network development and provide fixed line, mobile, satellite, paging and other communication services, under Build-Transfer-Operate (BTO) agreements. Under such an agreement, private concessionaires invested in infrastructure and transferred legal ownership of the installed network to the state operator upon completion. In exchange, they were granted 25-30 years' exclusive operation of the network. Over 30 telecom concessions were signed and implemented in the nineties.

The entry of the private sector into the Thai telecom landscape via BTO concessions ushered in an era of remarkable expansion in the subscriber base of both the fixed and the cellular networks, as can be seen in Figure 1 below. The figure reveals a striking divergence in the growth paths of fixed versus mobile services. This was because the fixed line concessions specified the maximum number of lines that each private operator was allowed to install. Since no new concessions were granted during the later half of the nineties, the roll-out of the fixed line network stalled when the number of installed lines reached the ceiling.

The concession era came to an end with the promulgation of the Telecommunications Act in 2001, which terminated statutory state monopolies by empowering the National Telecommunications Commission (NTC) to issue new telecom licenses. The law, however, also upholds the legal legitimacy of the BTO concessions, meaning that all terms and conditions stipulated in telecom concessions signed between the state telecom operators, TOT and CAT, and the private telecom operators in the past remained effective.

This has been a major regulatory problem as these concessions contain provisions that are inconsistent with regulatory rules established by the NTC. Since BTO concessions were written up during the time when state enterprises are monopolies and assume certain regulatory role, they contain several clauses that overlap with the NTC's regulatory functions. For example, private operators were required to obtain a permission from the state-owned operators for any price changes, network expansion or introduction of new services and pay access charge according to terms and conditions of the concessions. This has posed a major obstacle for the NTC in introducing interconnection charges and regulate prices. Much of the discontent expressed by respondents are a result of this particular problem that can only be solved at the policy rather than regulatory level.

Figure 1: Telecom Market Development during 1990-2007



Source: Companies' data (TOT, TT&T, AIS, DTAC, TrueMove)

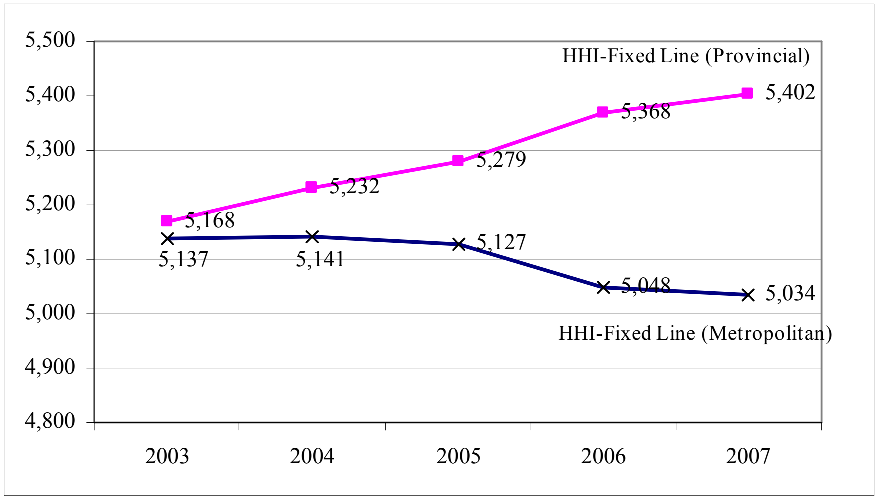
Private sector entry into the telecom sector has introduced competition into what was once a monopolistic market. The degree of competition in each sector varies, however, on the number of concessions handed out and the terms and conditions of the concessions.

The fixed line market is divided into 2 separate geographical markets: the Greater Bangkok market and the Provincial market. Both markets are duopolistic. This is because the two private concessionaires, TA[2] and TT&T, are allowed to provide services only in their respective area, while the state operator, TOT, operates nationwide and thus competes directly with its private concessionaires in both markets.

The level of competition in the fixed line markets as measured by the HHI index for the Bangkok market has increased (HHI declined) during 2003-2007 as can be seen in Figure 2. This is due to the fact that the market share of the 2 providers in the market, - the state (TOT) and the private operator (TA) – has been converging. On the contrary, in the provinces, the state operator's market share has continued to climb at the expense of that of its financially strapped private concessionaire, TT&T. Indeed, the lack of competition in this duopoly has led to much lethargy in the fixed line market. Several network licenses that allow broad service category have been granted by the NTC but no new fixed line roll out is anticipated. This may be due to the extremely low regulated fixed call tariff rates, which makes any investment in the service commercially unviable. New network service providers are badly needed in the fixed sector.

[2] TA was changed the company name to "True Corporation"

Figure 2: HHI – Fixed Line



Source: Calculated by author using data from TOT, TT&T and True Corporation

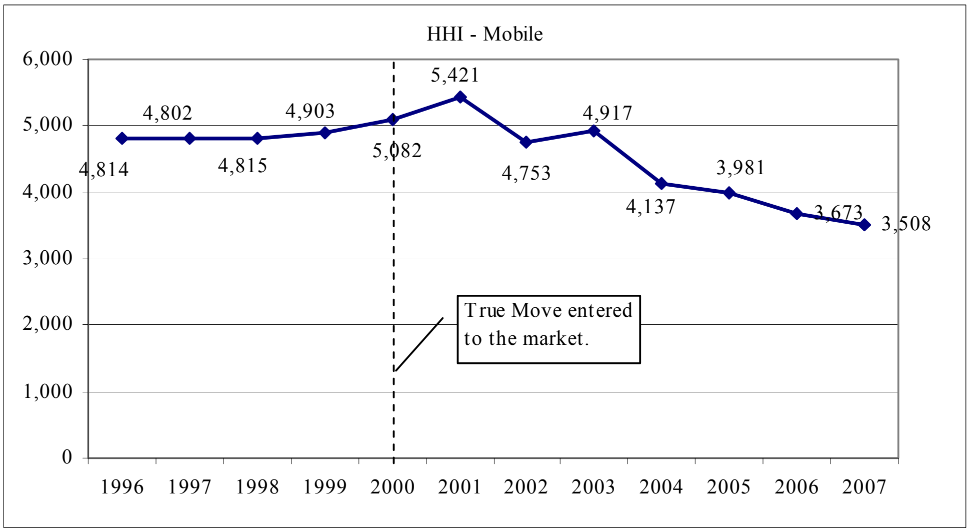
The mobile phone market has three major service suppliers, all of which are private concessionaires. They are Advanced Info Service PLC.(AIS), Total Access Communication PLC. (TAC or DTAC) and True Corporation (True Move). The fourth player that is trying to establish a foothold in the market is the state owned Thai Mobile, currently the only operator with a 3G license. The latter was a joint venture between the two state operators, the TOT and the CAT until mid 2008 when TOT acquired the entire equity stake as the partnership encountered many problems.

In terms of past trends, the level of competition in the cellular market, measures by the HHI Index, has increased markedly after 2001 after the entrance of the third major mobile operator in the market, as can be seen from Figure 3 below. Since then, competition between 3 major private suppliers has been fierce so that each provider's market share has become more comparable as the dominance of once formidable AIS fades away. The HHI index is likely to continue to fall with the continued decline in AIS's market share. However, in the absence of a fourth player in the market, the index cannot fall below 3333. A potential major entrant in the market is TOT's Thai Mobile, the only operator with a 3G license as mentioned earlier. However, the only state operator is still saddled with legal problems concerning the transfer of the 1900 MHz frequency from the CAT, its former joint venture partner that pulled out during mid 2008. The NTC will have to decide whether to allow the requested transfer or re-open an auction for the said frequency. The whole process is likely to take several months as public hearings are required.

The broadband market has been booming due to a number of new internet licenses handed out by the regulatory body over the last 2 years. Nevertheless, incumbent provider with extensive existing fixed line network such as True was able to capture the main market share, with the state owned operator, TOT, trailing well behind new comers will have to face right of way problems and will have to spend significant time and investment in network installment.

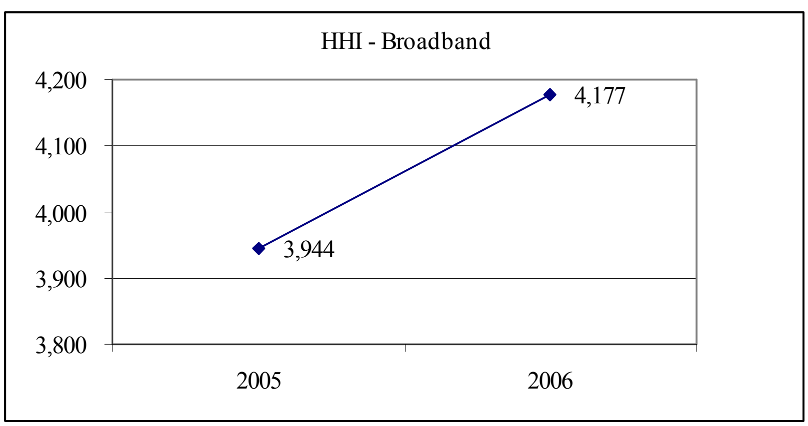
Potential competitors with extensive right of way in hand such as the state electricity enterprises were able to secure licenses from the NTC. However, they have been mired in legal problems as it is not clear whether the law allows them to be engaged in services unrelated to its core activity, electricity generation and distribution. In the absence of new effective entrant, the private incumbent continues to capture ever larger share of the market from rapid roll out of its broadband network. Hence, the higher HHI index as shown in Figure 4 below. The index will likely begin to fall over time as new entrants begin to install networks.

Figure 3: HHI - Mobile



Source: Calculated using data from AIS, DTAC and True Move

Figure 4: HHI – Internet Broadband



Source: Calculated using data from IDC Thailand

In summary, Thailand's telecom industry has benefit greatly from private sector participation since over a decade ago. Competition among the private sector has resulted in a cellular boom that has markedly improved the connectivity of the people. In contrast, the fixed line roll-out has been constrained by the conditions stipulated in the concessions, which limited the number of lines that private concessionaires may roll out and the lack of new entrants into the lethargic market. Nevertheless, given the numerous network licenses handed out by the NTC in the past 3 years, more competition in all markets is anticipated.

3. Methodology

To attain the research objectives, the survey had been conducted a perception survey of informed stakeholders of Thailand's telecom sector during June-August 2008. Respondents were asked to evaluate the regulatory and policy environment in Thailand's mobile, fixed and broadband markets along 7 different dimensions (market entry, access to scarce resources, interconnection, tariff regulation, regulation of anti-competitive practices, universal service obligations and quality of service). The evaluation is done on a Lickert scale of 1 to 5, 1 being "highly ineffective" and 5 being "highly effective".

The potential respondents broadly fall into 3 categories:

Category 1: those directly involved in and effected by the sector such as operators and equipment manufacturers

Category 2: those observing the sector with broader interested and who may be indirectly impacted by the sector such as lawyers, telecom sector consultants, and analysts

Category 3: those who represent the public interest such as media, other government officers, retired regulators or civil society organizations

The research team distributed the questionnaire responses through three main channels;

1) Sending fax and emails. Out of 144 questionnaires sent out, 38 were returned.

2) Distributing the questionnaire at the public hearing conference concerning the impacts of the delay in issuing the wireless 3G, organized by the Senate Committee on Science, Technology, Information and Telecommunications on July 3, 2008. In total 215 questionnaires were distributed, 30 of them were returned.

3) Distributing questionnaires to analysts through the Association of Securities Analyst. Only 4 questionnaires were returned.

A total of 72 responses were received. Since each respondent category should contribute equally to the final score in each dimension, and since it is not possible to pre-plan the number of completed questionnaires that will be received in each category, weights are assigned to equalize the contribution from each sector's score. These weights are shown in Table 1 below.

Table 1: Number of Respondents

	No. of Respondents	Weighted by LIRNEasia
Category 1: stakeholders directly affected by sector regulation – i.e., operators	40	0.60
Category 2: stakeholders who analyze the sector with broader interests -- i.e., analysts	15	1.60
Category 3: stakeholders with an interest in improving the sector to help the public –i.e., academics, journalists, civil society, etc.	17	1.41
Total	72	

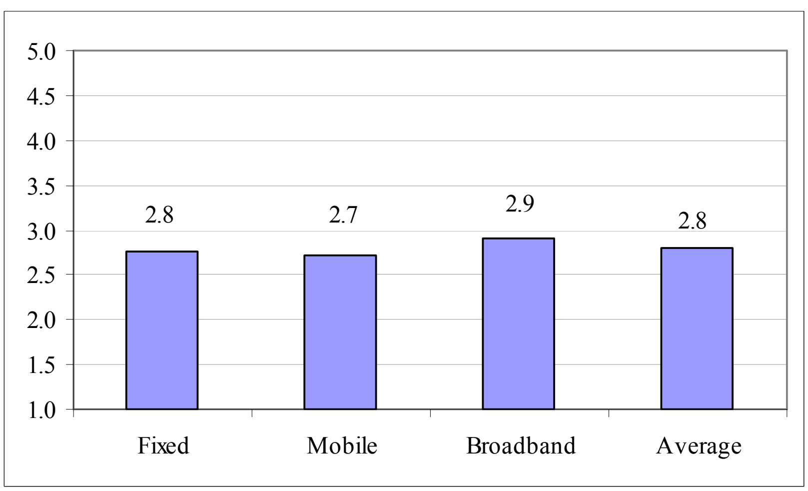
4. Finding/Results

4.1 Overall results

The average TRE score for all 3 telecom sectors in all 7 regulatory dimensions is 2.8. The lowest score goes to mobile as can be seen in Figure 5 below. This is because the size of and the level of dynamism and competition in this particular market require sophisticated and effective regulation in many areas such as frequency allocation and assignment, number portability and interconnection that may be lacking in the views of the respondents. Also, no new mobile or 3G licenses have been handed out thus far due to legal complications that will be elaborated later.

The highest score goes to broadband services. This is because internet services, unlike fixed line and cellular services, are not subject to regulatory complications associated with the concession terms and conditions. Also, several new type 3 licenses were handed out to new operators in 2007, providing consumers with alternative broadband suppliers with own network.

Figure 5: Average TRE scores by sector



Among the different regulatory dimensions surveyed, the highest score goes to market entry as can be seen in Figure 6 below. This reflects the fact that many licenses were issued by the NTC during the last three and a half years as shown below. But at the same time, most licenses handed out thus far have been type 1, non-network services such as internet services, resale services and broadband services for small operators. Type 3, network-based services have been much more limited as can be seen in Table 2 below.

Table 2: Number of Licenses Handed out by NTC during 2005-2008 (August)

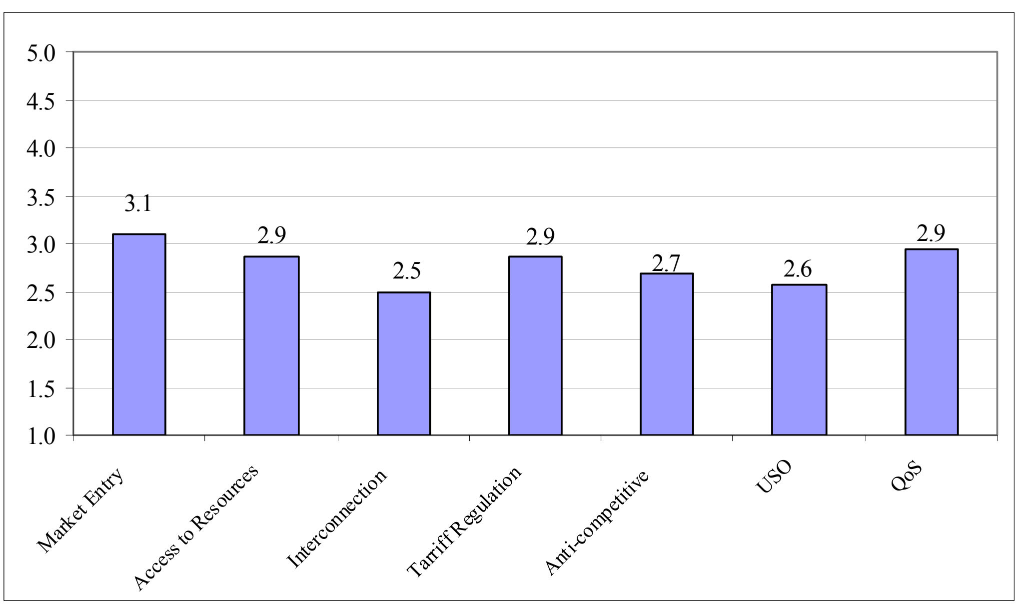
	2005	2006	2007	2008 (as of August 08)	Total
Type 1 licenses (service without network)	23	26	62	32	143
Type 2 licenses (private telecom services)	1	6	13	2	22
Type 3 licenses (public network telecom services)	2	5	9	3	19

Source: NTC

The lowest score goes to interconnection issues because of the long standing disputes and pending court case concerning interconnection and access charge between private telecom concessionaires and state operators. The relatively low USO score also reveals the shortcomings of the current universal service regime established by the NTC.

On the whole, only one dimension (Market Entry) receives a score above the mid-point of 3.0. The low overall scores reflect the fact that the NTC is seen to be "slow" and "ineffective" as evident in the comments made by respondents summarized in Table 3 below under the category "others".

Figure 6: TRE Scores by Regulatory Dimension



Scores do not seem to fluctuate too much across different types of services for each regulatory dimension as can be seen in Figure 7 below. Bottom score goes to interconnection problem in fixed line services arising from concession provisions that are inconsistent with NTC's Interconnection (IC) rules as reflected in the comments made by respondents shown in Table 3. The top score goes to market entry for broadband as already explained earlier.

Figure 7: TRE Scores by Sector and by Regulatory Dimension

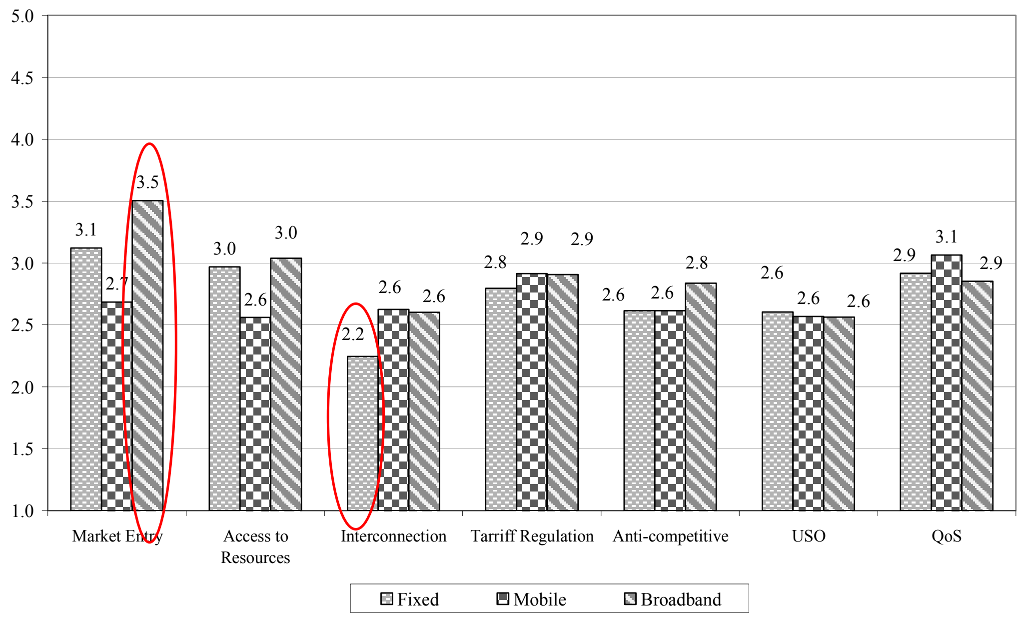


Table 3: Comments made by Respondents

	Fixed Line	Mobile	Broadband
Market Entry	• Licensing regime is inefficient and not up to international standard, in particular concerning the amount of time taken to deliver a decision. • There is no clear rules regarding the right of way • Although several new fixed line operators have been granted, few rollouts materialized thus far.	• No new mobile licenses have been issued thus far. • Regulatory permission for AIS to launch commercial 3G pilot project in the North is discriminatory. • Thailand lags behind others due to the delay in issuing 3G licenses. • Number portability policy should be implemented the soonest possible.	• In many areas of Bangkok, there is only one choice of ADSL providers. • The issuance of WiMAX licenses should be sped up in order to support the surge in the demand for internet bandwidth in the near future. • Although several broadband licenses have been issued, but small operators face unfavorable regulatory rules.

	Fixed Line	Mobile	Broadband
Access to Scarce Resources		• The delay in frequency allocation delayed network upgrade from the current 2-2.5 G TO HSPA	
Interconnection	• Fixed line services do not comply with the cost based IC rules established by the NTC (because of the concession contracts)	• The NTC does not intervene in the setting of the IC charge by larger players in the market, which can be unfair to small players. • The NTC has not been able to bring in state owned enterprises under its IC rule.	• The NTC has not taken any action regarding legal disputes between state operators and private concessionaires regarding the use of network under the build-transfer-operate scheme. • Interconnection rules for internet services are unclear.
Tariff	• No clear tariff regulation	• Maximum price for mobile services established by the NTC in 2008 are replicas of those stipulated in the concession, which does not reflect market environment.	
Anti-competitive	• No clear anti-trust regulation and no definition of a dominant player.	• No clear anti-trust regulation and no definition of a dominant player. • No competition rules for anti-competitive or discriminatory behavior of vertical integrated operators. • No definition of a dominant player • No decision has been made on complaints on predatory pricing.	• NTC chooses not to regulate price and let price be determined by the market.
USO	• The NTC has not yet passed clear rules or guidelines regarding the operation and management of USO • The NTC should urgently promote the rollout of fixed line services to all regions. • The NTC does not regulate the quality of USO services. • CAT and TOT, the only	• The NTC has not yet passed clear rules or guidelines regarding the operation and management of USO	• The NTC should allow all licensed operators to participate in the USO Projects. Service fees may vary according to the nature of the service provided.

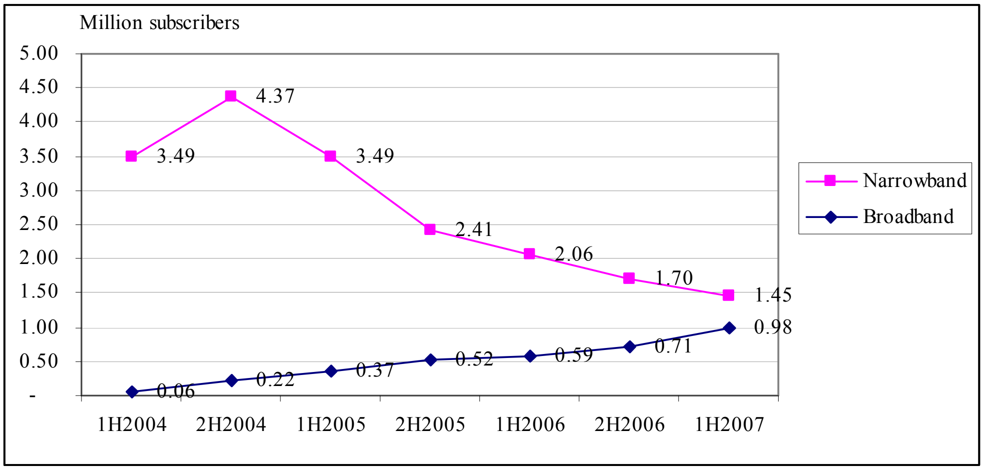
	Fixed Line	Mobile	Broadband
	two state owned operators in the market, are assigned USO obligations without financial subsidy from the NTC. • USO contribution is too high.		
QoS	• There is not yet QoS regulation.	• There is not yet proper QoS regulation.	• The NTC has not yet announced QoS for internet services.
Others	• The NTC is slow to respond to regulatory needs of a dynamic sector.	• The establishment of the Telecommunications Consumer Association by the NTC as stipulated by the telecom act is to be applauded. • The NTC cannot respond to regulatory problems effectively and timely.	• The NTC is slow in performing its tasks and has not yet produced any visible performance results.

4.2 Market Entry

Market entry receives the highest score among all regulatory dimensions of the NTC, which reflects the regulatory body's relatively generous licensing policy. As can be seen in Figure 7 above, scores for market entry is highest for broadband and lowest for mobile. Although several general network licenses have been granted, no new cellular services have been possible due to problems NTC face concerning frequency assignment and management as will be discussed later. In contrary, there is no such restriction to the roll out of broadband services, except perhaps for the right of way problems.

Most new broadband providers have not yet rolled out own network, however. This means that they have to rely on the wired network of existing fixed line operators in combination with other wireless technology for the last mile, such as WiMAX. The NTC has not yet handed out full WiMAX licenses. In April 2008, it issued 14 temporary (90 days) WiMAX licenses to test the technology. Incumbent fixed line operators, namely, True Corporation, TT&T as well as the state owned TOT, have been putting much effort in expanding and upgrading their broadband network to accommodate the surge in demand for broadband internet services in place of narrowband dial-up services as can be seen in Figure 8.

Figure 8: Number of Internet subscribers



Note: the numbers of the narrowband internet subscribers were estimated based on the numbers of dial-up internet cards sold, most of which were prepaid. However, the numbers of broadband internet subscribers were based on the number of accounts registered for monthly fee payment.

Source: IDC Thailand

Number portability has also been a concern of several respondents. The NTC has just arranged for a public hearing of its draft Regulations on Number Portability for mobile phone in August 2008. Although the draft regulation was much delayed since 2 years ago, it was welcomed by all stakeholders. However, experts have several reservations concerning the draft Regulation as follows:

- The draft regulation does not require that the number portability fee charged be cost-based. Rather, it establishes a price ceiling for fees charged at 300 baht around USD 8.7[3].The set price by no means reflects the underlying costs. Rather, it is the maximum price that subscribers are willing to pay expressed in their responses to NTC's questionnaires International best practices such as the EU's Universal Directive require that service charges must be cost-based.

- The draft regulation sets the maximum number of days service providers may take to transfer the number to the new provider at 3 days. However, it fails to specify penalties arising from non-compliance.

- Since mobile service providers currently set call charges based on whether the number called is within or outside its own network, a transfer of a number from a service provider to another may lead to additional costs for unsuspecting callers. The draft regulation does not require the service provider to notify callers that the number called is now subject to higher rates.

[3] The reference exchange rate of Bank of Thailand in October 2008 was 1 USD = 34.4285 Baht.

4.3 Access to scarce resources

4.3.1 Frequency allocation

According to the TRE Survey results, the allocation of frequency for cellular service seems to be the single most serious access to scare resource concern among respondents. The delay in auctioning the 3G license since 2005 arises from legal uncertainties surrounding the NTC's authority to allocate frequencies. The Frequency Allocation Act 2000 mandates that the NTC and the National Broadcasting Commission (NBC) jointly develop a national frequency table, manage the telecom and broadcasting spectrums and prescribe spectrum regulations. The NBC was supposed to have been formed years ago but claims of conflict of interest and political interference brought the process to a halt. As a result, the NTC was not able to assign and manage frequencies in the absence of its broadcasting counterpart.

To avoid the deadlock, the NTC had asked the Council of State, the government legal advisory body, to determine whether it has the legal authority to allocate and manage frequency in the absence of the NBC. In 2006, the Council ruled that the NTC may manage frequencies for telecom use. Following this decision the NTC handed out WiMAX licenses to incumbent operators. But because 3G licenses involve the allocation of 2.1 – 2.5 megahertz which can be used jointly with broadcasting, the NTC has been more cautious in exercising its authority and submitted additional queries to the Council of the State regarding the interpretation of the Council's earlier decision. It is only in the mid 2008, that it received positive response from the Council that the NTC decided to go ahead with the planned auctioning on the 3G license. In short, the 3G crisis has mainly been a result of legal problems external the control of NTC.

The Broadcasting Act was finally promulgated in March 2008. However, the Constitution of 2007 stipulates that the allocation and assignment of frequencies are to be managed by a single agency, namely, the National Telecommunications and Broadcasting Commission (NTBC), that will be established by and amendment to the Frequency Allocation Act. However, the draft act, which was approved by the cabinet in August 2008, faced much criticism from both the public and the media such that the Ministry of Information, Communication and Technology has had to remove the act from the legislative pipeline and hold new rounds of public hearings on the matter. Hence, the prospect of having a proper body that will oversea frequency allocation in the near future is rather bleak.

4.3.2 International Internet Gateway

The NTC has handed IIG license rather liberally to all internet and broadband service providers. As of October 2008, 12 type 2 IIG licenses have been granted.

4.3.3 Local loop unbundling

The Telecommunications Business Act 2001 stipulates that interconnection is mandatory at all "technically feasible" points, which is consistent with the WTO's Telecommunications "Reference Paper" that establishes standard telecom regulations for member states that are signatories to the telecommunications agreement. However, the law allows network owners to deny access or interconnection in case of limited capacity or technical problems.

To implement this particular clause, the NTC requires that network licensees "Ensure fair and equal access to network and facilities which is supply for ADSL Internet services by:

- *Network licensees must allow other licensees to interconnect with his telecommunications network (under specified technical criteria)"*
- *Access/Interconnection conditions and charges must be on equal and non-discrimination basis and*
- *Access/Interconnection conditions and charges must be disclosed,*

However, the quality and consistency of the last-mile copper wire service may be an issue. As a result, many ISPs have requested for WiMAX licenses. As of October, 18 trial WiMAX licenses have been issued to ISPs.[4]

4.3.4 Right of way

The Telecommunications Business Act 2001 stipulates that licensees have the right to install poles or lay cables or wires in state and private properties if the network rollout plan is approved by the NTC. The licensee will have to negotiate compensation for land usage with the property owner. In case an agreement on the appropriate compensation rate cannot be reached, the NTC can establish a rate which it considers to be appropriate. If the land or property owner is dissatisfied with the proposed compensation rate, he/she may lodge an appeal to the NTC. If the appellate decision is unsatisfactory, the property owner may file a complaint to the Administrative Court. To implement this particular provision, the NTC has drafted the "Right of Way Regulations" that will be subject to public hearings before becoming effective.

While the right of way of telecom licensees – i.e., the right to hang wires over the electricity poles, the right to install public telephone booths -- may not be an issue of disputes, but the rate of compensation will likely be the subject of intense negotiation. As in the case of interconnection, the NTC will need to establish clear rules and principles in determining "fair" compensation rate that will be acceptable to both parties. Until NTC rules are passed, disputes about compensation for right of way seem inevitable.[5]

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[4] www.ntc.or.th

[5] Recently, there was a dispute between private fixed line service provider and the Bangkok Metropolitan Administration (BMA) about the location of telephone booths and whether the operator needs to pay the BMA for the use of the site.

4.4 Interconnection

Among all regulatory dimensions surveyed, interconnection received the lowest score of 2.5. Concerns expressed by respondents include the inability of the NTC to enforce its IC rules on state operators that are protected by terms and conditions of the concessions that grant them regulatory rights, unclear IC rules and NTC's failure to intervene in the setting of IC charges by large private mobile players in the market. As interconnection problems in Thailand are rather complicated as it involved several laws and regulations that are inconsistent with each other, it is perhaps best to lay out the background of the problem.

The Telecommunications Business Act 2001 (TBA) mandates that interconnection is mandatory for all license holders and that interconnection charges are to be negotiated privately. Interconnection terms and rates are supposed to be non-discriminatory. No method for calculation of interconnection fees is prescribed, but the law requires that the interconnection rates be reasonable and fair to all affected licensees.

The TBA sets procedures resolving disputes on interconnection agreements and requires the NTC to issue a decision within 30 days. The law does not require the disputing parties to exert efforts to reach a resolution before appealing to NTC such that private carriers may seek NTC's intervention at any point of time during the interconnection negotiation.

While interconnection rules set out in the TBA is clear, all telecom concessions are exempted from such rules[6]. This is because all networks installed under concessions are legally owned by the two state enterprises, the TOT and the CAT. Private operators are mere subcontractors. Hence, all interconnection charges must be negotiated and paid by the two legal license holders only. The concession mandates private cellular concessionaires of the CAT (gateway operator without domestic network), namely, DTAC and True Move, to pay the TOT (domestic fixed line operator with network) a hefty 200 baht/month (around USD 5.8) flat rate per post-paid subscriber and 18% of revenue for pre-paid users, while its own concessionaire, AIS, does not have to pay such a fee.

The lack of access or interconnection charge among cellular providers proved chaotic as mobile operators engaged in a price war in quest to expand own market share that overburdened the network capacity, leading to a sharp deterioration in the quality of calls. Struggling to compete in cost, the two mobile operators had stopped paying interconnection charges to the TOT since November 2006 referring to NTC's rule on IC. The three operators successfully agreed on bilateral interconnection charges among themselves in early 2007. The TOT has filed a civil suit against them to demand outstanding access fees of Bt10 billion (USD 290 million) from DTAC and Bt4 billion (USD 116 million) from True Move. At the same time, the TOT has submitted a petition to the Administrative Court requesting for a withdrawal of the

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[6] The 1997 and 2007 Constitutions protect the legal enforcement of all provisions stipulated in all telecom concessions.

NTC's IC regulation that allows the substitution of interconnection charges for access charges stipulated under the concession agreement.

To sum up, the interconnection chaos is very much to do with conflicting rules and regulations that are well outside the scope of the NTC's authority. However, concerns about NTC's lack of supervision of privately established IC fee calls may reflect the authority's failure to enforce its cost-based IC rules.

4.5 Tariff

Tariff regulation receives average scores compared with other regulatory dimensions as can be seen in Figure 6. Respondents complained about the lack of clear tariff regulation and the arbitrary tariff ceilings established by the NTC.

So far, the NTC has taken a hand-off approach in tariff regulation and has allowed prices to be determined by competition in the market. Although it has recently established ceiling prices for several services, most are non-binding with the exception of local fixed line service as will be elaborated in greater details below.

In September 2006, the NTC announced Tariff Rule that requires operators to submit tariffs schedules and cost structure in order to assist the NTC in setting maximum prices for all services. In May 2008, the NTC has announced the price ceilings for all major voice services including fixed line local and long distance, cellular (pre-paid and post-paid), public phone services. The maximum rates established were by no means rates that reflect the underlying cost and rate of return of investor as specified in the Tariffs Regulation. They are merely rates currently charged by incumbent operators. For cellular, the tariff ceiling was not binding as it accommodates all rates set by various providers presently.

The maximum rate for fixed line, however, was set at 3 baht per call (less than 10 US cent), a rate which was approved by the Cabinet some 20 years ago. It is therefore not surprising that fixed line tariff regulation received the lowest score as shown in Figure 7 above.

The regulation of tariffs based purely on private operators' submission of tariff information and benchmarking them against those in foreign countries clearly reflects NTC limited capability to examine detailed cost structure of telecom operators. While non-binding maximum bodes well for the dynamic and competitive cellular market that requires no regulation, the same cannot be assumed for fixed line services. By setting arbitrary prices without any regards to costs, the NTC sets the stage for serious under-investment in the roll out of fixed line services that is much needed after many years of restrictive investment conditions under the concession schemes.

To conclude, the NTC displays clear incapability in setting telecom tariffs due to the lack of data and information. It set fixed line service fees well below cost. Fortunately, it has at least kept its hands off tariffs regulation in the mobile sector as the ceiling rates set were non-binding and hence, pose no market distortion.

4.6 Anti-competitive practices

Results from the survey indicates that the NTC has failed to establish proper rules to address anti-competitive practices in the telecom sector, in particular in the fixed line and cellular services. Most complaints concern the following issues:

(1) the absence of a definition of a "dominant provider"

(2) absence of rules addressing vertical restrictions such as discriminatory practices or refusal to deal and

(3) unclear rules in general.

There are two legislations that provide safeguards for competition in the Thai telecommunications market: the Trade Competition Act of 1999 and the Telecommunications Business Act 2001 (TBA). The TBA requires that telecom businesses be subject to all provisions under the general competition law.

The Trade Competition Act contains provisions against five types of anti-competitive behavior.

- Abuse of Market Dominance: A business entity that has market power is prohibited from fixing prices, setting conditions that limit the provision of goods or services, and interfering with business operations of other parties without reasonable grounds.

- Merger and acquisition: A business entity is prohibited from merging with other operators in a way that may reduce competition, unless permitted by the Trade Competition Commission.

- Collusion: A business entity is prohibited from colluding with other business operators to conduct any act of monopolizing, reducing or limiting competition in the market.

- Cross-border provision: A business entity having a business relationship with a business operator outside the country is prohibited from performing any activity that will restrict the freedom of a person in the country in purchasing goods and services.

- Unfair Competition: A business entity is prohibited from carrying out any act that ruins market competition and has the effect of destroying, impairing, or restricting the business operations of other businesses. The use of information obtained from competitors with anti-competitive results can also be considered an unfair practice.

Although the Act does address all dimensions of restrictive practices, there are still no guidelines for the implementation of the above prohibitions. For example, the law prohibits charging "unfair prices", but there is no concrete description of what price level can be considered "unfair". Similarly, the law requires pre-merger notification, but the threshold market share that would trigger the notification has not yet been determined. As a result, all mergers (including those in the telecom sector) are currently unregulated or supervised. In the absence of clear rules, the current competition regime is highly arbitrary and unpredictable to the discontent of those governed by it.

The TBA mandates that the telecom sector be subject to the Trade Competition Act. It also empowers the NTC to undertake specific measures that prevent a licensee from carrying out acts that have the effect of restricting market competition. This law may provide adequate competitive safeguards for the telecommunications sector.

In September 2006, the NTC passed Rules on Monopolistic or Unfair Trade Practices in the Telecommunications Market. The rule stipulates that all license holders as well as concessionaires are subject to the Trade Competition Act 1999, the national competition law. It also contains the provisions that restrict cross equity holding in telecom businesses, prohibit cross subsidies except for USO and specify several trade practices that are deemed anti-competitive.

Contrary to the complaints found among the questionnaire responses (shown in the section on Anti Competitive Practices in *Table 3 Comments Made by Respondents*), the NTC's competition regulation *does specify* the definition of dominant service providers to be those with market share greater than 25 per cent <u>or</u> those that the NTC declares to be dominant. Perhaps it is the latter part that operators are not too comfortable with as it appears to be overly subjective in the absence of any guidelines.

Also, in contradiction to the concerns expressed by some respondents, the NTC's competition rule does address practices that are considered to be vertical restrictions. The languages used are very imprecise, however, which leaves broad discretion to the NTC.

For example, it is unclear what "unfair price discrimination", "unfair prices", "predatory pricing" and "unfair conditions in dealing with other operators" refer to. In the absence of implementing guidelines that clearly specify what "fair" or "predatory" means, service providers cannot assess whether say, a price cut, will be deemed unfair or anti-competitive rather than competitive. Perhaps it is the subjective and unpredictability of the rule rather than their absence that bothered most respondents about the NTC's competition rule.

4.7 Universal Service obligation

Survey results indicate that USO regulation receives the second lowest score, 2.6, after interconnection regulations. Major complaints expressed as shown in Table 3 includes unclear rules and selective implementation through incumbent state operators only. It is interesting to note that while state operators complained about having to implement USO without financial subsidy from the NTC, other operators complained about having to pay the hefty contribution fee when it prefers to deliver the services themselves. Perhaps, discontent on both sides result for lack of transparency in the implementation of the USO scheme.

Traditionally, the state monopoly in fixed line, the TOT, was the sole provider of USO with financing from relatively expensive long distance calls and the hefty access charges imposed on overseas call operated by its counterpart providing overseas voice services, the CAT. This cross-subsidy arrangement has fallen apart as the international and long-distance markets have been liberalized. The TOT then turned to massive financial surpluses generated from revenue sharing schemes under private concession contracts. But this financial source, too, is also drying up as private concessionaires began to refuse to pay up fees or charges stipulated in the terms and conditions of the concessions that they deem "unfair", such as hefty and discriminatory access charges discussed earlier.

The TBA provides a new framework for universal service provision by setting up a Universal Service Fund that can be dispensed for USO. It also empowers NTC to require a licensee to provide universal service but specifies that the obligation must not cause an inappropriate investment burden on the licensee and should be the same for operators providing the same services. The NTC has the authority to decide how the Fund will be used to provide universal services. The Act is ambiguous on the mechanics for the disbursement of the Fund; this might be a source of contention in the future.

In August 2005, the NTC announced its USO Rule. The rule specifies the following:

1) the scope of universal service obligations that must be carried out by license holders, which includes

(a) the installation of at least 3 public phones per village, not exceeding 6,000 villages within 30 months after having obtained the operating license in areas and within the time limit specified by the NTC;

(b) the installment of at least 2 fixed line or public phones in education institutions, hospitals and other social service organizations not more than 4,000 sites within 30 months after having obtained the operating license in areas and within the time limit specified by the NTC;

(c) the provision of free telephone cards for not more than 1 million handicapped and elderly persons registered with the Ministry of Social Development and Human Security per month for 30 consecutive months.

2) all type 3 license holders and type 2 license holders with own network are required to contribute to USO by providing services as specified above or contribute the 4% of the revenue. So far TOT and the CAT are the only license holders that have chosen to provide USO instead of paying the 4% contribution by installing facilities in remote areas or in public places such as educational institutions, schools and hospitals. Other operators, most of whom are not in the position to provide the required social service obligations that often involve the installation of fixed line or internet services network have had to make financial contributions set at 4% of revenue. The figure has solicited widespread criticism from operators as it is rather high compared with 1-2% set in most other countries.

To sum up, the relatively USO score is a result of NTC unclear and opaque rules and regulations that leave all operators as well as academics and other stake holders dissatisfied with the regime.

4.8 Quality of Services Regulation

It is rather surprising that the quality of service ranked second highest after market entry given that QoS regulation by the NTC is basically non-existent today. Mobile service receives the highest score of 3.1, while broadband receives the lowest score of 2.9. Perhaps competition in the cellular market has prompted service providers to maintain service quality in order to gain or secure their market share. Lower quality for broadband reflects the lack of competition in the service as the market is currently dominated by a single provider, TRUE, with a much smaller market share held by TOT. The NTC has handed out several broadband licenses to new entrants, but the installation of network is time consuming. Competition in the market is likely to intensify in the near future, however. Hence, consumers can expect improved service quality then.

Prior to the TBA, quality regulation responsibilities rested with the state owned operators providing the service. Hence, dropped call and unsuccessful calls rates were monitored by the TOT. However, with the NTC, the TOT has ceased to monitor private operators quality of service altogether. Unfortunately, the NTC has failed to regulate QoS as it has not yet set up proper system to collect and monitor service quality. As a result, broadband users of certain private operator has had to put up with internet speed well below subscribed capacity because of provider's aggressive promotional campaign to expand customers base (hence, the low broadband score). Likewise, in the past, cellular phone subscribers have had to put up with dropped calls and unsuccessful calls during peak periods because of providers' overloading of the network as there is no monitoring of the subscriber to bandwidth ratio.

To sum up, QoS score reflects market forces rather than regulatory oversight of the NTC. The case of Thailand goes to show that market forces can substitute for regulatory failure.

5. Conclusion

Results of the TRE Survey in Thailand paint a mixed picture of the Thailand's first truly independent regulatory body, the NTC, in all regulatory dimensions. The performance of the NTC is attributed to three major factors:

(1) unfavorable regulatory environment associated with the legacy of telecom concessions

(2) political interferences in the setting up of proper institutions that facilitate effective regulatory regime and

(3) NTC's capacity constraints.

The TRE performance assessment reveals the NTC's inability to deal with more complicated regulatory issues such as competition regulation, tariffs regulation, quality of service monitoring and universal service obligation. In all of these areas, the NTC has merely passed rules with broad guidelines with little detailed implementation regulation. It therefore has failed to establish a transparent, effective and predictable regulatory regime.

Handling out licensing appears to be the only regulatory dimension that the NTC was able to perform relatively well. But even here there has been much criticism about the vagueness and arbitrariness of assigning different types of licenses.

The lesson learnt in the Thai case is that while independence is often emphasized as one of the most important characteristics of a regulatory body, it by no means guarantees any regulatory success.

6. Recommendations

Although the NTC has contributed significantly to a more competitive telecom market with its relatively liberal licensing policy, unclear regulatory rules pose a major problem for telecom operators and absence of proper quality regulation has left consumers at the mercy of service providers. Nevertheless, the Thai experience shows that competition can go a long way in protecting consumers in the absence of proper regulatory oversight. High TRE scores for market entry, tariff regulation and quality of services can be linked to the level of competition in the market. On the other hand, in areas where regulatory rules are required as market forces fail to function, such as interconnection, universal service and anti-competitive practices, TRE scores are lower, reflecting the urgent need to improve the relevant rules are regulations.

It should be noted, however, that the low TRE scores in certain category, in particular interconnection and access to resources (frequency allocation) reflect to a large extent, constraints that are external to the regulatory body. Concession contracts written up over a decade ago during the era of state monopolies operators contain many clauses (such as access charges) that are inconsistent with modern regulatory rules. As these concessions are upheld by the country's Constitution, there is not much that the NTC can do. Similarly, the much delay in the planned promulgation of the Broadcasting Act that will establish a National Broadcasting Commission has left frequency allocation and assignment in suspension as the law requires that the task is to be carried out jointly between the 2 commissions.

Going forward, to improve the current regulatory environment, it is recommended that the Thai government and the NTC take the following key measures or steps;

The Thai Government

1. Devise a concession conversion scheme that will eliminate clauses that are consistent with NTC rules, in particular those concerning arbitrary access charges that are levied on certain mobile operators, price regulations by TOT and revenue sharing schemes between state enterprises and private concessionaires.

There has been no major progress in this area thus far since the last failed attempt back in 1999. Any conversion scheme would have to be perceived as transparent and fair, not only by the private concessionaires and the state owned enterprises, but also by the public. Past attempts at converting these concessions have become subject to alleged money politics and vested interests.

2. Urgently pass the draft amendment of the Frequency Allocation Act to establish the NTBC so that frequency allocation and assignment can be undertaken properly.

The NTC

1. provide clear definition of type 1 2 and 3 license in order to promote transparency in the granting of licenses.

2. urgently build up cost data base for key services that will allow effective cost-based price regulation, in particular for interconnection charges and fixed line services.

3. urgently build up industry's data base that contain detailed data about service providers, their revenues, output, prices, and quality of services.

4. clarify and pass clear rules regarding its anti-trust rules such as providing market share threshold for dominance and pre-merger notification requirement and provide implementing guidelines for vague prohibitions such as predatory pricing.

5. establish a clear and transparent accounting system for the management of the universal service fund.

7. Annex 1: Significant regulatory and policy events for Thailand (February 2007 – April 2008)

Date	Event
9 February 2007	Establishment of the Telecommunication Consumer Protection Institute.
8 March 2007	Commission Announcement regarding the permission licenses for phone-to-phone VoIP services.
16 March 2007	Issuance of Type 3 (owned-network) licenses for Fiber Optic and Low Voltage Power Line Services to EGAT (Electricity Generating Authority of Thailand), MEA (Metropolitan Electricity Authority) and PEA (Provincial Electricity Authority).
15 June 2007	CAT installed a fixed line regarding the universal service policy at Koh Pan-Yee.
15 June 2007	Issuance of an order for TOT to negotiate interconnection charges with DTAC (The latter's refusal to pay access charge to the former according to the terms of the concession since November 2006 is currently being examined by the court).
18 June 2007	Discussion of the possibility of emerging two regulatory body, the NBC (broadcasting) and the NTC (telecommunications)
19 June 2007	Approval of use of Short Range Radio Communication Devices 17 categories without licenses.
23 July 2007	Several telecom operators signed Interconnection Charge contracts.
17 August 2007	Allocation of 2 million mobile numbers to DTAC
14 November 2007	Regulations on the technical standard of the Next Generation Network.
26 November 2007	Reduction of Type 3 license fee from 3% to 2.5% of sales for year 2008.
3 December 2007	Delay of allocation of numbers for VoIP services since announced regulation in March 2007.
14 January 2008	Regulations on the quality and standard of voice telecommunication services.
4 March 2008	Regulations on the interconnection standards.
4 March 2008	Regulations on the technical standard of Time Division Multiplexer (TDM). Type interconnection.
4 March 2008	Regulations on the technical compatibility of interconnection nodes.
28 March 2008	Announcement of the Telecommunication Master Plan II (Year 2008-2010).
24 April 2008	Allocation of each 2 million mobile numbers to AIS and DTAC.

Source: NTC

8. Annex2: TRE Questionnaire

Questionnaire Number: ……………………

Respondent Name: …………………………………… Tel /Fax……………………………

Position: ………………………………Company / Organization …………………………

Telecom Regulatory Environment for Thailand

You are kindly requested to make your frank assessments of the telecom regulatory environment (TRE) for the year 12 months ending April 2008 for the fixed, mobile and broadband telecom sectors on a five-point scale.

The dimensions used in this questionnaire are broadly based on the WTO Regulatory Reference Paper (GATS Protocol 4) and are briefly described below. A fact-sheet of key events in the Telecom Regulatory Environment is also attached for your reference for the period May 2007 – April 2008.

Completing the Questionnaire should take less than 5 minutes of your time. Please email the completed questionnaire or fax it to us.

Dimension	Aspects Covered
Market Entry	Transparency of licensing. Applicants should know the terms, conditions, criteria and length of time needed to reach a decision on their application. License conditions. Exclusivity issues.
Scarce Resources	Timely, transparent and non-discriminatory access to spectrum allocation. Numbering and rights of way: frequency allocation, telephone number allocation, tower location rights.
Interconnection	Interconnection with a major operator should be ensured at any technically feasible point in the network. Quality of interconnection comparable to similar services offered by own network. Reasonable rates for interconnection. Unbundling of interconnection. Interconnection offered without delay. Sharing of incoming and outgoing IDD revenue. Payment for cost of interconnection links and switch interface. Payment for cost of technical disruption of interconnection.
Tariff Regulation	Regulation of tariffs charged from consumers.
Regulation of Anti Competitive Practices	Anti-competitive cross subsidization. Using information obtained from competitors with anti-competitive results. Not making technical information about essential facilities and commercially relevant information available to competitors on a timely basis. Excessive prices. Price discrimination and predatory low pricing. Refusal to deal with operators and other parties. Vertical restraints. Technical disruption of interconnection. Sharing of towers and facilities by parent company and subsidiaries in different segments of the market.
Universal Service Obligation (USO)	Administration of the universal service program/fund in a transparent, non-discriminatory and competitively neutral manner and is not more burdensome than necessary for the kind of universal service defined by the policymakers.
Quality of Service (QoS)	The actual performance of a service with respect to what is promised, depending upon the network traffic control mechanisms. Specific criteria may be call quality (for mobile and fixed), connection speeds or throughput (for broadband)

FIXED SECTOR Telecom Regulatory Environment May 2007 – April 2008

Please **TICK** the number that best represents the **quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

		Highly ineffective				Highly effective
F1	**Market Entry**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
F2	**Access to Scare Resources**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
F3	**Interconnection**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
F4	**Tariff Regulation**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
F5	**Regulation of Anti-competitive Practices**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
F6	**Universal Service Obligation (USO)**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
F7	**Quality of Service (QoS)**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Comments:

MOBILE SECTOR Telecom Regulatory Environment, for May 2007 – April 2008

Please **TICK** the number that best represents the **quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

	Dimension	Highly ineffective 1	2	3	4	Highly effective 5
M1	**Market Entry**	☐	☐	☐	☐	☐
M2	**Access to Scare Resources**	☐	☐	☐	☐	☐
M3	**Interconnection**	☐	☐	☐	☐	☐
M4	**Tariff Regulation**	☐	☐	☐	☐	☐
M5	**Regulation of Anti-competitive Practices**	☐	☐	☐	☐	☐
M6	**Universal Service Obligation (USO)**	☐	☐	☐	☐	☐
M7	**Quality of Service (QoS)**	☐	☐	☐	☐	☐

Comments:

1 2 3

BROADBAND SECTOR Telecom Regulatory Environment, for May 2007 – April 2008

(Broadband = greater than 256kbps upload/download)

Please **TICK** the number that best represents **the quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

B1 **Market Entry** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

B2 **Access to Scare Resources** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

B3 **Interconnection** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

B4 **Tariff Regulation** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

B5 **Regulation of Anti-competitive Practices** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

B6 **Universal Service Obligation (USO)** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

B7 **Quality of Service (QoS)** — **Highly ineffective** 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ **Highly effective**

Comments:

Telecom Regulatory and Policy Environment in India:
Results and Analysis of the 2008 TRE Survey

Payal Malik

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***Abstract:** Telecom reforms in India allowed for private entry but did not entail privatization of the incumbent erstwhile monopoly service providers. Market liberalization accompanied with the introduction of new laws and regulations was the cornerstone of reform. Regulatory agencies and regulation have become integral components of the telecom reform process, in order to protect consumers, reassure investors and, in theory, help advance competition.

The results of liberalization have been impressive. Teledensity has increased from merely 2 percent or so in 1999 to around 26.22 percent in 2008 and almost 6 million mobile subscribers are added every month. Wireless has been the principal engine for telecom growth in the country. The wireless subscriber base has grown from 0.88 million in1999 to 261.07 million in 2008.

***Keywords:** TRE Survey, India

Telecom Regulatory and Policy Environment in India: Results and Analysis of the 2008 TRE Survey

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List of Acronym

ADC Access Deficit Charge

AGR Adjusted Gross Revenues

ARPU Average Revenue Per User

BSOs Basic Service Operators

BSNL Bharat Sanchar Nigam Limited

BPO Business Process Outsourcing

CLS Cable Landing Stations

CPP Calling Party Pays

COAI Cellular Operator's Association of India

CDMA Code Division Multiple Access

DoD Department of Defence

DTO Department of Telecom Operation

DTS Department of Telecom Services

DoT Department of Telecommunications

DTEs Developing and Transitional Economies

DOI Digital Opportunity Index

EBITDA Earning before Interest Tax and Depreciation allowance

FDI Foreign Direct Investment

GAIL Gas Authority of India Limited

GSM Global System of Mobile

GDP Gross Domestic Product

GoT Group on Telecom

HHI Herfindahl-Hirschman Index

IMPCS India Mobile Personal Communication System

ICTs Information Communication Technologies

IUC Interconnection Usage Charges

ILD International Long Distance

ISD International Subscriber Dialing

ITU International Telecommunication Union

ISPs Internet Service Providers

IT Internet Telephony

IP II Infrastructure Provider

ITeS Information Technology enabled Services

LLU Local Loop Unbundling

MTNL Mahanagar Telephone Nigam Limited

MHz Mega Hertz

NIXI National Internet Exchange of India

NLD National Long Distance

NRAs National Regulatory Authorities

NTP National Telecom Policy

NGN Next Generation Networks

NLDOs National Long Distance Operators

PGCL Power Grid Corporation

RTIT Rail Telecom & Information Technology

RoCE Return on Capital Employed

RIO Reference Interconnect Order

RDELs Rural Direct Exchange Lines

SSAs Secondary switching Areas

SDCA Short Distance Charging Area

TDSAT Telecom Dispute Settlement Appellate Tribunal

TRAI Telecom Regulatory Authority of India

TRE Telecom Regulatory Environment

TTO Telecommunication Tariff Order

UNE-P Unbundled Network Elements

UALR Unified Access Licensing Regime

USO Universal Service Obligation

VSNL Videsh Sanchar Nigam Limited

VOIP Voice over Internet Protoco;

VPTs Village Public Telephones

VSAT Very small Aperture Terminal

WLL Wireless Local Loop

WPCC Wireless Planning Coordination Committee

WISR World Information Society Report

WPC Wireless Planning Commission

Telecom Regulatory and Policy Environment in India: Results and Analysis of the 2008 TRE Survey

1. Executive Summary

In India, like in many other developing countries, the abysmal performance of the state-owned telecommunications service provider and the increasing requirement to attract capital for the upgrading the sector were the major drivers for liberalization. At the macro level after enshrining policy in a closed centralized economic model based on import substitution for almost four decades, India made a structural shift to a market-oriented model in the early 1980s. This shift in policy and the associated institutional arrangements also had an impact on the telecommunications industry. India faced many difficult challenges in liberalizing its telecommunications industry from a monopoly to a decentralized competitive model. During monopoly era, telephone was not considered as a necessity, and, as a result, telephone penetration levels were very low and the quality of service was poor. However, long-waiting lists, technological advancement and pressure from various domestic and international stakeholders pushed the government to initiate reforms in middle of 1980's to spread telephone infrastructure.

Telecom reforms in India allowed for private entry but did not entail privatization of the incumbent erstwhile monopoly service providers. Market liberalization accompanied with the introduction of new laws and regulations was the cornerstone of reform. Regulatory agencies and regulation have become integral components of the telecom reform process, in order to protect consumers, reassure investors and, in theory, help advance competition.

The results of liberalization have been impressive. Teledensity has increased from merely 2 percent or so in 1999 to around 26.22 percent in 2008 and almost 6 million mobile subscribers are added every month. Wireless has been the principal engine for telecom growth in the country. The wireless subscriber base has grown from 0.88 million in1999 to 261.07 million in 2008.

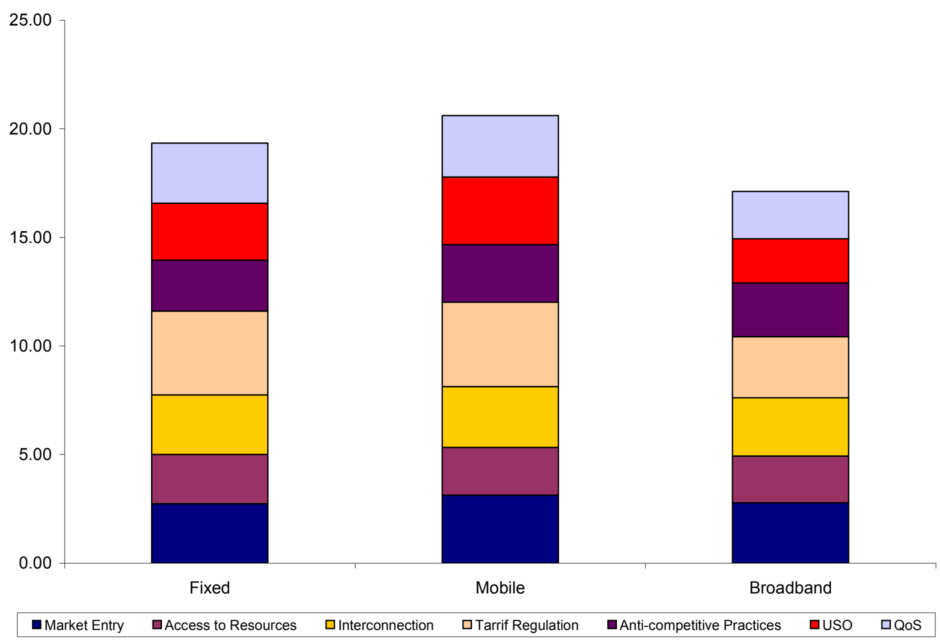
Given the importance of the Telecom Regulatory Environment (TRE) on the outcomes of reforms, LIRNEasia has developed a TRE index, which summarizes stakeholders' perception on certain TRE dimensions. The index is created with the help of a survey of the key stakeholders. The first survey was conducted in July 2006 in five Asian countries, India, Sri Lanka, Pakistan, Thailand, and the Philippines on six dimensions: i) market entry; ii) access to scarce resources; iii) interconnection; iv) tariff regulation; v) anti-competitive practices; and vi) universal services, for the fixed and mobile sectors. In the most recent survey carried out in July 2008, a seventh dimension dealing with the "quality of service" was added, and the survey was conducted for the broadband sector in addition to fixed and mobile sectors. The survey was carried out in eight countries, which are, Bangladesh, India, Indonesia, Sri Lanka, Maldives, Pakistan, Thailand, and the Philippines.

The following figures summarize the sector assessment results for India for 2007-2008.

Figure 1: Sector Assessment Results for the period April 2007-March 2008: Individual Score Chart

Likert Score: 1– Highly ineffective; 2-unsatisfactory; 3-neutral; 4-satisfactory; 5-highly effective

Figure 2: Sector Assessment Results for the period April 2007-March 2008: Total Output Score Chart



The results point out to the fact that the stakeholders perceive the TRE to be most conducive for the mobile sector followed by fixed and then broadband[1]. Other than for Access to Scarce Resources the fixed sector lags behind the mobile sector. The fixed and mobile sectors have the highest scores for Tariff Regulation. Market entry also scores well for the mobile sector as competition is well entrenched with most of the circles with 4-5 mobile service providers. The broadband sector has the lowest score in the aggregate. The low penetration of broadband of mere 3.87 against the policy objective of 9 million at then end of 2007 clearly indicates that the regulatory environment is not very conducive. The following table is a summary comparison of the TRE scores for fixed and mobile telecommunications for the two periods (2006-05 and 2007-08) for which the survey was conducted. Since, Quality of Service was not a survey parameter for the previous survey we have dropped it in our comparison.

Table 1: Comparison of the TRE score for the two periods of survey for fixed and mobile

TRE Parameter	Fixed		Mobile	
	2005-06	2007-08	2005-06	2007-08
Market Entry	3.3	2.7	3.3	3.1
Access to Scarce Resources	2.6	2.3	2.3	2.2
Interconnection	2.5	2.7	2.7	2.8
Tariff Regulation	3.7	3.9	3.9	3.9
Anti-competitive Practices	2.2	2.4	3.1	2.7
USO	2.0	2.6	2.0	3.1
Average (Total)	**2.7 (16.30)**	**2.8 (16.56)**	**2.9 (17.30)**	**3.0 (17.78)**

For both the fixed as well as the mobile sector the overall score has shown a marginal improvement over the two time periods of the survey. Though the mobile sector has performed worse in comparison to the previous on almost all the parameters, it has done exceptionally well for USO, raising the overall score The score for mobile USO is a surprise given that the previous scores for this parameter were the worst. However, a closer examination of the reasons explains it. First, mobile operators were included as beneficiaries of USO funds from March 2007. Second, the mobile additions of 6 million subscribers every month is perceived as universalization of the service notwithstanding the poor performance of the fund itself. Scores for market entry and regulation of anti-competitive practices have declined the most for the mobile sector. Over the past year there have been many pointers to the fact that there is a possibility of a tacit collusion among the current operators, which in the absence of a functioning competition authority may have been overlooked. Moreover, the market entry procedure has been tardy as for quite a long time the Department of Telecommunications was not in favour of new entry. Moreover, any new entry is inextricably linked with the availability of spectrum for it to offer credible contestability. Given that the worst performance has been Access to Scarce Resources, this may have also impacted the Market Entry score since without spectrum entry is meaningless.

2. Methodology

In this report we use the TRE instrument[2] to get a perception of informed stakeholders on the telecom regulatory and policy environment of India. The TRE has many uses: it is a

[1] See Annex 1 for the regulatory events for the year of the survey
[2] The original TRE instrument was designed to assess regulatory effects on investment (Samarajiva & Dokeniya, 2005)

diagnostic instrument for assessing the performance of the laws affecting the telecom sector and the various government entities responsible for implementation. The detailed methodology of the application of this instrument is detailed in Samarajiva et al (2007)[3].

The role of the Indian regulator is assessed on seven broad parameters: (a) market entry; (b) access to scarce resources, mainly spectrum; (c) interconnection; (d) tariff regulation; (e) regulation of anti competitive practices (f) universal service obligations (USO); and (g) quality of Service (QoS). The respondents were asked to rate the quality of the regulatory environment for each dimension on a Likert scale ranging from 1 (highly ineffective) to 5 (highly effective). Posing questions in this format ensures that responses can be easily analyzed without losing any qualitative information as often occurs when using open-ended questions. Then the scores are averaged over the respondents to get one number to allow for inter temporal and international comparisons.

However, a caveat must be added that the average score may mask some other details about the perception, as it may not represent the majority as the cardinality of the response has an effect on the outcome. So, for instance a few people giving a score of 5 can upwardly bias the average and vice-versa.

Attempts were made to get 15 respondents each for each of the following categories:

- Category 1: Stakeholders directly affected by telecom sector regulation, such as operators, Industry associations, equipment suppliers and re-sellers
- Category 2: Stakeholders who analyze the sector with broader interest, such as those working for financial institutions, Telecom consultants, Law firms
- Category 3: Stakeholders with an interest in improving the sector to help the public such as academics, research organizations, journalists, telecom user groups, civil society, former members of regulatory and other government agencies, donors.

In our observation category 3 who do not have a financial stake in the sector are the most enthusiastic respondents followed by category 2 and the operators who are most affected by the TRE are the most difficult to get responses from. We were however only able to get 42 responses. A few of the respondents did not reply for either the fixed or the broadband sector. Most of the questionnaires were served to individuals through email. However, in the case of operators field visits were essential and hence they filled up a hard copy of the questionnaire. Almost 100 people were contacted for the survey

The next section of the report documents past policy and regulatory developments that have shaped the outcomes of the industry in terms of hard indicators. In order to monitor the performance of the Indian telecommunications industry, it is important that a systematic set of economic indicators on this sector giving information on the number of licenced operators by type of services provided, infrastructure and investments, subscriber base, state of competition, degree of concentration of the market, broadband connectivity, tariffs, quality of service etc. are available. In this section, the description of the reform process is supported with objective data that quantify the outcomes of reform in its various dimensions.

In the sections that follow (Sections 4- Sections10) we analyze the reform process through the prism of TRE. Since TRE was also conducted in India for the period June 2005-06, the

[3] Available at: http://www.lirneasia.net/wp-content/uploads/2008/05/lirneasia-tre-paper-for-tprc-v8.pdf

TRE scores for comparable sectors and comparable parameters will be analyzed for the differences. Some conclusions will be drawn based on the comparisons.

3. Development of the Regulatory and Policy Environment

Telecommunications

In India, like in many other developing countries, the abysmal performance of the state-owned telecommunications service provider and the increasing requirement to attract capital for the upgrading of the sector were the major drivers for liberalization.

After four decades of closed centralized economic model based on import substitution India made a structural shift to market-oriented model. This shift in policy and the associated institutional arrangements also had an impact on the telecommunications industry. India faced many difficult challenges in liberalizing its telecommunications industry from a monopoly to a decentralized competitive model. During monopoly era, telephone was not considered as a necessity, and, as a result, telephone penetration levels were very low and the quality of service was poor. However, long-waiting lists, technological advancement and pressure from various domestic and international stakeholders pushed the government to initiate reforms in middle of 1980's to spread telephone infrastructure.

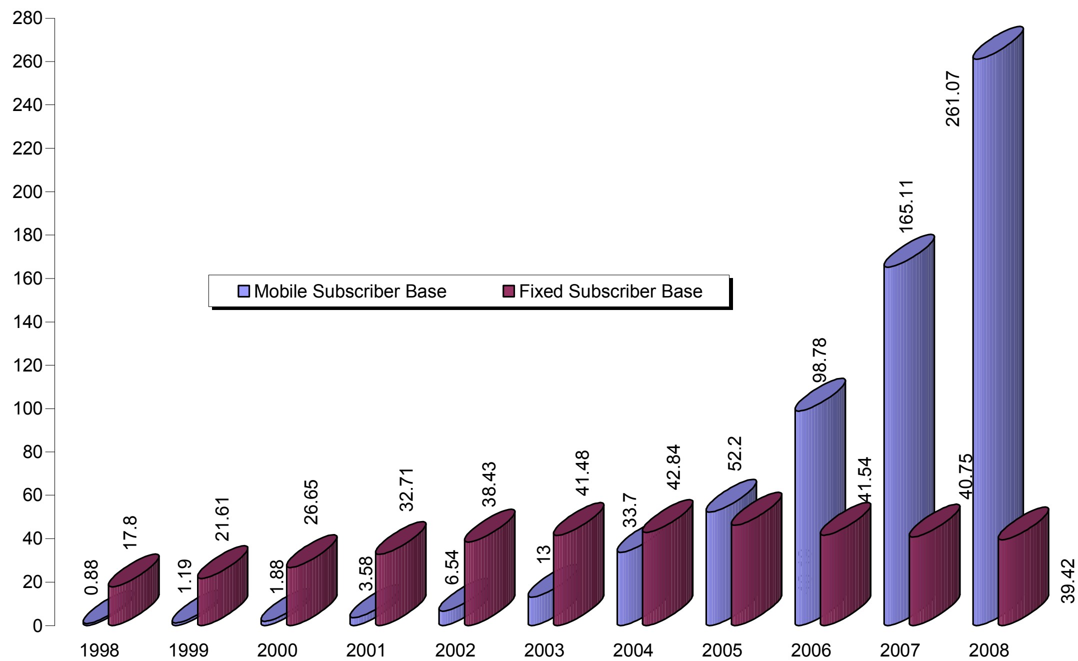
The two key elements defining the change in the market structure were (i) the restructuring of the government operator and (ii) the entry of private operators. The restructuring of the incumbent was initiated in October 1999 involving the bifurcation of the Department of Telecommunication (DoT) into two departments, namely, the Department of Telecommunications and the Department of Telecommunication Services, later corporatised in October 2000 into a new entity-Bharat Sanchar Nigam Limited (BSNL). While the former functions as the licensor and policy maker, the latter was entrusted with the responsibility of operations. BSNL provides services in the entire country except in Delhi and Mumbai, where the government controlled corporate entity Mahanagar Telephone Nigam Limited (MTNL) continues to be the service provider.

Thus, there was a shift from a static, monopolistic industry that provides a single product, telephone service to a dynamic, multiproduct, multioperator industry. It should be noted, however, that this change in market structure has taken place without the privatization of the domestic incumbent service provider BSNL and MTNL. The privatization of the overseas carrier Videsh Sanchar Nigam Limited (VSNL) in April 2002, with the strategic sale of a stake of 45% to Tatas and the government and employees retaining a stake of 26.13% and 1.97% respectively, represents the first and only instance of the government transferring control of a telecom undertaking to the private sector.

The results of liberalization have been impressive. Teledensity has increased from merely 2 percent or so in 1999 to around 26.22 percent in 2007 and almost 6 million mobile subscribers are added every month. Wireless has been the principal engine for telecom growth in the country. The wireless subscriber base has grown from 0.88 million in1999 to 261.07 million in 2008.

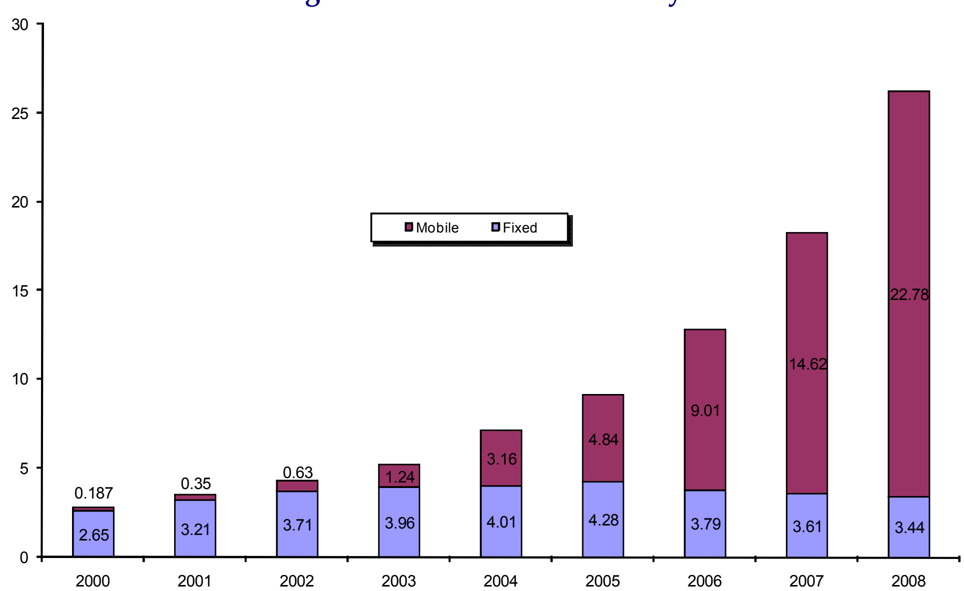
Till March 2007, the stock of capital investment f the telecom services sector has reached Rs. 2346.87 billion (USD 58.67 billion) at the end of financial year 2006-07. The total revenue of the telecom sector in 2006-07 of Rs.1053.18 billion (USD 26 billion) accounted for 2.83 percent of the GDP in current prices. The EBITDA of the telecom companies at the end of the last fiscal was Rs.391.67 billion (USD 9.79 billion) and the EBITDA margin was 37 percent.

Figure 3: Fixed and Mobile Subscriber Base



Source: Various Performance Indicator Reports, TRAI

Figure 4: Growth of Teledensity



Source: Various Performance Indicator Reports, TRAI

Table 2: Financial Summary of the Indian Telecom Industry

Indicator	2004-05	2005-06	2006-07
Total Revenue (Rs. billion)	716.7373	867.1955	1053.18
Contribution of Govt. Companies	421.7420 (59%)	452.3298 (52%)	454.72 (43%)
Contribution of Pvt. Companies	294.9953 (41%)	414. 8657(48%)	598.45(57%)
Total EBITDA (Rs.billion)	267.8570	301.3792	391.67
Govt. Companies EBITDA	186.1320	187.0912	195.86
Pvt. Companies EBITDA	81.7249	114.2880	195.80
Capital Investment (Gross Block[4])	1788.31	2006.66	2346.4
Gross Block - Govt. Companies	66%	64%	57%
Cross Block - Pvt. Companies	34%	36%	43%
Capital employed[5]	1538.64	1700.87	1898.34
Capital Employed – Govt. Companies		1042.31	1030.71
Capital Employed - Pvt. Sector	599.25	658.56	867.63
Return on Capital Employed (RoCE)		7.82%	10.64%
Cumulative FDI in Telecom (Rs. Billion) (Percentage of total FDI)	113.13 (8.3)	143.36.18 (8.88)	166.91 (7.91)
Gross Domestic Product (Rs. billion)at factor cost) Current Prices	28439	32006	37175
Share of Telecom sector to GDP	2.52%	2.71%	2.83%
Total Employees of Telecom Companies	436891	429400	432771
Govt. Companies	394334	382105	369035
Pvt. Companies	42557	47295	
Subscribers per Employee at year end			
Govt. Companies	132	158	193
Pvt.Companies	1089	1678	2110

Source: TRAI various Performance Indicator Reports.

As mentioned earlier, the outcome in terms of increased connectivity is a consequence of a liberal pro-competitive policy and regulatory regime (which we discuss in the following sections) which increased affordability, of the once considered “luxury” item by Indian policy makers,[6] for a large unserved population of India. This competitive regime has resulted in an oligopolistic market structure (with many sellers), of the Bertrand kind, where the prices have reduced substantially. The presence of many sellers makes it difficult for any single operator to wield its market power by setting prices far above what fetches it the “normal rate of return”.

[4] Gross Block is the Gross Capital Investment or the stock of investment
[5] The Capital Employed is the fund deployed to operate the business
[6] http://www.columbia.edu/~ap2231/ET/et102-December%2027%202007.htm

Figure 5: Market share of the mobile operators as of March 31, 2008[7]

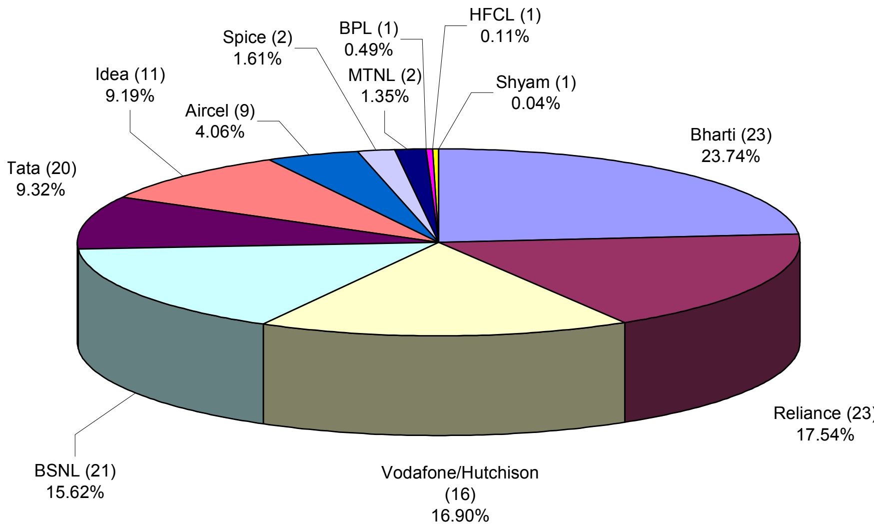
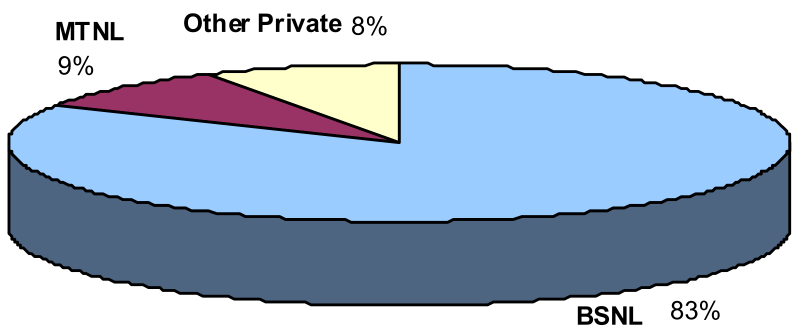


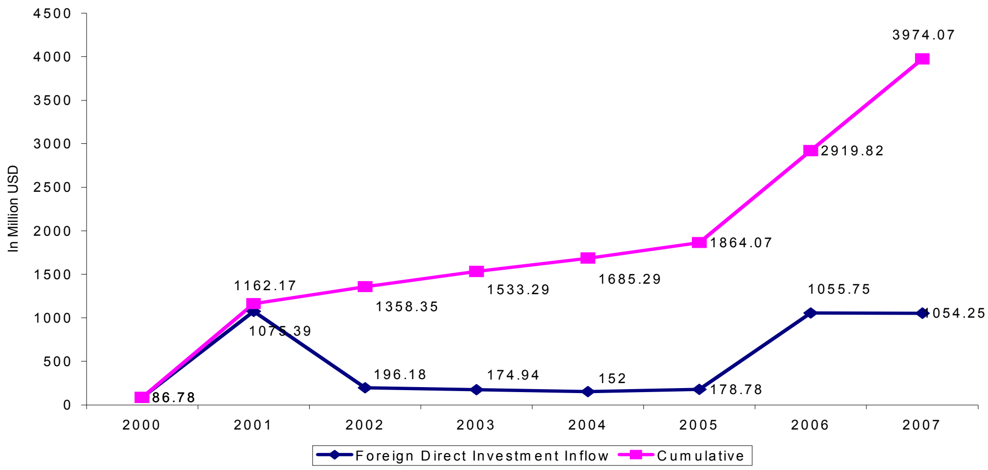
Figure 6: Market share of the fixed operators as of March 31, 2008



However, if we look at the market shares of fixed service providers, it is quite evident that it is still public sector incumbent-dominated, with BSNL and MTNL accounting for almost 92 percent of the market. Even after so many years, private entry into the fixed services has been largely restricted to the large cities. Ironically, this is despite the fact that India has 670,000 route kms optical fibre network connecting 30,000 exchanges; of which, 27,000 are in rural areas. Backbone Optical fibre covers virtually the entire country. But due to an absence of a policy on infrastructure-sharing, the private basic service operators have resorted to (quite understandably) extending their networks mainly to high-revenue customers. Thus while in the urban areas the fixed sector has seen private entry, small towns and rural areas are largely served by the public sector companies. This classic cherry-picking model of entry characterizes the entry process of both the mobile and the fixed sector, but in the mobile segment, competition has been more aggressive, as there was no incumbent presence at the time of entry. The absence of competition in the fixed segment has had an impact not only on voice services, but also on data services. It is not surprising therefore that broadband penetration in India remains lower than the potential (of course PC penetration is also low owing to demand side factors but the proportion of broadband to total internet subscribers is very low).

[7] The number in the brackets of the diagram represents the "circles" (each circle being contiguous with individual states, in addition to the four metros) More than six cellular service providers are present in each circle,

Figure 7: Foreign Direct Investment Inflow in Telecom



Another important feature of the Indian telecom growth story is that it is driven by domestic investment; with only 4 billion USD coming from Foreign Direct Investment. Unlike many countries in the region, FDI in telecom only accounts for 8.13 percent of the total FDI flows to India.

There is no doubt that policy and regulatory initiatives can go a long way in making markets more effective as a mechanism for universalizing the service. Navas-Sabater, Dymond, and Juntunen, 2002 had called these the, market efficiency gaps which is the difference between what markets actually achieve under current conditions, and what they can achieve if market barriers are removed. Effective competition, private provision of service, and market-oriented policies and regulations that create a level playing field for new entrants have a potential to bridge this gap.

Competition allows for a range of price and quality options, making service possible to regions and income levels that a monopoly provider would never have considered. In fact one salient reason for opening up the sector for privatisation has been the realisation of scarcity of the incumbent's funds and the consequent pent-up or unmet demand that was met by the new entrants.

Malik (2007)[8] shows that competition induced decline in tariffs (and hence increased affordability) resulted in wireless telephony boom in India. Tariff reduced up to 35 percent during 2003-04. IPLC charges decreased by 35 percent for low capacity and 70 percent for higher capacities The Indian case study clearly demonstrates that competition can deliver, and hence should be fostered by regulation and policy. This is evident from the year on year growth experienced in the mobile sector that not only surpassed the fixed sector growth but also lead to increased substitutability between the fixed and mobile telephones. This consequence may be attributed to the fact that since the regulator was unable to foster competition in the fixed sector due to the presence of the incumbent, it diverted its regulatory efforts to the mobile sector.

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[8] Malik (2007), An Analysis of the Reform's of India Telecommunication's Industry: Policy, Regulation and Indicators, LIRNEasia Multi component 6 country study. http://www.lirneasia.net/wp-content/uploads/2007/04/malik-2007-6cmcs-india.pdf

Figure 8: Mobile substituting fixed services? : YoY growth Mobile vs. fixed

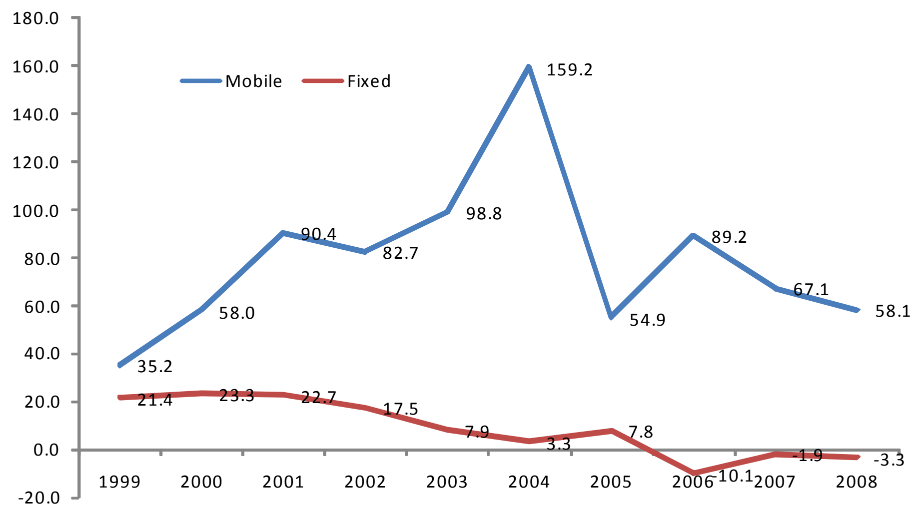
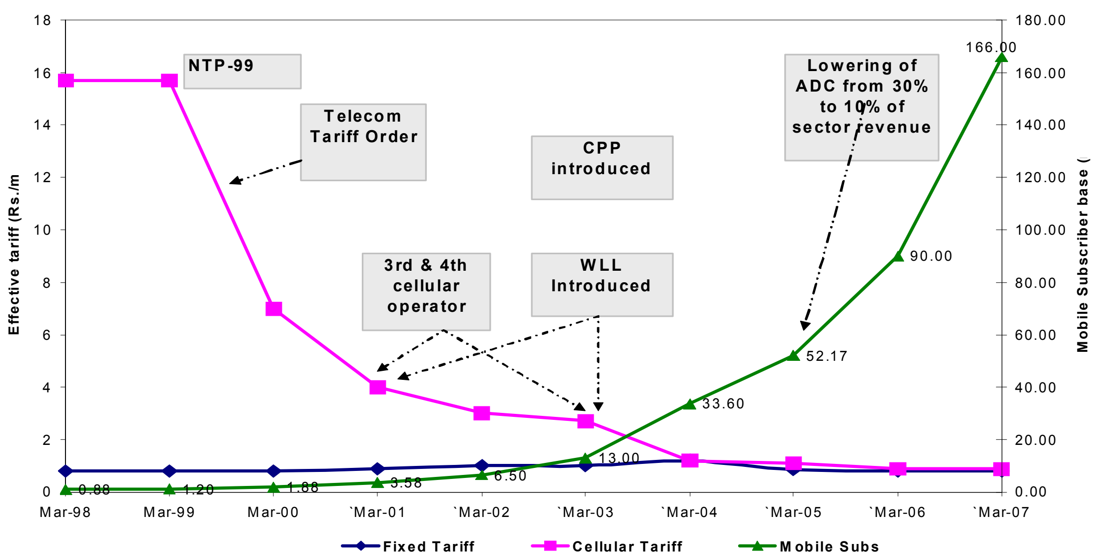
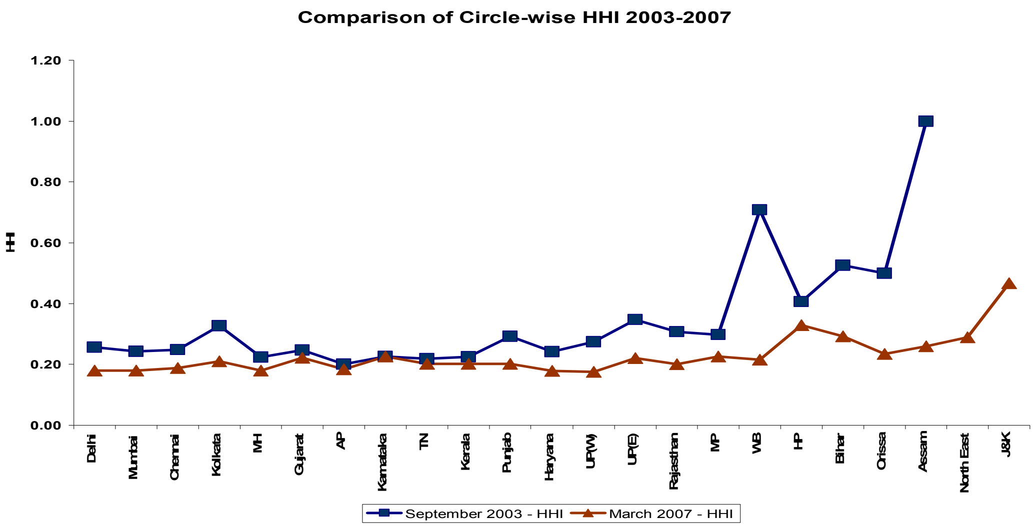


Figure 9: Decline in Tariffs due Policy and Regulatory initiatives



The measures taken by TRAI to reduce tariffs through encouraging increased competition included: introduction of a Unified Access Licensing Regime; introduction of the Calling Party Pays regime; lowering of the Access Deficit Charge (ADC) from 30 percent to 10 percent of the sectoral revenue and finally scrapping it from April 1, 2008; allowing cheaper handsets to be sold at the time of delivery (with the rest of the money charged in installments); and allowing cheaper intra-network calls, among others. The Government encouraged the process by changing high entry fee with revenue share and reducing the revenue share further in 2001 and 2003 by accepting the recommendations of the regulator in this regard. If one takes the HHI as a measure of the level of competition not only they show low market concentration, but have also continuously improved in all the circles.

Figure 10: Increasing competition 2003- 2007



In a low income market like India, vendors too have a role to play, in addition to the regulators' efforts to create a positive investment climate for operators, to serve rural subscribers. Indian operators are currently operating at very low Average revenue per user per month (ARPU) of USD 6, but they are still making profits as revealed by their EBITDA. Estimates have been made that the telecom business in India is viable at a low ARPU of USD 4, without a handset subsidy. Some observers argue that low ARPU model of affordability is sustainable due to operators cutting investments (to reduce their costs) on improving the quality of service. Hence the full exploitation of the network as expressed in high Minutes of Usage (MoU) for India at 471 minutes per user, points to the fact that the operators are working at full capacity and at the minimum efficient scale of their investment.

Figure 11: Average revenue per subscriber/per month

Table 3: Important milestones Policy and Regulatory in Indian telecom sector

New Telecom Policy – 1999	The service – providing arm of the Department of Telecom separated from the policy making and licensing functions
	Creation of corporatised BSNL in October 2000
	BSNL/MTNL allowed to enter as the third cellular service provider in all circles
	National long distance market thrown open for competition
	Wireless Planning and Co-ordination Committee created to review and enforce spectrum allocation policy
Lowering the Licence fee – 1999	Government changed the prevailing fixed annual licence fee to a revenue share regime
Interconnect Usages Charges regime – 2003	IUC regime of 2003 specified the interconnect charges clearly
	Paved the way for a calling party pays (CPP) regime – subscriber no longer had to pay for incoming calls, making the mobile phone highly affordable to the low usage customers who mainly used it for incoming calls
	The termination charges made uniform for all types calls – cellular mobile, fixed and WLL (M)
Unified Licence	Allowed an operator to provide fixed and/or mobile service using any technology
	The objective was to allow the exploitation of technological developments to the fullest extent to provide new applications and services
	The first phase of implementation, the Unified Access service licence, was readily adopted by most of the major operators
Lowering of Access Deficit Charge	Feb 2005: The per minute ADC on domestic long distance calls reduced by up to 60%, and the ADC on international calls by up to 40%
	March 2006: The per minute ADC for domestic calls replaced with a revenue share fee of 1.5% of non-rural (wireline) AGR, coupled with a sharp 60% drop in per minute ADC on international calls
	March 2007: ADC on percentage revenue share reduced to 0.75% from 1.5% of AGR. Per minute ADC on outgoing International calls reduced to zero, and on incoming International calls reduced to Rs. 1.
Lowering duty of telecom equipment - 2003-05	Union Budget 2003-04 cut the customs duties on telecom sector capital goods from 25% to 15% and on cell phones from 10% to 5%
	Union Budget 2004-05 exempted imports of capital goods for manufacture of mobile handsets from customs.
Roaming Charges	Jan 2007: Roaming rental reduce to zero. Reduction of roaming tariffs to the extent of 22%-56%
Port Charges	February 2007: Port charges reduced by 23-29%.

Source: TRAI consultation paper on cap on access providers, April 2007

Broadband

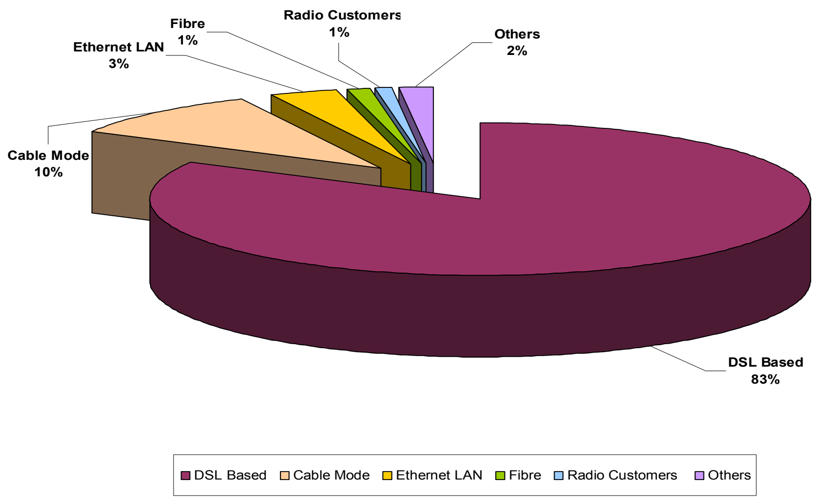
While regulatory reform in the telecommunications sector aimed at introducing competition was fairly successful for certain technologies, such as mobile telecommunications as reflected by the HHI index of market concentration, it was less successful for the fixed, or wireline, network.

Regulatory and policy neglect of the fixed sector has an impact on the diffusion of broadband services, not only in India, but also in many developed countries[9]. The diffusion of access to broadband services is important due to the positive externalities offered by the adoption of such advanced technology. Broadband access can be provided *via* different technological platforms or types of networks. An important feature therefore is the role of the legacy telecommunications systems already in place and to what extent market power derived from the legacy system can be transferred to the emerging broadband market. In the Indian context broadband through coaxial cable does not provide any credible competition to the DSL

[9] An international comparison in the wireline access markets shows that for most OECD countries the market share of the incumbent wireline firm is well above 90 per cent. As wireline access remains key in providing broadband services in most countries, policy-makers have to find ways to address the problem of market dominance.

offered through the incumbent's copper. Hence the regulatory and policy initiatives to promote broadband have to be directed towards the legacy fixed line network.

Figure 12: Broad Band Subscribers by Type of Technology



At the end of March 2008, the Internet subscribers were 76.59 million and broadband subscribers were just 3.87 million. It may be important to mention that 65.50 million subscribers are accessing Internet through wireless networks (GSM/CDMA) of Unified Access Service Providers (UASPs) and Cellular Mobile Service Providers (CMSPs). Therefore the growth of Internet subscribers is satisfactory but India is seriously lagging behind in broadband. The broadband subscriber growth initially (during 2005-06) was high (more than 600 %) but subsequently declined to an annual growth of just 60-70%. The high growth rate of broadband in initial years was on a narrow base. The targets fixed for the Broadband Policy are unlikely to be achieved. There are critical issues inhibiting broadband expansion in urban as well as rural areas. They need to be addressed urgently to facilitate expansion of broadband services in urban as well.

The recent report of Organization for Economic Cooperation and Development (OECD) lists India at the bottom of 34 countries in which countries have been ranked based on the broadband penetration. India is not only below developed countries such as the US and the UK but also far below even smaller countries such as Denmark and Iceland. China adds 3.32 million broadband connections in a quarter whereas India adds just 0.08 million.

TRAI said that it has been suggesting measures to boost broadband growth in India but the Government has not taken any action on the same. DoT had set a target of 9 million subscribers by 2007. This has not been met by far as there are just about 3.87 million broadband users at present. The telecom regulator issued another set of recommendations recently reiterating the suggestions made earlier. It said that the last mile local loop owned by the State owned BSNL and MTNL should be opened up for franchisees to offer broadband services. BSNL and MTNL were supposed to provide 1.5 million broadband connections by the end of 2005 whereas actually they could provide only 0.5 million by 2005.

The number of Broadband subscribers (with a download speed of 256 Kbps or more) was 3.87 million at the end of March 2008 as compared to 3.13 million at the end of December

2007. The growth rate of broadband subscribers in the last quarter is 23.64%. However, this is not an impressive performance. According to TRAI, even at the end of March 2008, BSNL and MTNL together have provided just 2.57 million broadband connections using DSL technology. As such the available copper loop to provide broadband connections have not been effectively utilized. The regulator also urged DoT to expedite decision regarding mechanism and pricing of spectrum for 3G and Broadband Wireless Access. "Spectrum for 3G and WiMAX should be made available at the earliest to boost the deployment of broadband using these technologies," the regulator said. Moreover, TRAI has urged that the Government should expedite the action on allowing resellers for international bandwidth as it will reduce Internet cost.

Figure 13: Internet and Broadband subscribers

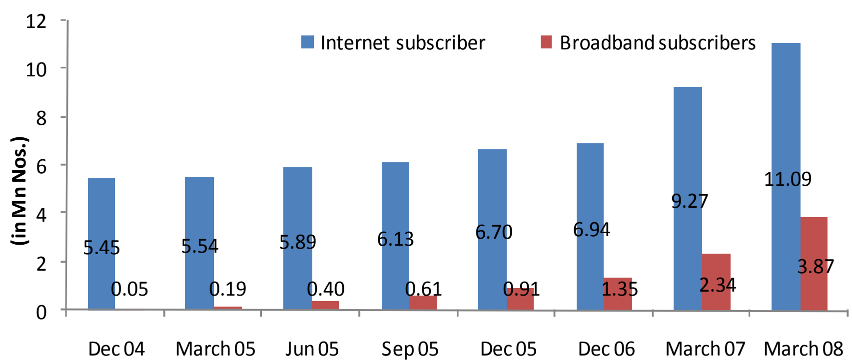
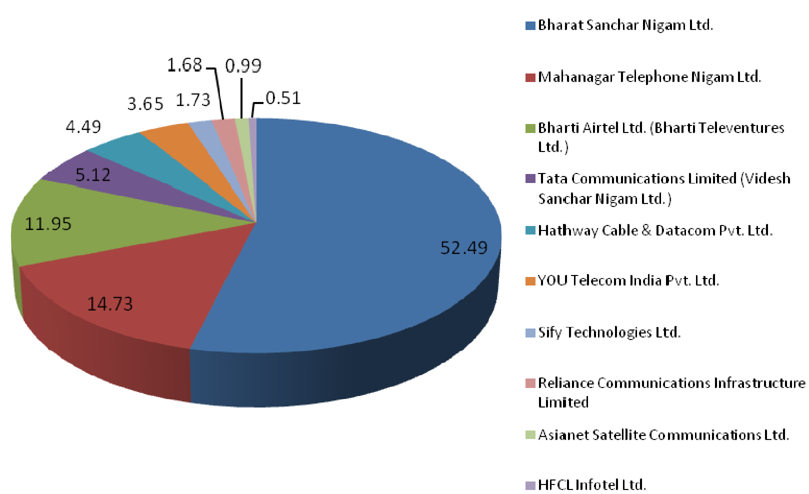


Figure 14: Broad band market share of companies



4. Market Entry

When private service provision was first contemplated in July 1992, the policy-maker's goal was not to allow competition in basic services, but instead to supplement basic services by allowing private providers to offer premium services at higher prices (such as mobile services). Telecom licences were auctioned for basic and cellular services by the Department of Telecom (DoT), the incumbent government policy-maker, regulator and service provider until January 1995. The same tired old Indian *Telegraph Act of 1885*, which governed telecommunications services under the colonial PTT model, was left in place to cope with the competitive era. Thus, DOT along with the Ministry of Communications, became responsible for issuing licences to its own competitors.

In the first round of bidding of basic service licence the response was poor and nine circles remained without any service providers. Finally, only six providers signed the licence agreement for the provision of basic services.

In cellular services, duopoly was introduced through a bidding process in circles and forty-two licences were awarded. Despite fewer problems with the award of cellular licences, services were slow to take off due to high bids, slow frequency allocation and the lack of a suitable framework for managing interconnection arrangements (Jain, 2001).

The revenue earned by the state through licence fees and other charges on private providers was to be used to fulfil the state-owned incumbent's investment and rollout targets. Licences were issued to those who bid the highest up-front fees. The intention was to create at least two viable service providers in each circle of operation (each circle being contiguous with individual states, in addition to the four metros). However, the concept of private service provision suffered a serious setback when none of the mobile service licensees, as well as private basic service licensees, were able to pay the fees that they had bid, due to overbidding. Both cellular and basic service operators had committed to unrealistic licence fees and were struggling to survive in the market. They owed almost $873 million to the government towards their outstanding licence fees.

A key aspect of NTP-99 was the development of a migration package, according to which, all fixed service providers would pay their licence dues as of 31 July 1999 as a one-time entry fee, as well as a stipulated percentage of their revenue as licence fee over the period of their licence.

Both cellular and basic service operators were required to pay a licence fee at 12% of adjusted gross revenues (AGR) in metropolitan areas and category A circles, 10% in category B circles and 8% in category C circles[10]. So under NTP-99, they were allowed to migrate from the earlier fixed licence-fee regime to revenue-sharing of licencee revenues, while duopoly rights were discontinued. As a result of this policy, the government decided to reduce mobile operators' licence fees from USD 59 billion to USD 1.5 billion and converted the regime to one of revenue-sharing.

Although the licensing process has been a mechanism for liberalising markets, it has also been a key mechanism for controlling and restricting entry and raising large amounts of money through licence fees

On 13 August 2000, the government announced the opening up of domestic long distance to the private sector, ending the monopoly of the DoT. Under NTP-99, the private sector was allowed to provide NLD and international long distance ILD voice services, with no limits placed on the number of participants. Wireless-in-local-loop (WLL)-based limited mobility was allowed for private basic service providers. Data services were fully opened to the private sector. Cellular service providers were permitted to carry their own long distance

[10] Further concessions were provided in 2003 at the time of the introduction of the UASL (Unified Access Service Licence), which included a reduction of revenue shares by 2 per cent for all players and a further concession of 2 per cent for those cellular players which had entered the field in the first round of bidding for higher licence fees.

traffic within their service area (earlier operators had to pay charges for carrying calls on the DoT network within the same circle too). The duopoly in cellular service was broken to allow for unlimited competition and public sector entities entered as third cellular operator in their respective circles

In January 2001, the Government announced guidelines for the fourth cellular operator to provide cellular services in the country and the licences were issued in September 2001 through a revised three-round open bidding system, instead of the earlier sealed bid system. Thus, while the initial auctions resulted in perverse outcomes with respect to market entry, the design of the fourth cellular licence was extremely efficient.

The regulatory environment prior to NTP-99 with regards to market entry was ad-hoc and non conducive for the operators to roll out their investment plans. In early 1999, Indian telecommunications reform was on the verge of a disaster. The independent regulator had been declared to have no authority over the prices and entry decisions of the public sector[11] and DoT had made a series of decisions that were bankrupting the private entrants and thereby re-monopolizing the industry. The TRAI Act of 1997 had in principle given clear powers to TRAI to give directions to operators and adjudicate disputes between them. DoT had contested these powers in the court on many occasions and in most of the cases, it won decisions in its favour. All this made initial investors wary, as DoT, with the help of legal intervention, escaped regulatory oversight.

TRAI was not given the responsibility to issue and revoke licences, but only to recommend them. However, under the NTP-99 framework, assurances were given that TRAI should be consulted on issues of number of competitors and the timing of their entry. The DoT surrendered its regulatory role in principle, although it still retained policy-making, licensing, and operative powers within the same organisational boundaries.

In 1999, a disagreement between the TRAI and the government led to the reconstitution of TRAI. On the initiative of an interministerial GoT-IT and in the interests of convergence, the government issued an ordinance in January 2000, to amend the TRAI Act. It made it obligatory for the government to consult TRAI on the issue of new licences.

Some analysts (Desai, 2004) argue that this amendment removed the cause of conflicts between DoT and TRAI. DoT was now under the directive power of TRAI and it could no longer seek the protection of the Delhi High Court in any matter not decided in its favour. The legal recourse taken by DoT had in many instances undermined the TRAI authority. Despite this rationale, there were suspicions about the government and some loss of credibility. Telecom reforms, however, continued with private entry into domestic long distance (freed in 2000-01) and into international long distance (freed in 2002-03).

Licensing affects the nature of competition and the resulting market structure. This was demonstrated in the WLL (Wireless in Local Loop) and cellular licence standoff. Ignoring the technological capability of WLL, it was licenced to provide local mobility. A situation emerged where two types of service providers, licenced under very different licensing regimes, started to compete with each other in the mobile wireless market.

[11] The November 1997 MTNL decision to start CDMA-based cellular services, without the government seeking recommendation from TRAI on issuing new licence. This led to legal battles that seriously undermined the power of the regulator and in October 1999, MTNL went ahead with the cellular service, without even seeking TRAI's approval on tariffs.

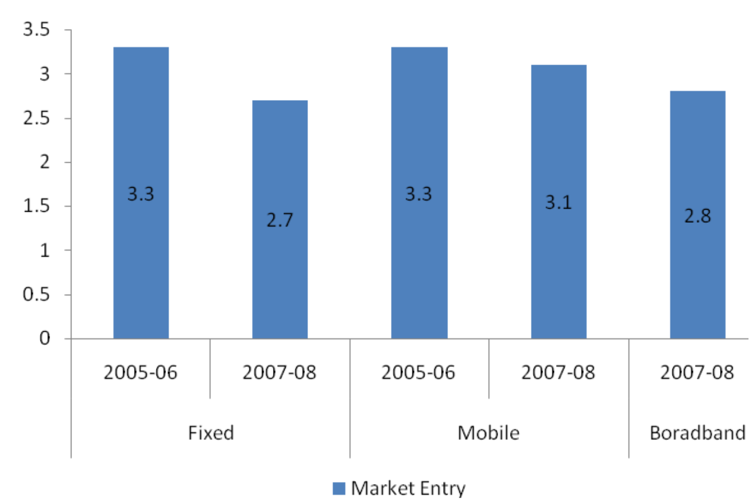
This led to an obvious need for convergence – since two types of service providers competed in the same market, but had very different licence conditions, TRAI facilitated the Unified access regime. Therefore, the licensing regime did not get in the way of technological developments. TRAI provided its recommendations to the Government on 27th October 2003, which were accepted on 11th November 2003. The objective of the Unified Licensing/Authorisation Regime was to be achieved in a two-stage process with the Unified Access Regime for Basic and Cellular Services being implemented in the first phase. This was to be followed up with a process to define the guidelines and rules for a fully Unified Licence/Authorization Regime.

However, DoT did not follow the TRAI recommendations on Unified Licensing. Instead, it liberalized the market entry process by reducing the entry fee into the NLD and the ILD from the existing level of USD 21 million (USD 5.5 million for ILD) to USD 0.5. Likewise, the Annual licence fee for NLD licences is to be reduced from the existing level of 15 percent to 6 percent of AGR w.e.f. 1.1.2006.

Moreover, according to the new guidelines, NLD service providers can access the subscribers directly for provision of leased circuits/closed user groups, i.e., they can provide last mile connectivity. Access service providers can provide Internet telephony, Internet services and Broadband services. If required, access service providers can also use the network of NLD/ILD service licensee.

A host of service licences still exist within the liberalized of the ILD and NLD sector. The unification process will be completed only when DoT removes all service-based licences and brings them under a single umbrella of a unified licence. The current market entry procedure ignores the technological possibilities opened up due to convergence. More recently, the TRAI recommended to the DoT that there was no need to cap the number of access providers to be permitted to operate in a particular service area and leave it for market forces to decide. On its recommendations on Mergers and Acquisitions the TRAI has imposed a caps such that no mergers and acquisitions should be allowed if the number of operators fall below the minimum threshold of four. Broadband Regulations came into force with effect from January 1, 2007. Total number of the Broadband Service providers was 72 in quarter ending December, 2007.

Analysis of TRE Score



The highlights of the market entry process in the past one year are that despite removing a cap on the licences by TRAI that had been proposed by DoT, the whole process of awarding licences was tardy. This could have resulted in a lower score than the previous scores for this parameter. Moreover, the government prolonged the declaration of explicit guidelines for the entry of MVNOs, in order to protect the investments of the incumbent

The application procedure and the manner in which it was implemented with litigation delays by the incumbent firms may have lowered the score this year in comparison to the previous TRE. Moreover, the government's approval of the use of dual technology, under which operators can offer services on both GSM and CDMA technology platforms was under a lot of criticism as this was perceived as according some undue favours to current firms. Free entry with the government awarding LoIs to 9 companies, which had submitted their applications before the September 25, was a good development but most of the operators could not begin their operations due to non-availability of the spectrum.

Expressing dissatisfaction with the entry procedure, TRAI said that the decision to give Letters of Intent to new players was not totally in line with the recommendations of the regulator. TRAI said that while it had not suggested any cap on the number of operators, it had suggested that the Government make sure that there is adequate spectrum before allowing new players in. What has irked the telecom regulator is the DoT trying to justify its decisions on grounds that they were based on TRAI recommendations.

Market entry in the broadband is constrained on account of two factors. First, a lot of potential can be exploited if the Local Loop Unbundling recommendations are accepted. It is estimated that initially around 25-30% of the 26 million-cooper loops in urban area (Approx. 8 million) could be leveraged for providing broadband services by both the incumbents i.e. BSNL and MTNL. 2.4 BSNL and MTNL were supposed to provide 1.5 million broadband connections by the end of year 2005 (50% of overall target) whereas actually they could provide only 0.5 million by 2005 i.e. only 33% of the target fixed for them. Even at the end of March 2007 BSNL and MTNL together have provided just 1.45 million broadband connections using DSL technology. As such available copper loop to provide broadband connections have not been effectively utilised. At present BSNL and MTNL are having almost 60% market share but they are significantly behind overall targets as stipulated in the Broadband Policy (TRAI, 2008). Second, broadband access through wireless requires the government to release 3G spectrum through a well designed auction.[12]

5. Access to Scare Resources

As mentioned in the section on market entry, cellular mobile services started with a duopoly in 1994-95. The technology at that time was specified as GSM and the licences included a spectrum commitment of 4.5 + 4.5 MHz (later amended in 2001 to 4.4 + 4.4) with a possibility of increase to 6.2 + 6.2. Keeping in view the development of technology, all the licences were made technology-neutral in 1999. The third cellular mobile licence was granted to the incumbent in 1999. In 2001, the Government auctioned the fourth cellular licence in the 1800 MHz band. In the 4th Cellular licence, the committed spectrum was 4.4 + 4.4 MHz and a possibility of increasing it to 6.2+ 6.2 MHz was mentioned. The spectrum charges were earlier based on the number of mobile terminals and allocated spectrum. Since August 1999, the spectrum charges were converted to a percentage of Adjusted Gross Revenue (AGR).

[12] The DoT has announced its decision to auction 3G by the end of January 2009

This varies from 2% to 6%, based on the amount of spectrum allocated. The amount of revenue share increases with the increased allocation, i.e. 3% up to 6.2 + 6.2 MHz, 4% up to 10 + 10 MHz, 5% up to 12.5 + 12.5 MHz and 6% up to 15 + 15 MHz. In the basic services segment, competition was introduced in 1997-98 with the introduction of duopoly in the country. For these service providers also, spectrum was allocated to offer telecom services through wireless access.

Post NTP-99, open competition was introduced in basic services in 2001 and these licences were available on a first-come-first serve basis. In order to add value to their services, BSOs were permitted to provide 'limited mobility' services. The frequency bands for providing their WLL (M) services included 824-844 MHz paired with 869-889 MHz (FDD) & 1880 – 1900 MHz (Micro-cellular technology based on TDD). Service providers were given an initial 2.5 + 2.5 MHz to start service. The amount of spectrum could be increased to 5 + 5 MHz on meeting certain criteria (largely relating to subscriber base and roll-out), in increments of 1.25 MHz.

Thus, the allocation of the electromagnetic spectrum was carried out through fiat allocation Under this purely administrative mechanism of allocation of spectrum, the government (the government set up the Spectrum Management Committee of the DoT and the Wireless Planning Commission on Spectrum Pricing in May 1999) assessed the relative merits of plans proposed by various competing firms and granted a share of the spectrum accordingly.

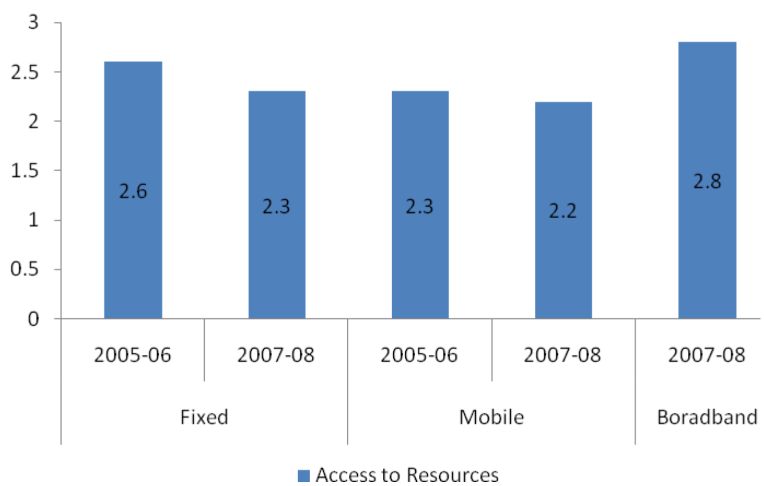
Thus, the regulatory set-up for allocation of a scarce resource such as spectrum has until now ignored the issues of efficient utilisation of spectrum, spectrum allocation procedure, and spectrum pricing. The present spectrum assignment policy is riddled with other anomalies as well. At present, spectrum allocation is linked to subscriber numbers and not usage. There is no policy for spectrum beyond 10 MHz. There is also no provision of a guard band, which results in interference in the signals of contiguous operators. Further, while the licence auction process did not allow companies to bid for a group of contiguous circles, subsequent changes in the ownership patterns show that cellular operators may have preferred to bid for contiguous circles. Several representations have been made to the government in recent times by mobile operators, as well as some others, about the limited amount of spectrum available for services. The delays in frequency allocation are subject to frequent criticism.

Spectrum is a scarce resource. Experience to date suggests that India has used it wastefully. The spectrum management is beset with several shortcomings, as a result of which, spectrum availability is rapidly emerging as a major constraint. First, the defence services use the non-NATO band which is also used for commercial purposes. Due to global interconnectivity considerations and the fact that most telecom equipment is manufactured in NATO countries, both defence and private users in India end up competing for the same spectrum bands. Due to this, the average frequency allotted to an Indian cellular operator is 6.2 MHz, compared to the world average of 17.18 MHz. The International Telecommunication Union (ITU) recognises a total of 110 MHz in 2G and 2.5G Global System for Mobile Communications (GSM). As against this, an average 35 MHz (a range of 25-50 MHz) is used currently by operators across circles in India. Another 31 MHz will be required to provide spectrum to the new licensees. This leaves about 34 MHz of spectrum for growth in 2G and 2.5G services. The Ministry of Defence is yet to clear about 20 MHz of this 34 MHz.

Growth in cellular mobile has exerted pressure on spectrum. In cities such as Delhi and Mumbai, where operators have been allocated upto 10 MHz, there is already demand for more. With the 900 MHz GSM band completely occupied, allocation beyond 8 MHz to each operator is possible only in the 1800 MHz band. In the 800 MHz CDMA band, some licencees have been allotted up to 3 carriers, out of a total of 4. With the growth of data, there is likely to be demand for more spectrum here too. Internationally, the next band for expansion of GSM and CDMA systems is 1800 MHz / 1900 MHz. Other government users are presently occupying a large part of these bands and refarming of this spectrum is a long-drawn process.

TRAI has recently come out with its recommendations on the allocation of spectrum for 3G and Broadband Services. These recommendations support the economic mechanism of allocation of spectrum through a well-designed auction, moving away from the previously adopted "beauty contest". In their recommendations, TRAI pointed out that spectrum identified for 3G should be treated as a stand-alone allocation and not as an extension of earlier spectrum allocation of 2G. Their recommendations are based on the following principles: Maximization of consumer interest (including affordability); responsible and efficient use of spectrum; aiding growth of the sector, particularly in rural areas; ensuring technology- and service-neutrality/convergence; recovery of costs and pricing of spectrum; orienting spectrum policy to support future competition; keeping a level playing field; and sharing of infrastructure. The DoT has ruled out any auction mechanism for the allocation of 2G spectrum. The subscriber linked formula has taken a long time to decide but even now there is no spectrum available to distribute it either to the current operators or new entrants.

Analysis of TRE Score



This dimension of TRE is the lowest performer and it is not surprising as the allocation of spectrum is the biggest imponderable that has plagued the sector in the last one year. The Minister of Communications Mr. A. Raja in a letter to the Prime Minister's office has ruled out auctions as a mechanism for allocation of spectrum. According to him, auctions are "unfair, discriminatory, arbitrary and capricious". By ruling out auctions he has implicitly endorsed the existing spectrum allocation policy that bundles spectrum with telecom service licence. Because of its inherent arbitrariness of this mechanism during the period of survey there were many operators who were disgruntled.

Moreover, the TRAI and the DoT were in disagreement for most part of the year in question of what is the appropriate subscriber linked formula. The arbitrariness of the process was demonstrated when the Telecom Engineering Centre tightened the norms of the subscriber based allocation by raising the threshold for such allocation by 800 percent, while the TRAI had recommended raising the subscriber based criterion by up five times.

With the DoT allowing for dual technology last year to the existing CDMA operators they too became contenders for GSM spectrum and this lead to endless litigations. Finally, some sort of consensus was reached with DoT accepting the recommendations of TRAI almost two years after the initial recommendations were made. However, there has been no provision of additional spectrum to either the incumbents that want more or the new entrants. With as many as seven new operators waiting to get telecom licences, the Government is now finding it difficult to make available adequate spectrum for all of them. The WPC report categorically says that there is no more spectrum in the 900 Mhz band. In the 1800 Mhz band it is being suggested to keep aside 45 Mhz to meet the demands of the existing operators and therefore new operators may get spectrum only in those circles where there is more available radio frequency. The 3G spectrum allocation policy has been announced but some anomalies seem to be favouring the current occupants.

For the expansion of broadband through wireless TRAI has been urging the government to expedite the implementation of its recommendations on spectrum allocation for 3G and WIMAX. In the case of the broadband Rights of Way is a major issue for deployment. TRAI has recommended that the Central Government may consider mandating the state governments to adopt uniform RoW procedures and streamline/ rationalise RoW cost, which may primarily be limited to cost of reinstatement only. RoW costs should be non-discriminatory, reasonable. RoW procedures should be transparent and publicly available. Tardy response of the government has resulted in low scores for the sector.

6. Interconnection

Refusal by the incumbent to provide access to the network calls for active regulation. The regulator may be required to fix access charges and other interconnection conditions. If the new entrant's coverage is small, the incumbent has an incentive to refuse interconnection since, in the absence of interconnection, it can corner the market. The licence agreement route to setting interconnection terms meant that newcomers were saved most, although not all, of the delays and negotiation to connect to the incumbent's network when they need to get their services off the ground.

In an asymmetric situation, the incumbent could use interconnection charges to handicap new entrants. This is what DoT did. In January 1997, after most of the cellular operators had made their minimum investment and started service, DoT raised the interconnection charge for mobile services to Rs 10 (about US$.22) per minute from Rs. 1.25. This action made cellular calls that interconnected with the fixed wire-line network extremely expensive for carriers, especially compared to the ceiling prices that they were allowed to charge for service. Moreover, DoT decreed that all calls from one wireless carrier to another had to be interconnected through the state-owned incumbent's network, so only calls within the same network could avoid the interconnection charge.

The successful challenge to the CPP regime was also a sign that TRAI lacked powers to enforce technically adequate and fairly-priced interconnection on all players in the market; arguably, the most important function regulators carry out in telecom market. The regulatory environment with regard to interconnection was highly unsatisfactory during this period.

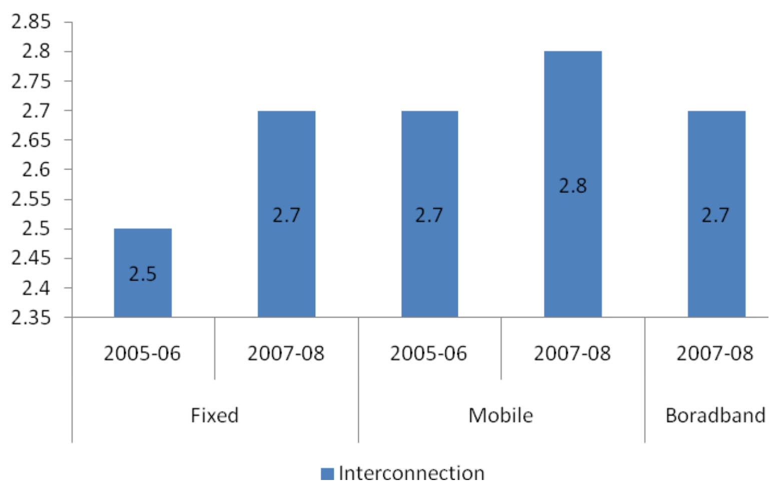
High interconnection charges constituted barriers to entry and quite possibly induced inefficient bypass.

The amendment ordinance of 2000 restored TRAI's powers relating to tariffs and interconnection, which had earlier been deemed by the courts to be limited. Even the government would have no right to overrule the TRAI in these two areas. Other thorny issues regarding interconnection were partly addressed in the NTP-99.

Thus, there was certainty of jurisdiction in matters relating to interconnection and a more level playing field had been created. On 12 July 2002, TRAI issued the Telecommunication Interconnection (Reference Interconnect Offer) Regulation, 2002 (2 of 2002). The regulation required service providers with significant market power to publish an RIO "stipulating the various technical and commercial conditions including a basis for Interconnect Usage Charges for Origination, Transit and Termination. Following these, the new entrants can seek Interconnection and agree upon specific usage based charges." All RIOs are to be approved by the regulator. The Telecommunication Interconnection Usage Charges (IUC) Regulation of January 29, 2003 was a comprehensive review of interconnection charges. It provided estimates of the costs of network elements involved in interconnection.

Although the final interconnection rules[13] were not adopted until late 2003 (TRAI 2003), their general form was known by early 2002 and they explain the subsequent boom in wireless networks. The current regulatory environment with regard to interconnection is fairly stable and the system eliminates much of the previous unnecessary complexity and unfairness. However, interconnection prices were still far above cost due to the "universal service" plan i.e. the access deficit charges (ADCs), which are incorporated into interconnection charges and are paid directly to the incumbent state-owned enterprise (BSNL) in order to compensate it for providing below-cost service in rural areas. After much litigation and several iterations, TRAI finally resolved the ADC issue in March 2008.

Analysis of TRE Score



[13] Termination charge for calls to basic (Fixed, WLL (Fixed), and WLL with limited mobility) and Cellular networks would be uniform @ Rs. 0.30 per minute. The same termination charge would be applicable for all types of calls viz. Local, National Long Distance and International Long Distance.

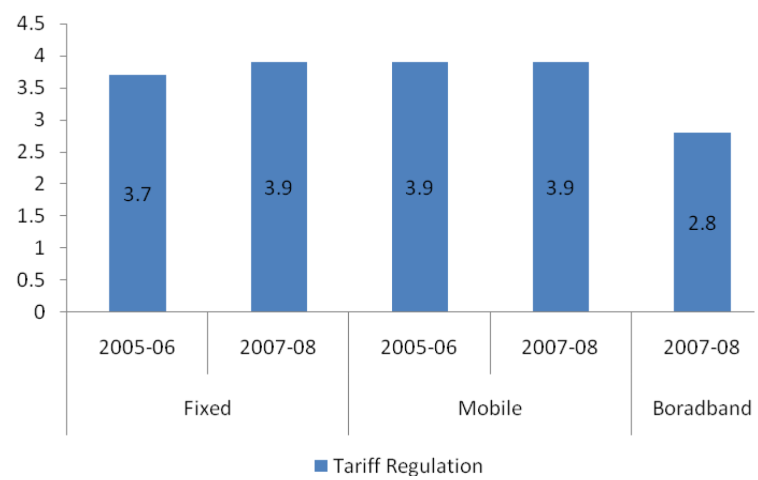
The TRE scores for interconnection were low but have improved this year. The major factor contributing to the improvement in the score can be attributed to the telecom operators welcoming the phasing out of ADC. The low scores for this parameter can also be attributed to the fact that TRAI has expressed its inability to force any operator to honour the interconnection agreement.

7. Tariff Regulation

The Telecommunication Tariff Order (TTO) 1999 issued by the regulator began the process of tariff rebalancing with an increase in monthly rental and decrease in National Long Distance (NLD) and International Long Distance (ILD) tariffs. This rebalancing exercise was implemented by TTO 1999 in three steps, the first in May 1999 and the third in March 2002. This resulted in a reduction of NLD tariffs by about 56 percent and ISD tariffs by about 47 percent. Under the 24th amendment of TTO of 1999, issued on 24th January 2003, the regulator brought down the tariff for domestic long distance calls by imposing a ceiling of Rs. 8.40 a minute for calls beyond 50km. It has been left to the operator's discretion to bring down tariffs further. Some companies have further slashed their rates.

The TRAI issued Telecommunication Tariff (Twenty Third Amendment) Order, 2002 (7 of 2002), which forbore from prescribing cellular tariffs and required only integrated operators to seek prior approval for their tariffs from TRAI. In this order, TRAI stated that, in light of emerging market conditions, market forces could effectively regulate cellular tariffs and the regulator could step aside, except for a broad supervision in the interests of consumers. More recently TRAI noted that despite intense competition in voice telephony in the cellular mobile services, competition was not adequate in the roaming services market. The Authority also found that there are justifiable grounds for a review of the tariff structure applicable for roaming services which had been fixed five years back, i.e. in the year 2002.

Analysis of TRE Score



The summary results show that the Indian TRE was the best vis-à-vis tariff regulation. The TRAI did not adopt RPI-X methodology for tariff rebalancing but a slow downward reduction. Despite not having support from the government, the incumbent, or the courts, TRAI proved pro-competitive and was successful to a certain extent in rebalancing telecom rates. This was no small achievement, as tariff restructuring had to be carried out despite the non-transparent and complicated accounting practices of the incumbent, which was the major source of information of the unbundled cost components.

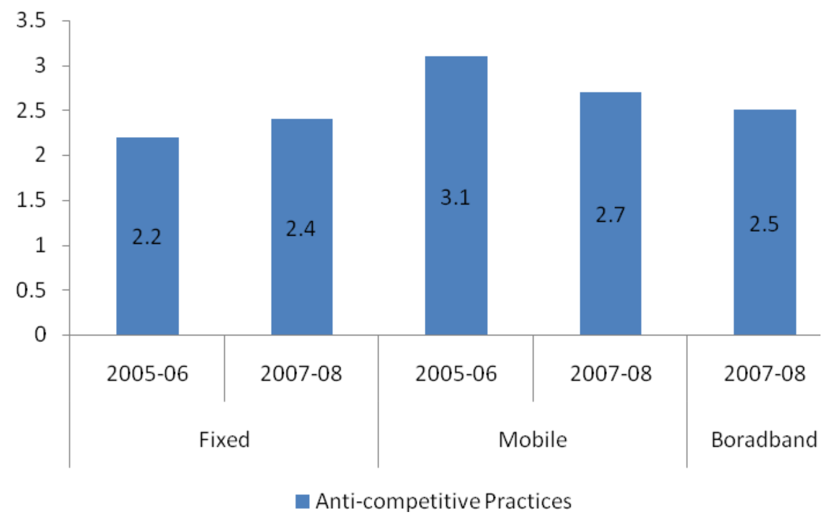
Though the tariffs may not be the lowest in the region the respondents have given the highest score to this parameter for the second year in succession. This does point out the success of the regulator. Though the regulator has forborne from tariff setting, various regulations have been passed in the recent times to address the tariff concerns, the most important being the regulator slashing the roaming rates as the operators seemed to be exploiting some market power.

8. Anti-Competitive Practices

Due to the unequal entry decisions made by the DoT as a licensor, with the state-owned incumbent being given a pan-Indian licence, while the competitors of the private telecom companies had service-specific and circle-wise licences, the monopoly power of the incumbent was bound to be retained. Thus, from the outset of the reform process, India's telecom market structure was highly skewed toward the state-owned incumbent. Given this initial condition, TRAI (old as well as new) has been unable to create parity between the state-owned incumbent and the private telecom operators. The attempt to regulate the incumbent asymmetrically has not been very successful. The regulator has accepted the market structure as given, even though this structure carries a huge risk for anti-competitive by the incumbent. The crucial missing link is the insufficient regulatory attention devoted to the design of appropriate market structures. Moreover, the ease with which policy, TRAI membership, and judicial oversight of TRAI decisions were shifted because the government wanted to change policies in its own favour shows the fragility of TRAI's independence (Uppal, 2003).

The regulator's attempts to dilute the inherent strength of the incumbent were resisted by DoT, on the issue of CPP and on the entry of MTNL/BSNL into the cellular business. Although the interconnection regime promoted by the regulator was pro-competitive, the regulator is not mandated to settle interconnection disputes and the incumbent blatantly refused to provide interconnection to the private entrants. This may have led to some inefficient bypass. The handling of the WLL controversy by the regulator (which was mainly on account of the alleged anti-competitive behaviour of a few basic service operators wanting to get a toehold in the cellular business) is another instance of a weak regulatory environment. Between 2001 and 2003, a series of litigation on this matter jeopardized the regulatory environment, especially in the context of fostering competition. India's new unified licensing regime for telecommunications is a step in the right direction, since it would reduce - as it already has done- the debilitating litigation and controversy in the sector. But it presents an increased challenge in regulating market power. With larger market size, the scope for anti-competitive subsidy by the integrated players, especially the incumbent, increases substantially. Until now, the general perception is that the regulator has only checked the incumbent's market power in a limited way. Moreover, by ignoring the recommendations of the regulator on infrastructure-sharing, the DoT is unable to dilute the restrictive and monopolistic practices of the incumbents and provide a level playing field to new entrants. It is ironical that even the private operators who were initially complaining of the anti-competitive practices are now themselves engaging in the same. This view has been put forward by the new players who seek entry in this sector.

Analysis of TRE Score



The score for regulation of anti-competitive practices for the mobile sector has deteriorated the most from 3.1 in the previous survey to an above average of 2.7 for the mobile sector and has marginally improved for the fixed sector. One should bear in mind that these scores are a consequence of the TRE on many other parameters such as market entry, universal service, interconnection etc. The existence of competing operators is not per se an indicator of competition. The test of competition must be contestability or ease of entry into the industry. Contestability naturally means that existing operators should not be able to preclude entry by other operators, but it also means that the government should not be able to stop it either. The Indian telecom competition is increasingly being threatened by the possibility of a cartelization. The sustainability of competition crucially depends upon the some ex-post measures to check anti-competitive practices for which the role of a Competition Authority cannot be underestimated. Other steps that can protect competition is the introduction of number portability, which has long been delayed in India.

9. Universal Service Obligation

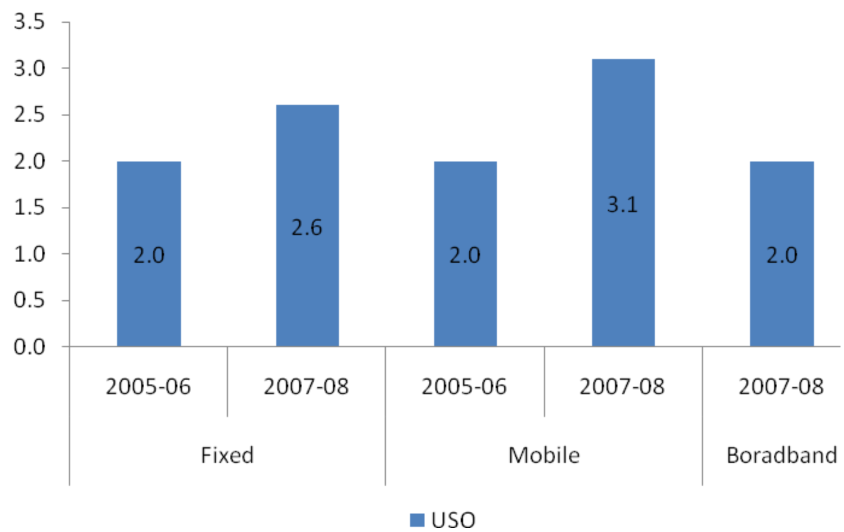
Universal Service was one of the main objectives of the National Telecom Policy (NTP) '99. Keeping in line with NTP'99, the government sought the recommendations of TRAI on the issues relating to the Universal Service Obligation. It is important to point out here that the regulator has only recommendatory powers on the issue of USO that the Department of Telecom (DoT) may consider in formulating or implementing the relevant policy.

Based on recommendations, the Universal Service Policy was framed and came into force on April 1, 2002. The Policy is framed under the Indian Telegraph Act 1885 as amended by Indian Telegraph (Amendment) Act, 2004 (No. 8 of 2004) and the rules framed there under. On January 9, 2004, the USOF was granted a statutory non-lapsable status with the passing of the Indian Telegraph (Amendment) Act, 2004.

By April 30 2007, INR 150 billion (almost USD 3.75 billion) had been contributed to the USOF. Only 33 percent of the amount collected has been expended and an additional INR 18 billion is expected to be for 2007-2008. Ironically, India accounts for nearly 50 per cent of the money lying unused in various Universal Services Obligations funds across 15 developing countries and has one of the highest levies as contributions toward the Universal Service.

The government until March 2007 gave USOF support to only fixed line operators that offer services in rural areas. But under this new policy the USO fund will be used for the creation of passive infrastructure for mobile services. Although this correction has been proposed, the previous auctions have yielded large rents for the incumbent. Even in the new USO scheme the active infrastructure including the backhaul is to be created by the service provider. The passive infrastructure to be created with the subsidy has to be shared with 3 other service providers. By capping the number of the service providers entry of new players has been restricted.

Analysis of TRE Score

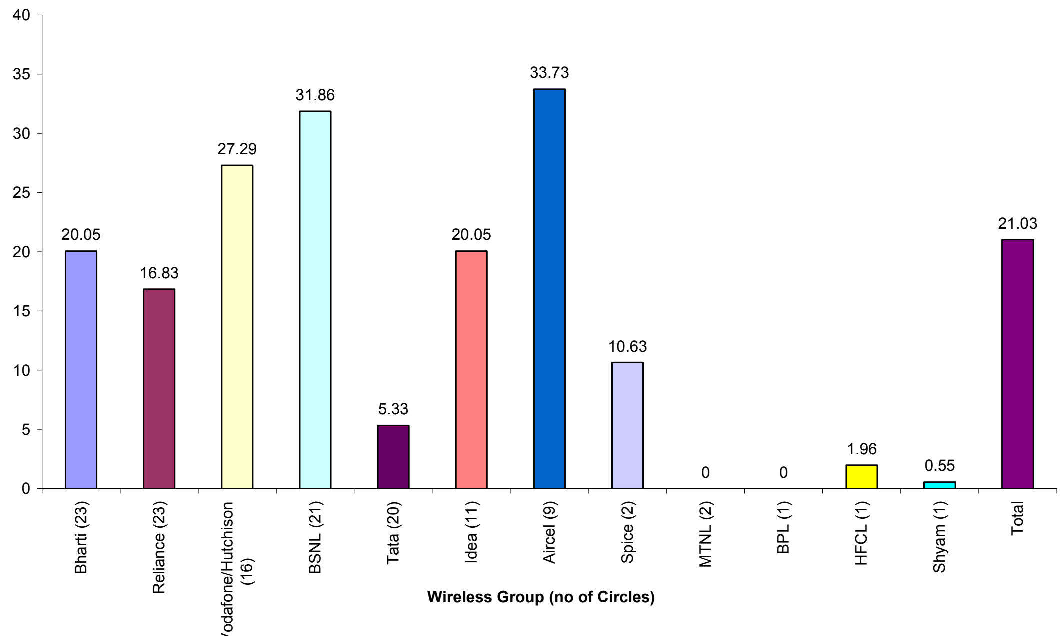


The remarkable improvement of the TRE score for this parameter especially in mobile can be attributed to a major change in the USO policy. The Indian USO policy as has been described in this section was not technology neutral but around March 2007 the government held least cost subsidy auctions for infrastructure companies for setting up infrastructure for mobile telephony. It also invited bids for the last mile connectivity from the mobile phone companies. This revised USO policy design seems to have been appreciated by the stakeholders participating in this survey.

While a 57 percent urban teledensity and a 10 percent rural teledensity is an issue of concern, it must be pointed out that the recent growth in the rural teledensity especially in the last few years has been mainly due to market innovations of the operators. The success of liberalization seems to be finally being extended to the rural areas. This achievement through the process of the market is being perceived as universalization and perhaps also explains the elevation of the score in this survey. With subscriber growth saturating in urban areas, operators are rapidly expanding into semi-urban towns and rural areas. These markets hold significant promise of subscriber growth but ARPUs may decrease even further with incremental increases in subscriber base. The figure below shows that the operators are willing to serve the rural areas but will require some support from the universal service fund for capital expenditures for infrastructure expansion.

Thus, the recent shift in the USO policy is a step in the right direction. The corrective mechanism to support mobile infrastructure funding and its consequent sharing has addressed some of the problems of the initial design of the USO programme but its design still raises questions about the impact of the programme on competition for the provision of rural services. Moreover, there are concerns of wasteful duplication of backhaul infrastructure due to the incumbent refusing to share its already existing infrastructure putting undue burden on the service providers over and above the Universal service fund contribution that they have to make.

Figure 15: Operator wise rural subscribers (in percentage)



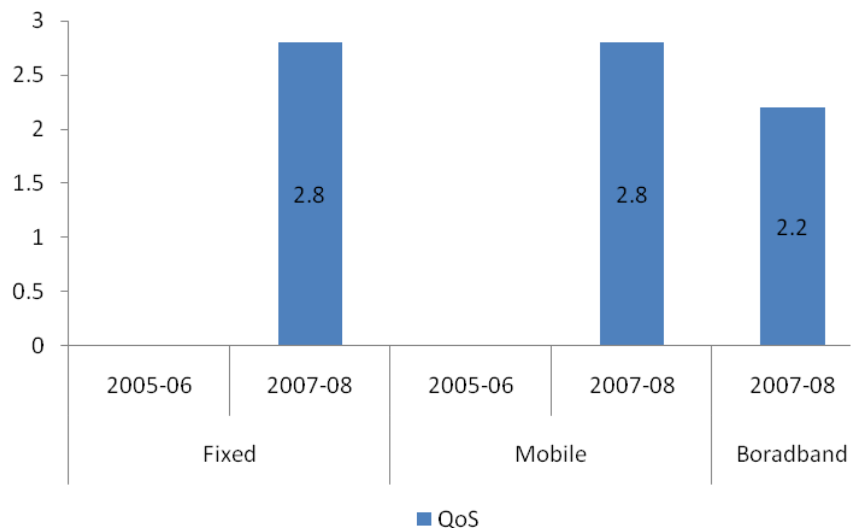
10. Quality of Service

Indian telecom sector has by all accounts experienced a 'revolution' of sorts but increasingly it is being pointed out that the low ARPU model is not sustainable as it is conjectured that the operators are cutting back on investments. Issues like frequent call drops, poor connectivity, unwarranted messages, telemarketing calls and absence of a consumer redressal cell still annoy the consumers in the world's fastest growing telecom market. This is despite five years of regulation and nearly 24 consumer advocacy groups continuously expressing displeasure over the QoS of telecom providers in India.

QoS, as defined by TRAI "is the main indicator of the performance of a telephone network, and of the degree to which the network conforms to the stipulated norms." The subscriber's perception of QoS is determined by a number of performance factors specified by the telecom regulator, particularly, network congestion.

The QoS regulations gained prominence in 2005 when TRAI sent a show cause notice to major telecom players like Bharti, Reliance Infocomm, Reliance Telecom, BPL Mobile and Spice Communication, demanding an explanation about high congestion at points of interconnection (PoI), which according to TRAI parameters, should be less than 0.5%. The network congestion report released by TRAI found that level of congestion at 404 PoIs was more than 0.5%

Analysis of TRE Score



TRE score for the mobile and the fixed sector for this parameter has been above the midpoint but still lower than for tariff regulation. TRAI came out with regulations for QoS for voice telephony in 2005 and for Broadband in 2007. However, telecom infrastructure is struggling to cope with the pace of subscriber growth. Besides congestion, a host of other QoS issues remain unresolved - mainly, mobile number portability, publication of mobile phone directory, office of ombudsman, consumer grievances cell, publication of name and details of nodal officer on the service provider's website. Though, these suggestions have been there for a longtime, the regulator seems to be incapable of tackling this problem according to many representatives of the consumer organizations. The QoS parameters that are reported by TRAI in its quarterly reports do not give a dismal picture of the performance of the mobile operators on the QoS parameters. According to the report all operators are meeting the call drop rate bench mark. However, the QoS of the broadband providers has been reported to be poor by TRAI in its latest performance indicator report, especially in regard to service activation time.

11. Conclusions and Recommendations

The Indian telecom sector's growth and its ability to serve the poor millions that inhabit the country is a classic example of the success of liberal policies. Market failures on account of monopolistic power of the incumbent or even due to the market entry deterrence practices followed by the new entrants are an issue of concern. These need to be addressed by proper regulatory instruments like encouraging more entry and infrastructure sharing. This has been partially addressed with the government coming out with guidelines for active infrastructure-sharing. Passive infrastructure-sharing was allowed earlier with the revamping of the universal service policy in 2007. DoT has said that active infrastructure-sharing will be limited to antenna, feeder cable, node B, and radio access network and transmission system only, still precluding the sharing of the backhaul infrastructure owned by the incumbent.

Considering the importance of sharing backhaul for provision of mobile services in rural and far flung areas, TRAI has recently recommended that, licensing conditions should be amended to allow service providers to share their backhaul. Access to expensive backhaul infrastructure can lead to several technological solutions to the "last mile" problem of access once the active component cost has been lowered.

Recognising this as an important mechanism increasing rural connectivity policy-makers, regulators and operators are increasingly placing greater emphasis on alternatives to the traditional high-cost infrastructure development model by considering such measures as infrastructure sharing, and Mobile Virtual Network Operator (MVNO) agreements. These measures can help reduce the financial burden on operators, accelerate the introduction of new services and the deployment of new networks while lowering barriers to market entry. TRAI has also recommended that financial incentive in some form will also be required by all service providers not benefiting from USOF support to set up passive infrastructure. This will ensure fair play, generate competition and discourage cartelization. Thus, the sharing of essential facilities will further improve competition and allow the market to innovate

Finally, what broad conclusions emerge from this study? The TRE results do provide some important insights to guide the regulatory environment. First, the deterioration of the score on market entry and regulation of anti-competitive practices as pointed out by the survey results do suggest current institutional limitations to address these. The fact that the regulator has to work with a predefined market structure, is limiting its ability to foster competition *ex-ante*. Moreover, in the absence of an effective Competition Authority, an *ex-post* check on anticompetitive behaviour is also weak, so much so there is an increasing concern that the incumbent wireless service providers are creating barriers to entry. The existence of potential competition is negated when barriers to entry are erected by way of policy hence the licensing policy should be as liberal as possible.

Second, as the analysis above has pointed out market entry is meaning less unless the spectrum issue is resolved. At the time the survey was being carried out there were enough portents that TRE for this dimension is very poor. This was reflected in the worst score that the participants in the survey gave to this dimension. By the time of this report was finalized the mishandling of spectrum allocation by DoT has become a major issue of controversy so much so that there are pressures on the minister to resign on this issue. Politics apart the Indian growth story in telecom will be spoiled till the government comes out with efficient guidelines for the allocation of spectrum. Moreover, broadband delivery through wireless will require a speedy resolution to the spectrum allocation problem. With the liberalization of the telecom sector, regulation of scarce resources such as spectrum has shifted from it being purely an issue of planning and coordination to being an effective tool in the creation of a competitive environment. This fact can be ignored only at the peril of attenuating the unprecedented gains that have been made so far on account of technology induced competition.

Annex 1: Key Regulatory Events- April 2007-March 2008

2007	
11 April	Recommendations on **Infrastructure Sharing of Passive, Active and Backhaul Networks** ▪ Reiterated the urgency of passive infrastructure sharing. ▪ Sought amendment in the licence condition to allow active infrastructure sharing ▪ Recommended that all the licencees in any service areas should qualify for financial subvention schemes meant for rural areas though at reduced scale compared to the winner in the tender process of USOF Administration.
13 April	Consultation Paper on **"Access to Essential Facilities (Including Landing Facilities for Submarine Cables) at Cable Landing Stations"**
4 May	**Regulation on 'Telecom Consumers Protection and Redressal of Grievances'.** ▪ mandatory for all telecom companies, providing basic, cellular, broadband or unified access services to establish call centres ▪ Appoint or designate Nodal Officers, for redressal of the grievances and also appoint one or more appellate authorities in each licenced service area. ▪ Mandates procedures and time limits for redressal of grievances. ▪ Publish a 'manual of practice for handling consumer complaints'
4 May	The DoT had imposed penalties on various operators for three different instances of violation of licence norms.
5 June	Regulation on **'The Telecom Unsolicited Commercial Communications'** which placed a mechanism for curbing the unwanted telemarketing calls.
5 June	**The Telecommunication Tariff (Forty- Fifth Amendment) Order, 2007**. Tariff of Rs.500 is charged for each unsolicited commercial communication made from Basic Services (Other than ISDN) and from Cellular also.
7 June	Regulation on **'International Telecommunication Access to Essential Facilities at Cable Landing Stations (CLS)'.** Highlights ▪ new service providers have access to the International bandwidth capacity in the same way as the consortium members; ▪ access facilitation is not unduly delayed by consortium members having control over CLS; ▪ transparent and non-discriminatory access at cable landing stations;
12 June	Consultation Paper on **'Review of Licence Terms and Conditions and Capping of Number of on Access Providers'.** A major initiative by the Authority to update the licensing and regulatory framework in sync with technological change. The key issue raised in the consultation paper relate to desirability of limiting the number of access service providers in a service area and determining optimum number of service providers in a service area. It also examines the role of market forces instead of a priori capping of access providers.
15 June	Regulation on '**Telecommunication Consumers Education And Protection Fund'** for educating consumers on the developments in the sector and check operators from charging excess rates from subscribers.
21 August	Second amendment in '**The Regulation on Guidelines for Registration of Consumer Organization/Non-Government Organizations (NGOs) and their Interaction with TRAI'**. ▪ As against a minimum experience of three years in areas of representing views of consumers, the amended regulation prescribes an experience of one year in assisting the consumers in redressal of complaints regarding shortfall in the supplies and deficiencies in service.

14 September	**Regulation on 'Domestic Leased Circuits (DLC) Regulations'.** ▪ Imposition of obligation on all service providers who have the capacity of copper, fiber or wireless, and who have been allowed under the licence to provide DLC, to share it with other service providers. ▪ Provide a framework to ensure transparency, predictability and reasonableness and allow provision of DLC/local lead in a non-discriminatory manner.
18 September	Consultation Paper on '**Issues Relating to Mobile Television Service**'.
1 November	**DOT has opposed the recommendation to recognize the 450 MHz band for third generation mobile services**. Its move was contrary to the suggestions made by the telecom regulator, the Defence forces and the National Working Group-8 (set up to formulate India's views in this regard).
21 November	**DoT** and **TRAI divided over key policy issues**. The regulator had given its views on capping mobile operators, spectrum management, and mergers and acquisition among others. However, DoT had not accepted TRAI's recommendations on mergers and acquisition and has also made changes on spectrum issues.
26 December	**Spectrum Allocation ruling by DoT**: To end the ongoing controversy over spectrum allocation to GSM-based mobile operators, finally the Government accepted the spectrum review committee's recommendation of allocating additional frequency to existing GSM operators based on the TRAI's subscriber-linked formula and in multiples of 1 MHz.
2008	
1 January	Study paper on **'Broadband speed'**. The status paper has analyzed broadband speed defined in various countries, the prevailing environment and impact of growth of broadband on the Indian economy.
21 January	Consultation Paper on **'Access Deficit Charge (ADC)'.** ▪ Recommended abolition of Access Deficit Charge (ADC), a levy paid by private telecom operators to the government to compensate state-run BSNL which offers services in non-lucrative rural areas, with effect from 1st April 2008.
24 January	**The Telecommunication Tariff (Forty-Sixth Amendment) Order, 2008**. ▪ Amendment made in Item 10 and 11 in Schedule I to the Telecommunication Tariff Order, 1999. ▪ No tariff for itemized bills in respect of long distance calls and for provision of hard copy of the bill or printed copy of the bill to the customers.
29 January	Consultation Paper On '**Issues arising out of Plethora of Tariff Offers in Access Service Provision**'. ▪ Inviting the views and suggestions of the stakeholders to protect the interests of the consumers without curtailing the flexibility of the operators in offering the tariffs.
17 March	**The Telecommunication Tariff (Forty- Seventh Amendment) Order, 2008.** ▪ Amendment made in Schedule XI to the Telecommunication Tariff Order 1999. ▪ Rs. 500 would be payable as tariff for every first unsolicited commercial communication and Rs. 1,000 for every subsequent unsolicited commercial communication.
27 March	Ninth Amendment in **'The Telecommunication Interconnection Usage Charges Regulation'.** ▪ Now, private telecom operators will not have to pay Access Deficit Charge (ADC) to BSNL to compensate it for carrying out rural operations..

Telecom Regulatory and Policy Environment in the Philippines:
Results and Analysis of the 2008 TRE Survey

Erwin A. Alampay, PhD

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***This report is presented as received from project recipient(s). It has not been subjected to peer review or other review processes.**

***Abstract:** The TRE survey was conducted from May 17 to July 7, 2008. Sixty-six (66) respondents comprised the three different stakeholder groups who participated in the study. Each group had at least 16 respondents who answered the survey.

Compared with the TRE in 2006 there were mixed results across the same dimensions surveyed in 2008. There are some dimensions that improved, and some that declined. Those that increased were perceptions about Universal Service Obligations, Regulation of anti-competitive practices and TRE for interconnection in the mobile sector in particular. Among those perceptions that declined were the TREs for Market Entry and Access to Scarce Resources. There was no change in perceptions on tariff regulation, which may be due to perceptions that declining tariffs are attributable more to market forces due to competition in both mobile and fixed lines, rather than direct rate regulations imposed by the state.

The broadband sector which was made part of the 2008 TRE had no comparative rating in 2006. However, on average, the scores obtained for broadband TRE was lower than the scores obtained for both mobiles and fixed line telephones. This suggests that informed stakeholders perceive that regulators have not been focusing on this sector as much as it has with voice services.

CDMA phones, also known as 'wireless fixed line' are considered part of the fixed line telephones. A seventh dimension, involving quality of service was introduced in the 2008 TRE. It is in this dimension that the mobile sector scored the highest, which implies (given how competition in the mobile sector is most intense) that competition can help spur improvement in services.

***Keywords: TRE Survey, Philippines**

Telecom Regulatory and Policy Environment in the Philippines:

Results and Analysis of the 2008 TRE Survey

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Summary

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Development of the Regulatory and Policy Environment

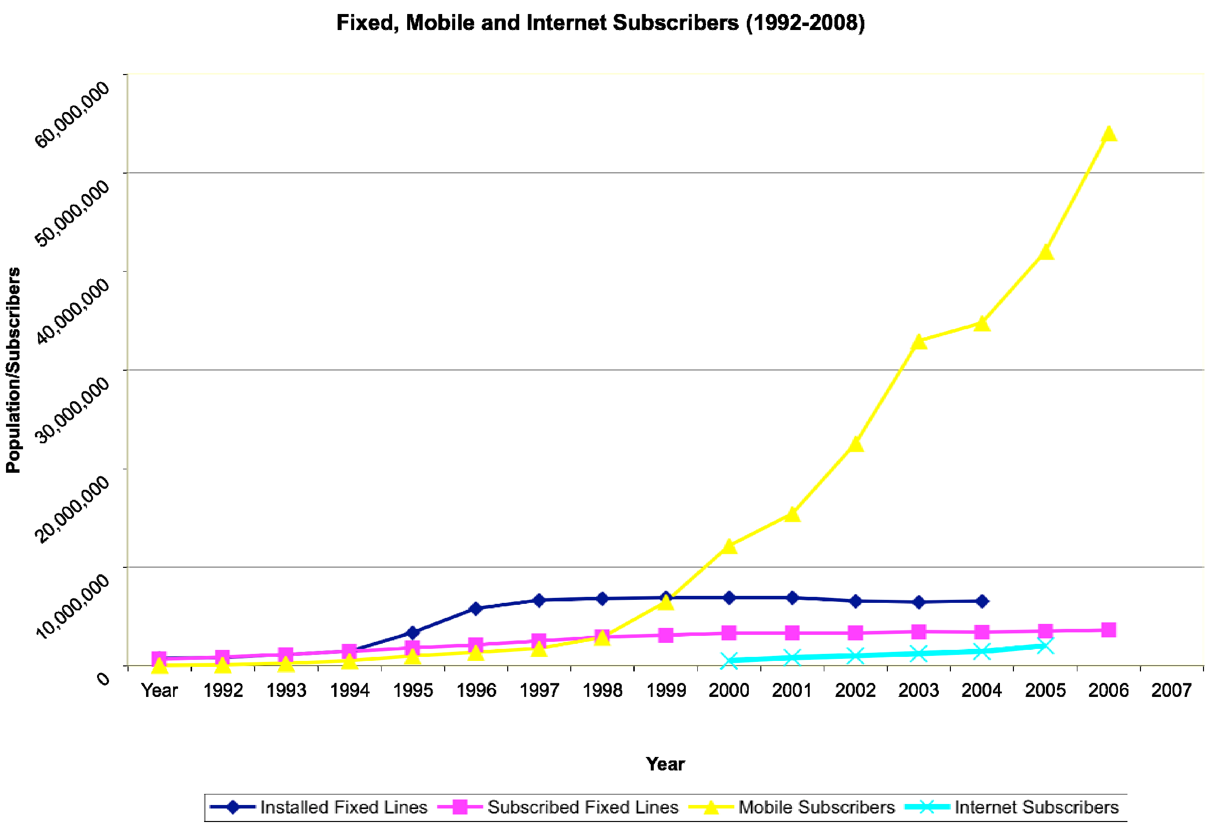
Pre-Reform Environment in the Philippines

Unlike many countries in the world, telecommunications services in the Philippines had historically been provided by a private company, the Philippine Long Distance Telephone Company (PLDT). The PLDT was initially private and foreign-owned, and had the sole authority to operate a national communications network under government regulation. In 1967, Filipino businessmen with strong political ties took over its ownership. Over the years it consolidated its monopoly on the industry while having little incentive to expand its network and improve services (Salazar 2007). During those years, however, it was complemented by a government backbone that provided limited services to underserved regions in the country (Mendes, et. al 2007). This was the situation until the early 1990s.

In 1990, the government’s National Telecommunications Development Plan (1990-2010) sought to divest the state of its role in the delivery of telecommunications services through privatization and encouraging more competition. At the same time, however, the plan was for government to continue facilitating official development assistance (ODA) for telecom projects in underserved and economically unviable areas (Abrenica 2000:150).

Although efforts to liberalize and reform the sector began in the 1980s, only with the issuance of Executive Orders (EO) 59 and 109 in 1993 did real competition emerge. EO 59 required mandatory interconnection among telecommunication providers, while EO 109 introduced service obligations among international gateway (IGF) and cellular mobile telephone service (CMTS) providers through the "service area scheme" (SAS). Service obligations were specific to putting up 300,000 to 400,000 fixed lines at a ratio of one line in a rural area for every ten in an urban area (Alampay 2006). Because of these service obligations, some considered the Philippines telecommunications market at that time as only 'semi-open' (Oliva 2003).

Figure 1: Policy, technology & access timeline



Source: National Telecommunications Commission, various years
Data for 2006 and 2007 computed from available Annual Reports from telecom providers
No available data for installed fixed lines after 2004

As such, prior to the policy reforms made in 1993, the country's telecommunications sector was seen not only as lacking, given its very low telephone density. It was also perceived to be inefficiently managed, as waiting time for telephone installation was measured in years.

Post-Reform Environment in the Philippines

The impact of the new policies, competition and new technologies are very apparent (see Figure 1). The government policies to liberalize the provision of basic telecommunication services in 1993 coupled with technological advances since then have contributed to the rapid expansion of ICT services in the Philippines.

First, higher teledensity has resulted from the early policy initiatives of the government to liberalize the sector by breaking PLDT's monopoly; allowing entry by more telecommunication providers to the sector; and imposing mandatory service obligations to international gateway facility providers and cellular phone operators to roll-out telephone lines under the service area scheme (SAS) in 1993. For instance, the notable increase in telephone lines coincided with the period that the SAS was implemented. Despite increased availability of fixed line services, however, subscription to government and private sector fixed line services did not grow as projected and regional distribution remained uneven. The majority of lines installed remain situated in the National Capital Region (25%), and about 50% in Luzon Island (Regions 1-5 including NCR and CAR). Furthermore, even with the increase in installed capacity, subscription had only reached 52% (See Table 1).

Table 1: Regional Teledensity Across the Philippines (as of December 2005)

Region	Population	Installed Lines	Subscribed Lines	% of Subscribed	Teledensity	
					Installed	Subscribed
Cordillera Auto. Reg.	1,553,173	89,154	33,660	38%	5.74	2.17
National Capital Region	11,289,368	2,840,239	1,619,608	57%	25.16	14.35
I	4,481,820	192,581	111,696	58%	4.3	2.49
II	3,086,812	37,990	28,066	74%	1.23	0.91
III	8,426,578	408,277	271,175	66%	4.84	3.22
IV	12,810,064	1,073,343	581,450	54%	8.38	4.54
V	5,165,243	109,631	68,387	62%	2.12	1.32
VI	6,884,429	427,481	135,385	32%	6.21	1.97
VII	6,068,238	470,616	222,748	47%	7.76	3.67
VIII	4,133,242	151,652	27,790	18%	3.67	0.67
IX	3,522,722	35,945	29,446	82%	1.02	0.84
X	3,189,990	146,258	56,361	39%	4.58	1.77
XI	5,902,604	322,243	108,916	34%	5.46	1.85
XII	2,971,763	117,116	31,927	27%	5.05	1.38
ARMuslim Mindanao	2,409,317	33,315	8,773	26%	1.38	0.36
Total	**84,214,778**	**6,538,387**	**3,367,252**	**52%**	**7.76**	**4**

Source: National Telecommunications Commission

Second, new technologies like the mobile phone made real competition in the industry possible. It expanded the alternatives for customers and helped companies to innovate and offer different payment plans, forced them to improve services and expand coverage. New services such as SMS and prepaid payments also led to telephones and mobile phones becoming more affordable to lower income households. These two innovations helped push mobile phone ownership to exceed fixed line subscribership. SIMs per 100 people exceeded subscribed fixed lines per 100 people in 2000. This was also complemented by lower handset costs (GSM Association 2007) and a second-hand market for cell phones. As such, new technologies and the declining cost to acquire them have also made universal access down to the "barangay" level more feasible. The recent spike in cellular phone subscription in

2004 may also have to do with the entry of a third player, Sun Cellular, which has spurred increased competition for the lower segment of the market. Sun has offered very competitive pricing, including unlimited calls and unlimited texts for subscribers using it within its network for a fixed rate.[1]

Third, new technologies not only made competition possible in a telephone industry long considered as a "natural monopoly", it also led to the question of whether basic telecommunication service should go beyond just voice, and also include access to other value-added services (e.g. the internet, SMS and simple mobile applications, such as e-commerce). While access to voice services through fixed line phones and mobile phones has increased dramatically, the potential for growth in the market for internet access is still high given that there were only 2 million internet subscribers as of 2006, which already represents a fourfold increase from 2001 (see Table 2).

Table 2: No. of Internet Subscribers and Registered ISPs (2001-06)

	INTERNET	
Year	Internet Subscribers	NTC-Registered ISPs
2001	500,000	64
2002	800,000	93
2003	1,000,000	121
2004	1,200,000	144
2005	1,440,000	177
2006	2,000,000	408

Source: NTC http://portal.ntc.gov.ph/wps/portal/!ut/p/_s.7_0_A/7_0_EBH (Accessed July 29, 2008)

This potential in broadband service, in turn, is driving the increase in the number of registered internet service providers (ISPs), from 64 to over 408 by the end of 2006.[2] Again, what is helping drive this are new technologies now available in the market. These include new 3G (third generation) services that can be used to access the internet in new cellular phones, the emergence of next generation networks, and other technologies for linking the last mile (i.e. ADSL, Wifi, VSAT, WiMax, etc.) (Lallana and Soriano 2007). An indication of this potential was evidenced by how, in 2007, SMART already reached over 300,000 mobile internet subscribers for their new SMART-Bro wireless internet service (PLDT 2007). There are some, however, who have observed that if there are new ISPs being registered, these may be ISPs operating in the provinces and rural regions and not in the cities. This is because as the larger telcos shift their focus on data and broadband services, the smaller ISPs are no longer able to compete in the areas where the bigger companies operate in (see Sec. 5 on Regulation of Anti-Competitive Practices). That said, market consolidation would eventually be expected once demand in smaller areas increase.

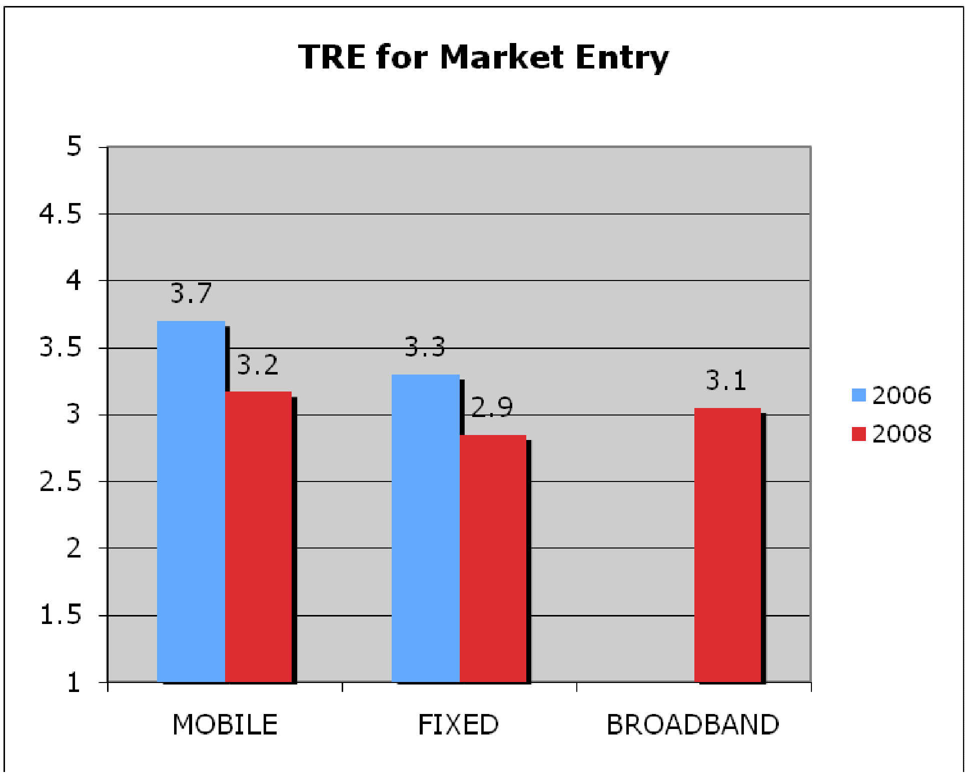
[1] Although some subscribers say their calls may be dropped after some time, a subscriber can call the same number for an unlimited number of times (whenever the calls are dropped) should they wish to.
[2] One problem with using registered companies as data is that they only tend to increase and not decrease. Companies register their operation, but seldom do companies delist when they no longer operate. AGREE

Telecommunications Regulatory Environment (TRE)

1. Market Entry

The goal of this section is an in-depth analysis of the market entry conditions for each sector. In the survey, Market Entry was defined as the transparency of licensing whereby applicants know the terms, conditions, criteria and length of time needed to reach a decision on their application. It also includes license conditions and exclusivity issues.

Figure 2: TRE Market Entry perceptions (2006 and 2008)



In the Philippines market, entry into the telecommunications industry is heavily regulated and involves two important processes. A new company that wants to operate in the sector is first required to secure a congressional franchise as provided for in the Constitution. The Constitution also limits foreign ownership of a telecommunication company at 40 percent and the life of a franchise to be no more than 50 years. Furthermore, the franchise must be approved by both houses of Congress (Salazar 2007). That said, all the major telephone companies are owned by commercially powerful and politically influential families, and have strong partnerships with overseas investors (e.g. NTT Docomo, Singapore Telecom, Deutsche Telecom) (Ure, 2004).

After securing a franchise, a company has to apply to the National Telecommunications

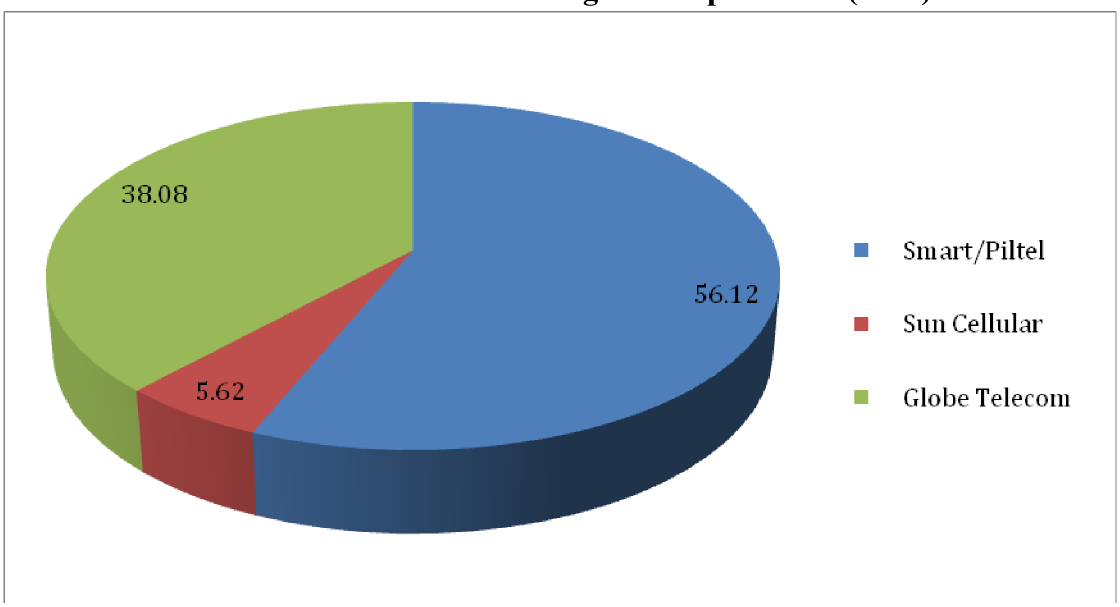
Commission (NTC) for a Certificate of Public Convenience and Necessity (CPCN) for the type of service that it wants to offer. Through the CPCN, the NTC assigns the area of operation, determines the allowable rate that could be charged for a service, and manages the allocation of radio spectrum or frequency.

Figure 2 shows that the perceived regulatory environment for market entry has declined from 2006. Market entry in the mobile sector is still perceived much better than the fixed line sector. Even the broadband sector is rated higher than the fixed line sector. These differences may also have a lot to do with perceived market potential, as growth in the fixed sector has been relatively flat, in comparison to both mobile and broadband. Also, providing internet access, which is classified as a value added service, is easier because it does not require a legislative franchise. The same goes with cable companies, which under Executive Order 436 of 1997 were recognized as being different from broadcasting and telecommunications. The requirement is only for a Provisional Authority of Certificate Authority from the NTC to operate.

1.1 Market Entry - Mobile

Of the three sectors, perception on market entry is most positive with respect to the Mobile industry. However, perception rating has declined from 3.7 in 2006 to 3.17 in 2008. Part of this may have to do not only with the fact that there are now three major players in the industry, and it would be harder for other players to compete, but moreso, from the process of how a fourth player, CURE, was recently awarded a license along with a 3-G spectrum, and was eventually bought out by SMART (see section on Access to Resources and the entry of CURE). Informed stakeholders may have felt the 'beauty contest' process used for the process was flawed.

Table 3: Market Share among mobile providers (2007)

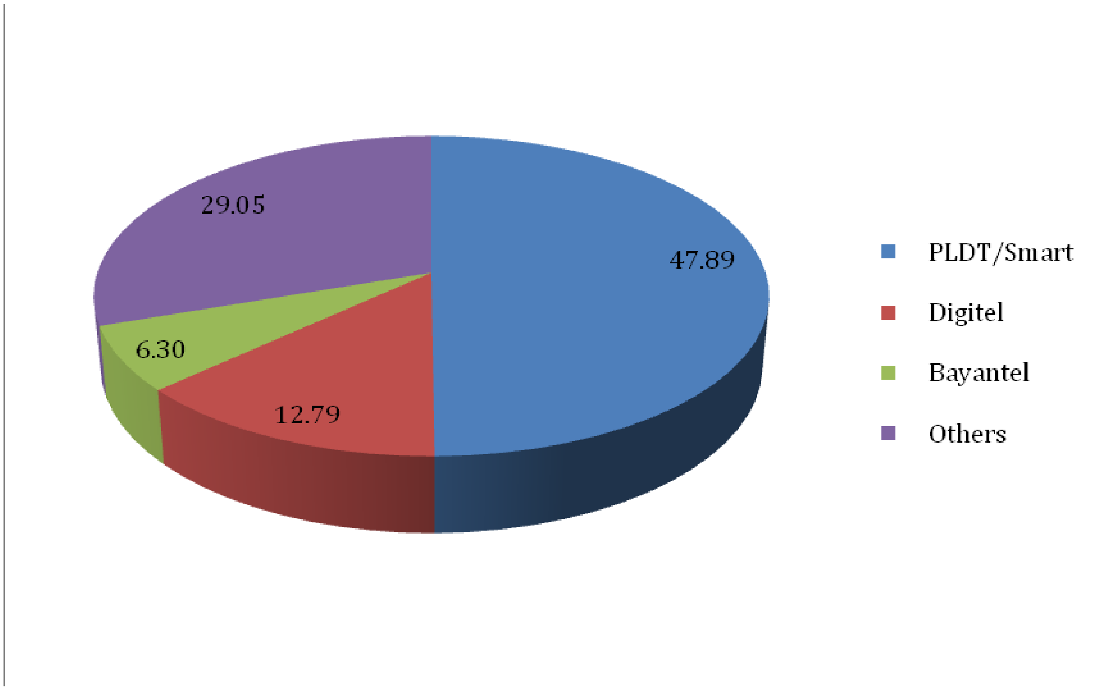


Nonetheless, the somewhat positive view of the sector may have to do with the inroads the 'third' player, Sun Cellular has made into the market (see Table 3). By the end of 2007, Sun had 5.6% of the market, and increased this to 7.4% by June of 2008. In fact, Sun's performance indicates that there is still some room for competition and growth in the sector. From 2004-2007, year on year growth in number of subscribers in the industry has increased by 18.6% on average.

1.2 Market Entry – Fixed

Perception of effective market entry policies in the fixed sector remains to be the lowest among the three. For one, it continues to be dominated by PLDT as a result of its decades old existence as the 'monopoly provider.' Also, subscriber growth in the sector remains relatively flat in comparison with mobile and broadband. As such, there has been no new service provider in recent years.

Table 4: Market Share among fixed phone providers



Some growth, however, is being exhibited in the wire-less fixed line business, which is actually a cross between fixed line and mobile services. Bayantel and PLDT are offering these services, which are also SMS-enabled. Bayantel has seen a nine fold increase from only 17,000 subscribed wireless fixed line units 2006, to approximately 160,000 units as of June 2008. On the other hand, PLDT, which only launched its counterpart service in 2007, already had 75,000 subscribers as of the first quarter of 2008 (TMCnet 2008).

1.3 Market Entry – Broadband

There is increasing competition in the broadband sector, as many of the major telecommunication providers are focusing their efforts on this service. In fact, there are more players (ISPs, cable operators, etc.) even as the penetration, in terms of number of broadband subscribers, remains low. As Table 2 earlier showed, the number of Internet Service Providers registered with the NTC has steadily grown from only 64 in 2001, to over 400 by 2006. Also, there were only 967,600 subscribers as of 2007, which is equivalent to only 1.1 subscribers per 100 (ITU 2008). While there was no indicator for broadband entry in the 2006 survey, a 3.05 rating is still a positive perception.

The positive perception on regulating market entry in the broadband sector may have to do with the fact that internet access is considered as a value-added service, and hence would not require an approval of the legislature in order to operate. Furthermore, tnvestment in broadband is not limited to the major telephone and mobile operators. Cable companies like Destiny and Skycable also provide internet services bundled with their fibre cables. Cable franchises are approved by the NTC and governs only specific areas (not national). Under EO 436 (issues by Ramos in 1997). It was made separate and istinct from telecpmmiunicatons and broadcasting. It only requires a certificate of authority from the NTC under EO 205 (of 1987).

As such, other companies, have reinvented their business to survive and have turned to Internet/broadband services. For instance, EasyCall, the largest paging system in the 1990s had to change course as it was severely affected by the popularity of SMS. It secured a license as a reseller of voice over Internet protocol or VoIP services to complement its Internet business (Olchondra 2008). On the other hand, ISM communications bought 78% of ETPI, an internet provider. In May it announced it was investing 2/3 of its $20 Million capex to finance the construction of a backhaul facility to support the broadband service of subsidiary Eastern Telecom Philippines, Inc. (ETPI) (Lorenzo 2008).

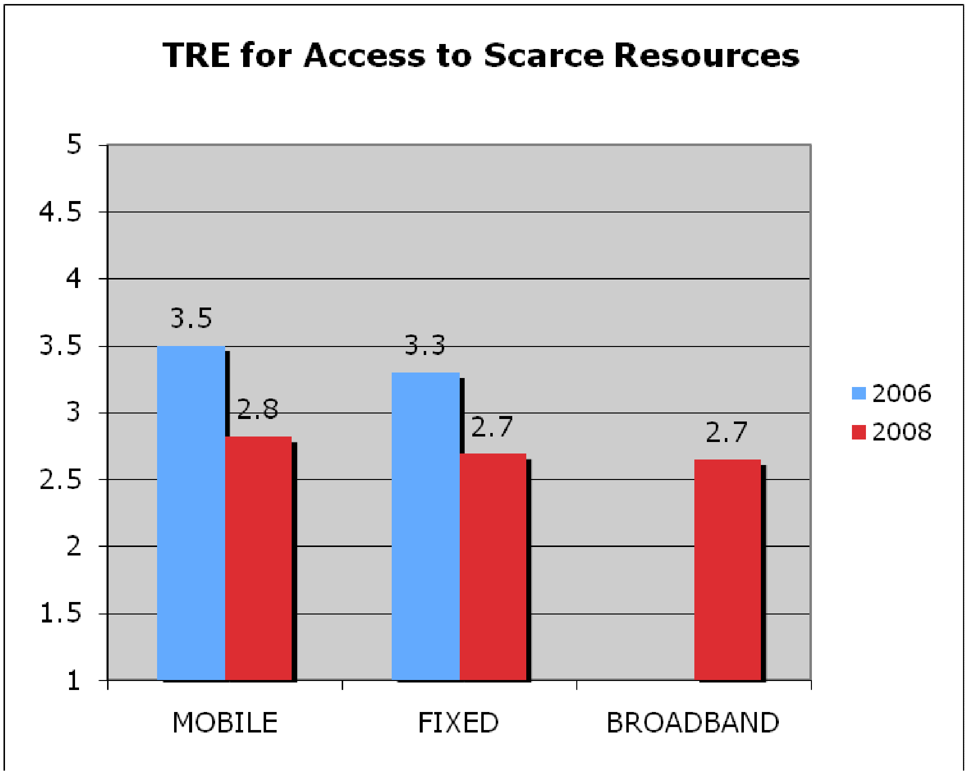
Perhaps, the perception on market entry into the broadband sector could have been more positive had it not been affected by political fallout with respect to the ZTE-National Broadband Network issue. Among the issues was the involvement of the son of the speaker of the house, as a a proponent in one of the projects. Also, another concern was the role of government in the provision of broadband services, whereas the policy direction had been to have it lead by the private sector. The 2006 Roadmap says that provision in major cities shall be left to the private sector, whereas those in municipalities and rural barangays will be a partnership between private and public sector organizations (CICT 2006).

2. Access to Scarce Resources

This section analyses stakeholder's perceptions with respect to regulating access to scarce resources. Access to scarce resources is defined here as the timely, transparent and non-discriminatory access to spectrum allocation. It includes the numbering and rights of way, frequency allocation, telephone number allocation, and tower location rights.

Republic Act 7925 states that "radio frequency spectrum is a scarce public resource that shall be administered in the public interest and in accordance with international agreements and conventions to which the Philippines is a party and granted to the best qualified. The government shall allocate the spectrum to service providers who will use it efficiently and effectively to meet public demand for telecommunications service and may avail of new and cost effective technologies in the use of methods for its utilization." Furthermore, the allocation of radio frequency spectrum allocation and assignment shall be subject to periodic review and its use is subject to reasonable spectrum user fees. Where demand for specific frequencies exceeds availability, the open tenders for the same and ensure wider access to this limited resource (Sec 15) (Salazar 2007).

Figure 3: TRE Access to scarce resources perceptions (2006 and 2008)



There was a big decline in the perception of stakeholders regarding the regulation of access to scarce resources (Refer to Figure 3).

The decline was particularly large for the mobile sector (from 3.5 to 2.8). What may have contributed to the huge decline in rating compared to 2006, was the process of handing out new licenses for 3G services through a 'beauty contest' and not a competitive open auction. The process involved submitting an application, getting public comments on the application, getting responses from the applicants regarding the comment, before NTC made a decision following this process. Applicants were evaluated along three criteria: track record, rollout plan, and their schedule rates for their services (Jain 2007).

Four licenses were awarded in December 2006. The three major players, SMART, Globe, and Digitel (mother company of SUN) were given licenses. A relatively new player, CURE, was awarded the fourth 3G license in December 2006. This was despite the reservations raised about the capability of this organization (which had not been an existing service provider) to maximize the allotted frequency given its "lack of technical capability, and managerial and operational experience, and adequate and qualified personnel" (Jain 2007:14). As such, its entry as a major player in the market was questionable, especially when compared to other major telecommunication operators like Bayantel who also submitted proposals. By early 2008, CURE, was already taken over by SMART.

There was also a large decline with perception of access to scarce resources in the fixed line sector. Part of this may be due to the lack of changes in the sector in terms of new players and growth in other areas of the country.

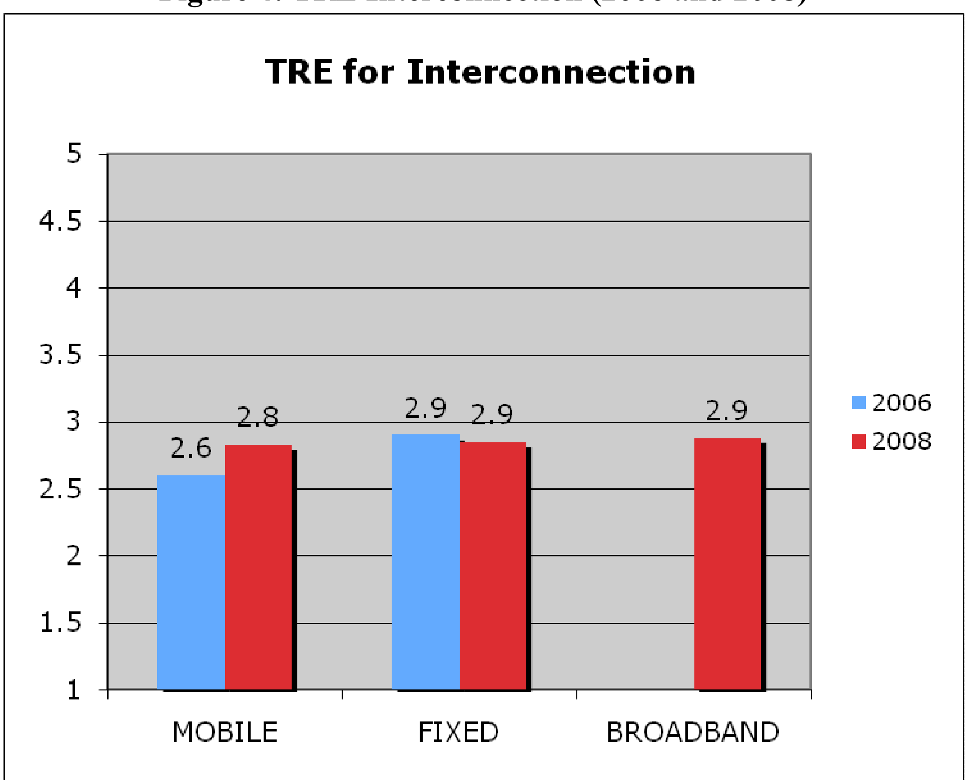
Even with the huge declines in the two sectors, the TRE rating of access to scarce resources was even lower in broadband. This was despite the NTC issuing two new Memorandum Circulars in June 2007 that allotted additional band allocations for broadband wireless access (see Annex 1). Perhaps, the impact of these policies, or band allocations have not yet been felt in the market. Also, it should be noted that during the Senate hearings on the National Broadband Network issue, some local stakeholders asked why local companies were not given the same opportunities to bid for the project.

3. Interconnection

This section looks at how interconnection issues are addressed by the regulator. Respondents were asked to rate whether interconnection with major operators are adequately ensured at any technically feasible point in the network. They were asked to consider whether there are reasonable rates for interconnection, there is unbundling of interconnection, and if these are offered without delay. Other interconnection issues that they were asked to consider include the sharing of incoming and outgoing IDD revenue, the payment for cost of interconnection links and switch interface and penalties for cost of technical disruption of interconnection.

One of the primary issues that had to be addressed when the industry was 'liberalized' and opened to more competition in 1993, was the issue of interconnection. In 2008, the TREs for all three sectors are closely bunched together (2.8-2.9). It is somewhat understandable given the convergence of the technologies. It is especially true when considering that interconnection does not only occur between mobile networks or between fixed networks but also between mobile and fixed networks. A recent example is the approval by the NTC for mandatory interconnection of wireless fixed line providers without access charges within local calling areas (NTC 2008) (See Annex 1).

Figure 4: TRE Interconnection (2006 and 2008)



Given that interconnection issues started with the fixed sector, this may have been resolved much earlier than the other sectors. However, as the TRE scores show, mobile interconnection issues have improved since 2006 (See Figure 4). The improved scores for mobile interconnection (from 2.6 to 2.8) also has to do with the fact that one of the primary interconnection issues in 2006 involved problems with Sun Cellular's entry in the market and complaints about its interconnection with SMART and GLOBE (Salazar 2007). In practice, interconnection rates are mutually negotiated between operators, although the govt would like to impose rate ceilings, as in the case of SMS between operators (see next Section on tariff regulation), it cannot intervene extensively because of the provisions of RA 7925 (Public Telecommunications Act). As such, interconnection rates are more or less set because of the non-discrimation clause in RA 7925. Apparently, stakeholders feel these issues have improved since the last TRE.

As for broadband, there were already three Internet exchanges in operation in 2002, two of which were commercial and operated by telcos. The first is PhIX which stands for the Philippine Internet eXchange, and was launched in July 1997. It is an interconnection or a network access point established by the Philippine Long Distance Telephone Co. (PLDT) that allows local Internet Service Providers (ISPs), with a primary connection to the global Internet, to access and exchange local Internet transactions. The second telco-run exchange is the Manila Internet Exchange (MIX), which is operated by the Eastern Telecommunications Philippines (ETPI) (Paraz & Yu 2002). Both exchanges offer network monitoring and security and are also peered together. However, some local technology bloggers note that

> "In theory, traffic from PLDT and ETPI should be fast because it does not have to pass costly transpacific or regional cable networks. However, the truth is far from it. The link between MIX and PHIX is so congested that it is actually faster if the traffic passed International cable networks!" [3]

The third exchange was called CORE (Common Routing Exchange) which was operated by the Philippine Internet Foundation (PHNet). It had a lower level of service, although it was completely free of charge. It was also actually the very first ISP in the Philippines, having started in 1994 (Paraz & Yu 2002).

A recent development to address the problem of network congestion was the initiative by the Applied Science and Technology Institute (ASTI), the research and development arm of the Department of Science and Technology (DOST) to operate the Philippine Open Internet exchange (PHOPENIX). This newest Internet exchange is meant to be operated as a neutral institution, as it is maintained by a consortium of commercial, non-government, academic and government institutions. It was launched in January 2007, and operated in April of the same year. The significance of the project is that Philippine-based Internet service providers will be able to route their traffic locally without depending on their telecommunications providers, especially during major disasters as exemplified by problems that were encountered when an earthquake hit Taiwan that damaged undersea cables which served as one of the Philippines' telecommunications backbones (Vilafania 2007). According to ASTI's Ms. May Celicious, among the bigger players, only PLDT has not joined PHOPENIX[4].

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[3] See http://hip2b2.yutivo.org/2007/01/13/the-rebirth-of-philippine-internet-exchanges/
[4] Personal interview conducted at the ASTI office, U.P. Diliman, on September 18, 2008.

Nonetheless, it is perhaps, because of this proactive initiative by a state institution that the broadband sector had the highest rating among the three sectors for this category, albeit marginally.

A more recent policy development on interconnection pertains to the circular for the mandatory interconnection backhaul operations to landing sites. It was drafted in by the NTC in April and formally approved and implemented in October 2008. Backhaul networks transmit traffic to and from international optical cable systems. It allows for faster communication not just within the country but also between the Philippines and other countries. Existing cable landing stations in the Philippines were established by Philippine Long Distance Telephone Co. in Nasugbu, Batangas and La Union; Globe Telecom, Inc. also in Nasugbu and soon in Cagayan Valley; and Digital Telecommunications Philippines, Inc. in Cavite. Each telco has separate backhaul facilities.

The NTC sees that the opening of backhaul-network services to other suppliers will bring down the prices to market levels to the benefit of the consumers. Since the backhaul networks are necessary to bring the traffic to and from the international optical submarine-cable systems, the cost of the backhaul networks is part of the prices of international circuits. Hence, according to NT Director Edgardo Cabarrios it can bring down prices of telco services that require international connections like fixed-line, mobile, and text messaging. It can benefit companies that do not have their own cable landing stations by providing them with the choice of backhaul network (Lectura 2008)

Whether this policy does reduce the fees paid by consumers who avail themselves of international telecommunication services should be evident by the next TRE.

4. Tariff Regulation

There was no change in stakeholder perception from 2006 about the regulation of tariffs charged to consumers. Furthermore, there is little difference in the perception in all three sectors given that the scores given ranged from 2.8 to 2.9. This may be due to the ample competition in all three sectors. As a result, rates have been going down even without direct government intervention in tariffs. For instance, the price for a 3-minute local call during peak times went down from US$0.54 in 2000 to only US$0.32 in 2007. In fact, some companies like SUN Cellular, allow unlimited call times within networks for a fixed price, hence effectively lowering actual call rates. Furthermore, while it cost US$37.34 to have a mobile cellular connection in 2000, by 2007, with the technology that allows people to pass credit loads, one can already have a cellular connection for only US$0.04. As such, one respondent said, “The mobile sector of the telco industry is very competitive, with prices among the lowest in the world.”

This is why recent government proposals to regulate the price of SMS were peculiar. In late May 2008, the government floated the idea of making text messaging free (Olchondra 2008, GMA 2008). A legislator also suggested that it be brought down from US$ 0.02 to US$0.003. This proposal may have been more politically motivated than rational, especially in light of rising inflation due to rising fuel costs. This eventually culminated in the President’s recent State of the Nation Address in Congress where she announced that she had convinced the telecommunications companies to lower standard SMS rates to US$0.01 instead. In reality, however, according to SMART’s spokesperson, the effective price of SMS has already been much lower, at US$0.002- US$0.004 or even lower in the case of unlimited text packages already offered in the market.

Figure 5: TRE Tarrifs (2006 and 2008)

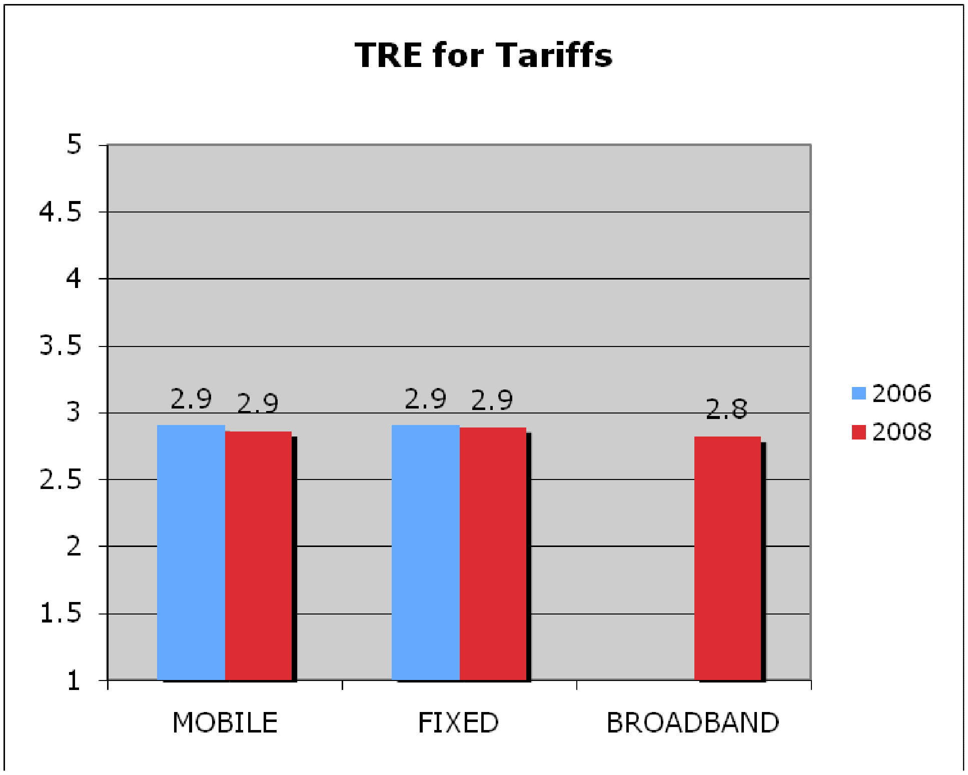


Table 5 provides a picture of the highly competitive pricing that the three main cellular providers are offering. Note that it is the latest entrant, SUN Cellular, which is functioning as the disruptive competitor and undercutting the prices of the more established providers.

Table 5: Mobile Service Rates for Pre-paid Users

		Globe		**Smart**		**Sun Cellular**
SIM	$1.38 $1.00 $4.00	P69 - 64K SIM (G-cash ready) P50 – (64K SIM with free 3 days unlimited text – current promo) P200 - 128 XL SIM	$1.80 $3.00 $4.00	P90 Talk and Text Power SIM plus P150 - SuperSIM-3 64K (P50 preload value) P199 SuperSIM-3 64K (P100 preload value)	$1.00 $2.00 $3.00	P50 - Super Value SIM (w/ 2 day 24/7 unlimited call and text, 10msgs free to other networks) P99 - Power SIM (w/ 4 days unlimited call and text, 15 SMS to other networks) P150 - Supreme SIM (w/ 7 days unlimited call and text, 30 SMS free to other networks)
Prepaid Card (scratch)	$2.00 $5.00 $6.00 $10 $20	P100 (15 free SMS) P250 (30 free SMS) P300 (35 free SMS) P500 (85 free SMS) P1000 (250 free SMS) (SMS/calls for all networks)	$6.00 $10	P300 (33 free SMS) P500 (83 free SMS) (SMS/calls for all networks possible)	$1.00 $3.00 $2.00 $3.00 $8.00 $3.00 $1.00	Regular: P50 P150 (free 25 SMS to all networks) Unlimited call & text cards P100 (5 days, sun to sun) P150 (7 days, sun to sun) P400 (30 days, sun to sun) Unlimited text (Sun to Sun) P150 (unlimited text, 4 hours free call) P50 (unlimited text, 7 days, 1 hour free call) P20 (Textlite-2 days free text)

					$0.40	
Autoload / Share a Load[5] (via OTA)	$0.04 $0.50	Autoload Max P2 and above P25 and above (recommended for retailers)	$0.04 $0.60	E-Load P2 and above P30 and above (recommended for retailers)	$0.40	ExpressLoad P20 and above (and unlimited text promos recommended for retailers)
Active distributors/ retailers		400,000 (2006)		700,000 (2004)		No data
Unlimited Text (via OTA)	$0.40 $0.80 $1.60	P20/ day P40/ 2 days P80 / 5 days	$0.30 $0.60 $1.20	P15 /day P30/3 days P60/4 days	$0.30 $2.00	P15 text /day with 10 min free voice calls to Sun subscribers P100 (unlimited sun to sun calls for 7 days from 12MN to 6PM)
SMS Rate	$0.02	P1.00 per text (160 characters)	$0.02	P1.00 per text (160 characters)	$0.02	
Call Rate	$0.13 $0.15	P6.50/min (for Globe and Touch mobile) P7.50/min (other networks)	$0.13 $0.15	P6.50/min (for smart and smart and other smart brands) P7.50/min (other networks)		

Adapted from Mendes, Alampay, Soriano and Soriano (2007)

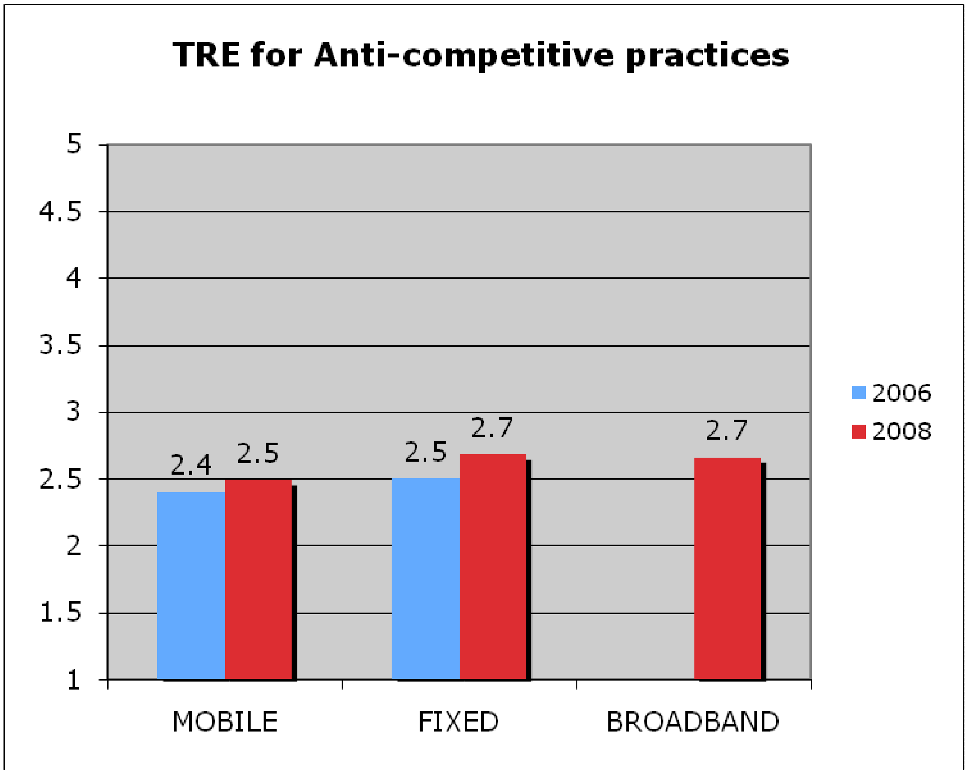
Source: Smart Communications (2007). http://www.smart.com.ph/Buddy/products/Rates.htm, Globe Telecom (2007) http://www1.globe.com.ph/products.aspx?secid=169, Sun-Cellular (2007) http://www.suncellular.com.ph/whatsnew.aspx

Data on active distributors and retailers from Proenza (2007, pp. 5-6)

[5] While certain load values are recommended for retailers to earn profits (i.e. P30 (econo), P60 (regular), P115 (extra) for Smart) and P25 and above for Globe, the Share A Load scheme technically enables the exchange/sharing of load as low as P2. However, as sharing a load costs P1 for the sender, higher increments are preferred by retailers. This may need more explanation for non-Pinoys.

5. Regulation of anti-competitive practices

Figure 6: TRE Anti-competitive practices (2006 and 2008)



Anti-competitive practices cover the use of information obtained from competitors with anti-competitive results, and not making technical information about essential facilities and commercially relevant information available to competitors on a timely basis. It could also involve excessive prices, price discrimination and predatory low pricing. Other practices may be a company's refusal to deal with operators and other parties, having vertical restraints, technical disruption of interconnection and sharing of towers and facilities by parent company and subsidiaries in different segments of the market.

In the survey, the scores for regulating anti-competitive practices were the lowest scores (among the dimensions) received for mobiles and fixed lines. However, the scores were higher than in the 2006 survey. This was also the only dimension where the regulation in the mobile industry ranked the lowest.

Much of this perception has to do with 'sister companies' being able to take advantage of their relationships in terms of interconnection agreements, so that they can provide lower fees for on-net calls/SMS. What is interesting, however, has been the ability of the newer entrant, Sun Cellular, to undercut prices, by offering unlimited text and call packages. In fact, in the last TRE, Salazar (2007) attributed the low marks for complaints about Sun's unlimited text and calls within networks and how it could affect service quality in the long run. What has happened, however, is that the more established companies like Globe and SMART, have considered the same strategies for its special promotions.

As such, it can be argued that the low marks for the mobile sector may have to do with it being the most competitive sector. Companies are trying to leverage their existing strengths and advantages to get ahead of the competition. It is to the regulator's credit, however, that perception has improved slightly on how they manage the highly competitive environment of the mobile sector.

In the broadband sector, the market is slowly being consolidated by the bigger players. According to ASTI's Ms. Selicious, many ISPs are dying because they can not compete with the bigger providers. Others have been forced to reinvent their business and provide instead other services such as web-hosting, payment gateways, web development, systems development etc. and are no longer in the internet provision business. In fact, the Philippine Internet Service Organization (PISO), a consortia of small internet service providers, filed a complaint against PLDT with the NTC in 2002. They argued that PLDT had unreasonable, discriminatory and predatory pricing practices meant to kill the competition. PLDT, they also argued, was denying them access to some of its services and infrastructure, and was tantamount to denial of service.[6]

Even though the NTC provides a venue for airing such complaints, some respondents nonetheless, pointed to the lack of institutional capacity and weak laws that make regulating competition difficult. These is one area where there was strong sentiments expressed by respondents, as examples listed below would show:

> *"Regulation for anti-competitive practices does not reflect three major realities: (1) lack of institutional capacity of regulator (and courts) to enforce policy, (2) lack of incentive/motivation (e.g., enforceable sanctions, viable and appropriate business model, etc.) for market players to comply with policy, and (3) strong political backing of major carriers from the executive and legislative branches of government."*

> *"NTC has not been granted sufficient powers to regulate the players. To such extent it is deemed that it is the regulatee that regulates the regulator."*

> *"There are no clear and transparent measures of equalizing or leveling the playing field and a lot of politic influence market entry decision making. In terms of competition regulation anti-competitive practices continue because there are not enough trade laws that pertain and address competition specifically for the ICT and telco industry if there are any then they may need to be reviewed and updated in view of emerging disruptive technologies."*

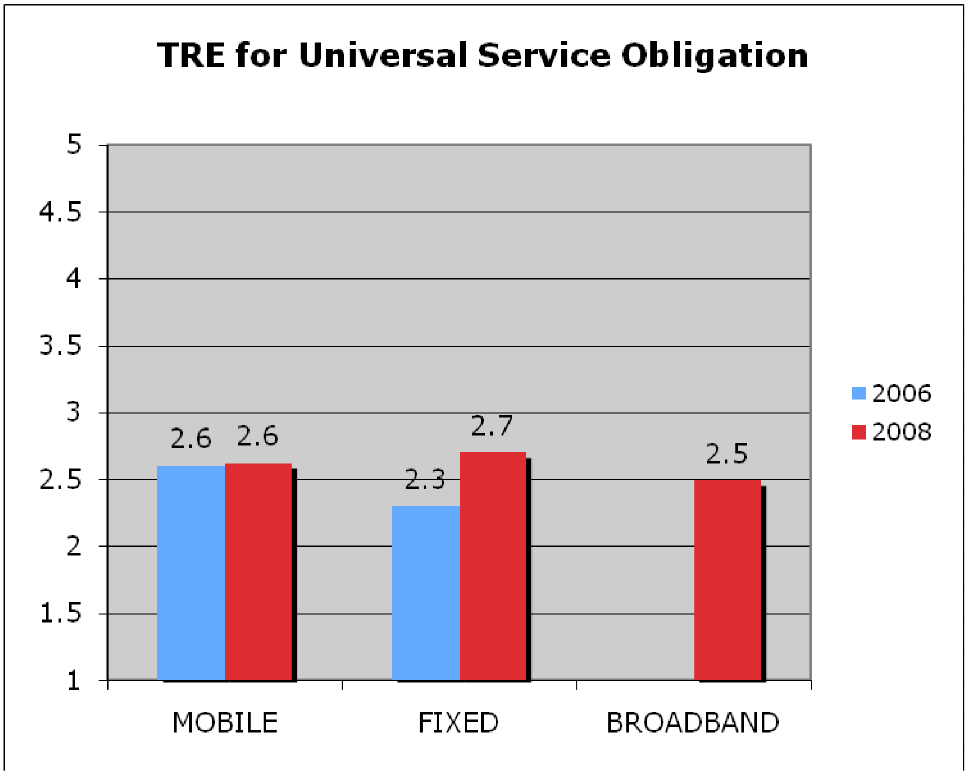
In a liberalized and competitive market, leveling the playing in order for players to compete fairly is among the bigger challenges that that regulators face.

6. Universal Service Obligations

This section evaluates whether the administration of the universal service program is transparent, non-discriminatory and competitively neutral and is not more burdensome than necessary for the kind of universal service defined by the policymakers. In the Philippines, the policy is not that of universal service, but that of universal access.

[6] Copy of the complaint can be found in http://www.piso.org.ph/ContentLoader?page=PISO_complaint

Figure 7: TRE Universal Service Obligation (2006 and 2008)



The Philippine government defines universal access as the availability of a minimum set of reliable and affordable telecommunications services in all urban and rural areas (DOTC 2000). This definition seems to have been left intentionally broad/vague to allow for targets to be adjusted with technological and national developments. Based on nationally set indicators (MTPDP, ICT Strategic Roadmap of CICT), with a wide set of access types and services. Further, the purpose for access is defined as access to "basic government services", information, and quality education through ICTs". However, it is not very clear what constitutes the basic services and information that the government aims to provide (Lallana and Soriano 2007).

One respondent commented that "USO is not applicable for mobile and broadband in the Philippines." This remark is consistent with previous universal access policies which have been defined to mean access to fixed telephones. This bias can be seen with the service area scheme (SAS), whereby mobile phone providers were obliged to install 300,000 fixed lines. As such, while there is generally more access to mobile phones, historically, the government has had more proactive strategies to pursue fixed line telephones. Nonetheless, as shown in Figure 1, mobile phone density per 100 has already exceeded 60% whereas fixed line access has been flat at 4.3 per 100 inhabitants. Furthermore, the percentage of the population covered by mobile telephony signal has steadily increased from only 70% in 2000 to 92.5 in 2005 (World Bank 2005 as cited in Bautista 2008), and to 99% by 2007 (ITU 2008).

In recent years, the government has been revising this policy approach and moving towards universal access targets pertaining to internet and broadband services. In the Philippines Strategic Roadmap released in October 2006, it targets 100% broadband connectivity in all cities down to fourth class municipalities. The government, through the Commission on Information and Communication

Technology (CICT) will jointly undertake provision with the private sector in municipalities and rural barangays (See Table 6 below). This will also be complemented by provision of broadband connectivity through public high schools (CICT 2006). This was highlighted by recent failed initiatives on the National Broadband Network and the Cyber-Ed project.

Table 6: Provision of Broadband Connectivity- Number of Public Access Points

Location	Target
Key cities, municipalities, & urbanized barangays	100% by 2010, to be undertaken by the private sector
1st to 4th class municipalities	100% by 2010, to be undertaken jointly by CICT and the private sector
Rural barangays	55% by 2010, to be undertaken jointly by CICT and the private sector

Commission on Information and Communication Technology (2006)

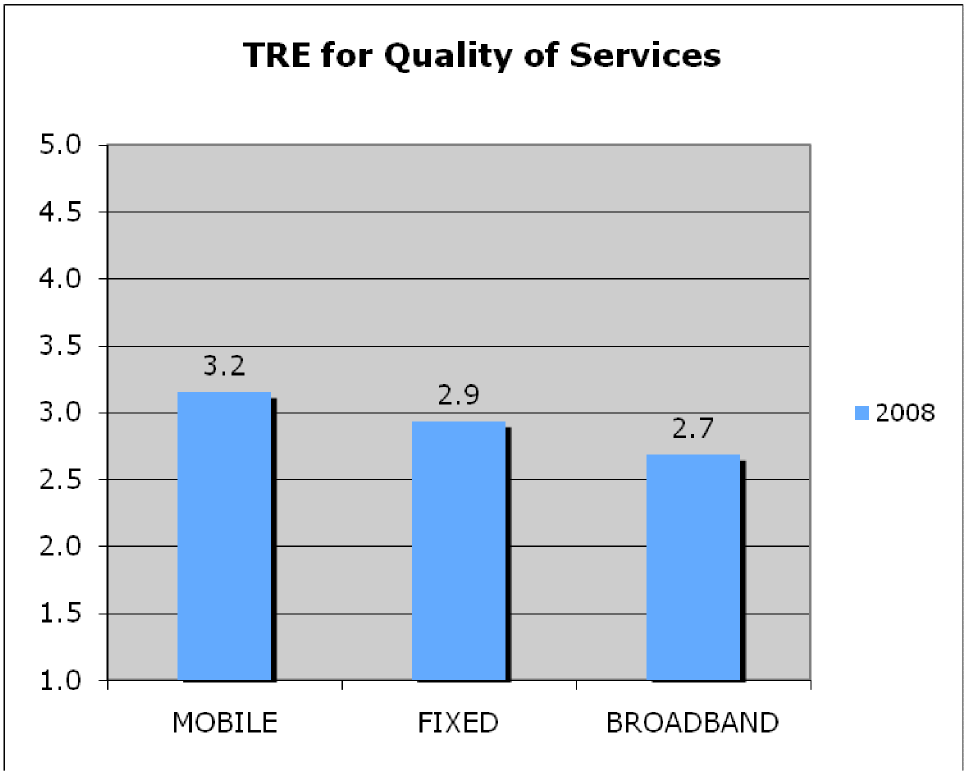
The lowest score for universal broadband access, is explained by the still low penetration of broadband in the country. All in all, there are approximately 2 million internet subscribers (NTC 2008) and 5.3 million internet users in the country (ITU 2008b). However, it is estimated that as of 2007, there were only 967,000 broadband internet subscribers, or 1.10 subscribers per 100 in the population (ITU 2008).

7. Quality of Service

This section looks at the perception of stakeholders of the regulatory environment pertaining to the actual performance of a service with respect to what is promised depending upon the network traffic control mechanisms.

In the Philippines, there are two existing memoranda issued by the NTC relevant to service quality. Memorandum Circular (MC) 10-17-1990 involves the national service performance standards for telecommunication services (telephone, telegraph and telex services). More recent, in 2002, MC 07-06-2002 was issued. It dealt with the service performance standards for cellular mobile telephone service. On the other hand, for broadband access, the Strategic Roadmap provides indicators for the capacity and quality of access. However, they define this only in terms of the number of simultaneous users for each access point and the number of access points per location (CICT 2006). It does not mention any targets for the reliability and speed of the service.

Figure 8: TRE Quality of Services (2008)



One problem with Quality of Service is the lack of regular measurement of indicators by the regulators that is available for the public to scrutinize.

Note that the Quality of Service dimension was not measured in the 2006 TRE. Liao (2006) reported that the NTC did a monitoring of cellular providers from October 16-27, 2005. They looked at call success rate, call completion rate and dropped- call rates. What stood out was Sun Cellular's call success rate which was a low 66.6%; whereas Globe has 98.5% and Smart had 97.8%. There has been no available recent data to compare with. However, the relative high marks for quality of service in the mobile sector of 3.2 may be reflective of the perceived quality of services all three providers are delivering.[7] However, actual monitoring of these services should be done more regularly over a random by the NTC and information made part of its annual reports.

Further, comparing the quality of service scores of the TRE against each sector, the highest score was that for mobiles, followed by fixed lines, and then by broadband. The high scores in the mobile sector may have to do with the occasional reports of testing mentioned in print media, along with clear indicators of quality (i.e. signal clarity, handover success rate, dropped calls). Standards do exist with fixed lines, but whether they are still monitored is not clear given the absence of reports. The lowest

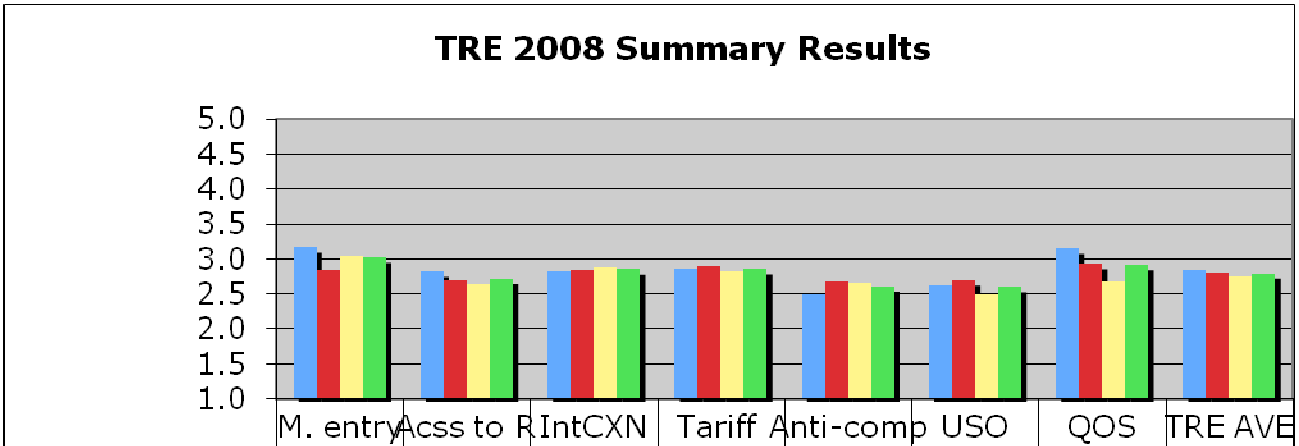
[7] NTC engineers conducted tests from Sept. 17 to Oct. 6, 2008 on three cellular service operators to measure the quality of services rendered, which was after the period covered in this study. Smart led the field on signal strength (91.81 percent), compared with Globe's 86.58 percent and Sun's 84.48 percent. In signal clarity, Smart rated 93 percent, slightly behind Globe (93.79 percent) and ahead of Sun (84.47 percent). In handover success rate, Smart led with 99.03 percent, followed by Globe (98.27 percent) and Sun (96.72 percent). High marks in these parameters reflect good network coverage, good signal quality and proper handover. Good performance in these areas should result in lower percentage of blocked and dropped calls. However, in terms of blocked calls, Smart registered 3.8%, Globe 2% and Sun18% respectively. On dropped calls, Smart registered 1.4 %, Globe 1.4%, and Sun 2%.

marks given to the broadband sector may have to do with the absence of clear guidelines and standards for measuring its quality.

Conclusions and Recommendations

Three particular issues stood out during the period covered by the TRE survey: first, on the allocation of scarce resources, particularly the contentious process of awarding a 3G license to a relatively new and untested telecommunications operator; second, was on tariff regulation, where the government was investigating the possibility of lowering access charges to SMS given the fact that the effective rates have been declining anyway; and finally on universal access to broadband services and the controversial contract with the Chinese company ZTE that was eventually rescinded. These importance of these events to stakeholders were manifested in the scores received for this TRE (See Figure 9).

Figure 9: TRE 2008 Summary Results



	M. entry	Acss to R	IntCXN	Tariff	Anti-comp	USO	QOS	TRE AVE
MOBILE	3.2	2.8	2.8	2.9	2.5	2.6	3.2	2.8
FIXED	2.9	2.7	2.9	2.9	2.7	2.7	2.9	2.8
BROADBAND	3.1	2.7	2.9	2.8	2.7	2.5	2.7	2.7
Average	3.0	2.7	2.9	2.9	2.6	2.6	2.9	2.8

The overall average for the TRE in the Philippines in 2008 was 2.8. The highest marks were given for the Mobile sector (2.8), followed by fixed line (2.8) and last was broadband (2.7). The marks for the mobile sector and fixed line were lower than the 3.0 and 2.9 averages respectively from 2006. The lower averages was a result of the significant decline in scores for market entry and access to scarce resources. Furthermore, this average would have been lower had Quality of Service not been included in the TRE. Note also that like Quality of Service, and stakeholders' perception about regulation of the broadband sector in general was not included in the 2006. The lowest average that the broadband sector received is reflective of the many issues that need to be resolved in this comparatively new area, foremost of which are Universal Service, Access to Resources and Quality of Service.

Compared with the TRE in 2006 there were mixed results across the same dimensions surveyed in 2008. Some dimensions had improved perception, while others declined. In only two items, Market Entry for Mobiles, and Quality of Service for Mobiles were rated higher than the middle score of 3. As such, perception of the regulator was generally more negative. In fact, perceptions were lower for dimensions that scored highest in 2006, such as the environment for Market Entry and Regulation of Scarce Resources. Those that increased were perceptions about Universal Service Obligations (USO), Regulation of anti-competitive practices and TRE for interconnection in the mobile sector in particular. Nonetheless, USO and regulation of anti-competitive practices received the lowest scores. Hence, they pose the biggest challenges for regulators: (1) how to temper a vibrant and dynamic market in order to have fair competition; and (2) how to harness the private sector to bring services to rural areas and the marginalized.

Among those perceptions that declined were the TREs for Market Entry and Access to Scarce Resources. Partly, this may have to do with the perception that these were dimensions that where political influence seemed to affect the regulatory environment the most. In Market Entry, for instance, to obtain a franchise would require an Act of Congress. The same could be said with respect to allocation of 3G frequencies that occurred via 'beauty contest.' Alternatively, there was minimal change in the perception of tariff regulation, which may be due to perceived regulatory forbearance in this issue. Declining tariffs can be attributed more to market forces due to competition, rather than direct regulations imposed by the state. As such, perception has been better in areas where the market seems to work and politics is less involved. Ironically, overall, the highest mark for the Philippines' TRE was also for Market Entry (See Figure 9). This may be reflective of the still positive policy environment for encouraging more players in the industry.

A caveat to comparisons with the 2006 TRE, however, would be some changes in how the survey was administered. In this case, a facility for answering the survey was made available online, of which majority of the respondents (82%, n=66) opted to do. Another difference would be the composition of the sample and a variation in how they were grouped (from four in 2006, to only three in 2008). Respondents were explicitly told that that they could opt not to not answer questions that they felt they did not know enough about. Items that were intentionally left unanswered were not made part of the score when computing for the averages.

Relatively higher marks were received for interconnection, tariff regulation and quality of service regulation. Further, Quality of Service Regulation is perceived better than other dimensions despite the absence of regular information about the regulator's actual monitoring of the performance of telecommunication providers. This mark was also pulled up by good perception regarding the regulation of mobile phone service quality, where there are clear standards and occasional monitoring by NTC reported in the press. What is needed are more regular monitoring and reporting of all sectors, and in particular the development of clear and measurable indicators for broadband services.

The lowest marks overall were for anti-competitive practices and universal service obligation. In fact, the lowest ratings for the mobile sector were in the TRE of anti-competitive practices (followed by USO) even though it was already an improvement from the 2006 TRE survey. The capacity of the regulator to effectively manage this domain remains a major concern among stakeholders.

Finally, while still low, the USO score for fixed phones is highest in comparison because of service obligations that exist as a precondition to market entry. The low marks for universal broadband access, are also understandable given the low level of broadband penetration at present. The perception here would be that government is not doing the correct things that would lead to greater access to broadband services. It was the very low marks for this sector that pulled the USO average down. It would be interesting to see whether dramatic progress will be made in this area in the next TRE, as new 3G services roll out, and growth in mobile internet access is anticipated. Government should look into how the provision of these new technologies can be incorporated into policies that would encourage greater access to the unserved.

Methodology

The methodology for this study on the Telecommunication Regulatory Environment (TRE) survey was developed by LIRNEasia. It asks informed stakeholders to answer a brief survey on the telecom regulatory and policy environment along 7 dimensions, namely: Market allocation, Allocation of scarce resources, Interconnection, Regulation of anti-competitive practices, Universal service obligation, Tariff regulation, and Quality of service.

Respondents were asked assess the TRE by providing a score on a scale of 1 – 5 for each dimension, with 5 being the most positive and 1 the least favorable. Respondents were given the option to give a blank (no answer) to items the felt they had little knowledge to base their perceptions about. Blank items were not given a score in computing for the average for each dimension. The survey was conducted in the Philippines over a period of six weeks, from May 19 to July 7, 2008.

There were three groups surveyed (See Table 7). The first group were composed of stakeholders directly affected by telecom sector regulation (E.g. Operators, Industry associations, Equipment suppliers, Investors). The second group were composed of people who analyzed the sector with broader interest (E.g. Financial institutions, Telecom consultants, Law firms). The last group were composed of stakeholders with an interest in improving the sector to help the public (E.g. Academics, Research organizations, Journalists, Telecom user groups, Civil society, Former members of regulatory and other government agencies, Donors). All in all, 66 people participated in the survey. Twelve of them answered a survey questionnaire 'offline', while the rest answered the TRE survey on the internet. There were 23, 16 and 27 respondents who answered for each respective group.

Table 7 : Composition of respondents by category and assigned weights

Category	No. of respondents	Weight
Category 1	23	0.957
Category 2	16	1.375
Category 3	27	0.815

For more information about the methodology, please refer to Samarajiva et al (2007) available at http://www.lirneasia.net/wp-content/uploads/2008/05/lirneasia-tre-paper-for-tprc-v8.pdf.

Acknowledgements

This research was conducted as part of LIRNEasia's Telecom Regulatory Environment Survey with research funding provided by the International Development Research Center (IDRC), Canada.

The author would like to acknowledge foremost Ms. Mae Ann Acha and Ms. Veronica Silva-Cusi for doing much of the physical work, identifying and following-up the respondents, both online and personally interviewing some of them, as well as gathering the indicative statistics available from various government and private agencies. Likewise, special acknowledgement to Lorraine Salazar, Grace Mirandilla and. Ranjit Rye for providing the research with leads from which a sampling frame could be based. Special thanks also to the people who took the time to answer and participate in the 2008 Telecommunication Regulatory Environment survey.

Finally, this paper would not have been possible without the able technical help and patience extended by Dimuthu Ratnadiwakara in the conduct of the online survey and calculations thereafter.

Annex 1: Summary of Regulatory Events for the Philippines

TRE Summary of Regulatory Events in the Philippines

May 2007-May 2008

Date	**Subject**
2007	
May 2	A consortium of seventeen major international telecommunication operators, including PLDT, signed an agreement to build the first high-bandwidth optical fiber submarine cable system linking Southeast Asia and the U.S. The cable project, known as the Asia-America Gateway, will span 20,000 kilometers and will use the latest Dense Wavelength Division Multiplexing technology to provide upgradeable, future proof transmission facilities that will support bandwidth requirements for new and revolutionary broadband applications. It is expected that the Asia-America Gateway will cost approximately US$500 million and will be ready for service by the first quarter of 2009.
June 5	CICT Chairman Ramon Sales resigns.
June 8	NTC issued MC 0506 2007 - Consumer Protection Rights
June 12	NTC issues MC 0606 2007 giving "Additional Frequency Band Allocation, 2300-2400 MHz for Broadband Wireless Access"
July 19	NTC issues MC 07-07-2007 giving out "Additional Frequency Band Allocation, 410-430 MHz for Broadband Wireless Access"
July 19	NTC issues MC 09-07-2007 spelling out the "Rules on the Interconnection of Local Exchange Carriers (LECs) in Local Calling Areas," stipulating that "there shall be no interconnection and access charges between interconnected LECs within a local calling area."
July 19	NTC issues MC10-07-2007 "Mandating the development of Reference Access Offers (RAO) to facilitate fair and expeditious interconnection or access between service providers." Per MC, all telcos are required to submit RAOs which "shall contain the terms and conditions for which an access provider is prepared to provide access to its telecommunications network or facility to any requesting service provider."
July 30	The Department of Justice approves the National Broadband Network contract as legal and valid.
Sept 11	The Supreme court issues a temporary restraining order against the NBN project
Sept 23	President Arroyo orders indefinite suspension of ZTE contract for the National Broadband Network.
Oct	Community e-Center (CEC) Roadmap 2008-2010 was launched by the CICT
October 3	President Arroyo scraps the ZTE contract.
Nov 22	The Department of Trade and Industry (DTI), the CICT, and the Business Processing Association of the Philippines (BPAP) sign a MOA agreeing to collaborate in the creation of an industry standard or scorecard to measure a location's ICT investment viability, and attract more investments in ICT through marketing efforts.
2008	

Feb 13	Adoption of Official Statistical Concepts and Definitions on ICT (PR-200801-NS1-04, Posted 07 January 2008) The National Statistical Coordination Board (NSCB) approved the first batch of official concepts and definitions for statistical purposes for the information and communications technology sector for adoption by all concerned government agencies.
March	The government established the National Public Key Infrastructure (PKI) To provide a secure online environment both for e-Commerce and e-Government. This is expected to boost e-commerce and enhance the country's global competitiveness, particularly in the area of electronic trading and secured cross border transactions. The National PKI involves the establishment of a PKI Center and government Certification Authority (CA) by 2010, as well as adoption of licensing policies of private certification authorities. In March 2008, implementation took off with a US$3.5M grant from the Korea International Cooperation Agency (KOICA).
April 4	NTC issues Memorandum to all call center operators reminding them to source VoIP requirements from registered VoIP providers
April 9	The NTC issues a draft of the proposed rules on the "Mandatory Interconnection of Backhaul Networks to the International Cable Landing Station" with public hearing set for April 17
April 15	The Final Draft of the Proposed Rules on Wireless Loop The NTC proposes to abolish access charges between phone firms that offer wireless fixed line in a local calling area. In their draft rules, 'there shall be no interconnection access charges between interconnected LECs for calls originating from or terminating in wireless local loop (WLL) subscribers within a local calling area. This means all wireless fixed line calls made within a local calling area shall be considered local calls. Public hearing is set for April 29
May 17	DICT Bill passes in House of Representatives. Counterpart bill in Senate still has to schedule public hearings on it

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Telecom Regulatory and Policy Environment in Bangladesh:

Results and Analysis of the 2008 TRE Survey

Miraj Khaled

Report Type: Research paper

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*__Country/Region__: Bangladesh

*__Full Name of Research Institution__: LIRNE*asia*

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*This report is presented as received from project recipient(s). It has not been subjected to peer review or other review processes.

***Abstract:** Until the late 1980’s, the state owned Bangladesh Telegraph and Telephone Board (BTTB) provided all telecommunication services in the country holding absolute monopoly power. In 1989 two companies were given permission to offer telecom services. Pacific Bangladesh Telecom (PBTL) was given a license for providing mobile and fixed wireless services; and Bangladesh Rural Telecom Authority (BRTA) was given the other license to offer fixed-wireless services in selected rural areas. Later in 1991, Sheba Telecom was awarded another fixed-wireless license for the same rural market. In effect this allowed BTTB to continue as the dominant player in the fixed-phone market with virtual monopoly; and PBTL was the only operator in the mobile telephony sector. Sheba and BRTA didn’t pose any significant competition in the telecom sector as their combined subscriber base was miniscule. The current HHI (*Herfindahl -Hirschman Index*) score for Fixed-phone sector is 5096.

BTTB has been playing both the role of operator and regulator until 1995. In 1996, the regulatory functions were transferred from BTTB to the Ministry of Post and Telecommunications (MOPT). Still BTTB played the de-facto regulatory role as the MOPT relied extensively upon BTTB for advice and technical help. Finally in January 2001 the Bangladesh Telecommunications Act was promulgated under which the Bangladesh Telecommunications Regulatory Commission (BTRC) was established by the government.

***Keywords:** TRE Survey, Bangladesh

Telecom Regulatory and Policy Environment

in Bangladesh:

Results and Analysis of the 2008 TRE Survey

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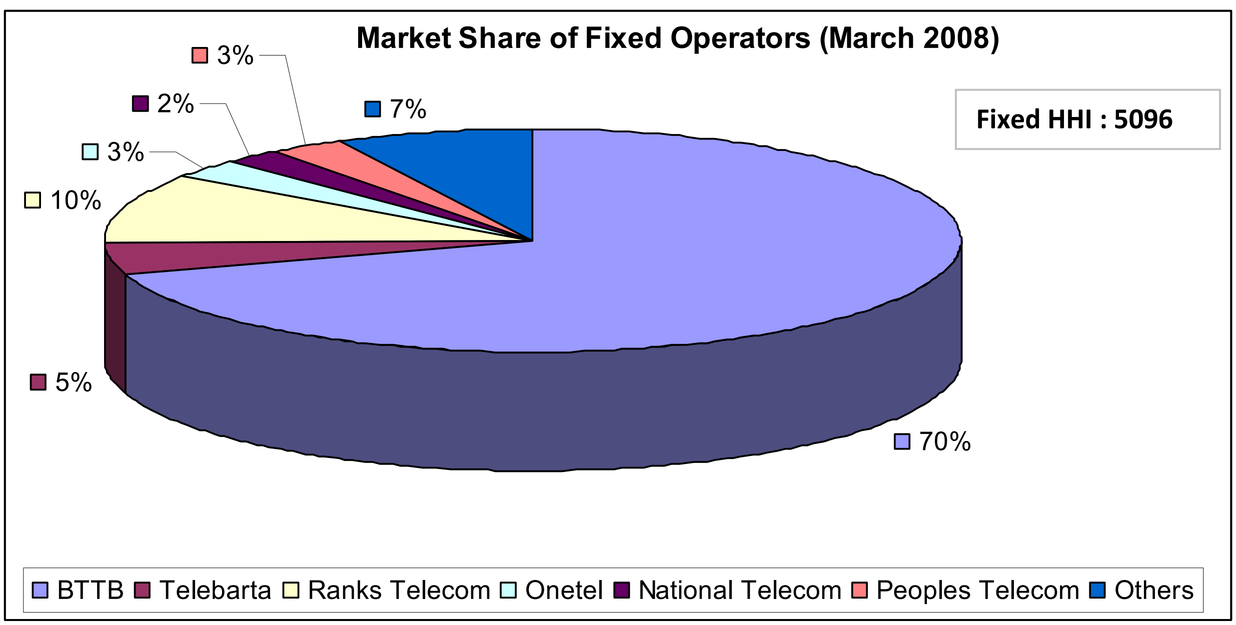
List of Figures

1. Development of the Regulatory and Policy Environment

Bangladesh is the most densely populated nations in the world yet until recently had one of the lowest penetration of telephones.   Bordering India, it has a population of 145 million and a population density of 953. It is one of the poorer nations of the world with GDP per capita of USD 482. 40% of the population live under the poverty line. 75% of the population is rural.

Fixed sector: Until the late 1980's, the state owned Bangladesh Telegraph and Telephone Board (BTTB) provided all telecommunication services in the country holding absolute monopoly power. In 1989 two companies were given permission to offer telecom services. Pacific Bangladesh Telecom (PBTL) was given a license for providing mobile and fixed wireless services; and Bangladesh Rural Telecom Authority (BRTA) was given the other license to offer fixed-wireless services in selected rural areas. Later in 1991, Sheba Telecom was awarded another fixed-wireless license for the same rural market. In effect this allowed BTTB to continue as the dominant player in the fixed-phone market with virtual monopoly; and PBTL was the only operator in the mobile telephony sector. Sheba and BRTA didn't pose any significant competition in the telecom sector as their combined subscriber base was miniscule. The current HHI (*Herfindahl -Hirschman Index*) score for Fixed-phone sector is 5096.

Figure 1 : Fixed sector Market Share and HHI



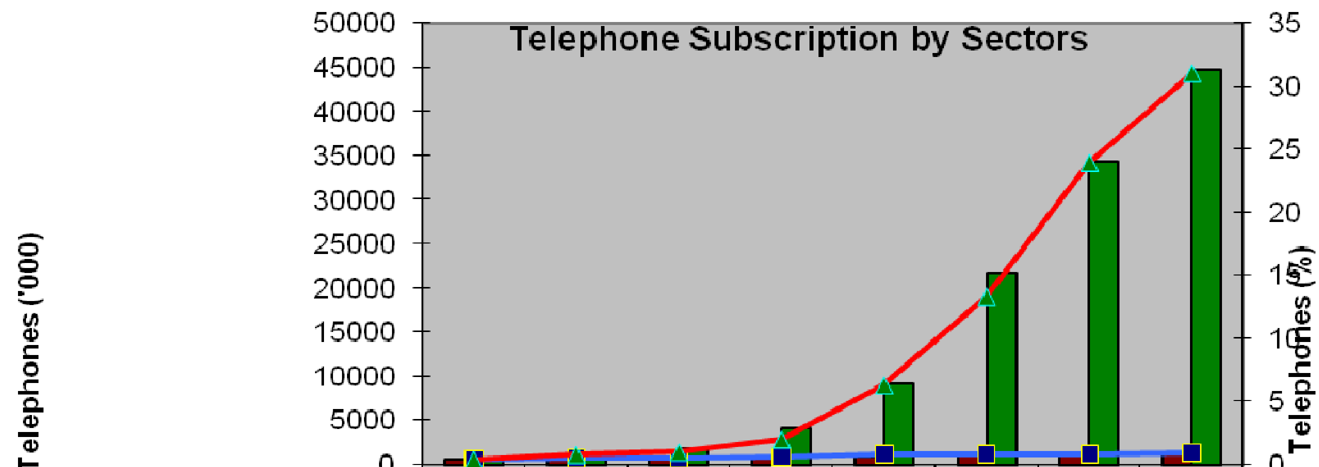
Source: BTRC

Overall, the performance of the fixed-phone sector has been quite unsatisfactory. Penetration of fixed-phone remains only around 1% of the population as shown in Figure 2. BTTB was transformed into a public limited company in 2008 by the government of Bangladesh. BTTB was renamed as the Bangladesh

Telecommunications Company Limited (BTCL). A separate company named Bangladesh Submarine Cable Company Limited was also formed which inherited the ownership of Bangladesh's only submarine cable and related infrastructures. Despite the entry of several operators in the fixed-phone sector, the outlook doesn't look very good. Substantial investments are needed to be poured in by the operators and their investors for the development of infrastructure of the sector.

Mobile sector: In contrast to the fixed sector, the mobile market in Bangladesh has caught the attention of industry experts, potential investors and global telecom operators alike. In last three/four years the mobile market has seen astonishing growth; and in last two years the market has seen intense competition between the operators. All these brought better services for the subscribers of mobile services in Bangladesh. Mobile penetration was under one percent in 2001, and has now reached quarter of the total population in the country. Figure 2 shows that increasing market entry resulting in subscriber growth for mobiles far surpassing fixed phones.

Figure 2: Growth & Penetration in Fixed and Mobile sectors in Bangladesh

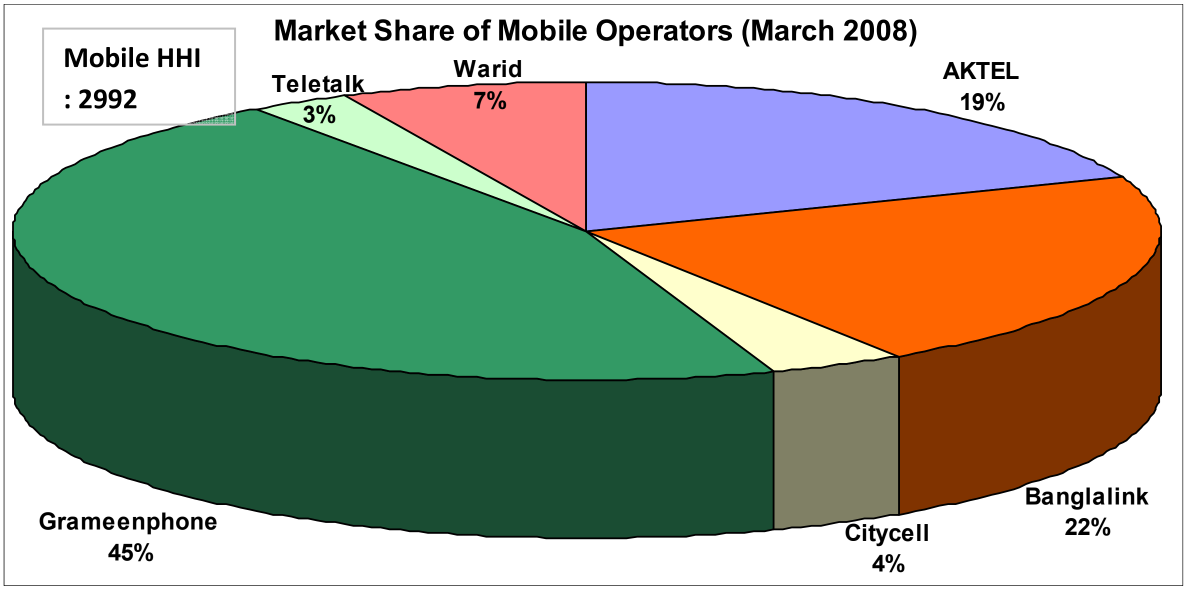


	2001	2002	2003	2004	2005	2006	2007	Jul-08
Total Fixed Phones ('000)	585	682	716	831	870	1045	1,187	1,294
Total Mobile Phones ('000)	662	1,140	1,907	4,151	9,278	21,760	34,370	44,800
Fixed Phones per 100 inhabitants	0.4	0.5	0.5	0.6	0.8	0.8	0.83	0.9
Mobile Phones per 100 inhabitants	0.4	0.8	1	2	6.3	13.3	23.89	31

Source: BTRC, ITU, Author calculation

While the mobile sector has still room for growth, it is by far more competitive than the fixed. Figure 3 shows the market shares for the mobile sector. The current HHI (*Herfindahl -Hirschman Index*) score for Mobile sector is 2992 and ARPU for the industry is USD 1.84.

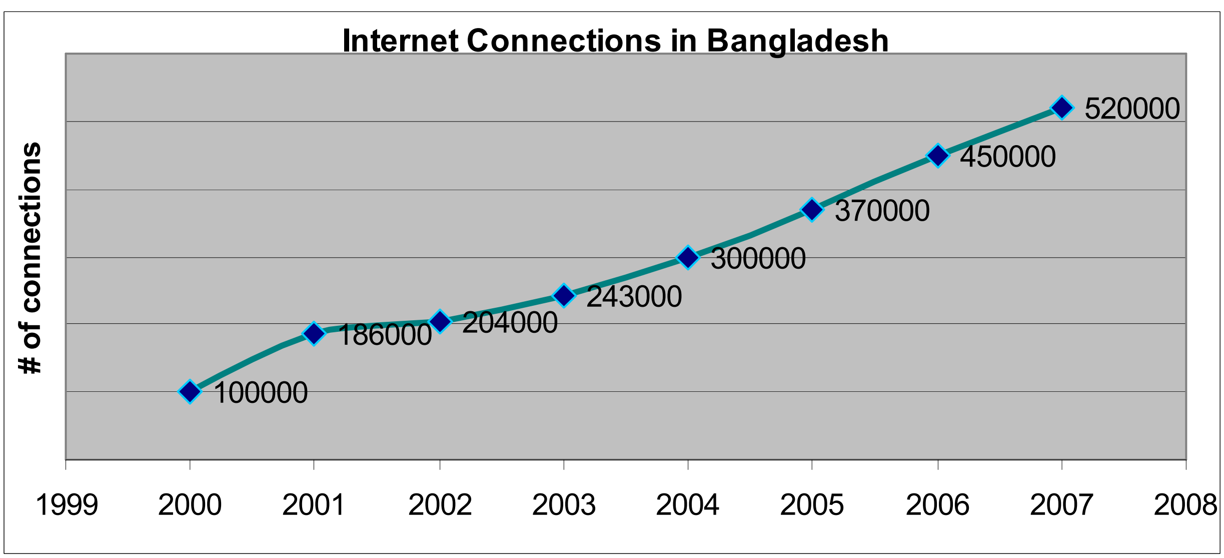
Figure 3: Mobile sector Market share & HHI .



Source: BTRC, Operator data

Internet: Bangladesh was connected to the internet in 1996. Internet penetration in Bangladesh is very low and broadband penetration is even significantly lower. A majority portion of internet connection in the country is being provided through dial-up connections; and nowadays an increasing numbers of subscribers are connecting to the internet through mobile phones. Figure 4 shows the growth of internet subscribers.

Figure 4: Internet Connections



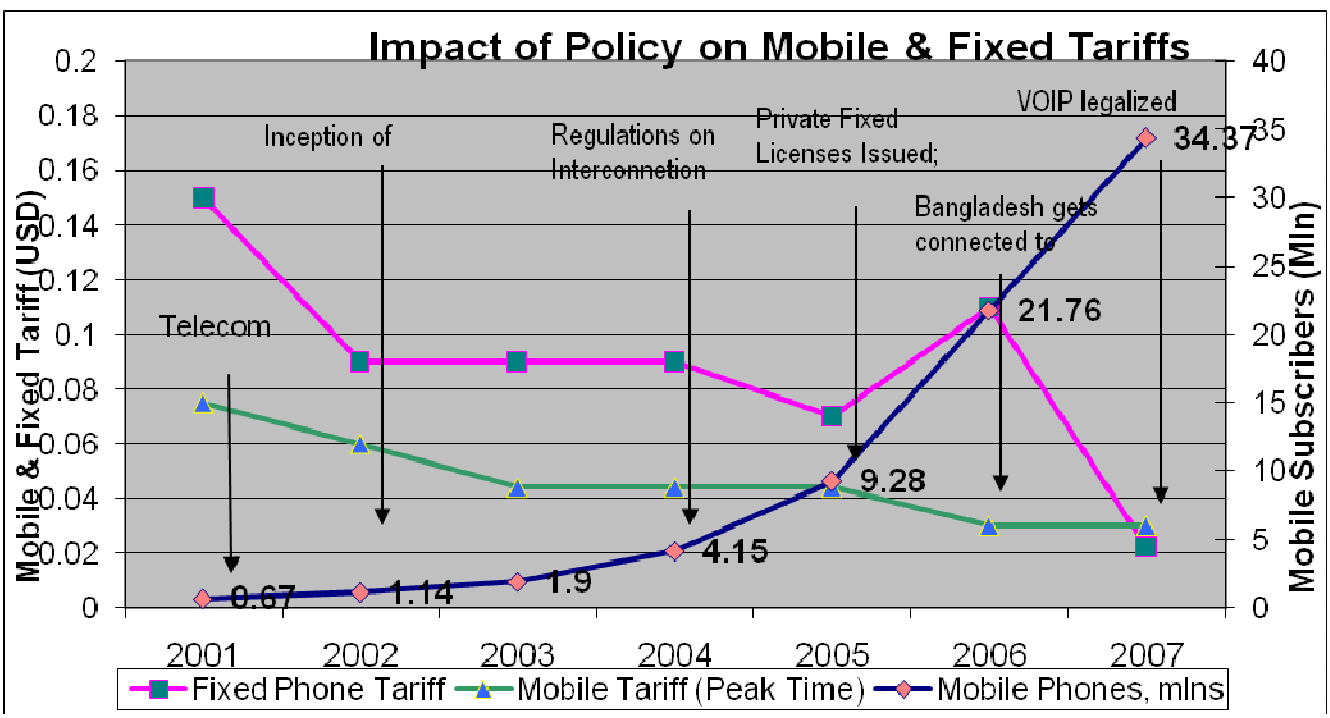
Source: ITU

Although the government has recently considerably reduced the internet tariffs and bandwidth charges by BTTB, it is still very high in comparison to global internet price benchmarks. The high cost of quality internet connectivity remains a major bottleneck for the growth of broadband and overall ICT sector of the country. This situation hopefully would be mitigated soon as the government announced its intention to issue four operator licenses for Broadband Wireless Access (BWA) services utilizing Wimax technology in the 2.3 GHz and 2.5 GHz spectrum bands. This would clear the way for telecom operators to offer high-speed broadband wireless internet access to the Bangladeshi subscribers.

Evolution of the Regulatory Regime: BTTB has been playing both the role of operator and regulator until 1995. In 1996, the regulatory functions were transferred from BTTB to the Ministry of Post and Telecommunications (MOPT). Still BTTB played the de-facto regulatory role as the MOPT relied extensively upon BTTB for advice and technical help. Finally in January 2001 the Bangladesh Telecommunications Act was promulgated under which the Bangladesh Telecommunications Regulatory Commission (BTRC) was established by the government.

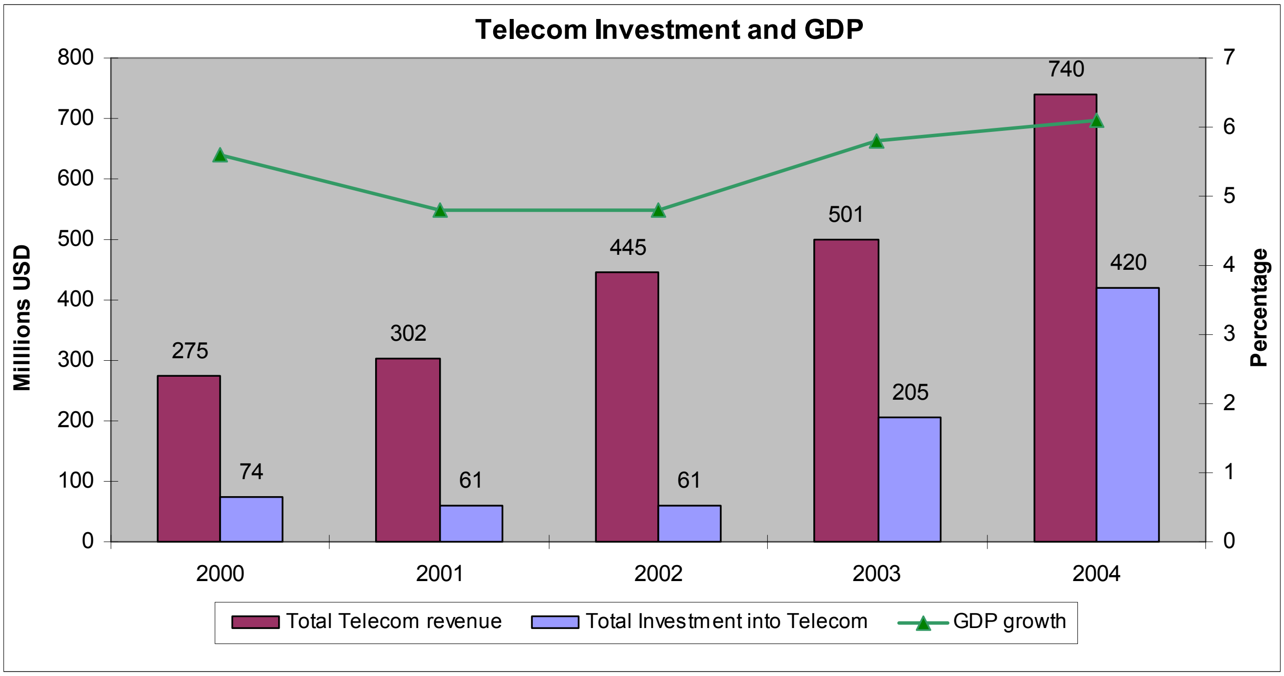
Figure#5 illustrates the impact of the recent policy/regulations on the telecom sector. Figure#6 shows the scenario of increasing investments made into the telecom sector due to favorable policy and regulatory environment (as perceived by investors) and greater revenue earning parallel to GDP growth.

Figure 5: Impact of policy on Mobile & Fixed Tariffs.



Source: BTRC, BTTB, Operators. [Fixed Tariff=Average of peak-time national call rates; Mobile Tariff= peak-time call rates, incl. both pre-paid and post paid]

Figure 6: Telecom Investment and GDP growth in Bangladesh



Source: World Development Indicators Database, GDP data from IMF Economic Outlook Database.

Policy and Laws on Telecommunications

The legal framework in the Indian Subcontinent and Bangladesh's telecommunication sector originates from the "Telegraphy Act of 1885". This act and other subsequent legislations are the legacy of the British Common Law system which is widely followed in the region. The following are the major legal statutes and policies that govern the telecom sector in Bangladesh:

I. The Telegraphy Act of 1885

The objective of the Telegraphy Act was to empower the government to provide telecommunications services to the citizens of the country. It gave exclusive power to grant licenses for telegraphs, maintain telegraph lines & equipments, and enforce penalties.

II. The Wireless Telegraphy Act of 1933

This act complemented the 1885 Telegraphy Act and rectified some loopholes that were inherent in the previous act. The 1933 act was primarily geared towards broadcasting services like radio.

III. The National Telecommunication Policy of 1998

The “Strategic Vision” of the policy was to facilitate universal telephone service throughout the country in order to ensure the orderly and rapid growth of telecommunications services for rapid socioeconomic development. The National Telecommunications Policy outlined for the first time Bangladesh government’s intentions for market liberalization and structural reform in the telecom sector. It opened the sector to private participation, mentioned a plan to privatize BTTB in future, and most importantly envisaged establishment of an independent telecom regulator. The telecom policy stipulated broad principles and future development goals but did not provide substantial directives and guidelines on how to achieve these.

IV. Bangladesh Telecommunications Act of 2001

The Bangladesh Telecommunications Regulatory Commission (BTRC) was established on 31 January 2002 with the expressed purpose of the efficient regulation and management of telecommunications system and related services in Bangladesh. According to the act, these are the broad objectives of BTRC:

> *"(a) to encourage the orderly development of a telecommunication system;*
>
> *(b) to ensure access to reliable, reasonably priced and modern telecommunication services and internet-services for the greatest number of people;*
>
> *(c) to ensure the efficiency of the national telecommunication system and its capability to compete in both the national and international spheres;*
>
> *(d) to prevent and abolish discrimination in providing telecommunication services, and to progressively effect reliance on competitive and market oriented system;*
>
> *(e) to encourage the introduction of new services and to create a favourable atmosphere for the local and foreign investors who intend to invest in the telecommunication sector in Bangladesh.”*

BTRC’s constitutionally mandated role is to: ensure a fair, transparent marketplace for all the players in the telecom sector. As the telecom watchdog it is envisaged that BTRC would: oversee the issuance of necessary licenses; allocate scarce resources i.e. spectrum; implement an efficient interconnection regime; set and regulate tariffs for telecom related services; and uphold the interests of subscribers and telecom operators by maintaining a judicious balance thereof. (MOPT, 2001)

V. National Information and Communication Technology (ICT) Policy of 2002

The ICT policy of 2002 recognized telecommunication as a vital component of the national ICT development strategy. Some of the most pertinent policy statements in regard to telecommunications stipulated that:

a. *"the telecommunication sector should be deregulated and made open to private sector investors as early as possible.*
b. *In order to establish direct connectivity with international information and communication backbone Bangladesh will join Fiber Optic Submarine Cable network.*
c. *Basic telecommunication facilities will be extended to the rural and under-served areas to bring the greater mass into the stream of ICT activities both by the public and private sector.*
d. *The bandwidth capacity and availability will be ensured all over the country at a reasonable cost to encourage the growth of Internet, ICT industries, e-Commerce and e-Government."* (MOSICT, 2002)

VI. International Long Distance Telecommunication Services (ILDTS) Policy-2007

This policy ended the long-standing monopoly of BTTB in the international telecommunications services. It also finally legitimized the utilization of VoIP based services in the country. Some of the major Objectives of the policy are:

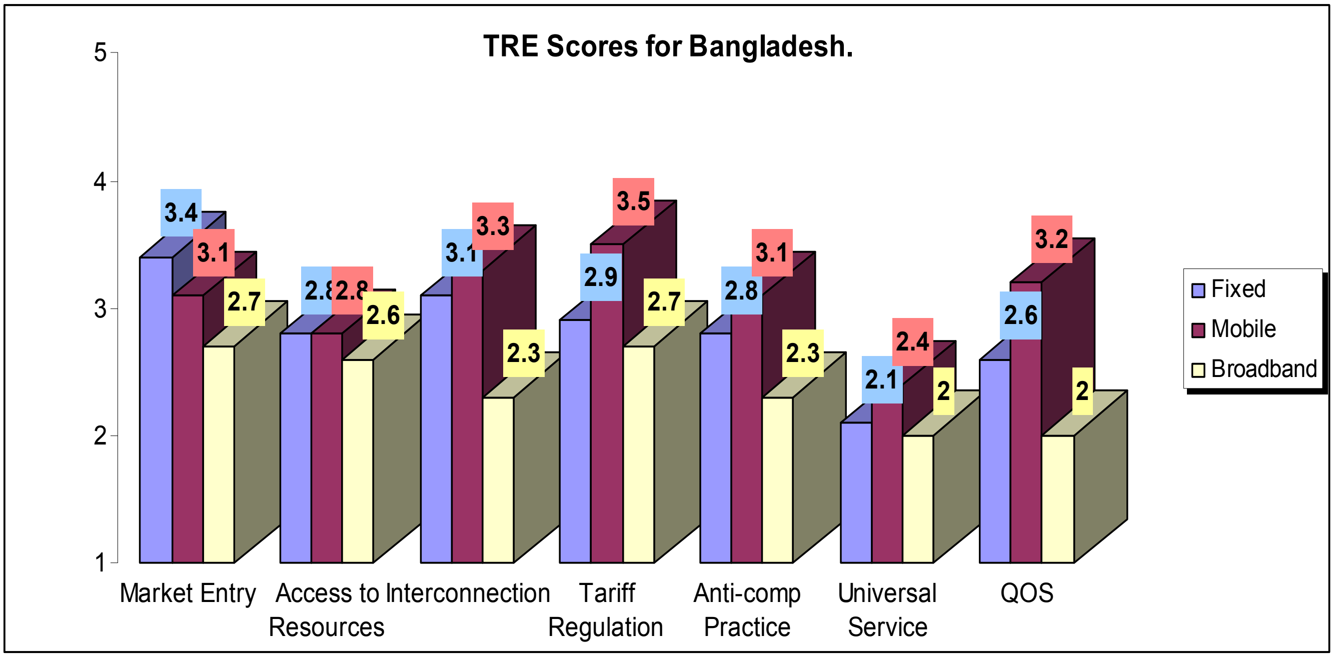
- *"Provide low cost telecommunication services using modern technologies.*
- *Encourage local businesses and enterprises in telecommunication*
- *Ensure proper revenue earning of the government.*
- *Encourage Next Generation Network (NGN) Technology."*

The ILDTS policy has been formulated to facilitate, liberalize and legitimize international voice and data communication services including VoIP. The main focus of the policy is to provide affordable communication means to Bangladeshis residing both at home and abroad, encourage local entrepreneurs, and ensure due earning of government revenues. (MOPT, 2007)

TRE Scores

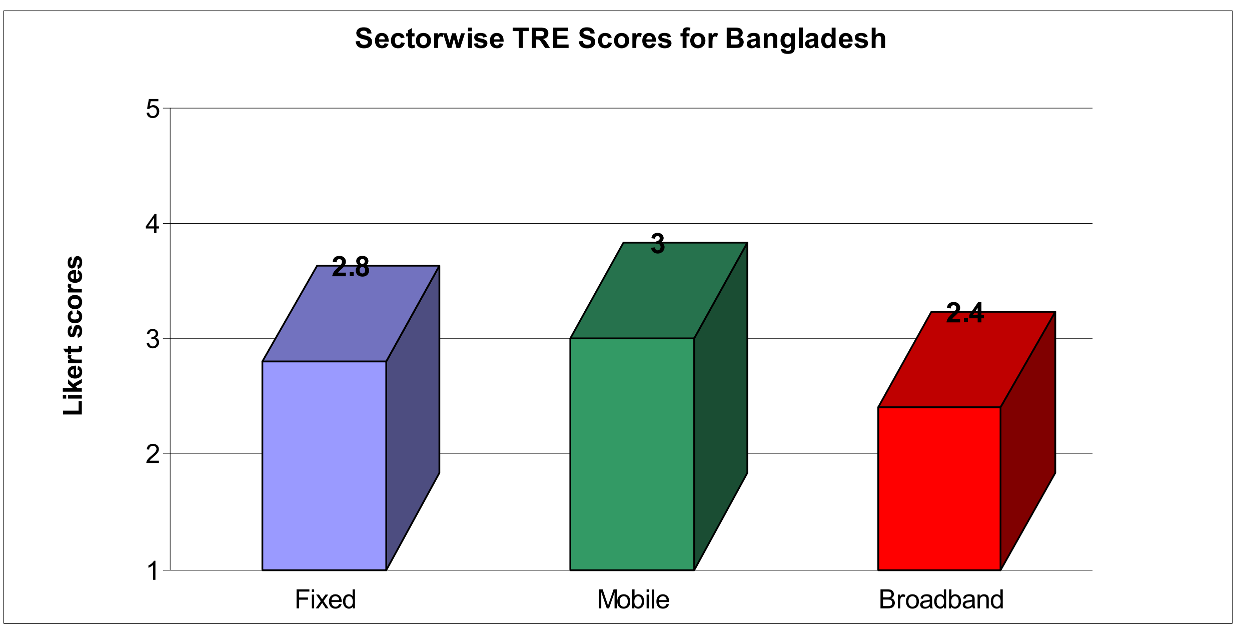
Figure#7 below depicts the complete TRE scores across all seven categories for the fixed, mobile and broadband sectors in Bangladesh. Figure#8 shows the aggregate scores for the three sectors. The mobile sector achieved the overall best TRE scores, while the fixed sector trailed closely and broadband sector performed poorly. Tariff regulation category garnered the highest individual scores for both mobile and broadband; whereas the score for market entry was the best in fixed sector. USO and QOS categories garnered the lowest scores across all sectors, (except for mobile in QOS).

Figure 7: TRE Scores for Bangladesh.



Source: TRE Survey 2008

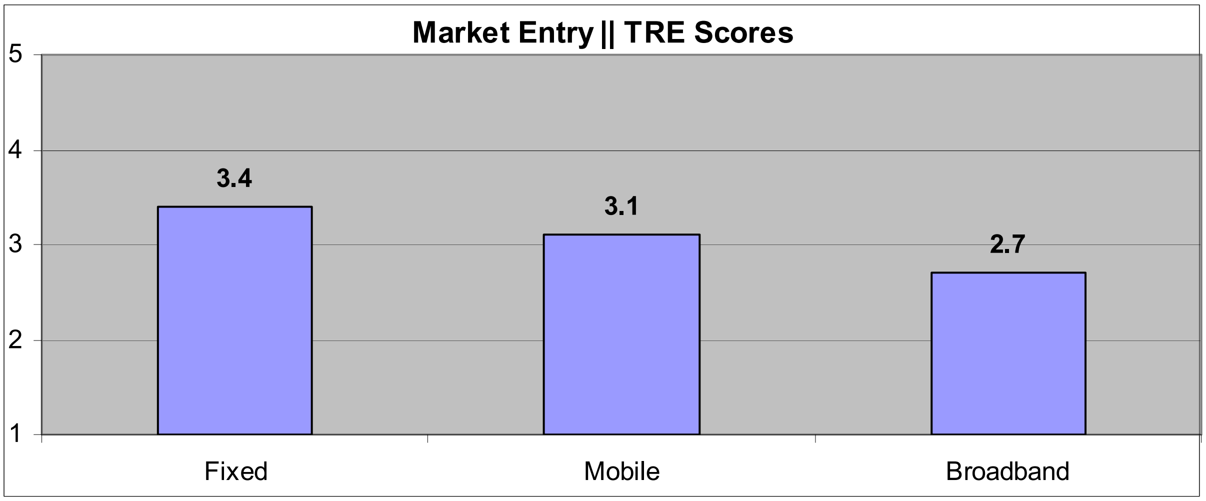
Figure 8: Sector-wise TRE Scores for Bangladesh



Source: TRE Survey 2008

2. Market Entry

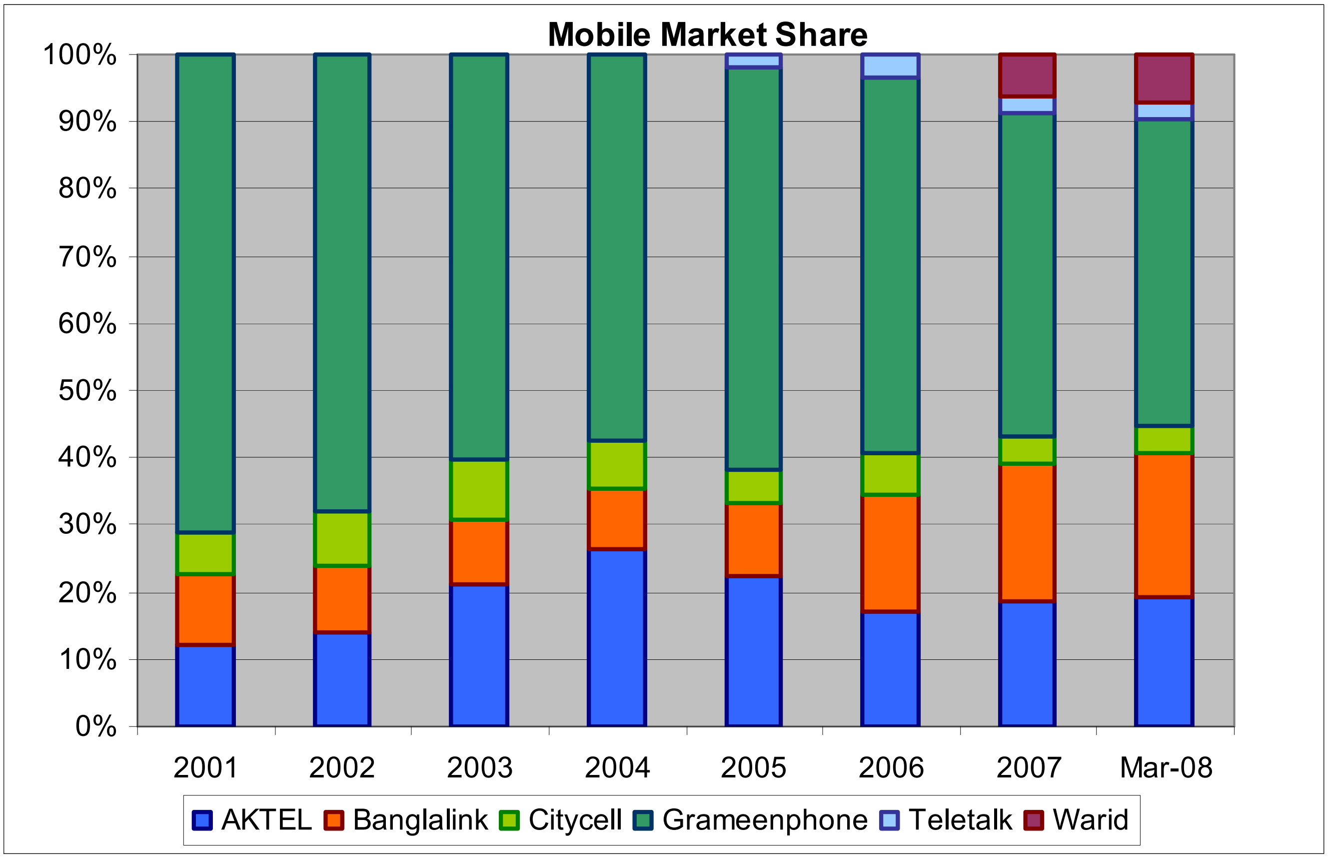
Figure 9: TRE Scores for Market Entry



Source: TRE Survey 2008

Fixed phone sector received the highest score in the market entry category followed by the mobile sector. Broadband sector received a comparatively low score. The mobile sector already has six operators in operation in Bangladesh, and the general perception is that there aren't any chances for additional entry into the mobile market. Although the mobile sector is generally very competitive in comparison to the fixed sector, but mobile sector received lower scores possibly because of peoples perception mentioned above. The first mobile operator license was awarded in 1989 to Pacific Bangladesh Telecom Limited (PBTL) who started their operation in 1993. After years of monopoly operation, the mobile market was opened up and another three operators namely Grameenphone, Aktel and Sheba were awarded licenses to offer their services in 1997. Teletalk, the subsidiary of state owned BTTB entered the market in 2004. The final mobile operator Warid began operation in 2007. Renewed interest by foreign investors into the mobile sector has spurred competition between the operators to retain and attract subscribers.

Figure 10: Mobile Market Share (2001-2008)



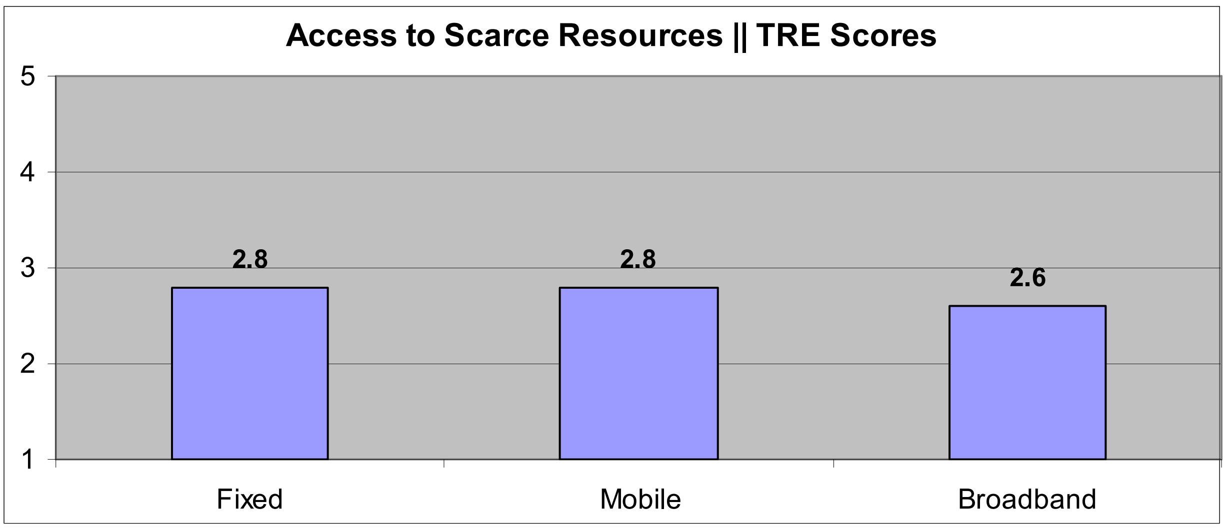
Source: BTRC & Operator data

Bangladesh government decided to open up the telecommunication sector to promote more competition and encourage greater participation of private operators. Towards that end BTRC announced the "Licencing Procedure Regulations" in January 2004. Under this new regulation, granting of ISP and VSAT licenses was liberalized and simplified. Any person having satisfactory technical and financial capabilities was deemed to be eligible to get licenses to provide internet services. The regulation stipulated that licenses for PSTN. Internet, national long distance, data communiation and VSAT services would be granted under a open licensing procedure. While services for mobile telephony, paging, radio trunking and satellite phones and international long distance would be granted through competitive bidding procedure . (BTRC, 2004a)

Both internet and fixed-phone marketplace were made fully open for any parties to participate in. Entry into the wireless and international telecom services was made conditional upon the availability of spectrum. So far about thirty PSTN licenses and hundreds of ISP licenses have been issued by the government. Therefore it is not clear why Broadband sector received low score while Fixed sector received the highest score in this category when entry to both sectors are open. BTTB remained the sole international voice gateway operator till 2008 when its monopoly ended as several new licenses were awarded to private operators for international voice gateway, international internet gateway and internet connection exchanges under the ILDTS Policy 2007.

3. Access to Scarce Resources

Figure 11: TRE scores for Access to Scarce Resources



Source: TRE Survey 2008

All three sectors received almost similar scores. The scores in this category were below 3, which is the threshold limit of satisfactory performance for the TRE study. Spectrum allocation policy is not very well developed in Bangladesh. According to the Bangladesh Telecommunications Act (IV : 31), the overall responsibility for spectrum management rests squarely on BTRC. Accordingly, the Bangladesh National Frequency Allocation Plan (NFAP) was formulated by BTRC on July 2005. The NFAP is said to be "based on current and expected spectrum requirements in Bangladesh in the foreseeable future (BTRC, 2005)." The Spectrum Management Committee at BTRC has very few participants from the private sector. It has been advised that in matters regarding spectrum allocation, BTRC should consult with the telecom industry to ascertain the optimum use of the spectrum for generating best value to consumers (Reynolds et al, 2007)

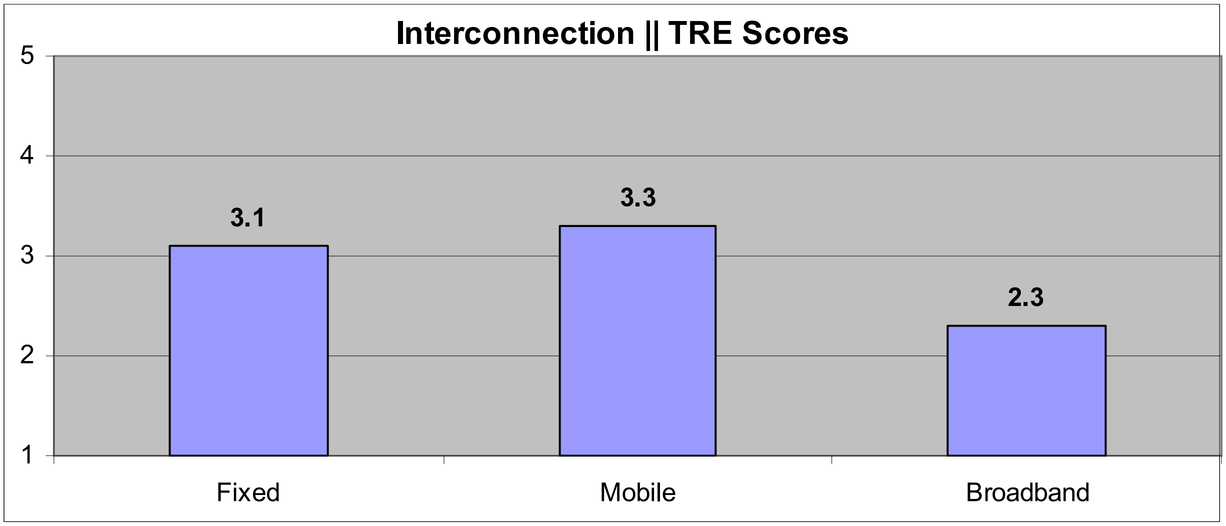
Previously spectrum was assigned on a "first come, first served" basis in the country. This has led to a scenario where this valuable resource being not allocated in a thoughtful way. Although recently the regulator has taken a more cautious stance regarding spectrum allocation. The leading mobile operators faced difficulties providing meaningful service to their massively increasing subscriber base with the limited spectrum allocated. A portion of the invaluable spectrum was left unused because these had been allocated to wireless local loop operators and other entities that have neither commenced their business activities nor utilized the spectrum for the specific activities the spectrum was assigned for. BTRC has recently cancelled some of the WLL licenses and reclaimed spectrum from these WLL and other firms who had unutilized spectrum. The regulator has recently announced that a portion of spectrum would be sold to mobile operators. It has also directed operators to cooperate with each other for sharing infrastructures like towers etc.

In the broadband sector a few companies wanted to offer services employing latest technologies like Wimax. But they were not able to roll-out their services due to BTRC's reluctance to assign the required spectrum. BTRC has now announced that it plans to award three licenses for Wireless Broadband Access through competitive bidding. An additional fourth license would be awarded to BTTB after they match the highest bid price reached at the auction. We have to wait and see if these new broadband licensees are able to attract a large enough subscriber base and able to provide broadband access to both the urban and rural areas as mandated by the regulator.

Bangladesh's first fibre-optic backbone was installed for Bangladesh Railway, which was later leased to Grameenphone. In addition to using for its own services Grameenphone subleases capacity to other entities. Power Grid Corporation of Bangladesh has also set up a fibre-optic network along its power transmission lines. And BTTB has a countywide backbone consisting of fibre-optics and microwave links. BTTB's backbone is also connected to the only submarine cable link of the country. Most of the other operators utilizes either BTTB's or Grameenphone's network as the backhaul connection for their operation. The government has recently issuedled RFPs for a second submarine cable network. And in August 2008 BTRC issued a "Regulatory and Licensing Guidelines for Nationwide Telecommunication Transmission Network License". They also issued a "Guidelines for Infrastructure Sharing" to facilitate sharing of infrastructure between operators for ensuring optimum utilization of telecommunication resources. This later guideline mandates all infrastructure providers to share resources ranging from Base Transceiver Station (BTS), Radio Access Network (RAN), switching centers, to Network Controller (RNC), optical fiber and backbone transmission network etc.

4. Interconnection

Figure 12: TRE scores for Interconnection



Source: TRE Survey 2008

One of the main roles of any telecom regulator is to set competitive interconnection charges. Yet Interconnection has been one of the major sticking points in Bangladesh's fiercely competitive telecoms marketplace. Even just a few years back, over 80% of calls originating on mobile networks failed to terminate on the public switched telephone network. Calls between mobile networks were also hampered severely as operators used to block each others' calls. BTRC enacted an "Interconnection Regulations 2004" statute with the express purpose of:

> *"to ensure effective telecommunication services in the country; prevent and abolish discrimination in the provision of services, ensuring fair competition; encourage the introduction of new services; and promote and safeguard the interests of consumers by ensuring reliable and fairly priced modern services with reasonable accessibility."*

Until recently, the existing interconnection arrangements prevented mobile operators to recover any termination cost for calls made from the state-run BTTB network. On the other hand, charges for calls made to BTTB were substantially higher. In effect, mobile subscribers have been subsidizing the fixed-phone subscribers. Interestingly the dominant mobile operator Grameenphone also used to charge termination fees arbitrarily from other mobile operators. These issues were aptly described in De Silva et al., 2004:

> *Absence of a conducive interconnection regime is a major bottleneck for the growth of the fixed line sector in Bangladesh. Service providers are prone to predatory pricing and to refusal of access to competitor operators. Interconnection with BTTB is consistently named as one of the top issues to be resolved in the sector by private operators.*

The recent introduction of Interconnection Exchanges is designed to eliminate any anomalies in the interconnection regime and also prevent anti-competitive behaviors among the operators. And as BTTB itself has been converted into a public limited company it is bound to adhere to market rules and follow standard interconnect procedures as any other operators.

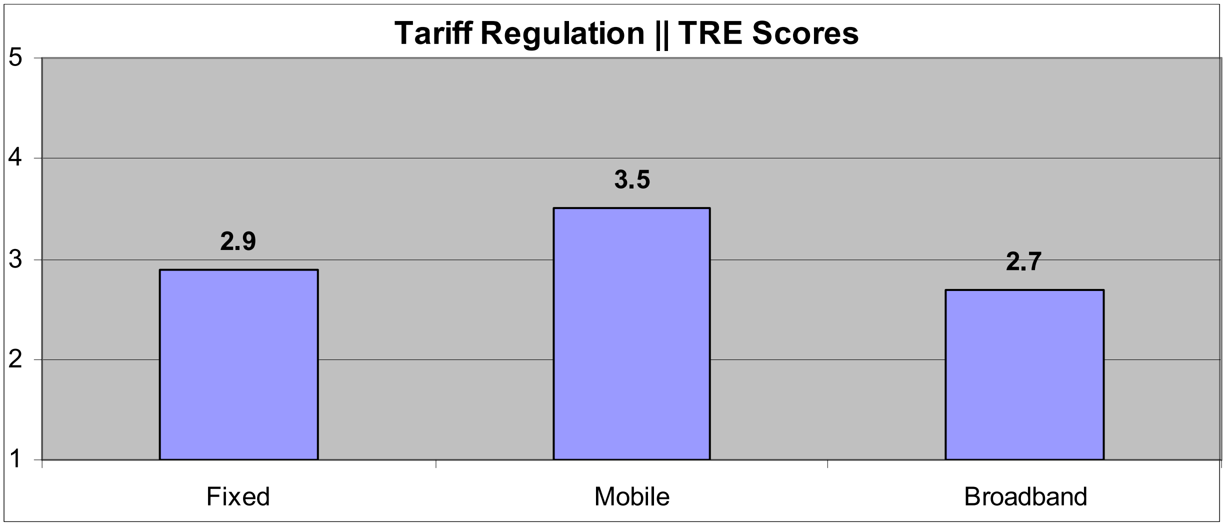
Another report by a leading telecom consultancy found that mobile-to-fixed interconnection rates in Bangladesh are very high and Fixed-to-mobile charges do not exist. It also mentions that there is an apparent inconsistency between The Bangladesh Telecommunication Act 2001, which stipulates cost-based interconnection; and the Interconnection Regulation 2004, which points towards cost orientation. (Lane et al., 2006)

In the broadband sector, the ISPs did not have any effective interconnection mechanism between themselves. Thus, even an email originating and terminating within Bangladesh had to be routed halfway around the world to reach its recipient. Bangladesh Internet Exchange (BDIX), which became operational only in 2004, alleviated the situation to some extent, but not entirely. Only a few dozen ISPs are member of BDIX. With the establishment of the internet connection exchanges this year there should be vast improvement in the country's internet infrastructure.

Both the mobile and fixed sector have received satisfactory (above 3) scores, although interconnection has been a thorny issue for years. This could be because the arbitrary setting of interconnection charges by the dominant operators is not practiced anymore. And the establishment of Interconnection Exchanges in 2008 will supposedly alleviate the situation by providing a common platform to connect all telecom operators. In the Wireless Broadband Access guidelines issued during August 2008, BTRC mandated Interconnection rates and procedures. It stipulated that all IP voice calls should be routed through the Interconnection Exchanges and International Gateways; and all data traffics need to be routed either via the International Internet Gateway or the National Internet Exchange.

5. Tariff Regulation

Figure 13: TRE scores for Tariff Regulation



Source: TRE Survey 2008

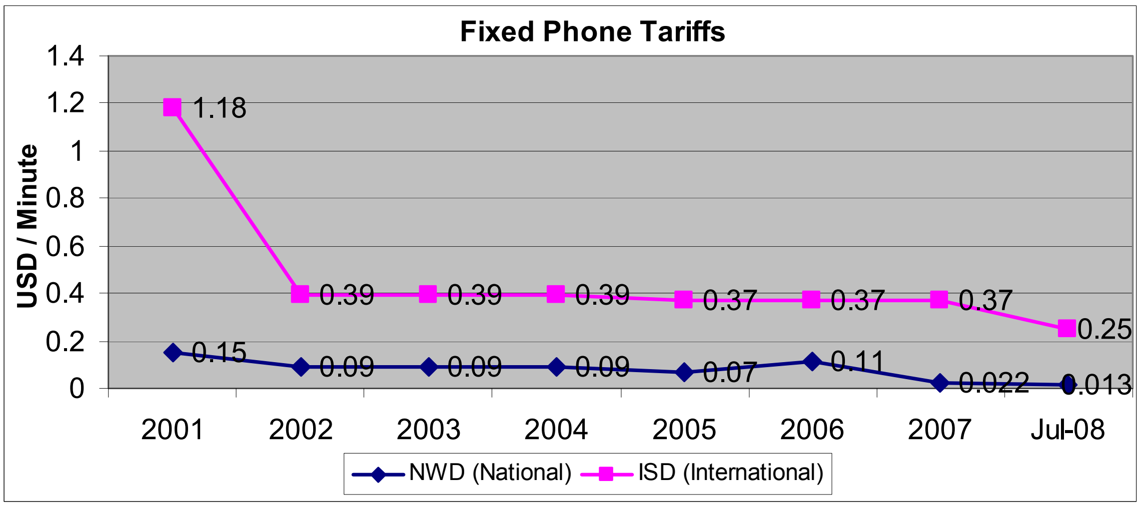
Fixed and Mobile sector did well while broadband sector received comparatively low scores for tariff regulation. In fact mobile sector received the highest score for this category in the entire survey. The Bangladesh Telecommunications Act gives the power to determine telecommunication tariffs and call charges and if necessary, suspend any tariffs proposed by operators.

In 2007, BTRC issued an "Interim Directive on Tariff" in order to harmonize the tariff regime for the telecommunication services. This directive mentioned that BTRC is formulating a comprehensive "Tariff Regulation". Two major tariff decisions were stipulated in the interim directive. A t*ariff circuit was* set up *mandating that all mobile call charges to be bounded by a circuit between Tk. 2.00 per minute and Tk. 0.25 per minute. Meaning, the maximum airtime charge has to be under Tk. 2.00 per minute and not less than Tk. 0.25 per minute. It was also mandated that when a promotional package is offered, the tariff must be same for all subscribers under the same package irrespective of geographic locations. (BTRC, 2007)*

In effect, through this directive, the regulator set a price band for the mobile services offered in the country. All operators have to set their tariff within the stipulated range, and as long as the tariff is within the range no prior approval would be required. The directive also ensured the uniformity of tariffs charged for promotional packages. In any case, mobile subscribers in Bangladesh now enjoy one of the lowest tariffs in the world.

There has not been any action by the regulator in regard to broadband tariffs so far. And in the fixed sector, BTTB has been fixing its tariffs almost exclusively, and other PSTN operators were compelled to react accordingly and revise down their rates in order to operate in the highly distorted fixed-phone marketplace. Rarely did BTRC step in to rein in BTTB; most of the times it treated BTTB's pricing moves with kid gloves.

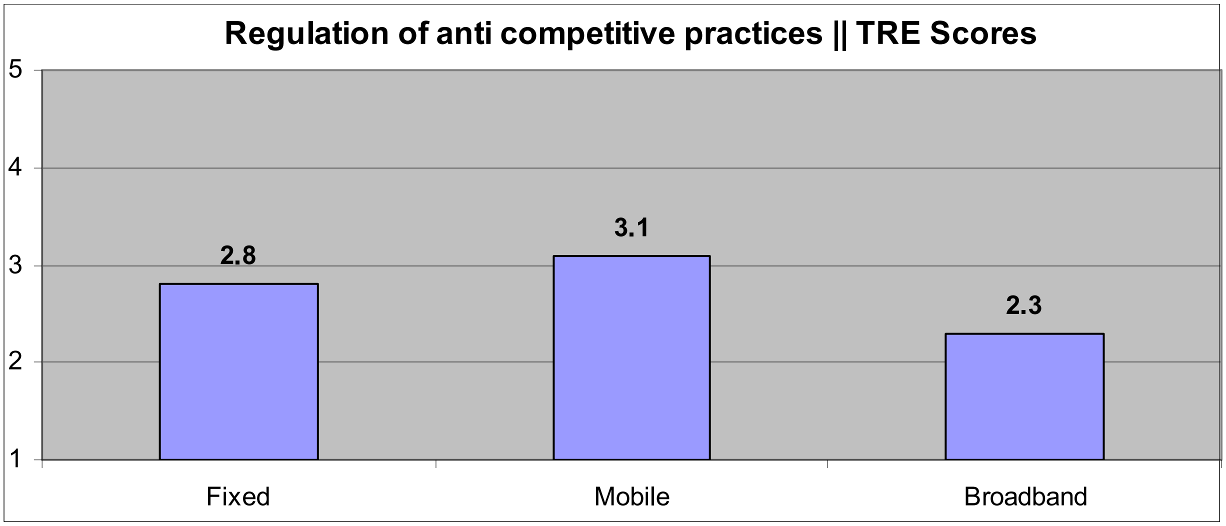
Figure 14: Fixed-phone Tariffs in Bangladesh.



Source: BTTB. ISD=Cost of an International Call (Average of all rates); NWD= Cost of a Nationwide Call (Average of all rates)

6. Regulation of anti competitive practices

Figure 15: TRE scores for anti competitive practices regulation



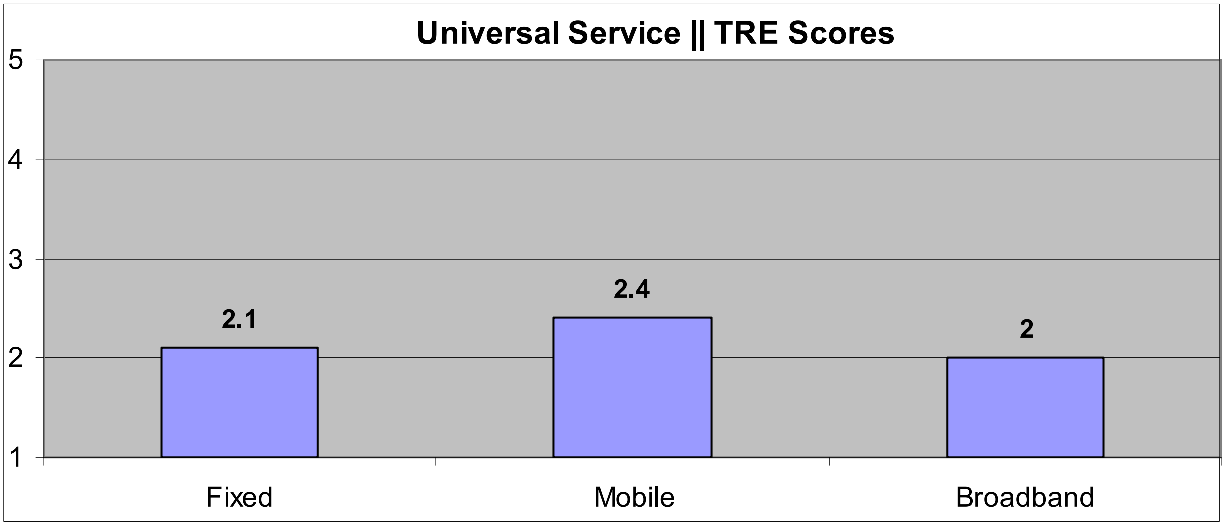
Source: TRE Survey 2008

In this category mobile sector received the highest score, followed by fixed-phone and broadband. Historically fixed telephony sector was framed by the mostly non-competitive actions of the dominant BTTB. The regulator oftentimes looked the other way despite repeated objections by consumers and other PSTN operators. As mentioned in a previous section of this report, BTTB had denied (or was unable to provide) interconnection facilities to majority of the mobile subscribers for several years.

In the mobile sector, denial of call termination to BTTB's network from subscribers of mobile network was one of the major problematic issues. Even Grameenphone – the dominant mobile operator – discriminated against other mobile operators in regard to "mobile termination rates". Another issue was BTTB's utilization of Voice over IP technology to offer a reduced rate to several countries; while mobile operators were continually denied the same privilege on legal grounds. BTRC was rarely able to check these discriminatory and anti-competitive behaviors.

7. Universal Service Obligations

Figure 16: TRE scores for Universal Service Obligations

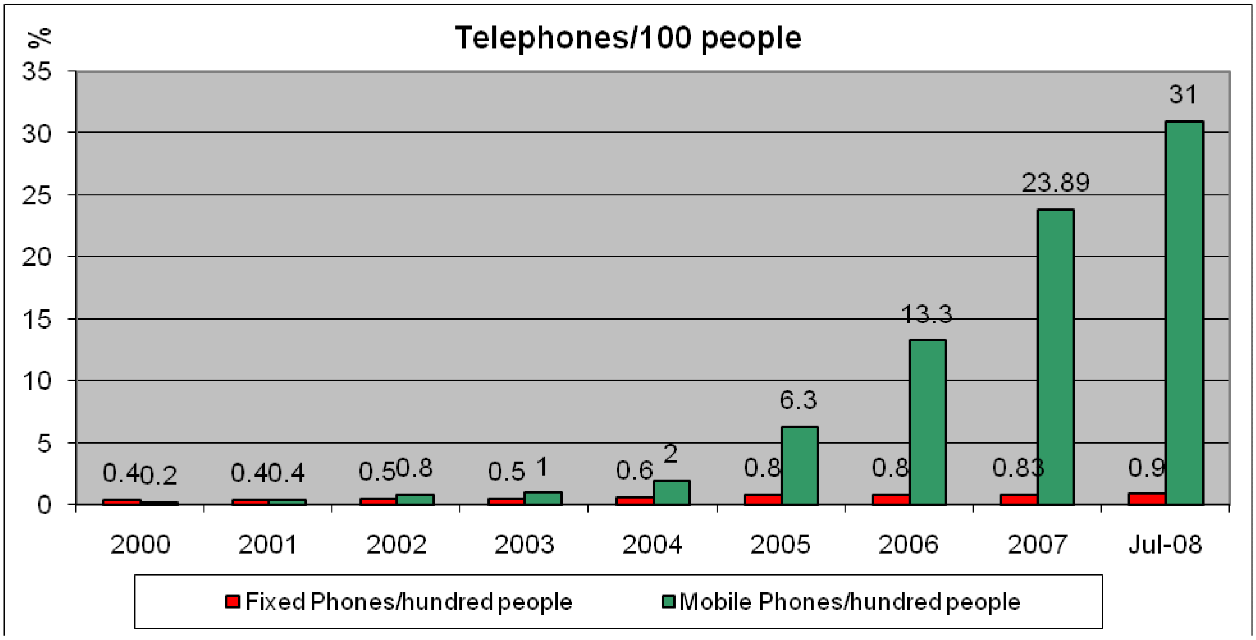


Source: TRE Survey 2008

USO dimension in the TRE survey garnered lowest scores for mobile and fixed and second lowest for broadband sector. One of the possible reason being the lack of understanding of the definition and purpose of USO among some of the respondents. Some respondents skipped answering the USO part altogether.

There has not been any formal Universal Service Fund (USF) operational in Bangladesh. Although there was a provision for developing a Universal Access Strategy under a World Bank funded technical assistance project. It was mentioned in the project document that producing credible and comprehensive strategy for improving access to telecommunications/internet services for rural and under-served urban areas is a priority of the government of Bangladesh (MOPT, 2005). It was also proposed that the appropriateness of creating a Telecommunications Development Fund for Bangladesh would also be assessed. One of the main objectives of the National Telecommunications Policy of 1998 was to provide access and delivery of a full range of modern telecommunications services to as many people as economically and socially justifiable (MOPT, 1998). Also, in the Telecom Act of 2001 there was a provision for the licensees to provide access to rural areas up to 10% of their installed capacities (37: 3 : b); but this USO was not very clearly defined. Currently the telecom regulator is exploring the idea of implementing a USF in near future and examining the various issues and global best practices related to USO/USF.

Figure 17: Telephones per hundred people in Bangladesh

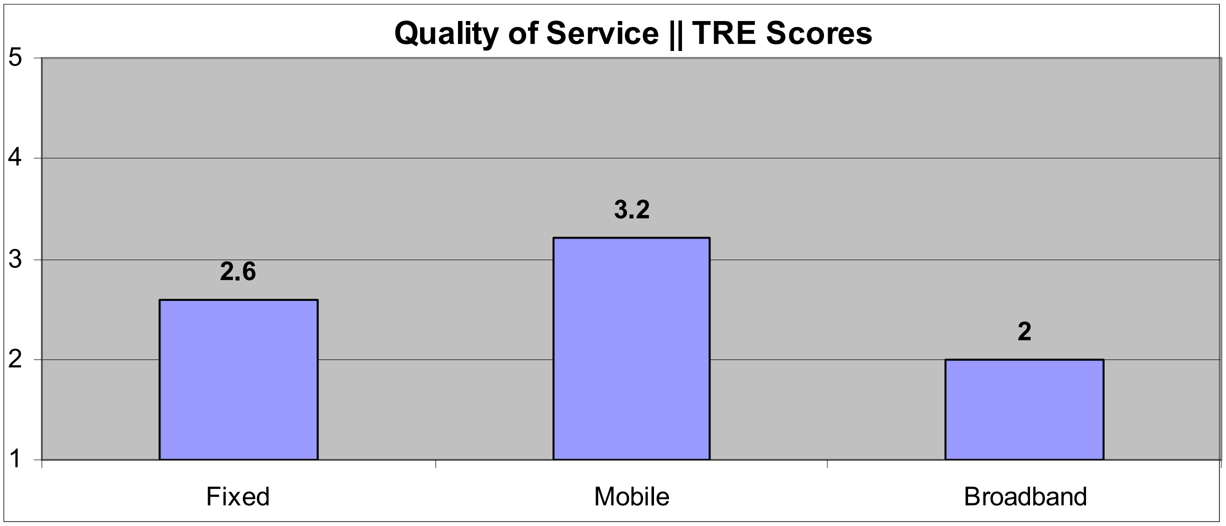


Source: author calculation from ITU & BTRC data.

Many people now think that as telecommunication services are already universally available in Bangladesh, specially mobile telephony services; there really is not any need for a Universal Service Fund.. Still, fixed-phone and internet services have very low penetration countrywide and particularly in the rural areas of Bangladesh. It is amply clear from figure#17 above, that despite the recent growth of mobile subscriptions, the overall telecommunication penetration still doesn't reach majority of the people. Broadband internet coverage should improve in future as the regulator put in place clear benchmarks mandating that the new broadband wireless licensees have to provide coverage to all the villages in Bangladesh within five years.

8. Quality of Service

Figure 18: TRE scores for Quality of Service



Source: TRE Survey 2008

Quality of Service (QOS) is one area that has been neglected until recently by both the regulator and telecom operators in Bangladesh. But beginning in 2008, BTRC has begun emphasizing on improvement of the quality of service. They have recently issued a circular outlining the various parameters to ensure QOS by the operators. Intense competition in the marketplace has also forced the mobile operators to focus more on their service quality in order to retain their subscribers and attract new subscribers. Lack of spectrums have made it difficult for mobile operators to keep a acceptable level of QOS, as they have to provide services to ever increasing huge numbers of subscribers without receiving the adequate amount of frequency. Still, the recent focus on quality by operators possibly enabled the sector to achieve a very reasonable score. In the fixed sector, BTTB has been notorious for the non-existent quality of their services. Again, a few of the new private PSTN operators are trying to maintain a reasonable level of QOS for their offerings. But as majority fixed lines are from BTTB, the low score for the sector probably reflects the incumbent's service quality.

The broadband sector is rife with QOS issues, or rather the lack of it. Many of the so-called broadband services are nothing but juiced-up connections. Even the established ISPs who provide broadband services are prone to periodic quality degradation. The frequent disruptions in the national fibre optic backbone due to cutting of cables (which connect to the country's only submarine cable network) don't help the situation. All Internet and Data communication providers are now required to connect via the submarine cable network. Some of them have discarded their V-SATs terminals altogether now rely solely on the undersea fibre optic link. But when that vital link is cut, the ISPs suffer a severe loss in service quality. A UNDP commissioned report found that there was no regulation on QOS for internet service or for VOIP based international long distance service (UNDP, 2006). The situation would hopefully improve as the government has decided to commission a second undersea cable network which would act as back up to the existing main cable network.

9. Conclusions and Recommendations

As the results of this perception survey indicates, scores for the regulatory environment in Bangladesh was average or below average for most categories. Only market entry and interconnection received favorable scores in at least two sectors. Broadband sector in general scored quite low and universal service plus access to resources dimensions scored below average across the board.

A previous report (De Silva et al, 2004) examining the relation between regulation and investments, looked at the regulatory environment in Bangladesh. Although it was not a perception study, assessment by the authors derived that both the fixed and mobile sectors have either 'poor' or 'unsatisfactory' regulatory environment across the board.

In the present TRE survey, both the fixed and mobile sectors have improved their scores; specially mobile sector obtained relatively good scores in few dimensions. Broadband sector received low scores overall, but this sector is very nascent in Bangladesh's context, and just getting off the ground.

From its inception, BTRC has been laden with political appointees by the government; specially the past two chairmen who were appointed from the bureaucracy. They failed to provide the requisite leadership and proper guidance to steer the telecom sector towards growth and development. No major significant policy actions emerged from the regulator for the first five years from its inception. The apparent growth of the telecom sector happened because of the huge size of the market and the unprecedented demand for telecom services in the country. After the current government appointed a new chairman and three new commissioners, BTRC has become more responsive to the market dynamics and taking a more methodical approach. The new BTRC administration has taken quite a few actions issuing licenses for myriad services/technologies etc. But in a complex market like Bangladesh it would be prudent to take a stock of how all these actions affecting the telecom sector and follow a steady reform agenda. In light of the general perception regarding the regulation of telecommunications sector in Bangladesh as stipulated in the current paper, the following suggested actions possibly could improve the telecom regulatory environment and overall development of telecom market in Bangladesh:

- Spectrum farming is being implemented by BTRC. They should also consider spectrum trading between operators. Thus an operator who has unutilized spectrum in its hands can sell spectrum to another operator after obtaining prior approval from the regulator. BTRC should immediately initiate the process for a "Strategic Spectrum Review and Audit" in order to ascertain a full overview of the available spectrum and current usage patterns.

- The authorities should rethink the taxes and levies imposed on the telecommunication sector. Reduction of taxes, specially on handsets & SIMs, can bring down the cost of ownership for telecom services and increase the subscriber base more rapidly than the present rate of growth. This would in turn increase the revenue earnings for the government.

- The National Broadband Policy should be implemented without delay. Bandwidth price needs to come down exponentially and the service quality needs to be substantially increased if the country wants to reap the benefit of global information society.

- BTRC needs to become fully independent from the Ministry of Post & Telecommunication if it wants to effect meaningful and pro-people legislations. It also needs to attain financial autonomy, enhance the technical monitoring capability and invest in capacity development of its staff.

- BTRC should maintain its present practice of transparency in licensing and aim for more clear directions during rule-making procedures.

- The government should plan to formulate anti-monopoly regulations for the utility sector including telecommunications, to help create a competitive marketplace.

- BTRC should issue a comprehensive QOS regulation stipulating minimum benchmarks to be achieved by the operators.

- BTRC should undertake a review to ascertain if the myriad policies and legislations have been able to achieve their stated goals/objectives, and whether the existing framework needs to be harmonized. It would also be good idea if they consider to uptake a self-evaluation exercise of their own performances and actions.

10. Methodology

The TRE survey is a measure of perception that is affected by a number of different factors. The original TRE instrument was developed by LirneAsia to assess regulatory effects on investment (Samarajiva & Dokeniya, 2005). It asked respondents to assess the telecom regulatory environment on a five-point scale across multiple dimensions. The present survey incorporates seven dimensions: Market Entry, Access to Scarce Resources, Interconnection, Tariff Regulation, Regulation of Anti-competitive Practices, Universal Service Obligation, and Quality of Service. Any regulatory or policy action in these dimensions and the periodic complex interactions between the fixed, mobile and broadband sectors affect the overall perceptual matrix of the TRE.

Via short questionnaires, informed stakeholders were asked to rate the quality of the regulatory environment for each dimension on a Likert scale ranging from 1 (highly ineffective) to 5 (highly effective). The TRE can be used as a diagnostic tool for assessing the performance of the laws affecting the telecom sector of a particular country; and of the various implementing agencies of the laws/policies. The TRE can also be used by telecom sector investors to assess regulatory risk of a country. The TRE can provide a comparative ranking between several countries in terms of telecom-specific regulatory risk (Samarajiva et al, 2007). Full description of the methodology is can be found in Samarajiva et al, 2007 and is available at http://www.lirneasia.net/wp-content/uploads/2008/05/lirneasia-tre-paper-for-tprc-v8.pdf

The following tables demarcate the composition of respondents and response mode of the 2008 Bangladesh TRE survey. In total 78 questionnaires were sent to prospective respondents, including 44 in the first category, 17 in second and 17 in third category. Overall response rate was 34.7%.

Table 1: Respondent Profile of TRE Survey 2008 in Bangladesh

Description	Number of Responses	Response rate
Industry Operators, Equipment Suppliers, Industry Associations etc.	13	16. 7%
Financial Institutions, Telecom Analysts/Lawyers.	4	5.1%
Former member of Regulatory and govt. agencies, Donors, Civil Society, Journalists, Academics etc.	10	12.9%
Total	**27**	**34.7%**

Table 2: Mode of Response of TRE Survey 2008 in Bangladesh

Mode of Response	Number	Percentage (of total responses)
Online	13	48%
Email	5	19%
Face to face meeting	9	33%
Total	**27**	**100%**

None of the three categories reached the desired response level of fifteen in Bangladesh. Responses for category two in particular was very low. One of the main reasons being, in Bangladesh there are very few persons in the legal firms and financial institutions who deal with the telecom sector. And there are even fewer telecom analysts/researchers in the country. Other probable reasons for the reluctance of respondents in general were the ongoing anti-corruption drive (including a special taskforce on BTTB) and the state of emergency in the country.

11. Acknowledgements

I wish to thank Mr. M.A. Mobarak (former Joint Secretary, MOPT) who has given valuable inputs and provided guidance towards the successful implementation of the TRE survey in Bangladesh. My sincere gratitude goes to all who have responded to the survey questionnaire and also to those who helped by providing indicators data.

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12. Annex 1: Summary of Regulatory Events for Bangladesh

Significant Regulatory Events in Bangladesh: 2007-08

Date	Subject
2007	
April 29	**BTRC is told not to take satellite TV channel ETV off the air** Bangladesh High Court orders BTRC not to take Ekushey Television off the air until an appeal against the suspension of frequency allocation has been heard by the court.
May 10	**Warid Telecom launches telecommunication services in Bangladesh** Bangladesh's sixth GSM mobile phone operator Warid Telecom commences commercial operation.
May 16	**BTRC conducts raid on Citycell headquarter** The telecom regulator carries out a raid on headquarters of the only CDMA based mobile operator Citycell for its alleged involvement in illegal VoIP activities.
June 21	**Chairman and Commissioners appointed to the Bangladesh Telecommunication Regulatory Commission (BTRC)** BTRC gets two new commissioners for the technical divisions. Earlier in 19th April 2007, a retired general from Army Signals Corps was appointed as the Chairman of the commission.
July 26	**BTRC imposes tariff ceilings for mobile phone calls** Via an interim directive [BTRC/SS/Tariff/2002-600], Bangladesh Telecommunication Regulatory Commission imposed tariff ceilings for all types of mobile phone calls. The upper ceiling has been set to Taka 2 and the lower ceiling to Taka 0.25 per minute. Restrictions have also been imposed on any promotional packages offered by the operators.
July 31	**BTRC cancels two fixed-phone licenses and penalizes another two firms** Bangladesh Telecommunication Regulatory Commission cancelled licenses of Bashundhara Telecom and Dominix technologies for their failure to start operations on time. It also fined Jalalabad Telecom and Bangla Phone each Taka 2 crore for poor customer intake.
August 20	**International Long Distance Telecommunication Service (ILDTS) Policy 2007 announced** Bangladesh government approved the ILDTS policy with the objectives, inter alia, to provide low cost international telecom services using modern technologies like VoIP, to encourage Next Generation Network Technology, and to encourage local entrepreneurs in the telecom

	sector.
August 21	**BTRC amends Licensing Procedure Regulations** BTRC made amendments to the licensing procedure of International Gateway Services (IGW), Interconnection Exchange Services (ICX), Internet Exchange Services (IX), IP Telephony Services, 3G Services, WiMAX Services, Call Center Services and Telecom Value Added Services (VAS).
September 06	**Bangladesh's first 24 hour news channel taken off the air** BTRC switched off the transmission of CSB News, a satellite TV channel for its alleged forgery in obtaining allocation of required frequency.
September 09	**Three land phone companies receive licenses to operate in Dhaka** Dhaka Phone, RanksTel and Square Informatix received licenses from BTRC enabling them to offer telecommunication services in the lucrative 'central zone' which includes the capital city.
October 1	**Interconnectivity charges slashed by Bangladesh Telecommunication Regulatory Commission** BTRC reduced the interconnectivity fee between the mobile phone and PSTN operators effective from October 1, 2007. According to a BTRC press release, the new inter-connectivity call charge will be Taka 0.40 per minute, down from Taka 0.66.
October 07	**Bangladesh Telecommunication Regulatory Commission penalizes Grameenphone** BTRC imposed fines totaling Taka 168.4 crore on Grameenphone for its alleged involvement in illegal call termination activities.
October 07	**BTRC invites bids for international telecoms gateways** Bangladesh Telecommunication Regulatory Commission invited bids from private sector companies to operate international telecoms services through announcements# BTRC/LL/ICX(248)/2007-3448 and BTRC/LL/IGW(247)/2007-3447. Two licenses for interconnection exchanges (ICX) and three licenses for international gateway (IGW) facilities would be issued by the telecoms regulator.
October 16	**BTRC invites bids for international internet gateways** Bangladesh Telecommunication Regulatory Commission invited bids from private sector companies to operate international internet gateway services through an announcement [BTRC/LL/IIG(249)/2007-3452]. A licensing guideline was also issued.
October 30	**Regulatory Reforms Commission constituted** A 17-member Regulatory Reforms Commission (RRC) was formed by the government to

	overhaul outdated administrative rules and regulations in the country. The commission would focus specifically on removing bottlenecks to foster economic development, investment, commerce and trade.
November 29	**Grameenphone asked by BTRC to submit IPO roadmap** Bangladesh Telecommunication Regulatory Commission asked Grameenphone to submit a detailed proposal on its proposed initial public offer (IPO) after it was reported earlier by Bloomberg that Grameenphone is planning an IPO next year on the Dhaka stock exchange.
December 06	**Raid carried out on Grameenphone and AccessTel premises in suspicion of illegal VoIP link.** Corporate documents and files were confiscated from Grameenphone's head office for its alleged involvement in illegal VoIP business. In another raid, VoIP equipments were seized from AccessTel, a broadband service provider, which obtained E-1 connections from Grameenphone.
December 11	**BTRC extends Cell phone re-registration deadline** Following a request from mobile phone operators in Bangladesh, the telecoms regulator granted an extension to the order for re-registration of mobile users. Earlier in July 2007 BTRC ordered mobile operators to re-register about 10 million customers who bought mobile phone connections before February 28, 2006.
December 23	**High Court gives go-ahead to BTTB for optical fibre network backup deal** Bangladesh's apex court stayed a BTRC order and allowed a private company to sign a deal with Bangladesh Telegraph and Telephone Board for providing a backup to BTTB's optical fibre network.
2008	
January 14	**Citycell pays Taka 150 crore fines to BTRC** Bangladesh Telecommunication Regulatory Commission collects Taka 150 crore in fines from mobile phone operator Citycell for its involvement in illegal VoIP activities.
January 22	**Government of Bangladesh approves alternative optical fibre link** The government approves a proposal to use the Public Grid Company of Bangladesh's optical fibre cable as an alternative line connecting Dhaka with the landing station of the submarine cable in Cox'sBazar.
January 30	**BTRC threatens Grameenphone with license cancellation** Bangladesh Telecommunication Regulatory Commission asked Grameenphone to explain why its license would not be revoked for breaching licensing agreement and rules. Previously

	the telecoms regulator filed a case against senior executives of Grameenphone including two preceding chief executives for alleged involvement in illegal VoIP business.
February 01	**Internet bandwidth charges reduced** State run BTTB reduced internet bandwidth charges after obtaining approval from BTRC.
February 10	**Bangladesh Telecommunication Regulatory Commission amends its Interconnection Regulations** BTRC amended the Interconnection Regulations to provide for compulsory interconnection among International Gateways (IGWs), Interconnection Exchanges (ICXs) and Access Networks and among Internet Exchanges (IXs) and Internet Service Providers' Networks (ISPNs).
February 19	**Three companies win licenses to operate international telecom gateways** Via a competitive auction, BanglaTrac Communications, Novotel Limited and Mir Telecom won bids to set up three International Gateways, ending the current monopoly in international telephony services.
February 25	**Licenses awarded to private sector companies to operate international internet services** BTRC awarded the sole International Internet Gateway (IIG) license to Mango Teleservices. Earlier in 20th February, Internet Connection Exchanges (ICX) licenses were awarded to M&H Telecom and Getco Telecommunications to establish and operate international internet gateway services.
March 02	**BTTB to be converted into a public company; separate company for submarine cable maintenance** Bangladesh government approved a draft ordinance that would convert the state-owned telecom operator BTTB into a public limited company, named Bangladesh Telecom Company Limited. It also approved a proposal to setup a separate company to maintain the existing submarine cable.
March 10	**Licenses of three companies canceled by BTRC** BTRC cancels two ISP and one PHS licenses for not adhering to licensing provisions.
March 19	**BTRC organises public hearing on call centres, Licensing Guidelines published** A public hearing on call-centre business organised by the Bangladesh Telecommunication Regulatory Commission. A guideline for "Call Centre Licensing" has been published soon after the consultation.
March 25	**Bangladesh Telegraph and Telephone Board receives licenses for various telecom services** BTRC provided BTTB licenses to operate five different services i.e. International GateWay

	(IGW), Inter Connection Exchange (ICX), International Internet Gateway (IIG), Nation Wide Internet Service Provider (NWISP) and Domestic Data Communication Service Provider (DDCSP).
March 25	**BTRC proposes raising fines by amending clause 65 of the Telecommunication Act 2001** Bangladesh Telecommunication Regulatory Commission proposed to increase the fine from existing maximum Taka 5 lakh to Taka 500 crore in case of any irregularities by telecom service providers.
March 27	**Mobile phone network to be introduced in CHT areas** Bangladesh government decides to allow commercial mobile phone operation in Chittagong hill tracts thus enabling all 64 districts of the country to come under cellular network coverage.
March 29	**Applications for second undersea cable invited by BTRC** BTRC issued a RFP to install and maintain a submarine cable system. This submarine cable is envisioned to bring uninterrupted overseas voice/data communications and to provide back up for the existing undersea cable of the country.

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Telecom Regulatory & Policy Environment in Pakistan:
Results of the 2008 TRE Survey

Joseph Wilson, PhD

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***Abstract:** The TRE survey measures informed stakeholders' perceptions about the regulatory and policy environment with regard to the telecom sector in a given country. The current (2008) TRE survey is the second in a series. The first survey was conducted in July 2006 by LIRNEasia in five emerging Asian countries, India, Sri Lanka, Pakistan, Thailand, and the Philippines using six dimensions: i) market entry; ii) access to scarce resources; iii) interconnection; iv) tariff regulation; v) anti-competitive practices; and vi) universal services, for the fixed and mobile sectors. In the 2008 survey, a seventh dimension dealing with the "quality of service" was added, and the survey was conducted for the broadband sector in addition to fixed and mobile sectors, in 8 countries: Bangladesh, India, Indonesia, Sri Lanka, Maldives, Pakistan, Thailand, and the Philippines.

The salient activities that happened in the last year are: (i) a rapid increase in the mobile SIMs/100 people and subscriber-base that is from 39.9% to 54.7% and from 63 million to 88 million respectively; (ii) implementation of mobile number portability in March 2007; (iii) change in the mobile numbering scheme from 7 digit to 8 digits; (iv) entry of China Mobile with the 100% acquisition of Paktel; (v) entry of other foreign companies through acquiring shares of the local companies; (vi) reduction in the activation fee for mobile connection from PKR 1000 to PKR 500; (vii) launching of WiMax services; (viii) Universal Service Fund (USF) became operative with the establishment of the USF Company and the grant of project for provision of telecommunication services in the rural areas; (ix) USF launched the project to lay optic fiber cable in the province of Sindh to be followed by other provinces; and (x) promulgation of a new competition law and establishment of Competition Commission of Pakistan. All this has led to a higher score of perception in 2008 as compared to the last survey that was conducted in 2006.

***Keywords:** TRE Survey, Pakistan

TELECOM REGULATORY & POLICY ENVIRONMENT IN PAKISTAN: RESULTS OF THE 2008 TRE SURVEY

JOSEPH WILSON, PHD

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List of Acronyms

ARPU: Average Revenue per User
CCP: Competition Commission of Pakistan
DSL: Digital Subscriber Line
FDI: Foreign Direct Investment
FTTH: Fiber to the Home
GDP: Gross Domestic Product
GNI: Gross National Income
GSM: Global System for Mobile Communication
GST: General Sales Tax
HFC: Hybrid Fibre Coaxial
HHI: Herfindahl-Hirschman Index
IMF: International Monetary Fund
IPTV: Internet Protocol Television
ISPAK: Internet Services Providers Association of Pakistan
ITU: International Telecommunication Union
MCP: Mobile Cellular Policy
MNP: Mobile Number Portability
MoIT: Ministry of Information and Technology
MOS: Mean Opinion Score
PTA: Pakistan Telecommunication Authority
PTCL: Pakistan Telecommunications Company Limited
QoS: Quality of Service
RIO: Reference Interconnection Offer
RITR: Reconciliation of International Telephony Traffic Regulations 2008
SMP: Significant Market Power
TH: Threshold
TRE: Telecom Regulatory Environment
USF: Universal Service Fund
USFCo: Universal Service Fund Company
WiMax: Worldwide Interoperability for Microwave Access

1. Executive Summary

Pakistan is the world's third fastest growing telecommunications market,[1] adding on an average two million cellular subscribers per month, following India which is the world's fastest growing mobile services market, adding on an average more than 8 million subscribers per month.[2] However, Pakistan as of June 2008 had a total of 58.9% access paths/ 100 people compared to 29.08 in India. [3] The South Asian region as whole offers a fertile ground for the growth of telecommunications.

The telecom infrastructure in Pakistan is improving dramatically with foreign and domestic investments in the fixed-line and mobile networks. The mobile subscriber base has skyrocketed, reaching 88 million in June 2008, up from only about 300,000 in 2000, 12.7 million in 2005 and 34.5million in 2006. Optical fibre systems are being constructed throughout the country to aid the growth of network. Today network coverage is available to almost 90% of the total population. Tariffs have been driven down to one of the lowest levels in the world. Driven by lowest tariffs, maximum coverage, and relatively better quality the Pakistan mobile market has maintained rapid growth. The mobile market is now working on sustaining the boom that hit Pakistan 2 years back and is now working on adding Value Added Services to increase customer satisfaction. The telecom sector as a whole grew by 80% during the year 2007 compared to the average growth rate of 100% in the pervious four years.[4]

The TRE survey measures informed stakeholders' perceptions about the regulatory and policy environment with regard to the telecom sector in a given country. The current (2008) TRE survey is the second in a series. The first survey was conducted in July 2006 by LIRNE*asia* in five emerging Asian countries, India, Sri Lanka, Pakistan, Thailand, and the Philippines using six dimensions: i) market entry; ii) access to scarce resources; iii) interconnection; iv) tariff regulation; v) anti-competitive practices; and vi) universal services, for the fixed and mobile sectors. In the 2008 survey, a seventh dimension dealing with the "quality of service" was added, and the survey was conducted for the broadband sector in addition to fixed and mobile sectors, in 8 countries: Bangladesh, India, Indonesia, Sri Lanka, Maldives, Pakistan, Thailand, and the Philippines.

[1] Omantel closes on Worldcall, 11/10/07 AME Info - Telco, Internet and IT;2007 WLNR 22221217
[2] Highest Mobile User Addition in July, 8/26/08 Statesman; 2008 WLNR 16057985
[3] Id.
[4] PTA, Industry Analysis Report 2007, available at: http://www.scribd.com/doc/3117277/PTA-Industry-Analysis-Report-2007.

The survey results for the year 2008 for Pakistan are as follows:

Table 1: Summary of TRE Scores (2008)				
Dimension	**Mobile**	**Fixed**	**Broadband**	**Average for Dimension**
Market Entry	3.9	3.0	3.2	3.3
Access to Resources	3.5	3.1	3.2	3.3
Interconnection	3.7	3.2	2.9	3.3
Tariff Regulation	3.2	2.7	2.6	2.8
Anti-competitive Practices	2.8	2.4	2.4	2.5
USO	3.2	2.8	2.0	2.7
QoS	3.2	2.7	2.7	2.9
Average for Sector	3.4	2.8	2.7	-

The salient activities that happened in the last year are: (i) a rapid increase in the mobile SIMs/100 people and subscriber-base that is from 39.9% to 54.7% and from 63 million to 88 million respectively; (ii) implementation of mobile number portability in March 2007; (iii) change in the mobile numbering scheme from 7 digit to 8 digits;[5] (iv) entry of China Mobile with the 100% acquisition of Paktel; (v) entry of other foreign companies through acquiring shares of the local companies; (vi) reduction in the activation fee for mobile connection from PKR 1000 to PKR 500; (vii) launching of WiMax services; (viii) Universal Service Fund (USF) became operative with the establishment of the USF Company and the grant of project for provision of telecommunication services in the rural areas; (ix) USF launched the project to lay optic fiber cable in the province of Sindh to be followed by other provinces; and (x) promulgation of a new competition law and establishment of Competition Commission of Pakistan. All this has led to a higher score of perception in 2008 as compared to the last survey that was conducted in 2006.

Table 2: Comparison of TRE Scores (2006 & 2008)				
	Mobile Sector		**Fixed Sector**	
	2005-06	**2007-08**	**2005-06**	**2007-08**
Market Entry	4.0	3.9	2.9	3.0
Access to Scarce Resources	3.6	3.5	3.1	3.1
Interconnection	2.8	3.7	2.6	3.2
Tariff Regulation	2.6	3.2	2.7	2.7
Regulation of Anti-Competitive Practices	2.3	2.8	2.3	2.4
USO	2.6	3.2	2.2	2.8
Total Score	17.9	20.4	15.8	17.2

The parameters that have done well compared to last survey are: interconnection, tariff regulation, regulation of anti-competitive practices and universal service obligation in the mobile sector; and market entry, interconnection, regulation of anti-competitive practices and universal service obligation in the fixed sector. The low score for market entry in the mobile sector may be attributed to the perception of some survey participants that the cost of a new/renewal of mobile license (US$ 291 million) is prohibitive, thus pose a serious barrier to entry. However,

[5] At present there is 11 digit scheme; previously there was a 4 digit code, now the code is 3 digit, and the phone number is of 8 digits.

what survey participants were not aware of was that the license fee, at least in the case of renewal by Mobilink GSM, was paid in installments over a period of three years.[6] Thus, lack of accurate information on the part of participants may have skewed the survey results.

In brief, the most active sector was mobile telephony where most of the above-mentioned activities were performed, followed by broadband. Fixed line sector remain somewhat static this year.

With competition now becoming mature in most areas of telecom sector, with the exception of local loop services, and given that lowest average score for dimensions is that of regulation of anticompetitive practices, competition provisions should be strictly enforced by both the Pakistan Telecommunications Authority and the Competition Commission of Pakistan within the scope of their respective mandates. In addition, the regulator needs to focus on improving the penetration and the quality of service for broadband services, in order to transform Pakistan into an "Information Economy" after having tapped and exploited the potential of voice telephony.

2. Methodology

The 2008 Telecom Regulatory Environment (TRE) survey asked informed stakeholders of Pakistan telecom sector to assess the regulatory and policy environment along 7 dimensions (market entry, access to scarce resources, tariff regulation, universal service obligations, regulation of anti-competitive practices and quality of service), on a Likert scale of 1 to 5 (1 being highly ineffective, 5 being highly effective, and 3 being d average). The respondents are selected from 3 categories:

- Category 1: Stakeholders directly affected by telecom sector regulation *e.g*. Operators, Industry associations, Equipment suppliers, Investors
- Category 2: Stakeholders who analyze the sector with broader interest *e.g*., Financial institutions, Telecom consultants, Law firms.
- Category 3: Stakeholders with an interest in improving the sector to help the public, *e.g*., Academics, Research organizations, Journalists, Telecom user groups, Civil society, Former members of regulatory and other government agencies, Donors.

The survey was conducted using the online survey tool and hard copies of survey forms. Of the 46 responses received, 24 respondents completed the survey online and 22 respondents completed the survey by filling out the printed (paper) questionnaire. In order to refresh the respondents' memory, a list of key regulatory event that took place during the period under consideration for the survey 2007-08 was sent along with the questionnaire. Over 100 informed stakeholders (potential respondents) were contacted, out of which 46 responded. 2 survey results were later discarded as they did not answer majority of the questions. The number of respondents for Category 1, 2 and 3 were 15, 15 and 14, respectively.

[6] PTA. TQR Dec. 07, page 2.

The TRE questionnaire and its evaluation are formulated by LIRNE*asia*.[7] All data and statistics relating to telecom used in this report are borrowed from the Pakistan Telecommunication Authority's website, Annual Reports, and Telecom Quarterly Reports, unless specified otherwise.

3. Development of the Regulatory and Policy Environment

The regulatory framework governing telecommunications in Pakistan has its origin in the Telegraphy Act of 1876, promulgated by the Crown in its colony - British India. Upon its independence in 1947 from the British rule, Pakistan inherited and adopted the British legal system, *mutatis mutandis*, including the Telegraphy Act of 1885.

a. The Telegraphy Act, 1885

The main objective of the Telegraphy Act of 1885 was to give power to the Government, and to any company or person licensed to provide telecommunication services under the Telegraphy Act of 1876, to place and maintain telegraph lines and posts under and over the property of any person whether private or public bodies.[8] Under section 7 of the Act, the Federal Government acted as the regulatory authority to control the conduct of all or any telegraphs established, maintained or worked by the government or any other person licensed under the Act.

b. The Wireless Telegraphy Act of 1933: The Origin of Mobile Telephony Regulation

In 1933, the Wireless Telegraphy Act was enacted with the objective to prohibit the possession of wireless apparatus without license, as distinct from the establishment, maintenance and working of such apparatus.[9]

c. Pakistan Telecommunication Corporation Act, 1991

As a first step towards deregulation, the government of Pakistan corporatized the Pakistan Telephone and Telegraph (PTT) department into a corporation, known as Pakistan Telecommunication Corporation (PTC). The Federal Government was the initial and sole shareholder of the PTC. All employees, assets, liabilities and functions of the PTT were transferred to the PTC.

d. Pakistan Telecommunications (Re-organization) Act, 1996

The restructuring of the telecommunication sector started with the enactment of the Pakistan Telecommunications (Re-organization) Act of 1996.[10] The 1996 Act provides for the

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[7] The methodology was developed by LIRNEasia.
[8] A. Mahmood, *The Telegraph Act*, (Lahore, Pakistan: Mansoor Book House) at 1.
[9] Gazette of India, 1933, Part V, p.8.; *See also* section 3 of the Wireless Telegraphy Act, XVII of 1933.
[10] Prior to the enactment of the PTA Act, there were a series of ordinances dealing with the almost the same matter. Telecommunications Ordinance, 1995 (XXIII of 1995); Telecommunications Ordinance, 1995 (CIII of 1995); Pakistan Telecommunications (Re-organization) Ordinance, 1995 (CXVIII of 1995); Pakistan Telecommunications (Re-organization) Ordinance, 1996 (XXX of 1996).

establishment of: 1. Pakistan Telecommunication Authority; (2) Pakistan Telecommunication Company Ltd. (PTCL); (3) National Telecommunication Corporation (NTC); and (4) Frequency Allocation Board (FAB).

The Pakistan Telecommunication Authority ("PTA' or the "Authority") is composed of three members appointed by the Federal Government for a term of four years. One of the members is nominated as the Chairman of the Authority, and is entrusted with the administrative powers. The functions of the Authority, among others, are to promote the availability of wide range of high quality, efficient, cost effective and competitive telecommunication services throughout Pakistan.[11] The Authority is also responsible for safeguarding the interest of consumers, and for encouraging fair competition in the telecommunications sector.

The Act paved the way for the privatization of the PTC by converting it from a corporation to a public limited company. It gave exclusive fixed line telephony rights to PTCL for seven years, which came to an end in 2003. NTC was formed to provide telephony services to government departments and employees. The Frequency Allocation Board is composed of six members with representation from all relevant ministries. FAB allocates and assigns portions of radio frequency spectrum to telecommunication services operators and systems vendors, radio and television broadcasting operations, public and wireless operators and others. Since April 2007, FAB is under the administrative control of the PTA.

e. Information Technology Policy, 2000

In 2000, the Government of Pakistan formed its first Information Technology (IT) Policy. The stated vision is "to harness the potential of information technology as a key contributor to development of Pakistan." The mission is to rapidly develop the infrastructure while at the same develop excellently trained human resource capacity.

f. Telecom Deregulation Policy, 2003

The exclusive rights to provide fixed telecommunications services of PTCL came to end in 2003, which necessitated opening up of competition in the fixed telephony. The Telecom Deregulation Policy paved the way for bringing competition in the fixed telephony.[12] It seeks to improve the acees paths/ 100 people by promoting competition in the provision of telecom services and by ensuring that rural areas get connected (universal service). It also laid out details on license fees, performance obligations, interconnection, and co-location provisions.

g. Mobile Cellular Policy, 2004

In 2004, Mobile Cellular Policy (MCP) was formulated with the objectives to:

1. promote efficient use of radio spectrum;
2. <u>increase choices for customers of cellular mobile services at competitive and affordable price;</u>
3. encourage private investment in the cellular mobile sector;
4. recognize the rights and obligations of mobile cellular operators;

[11] Section 4 of the Pakistan Telecommunication (Re-organization) Act, 1996.
[12] http://www.pakboi.gov.pk/Presentations/IT/De-Reg%20Policy%20-%20BOI%20(23%20Aug%2003)_files/frame.htm

5. encourage fair competition amongst mobile and fixed line operators; and
6. establish an effective and well defined regulatory regime that is consistent with international best practices.[13]

Section 6.8 of the MCP required the implementation of Mobile Number Portability (MNP) by 2006. The MNP was launched in March 2007, and as of December 2007, 118,000 subscribers have been successfully ported among cellular operators.[14]

h. Broadband Policy, 2004

In 2004, the government also formulated the Broadband Policy with the objectives to:

1 Spread an affordable, 'always on,' broadband high speed internet service in the corporate/commercial and residential sectors across Pakistan.
2 Encourage the entry and growth of new service providers while stimulating the growth of the existing ones at the same time.
3 Encourage private sector investment in local content generation and broadband service provision.

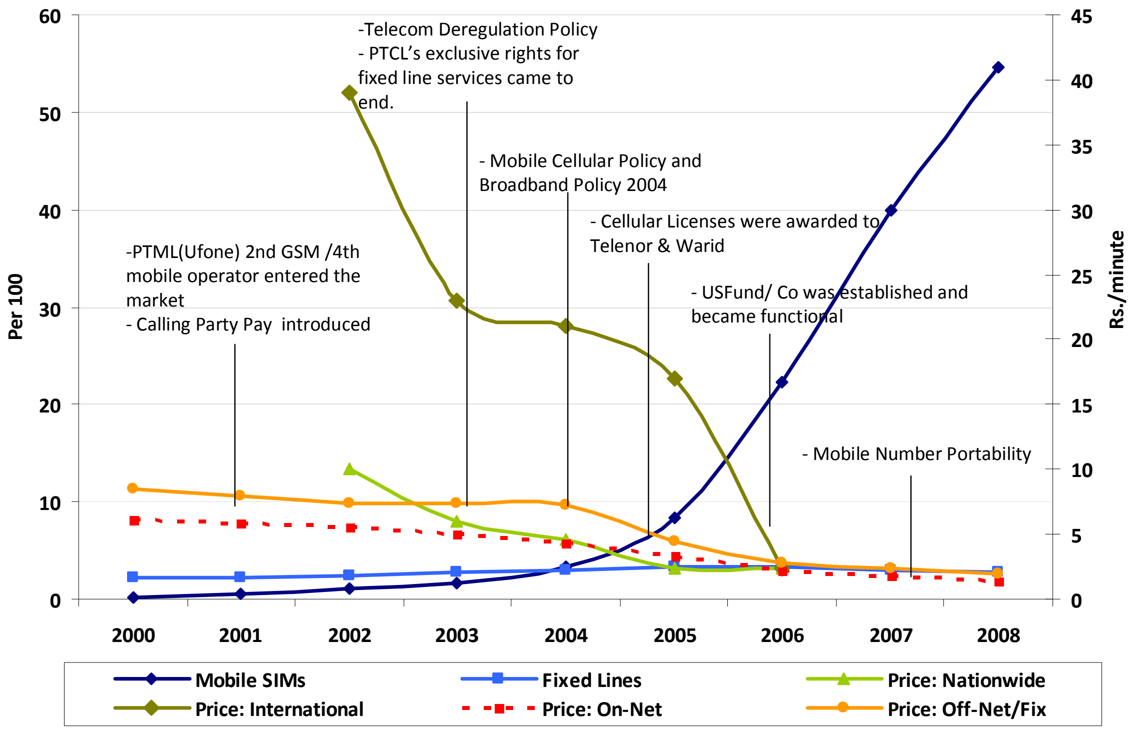
The policy proposes the following strategy for the achievement of the above objectives:

a. Removing the existing technical, commercial, operational and legal barriers to the growth of broadband in Pakistan.
b. Increasing the choice of broadband technologies (DSL, Cable & FTTx, Wireless, Satellite) available to the consumer at affordable prices.
c. Encourage the development and hosting of local content so as to reduce reliance on the expensive international bandwidth.
d. Promoting the sale of terminal equipment (PCs, CPEs).
e. Obligating a pro-active and facilitating role by the largest infrastructure provider PTCL for the growth of Broadband in Pakistan.[15]

The key regulatory events and a consequent reduction in fixed line tariff from the year 2000 are depicted in the chart below.

[13] Para 2, Mobile Cellular Policy 2004, available at http://www.pta.gov.pk/media/MCP.pdf
[14] PTA., Telecom Quarterly Review, December 2007 at p. 5 available at http://www.pta.gov.pk/index.php?option=com_mediacenter&catid=94&Itemid=225
[15] http://www.pta.gov.pk/media/bbp.pdf

Figure 1: Growth of Subscriber-base, Key Market/Regulatory Event, and Reduction in Tariff



From 2000 onward the PTA started rebalancing PTCL's tariff. Prior to the privatization of the PTCL, it has an uneven tariff structure. It had higher tariffs for International Direct Dialing (IDD) and Nation Wide Dialing (NWD), which could not be justified by the cost. The excess charges were used to cross subsidize the low tariffs of local calls. With the impending opening up, in early 2004, of the fixed-line telephony to competition, the PTA rebalanced the tariffs for IDD and NWD, as it was feared that the new entrants would focus on more profitable segments (i.e., IDD and NWD) and will not invest in local loop services. In that case, PTCL would be burdened with the provision of local services at a loss. Thus in the year, 2001-02, the installation charges for fixed line were reduced from Rs 3690/- to Rs 1850/-, long distance call charges were reduced to 12 percent for international call, and 10.5 percent for NWD calls. The reduction in fixed line tariff was further linked to the adjustment in international settlement rates, and termination rates.

In the fixed market entry was promoted by awarding 12 long distance international (LDI) and 84 local loop licenses for all 14 regions of Pakistan during the year 2003-04. In the same year, frequency spectrum for WLL services was auctioned to 23 companies, and around 108 WLL licenses were issued. However, as of June 2008, only five companies with WLL license are operative.[16]

[16] See Figure 9 below.

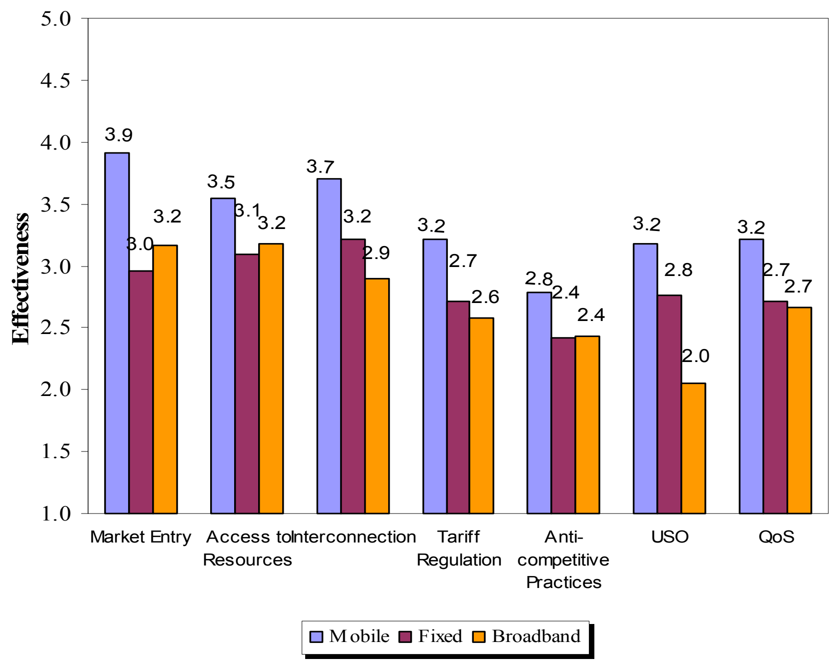
In the mobile cellular sector, a significant change took place in May 2001 when the tariff mechanism changed from Mobile Party Pays to Calling Party Pays. This was followed by award to licenses to Telenor and Warid in 2005. Mobile cellular subscriber-base grew rapidly since the entry of Telenor in March 2005 and Warid Telecom in May 2005. In a short span of three years, the mobile SIMs/ 100 people increased seven times from 7.9% in June 2005 to 54.7% as of June 2008. Telenor's subscriber-base rose to 18.12 million to become the second cellular operator following Mobilink GSM, and overtaking Ufone. Warid's subscriber-base also grew beyond 15 million. This is a remarkable growth. The competition offered by the new entrants brought the tariffs down, making it more affordable for the people to subscribe to mobile telephony.

However, the cellular subscriber's rate of growth declined in the year 2007-08 as compared to the last years. In 2007-08 subscriber-base grew by about 40%, as against 82% in 2006 -07 and more than 100% during 2005-06. Main reason for this slow growth could be the rising inflation and higher taxes by the government, which affects the affordability of the general public. Saturation of the urban markets and the blocking of approximately 7 million unauthorized SIMs by PTA, by June 2008, could be other reasons for the slow growth.[17]

4. Telecom Regulatory Environment Survey Results

The TRE survey results of individual parameters for each of the three categories are shown in the graph below.

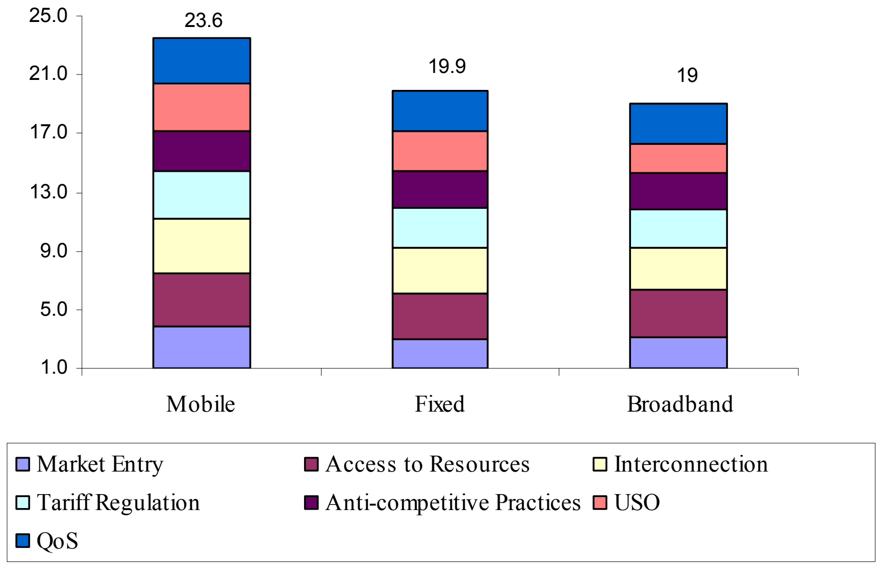
Figure 2: TRE Survey Results 2007-08



The total score achieved by each of the three sectors are show in figure below.

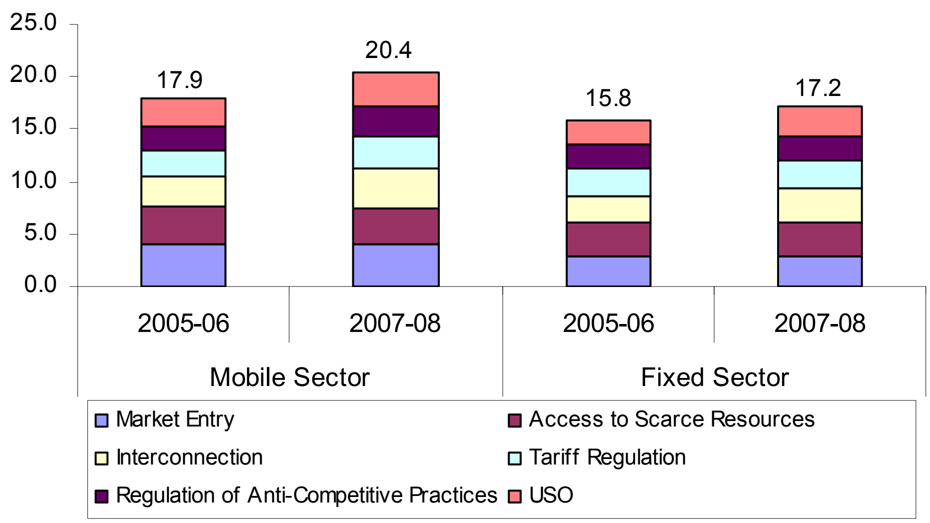
[17] PTA Annual Report 2007-08, at page 31 & 32.

Figure 3: Total TRE Score Chart – 2007-08



From Figure 3, it is evident that the mobile sector performed the best with a total score of 23.6, followed by fixed sector with a score of 19.9 and broadband with a score of 19.

Figure 4: Comparison of TRE Scores 2006 vs. 2008 (along six dimensions)



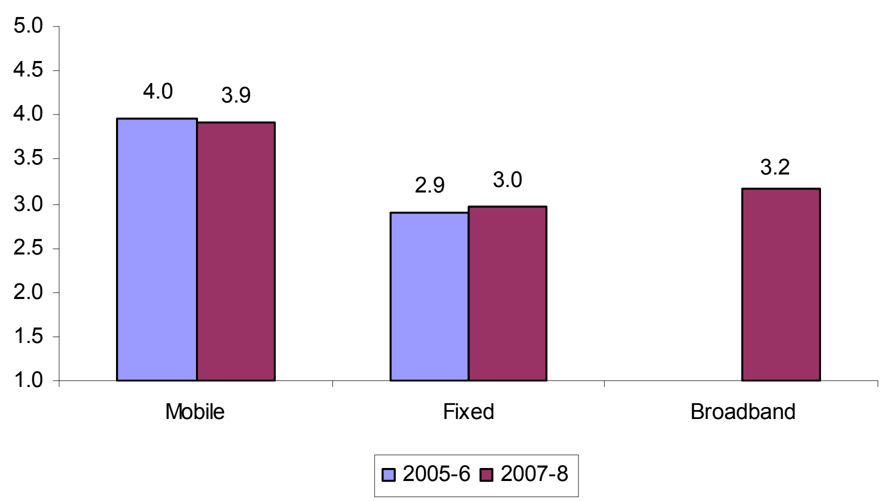
From Figure 4 we see that, in the eyes of the stakeholders, the regulatory environments in both mobile and fixed sectors have become more effective since the previous survey in 2006.

Table 3: Comparison of TRE Scores (2006 & 2008)				
	Mobile Sector		**Fixed Sector**	
	2005-06	**2007-08**	**2005-06**	**2007-08**
Market Entry	4.0	3.9	2.9	3.0
Access to Scarce Resources	3.6	3.5	3.1	3.1
Interconnection	2.8	3.7	2.6	3.2
Tariff Regulation	2.6	3.2	2.7	2.7
Regulation of Anti-Competitive Practices	2.3	2.8	2.3	2.4
USO	2.6	3.2	2.2	2.8
Total Score	17.9	20.4	15.8	17.2

Both mobile and fixed sectors scored in the year 2007-8 compared to the score they gained in the six parameters that were survey in 2005-6. Here below are charts which compare individual parameters measured in the mobile and fixed sectors.

i. Market Entry

Figure 5: TRE Survey Results for Market Entry (2006 & 2008)



Lack of entry barriers is the hallmark of a competitive market. The Mobile Cellular, the Telecom De-regulation, and the Broadband Polices encourage private investment in the mobile, fixed and broad band sectors respectively. The unbundled licensing regime has encouraged investors to come in, and offer services in the area of their choice.

In line with other emerging markets, mergers and acquisitions (M&A) have been taking place in Pakistan which also attracted foreign direct investment (FDI) and made Pakistan one of fastest growing telecom market. There are no restrictions on foreign investment regarding movement of capital or remittance of profits and dividends.

During 2007 about US$1.5 billion worth of acquisitions were made in the telecom sector.[18] In May 2007, China Mobile Ltd., a subsidiary of state-owned China Mobile Communications Corporation (CMCC), acquired 100% of Paktel for US$460 million and renamed it CMPak Ltd. CMCC plans to invest US$ 400 million in Pakistan to expand the CMPak networks.[19] Orascom from Egypt has purchased the remaining 11.31% shares in Mobilink GSM from the local partners for US$290 million, and now owns 100% of the firm. SingTel purchased 30% share of Warid Telecom for US$ 758 million. Oman Tel purchased 60% of World Call for US$ 193 million.

In August 2007, Mobilink GSM got its license renewed for another term of 15 years by paying a fee of US$ 291 million. The renewal fee was equivalent to the amount at which the last mobile license was auctioned, as required by the Mobile Cellular Policy 2004. However, given the large amount of renewal fee, Mobilink GSM was allowed to pay the license in fee in 6 installments over a period of three years.[20]

By the end of November 2007, Mobilink GSM, the dominant player, had invested $2 billion in Pakistan and in the coming years it is planning to further invest $500 million. Mobilink GSM has laid 6,000 km fiber optic lines in different cities of Pakistan and after lying additional 500 km fiber optic lines, Mobilink GSM's fibre optic network will be complete in Pakistan.[21] At present there are six mobile companies[22] operating in the country. During the financial year 2007-8, the FDI in telecom stood at US$ 1438.6 million.

Table 4: Foreign Direct Investment in Telecom Sector (in US$ millions)

Year	Total FDI	FDI in Telecom Sector	Telecom Sector's Contribution in Total FDI (%)
2001-02	484.7	6.1	1.26
2002-03	798	13.5	1.69
2003-04	979.9	207.1	21.13
2004-05	1524	494.4	32.44
2005-06	3521	1905.1	54.11
2006-07	5124.9	1824.3	35.6
2007-08	5152.8	1438.6	27.92

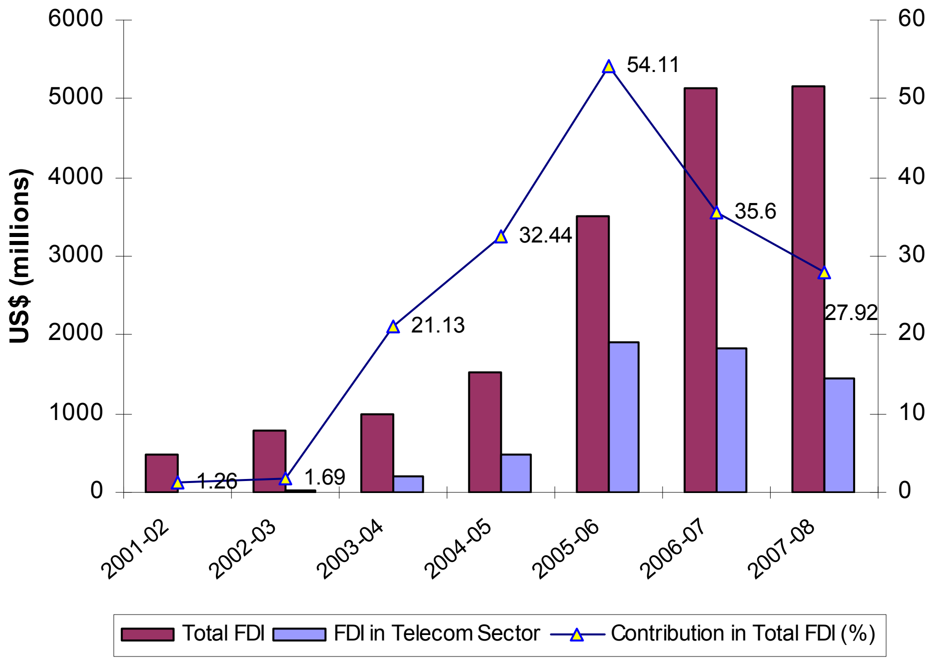
Table 5: Break Down of Foreign Direct Investment in Equity Purchase in Telecom Sector

	Foreign Companies who Invested in Pakistan	Local Companies where investments were made	Percentage of Shares purchased	Amount in US$ Million
1	Orascom, Egypt (in 2006-7)[23]	Mobilink GSM	11.31 %	290
2	Qtel, Qatar (in 2006-7) [24]	Buraq	75%	12.3

[18] Telecom sector fetches $4.87b, The Nation (Pakistan), February 12, 2008 Tuesday
[19] *China Mobile acquires Paktel for $460US million,* International Telecommunications Intelligence, May 17, 2007
[20] PTA. TQR Dec. 07, page 2. *See also*, Para 5.4 of Mobile Cellular Policy, 2004.
[21] *By Romail Kenneth* Mobilink to invest $500m more in Pakistan, (*Friday, November 16, 2007).*
[22] Instaphone, CMPak (ex:Paktel), Mobilink, Ufone, Telenor (March 2005), Warid (May 2005).
[23] http://www.otelecom.com/files/media_Files/1681204870_Pakistan%20Minority%20Acquistion.pdf
[24] http://robhom.genios.de/r_sppresse/daten/presse_nati/20070522/nati.1275626481.html

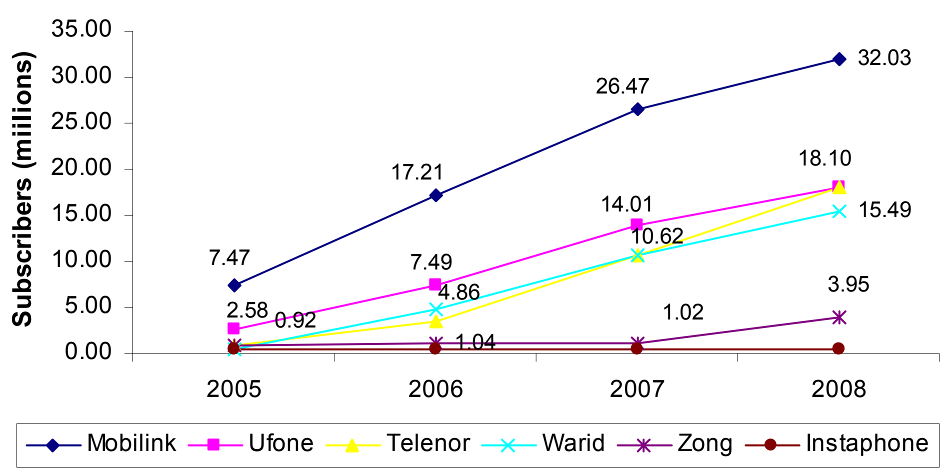
3	Singtel, Singapore[25]	Warid	30%	758
4	China Mobile, China	Paktel	100%	460
5.	Oman Tel, Oman	Worldcall	60%	200

Figure 6: Total FDI and its Share in the Telecom Sector



During 2005-06, the telecom sector received over $US 1.8 billion FDI and emerged as the only sector of the economy to attract such huge investment where its share in total FDI crossed 54%.[26] Once the companies enter in the market, the next step for them is increase their market share by increasing their subscriber base i.e., entry leading to penetration.

Figure 7: Growth in Individual Company subscriber-bases

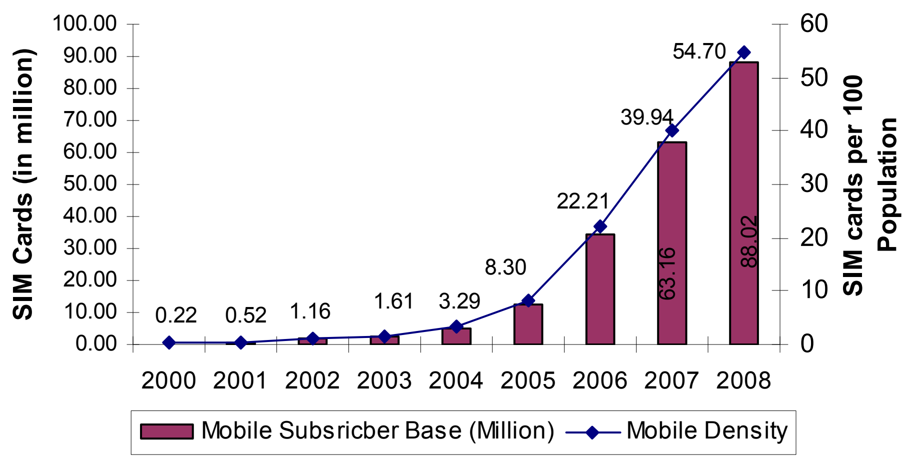


25 http://www.developingtelecoms.com/content/view/960/26/

26 The increase in FDI was primarily because of the purchase of PTCL's share by Etisilat.

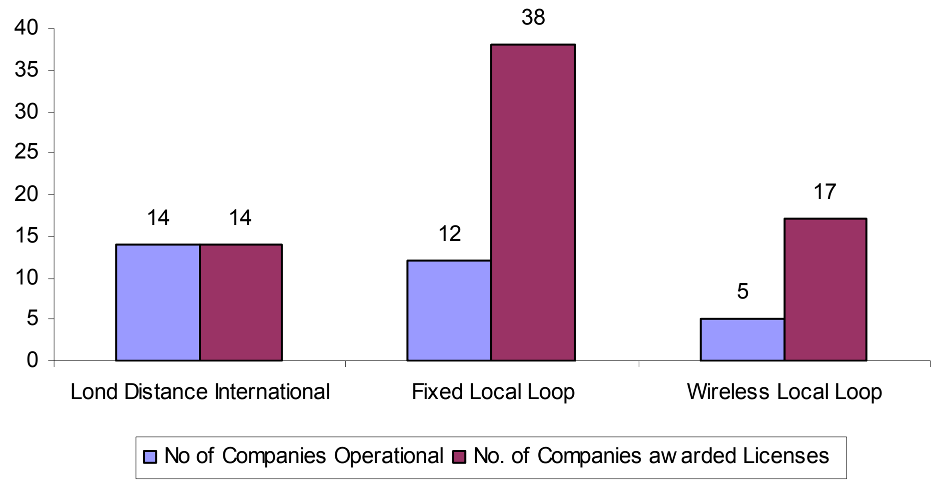
The mobile cellular subscriber-base grew rapidly since the entry of Telenor in March 2005 and Warid Telecom in May 2005. In a short span of three years, mobile SIMs/ 100 increased seven times from 7.9% in June 2005 to 54.7% as of June 2008. Telenor's subscriber base rose to 18.12 million to become the second cellular operator following Mobilink GSM, and overtaking Ufone. Warid also crossed the 15 million benchmark. This is a remarkable growth. The competition offered by the new entrants brought the tariffs down, making it more affordable for the people to subscribe to mobile telephony.

Figure 8: Mobile SIMs and SIM Penetration - 2008



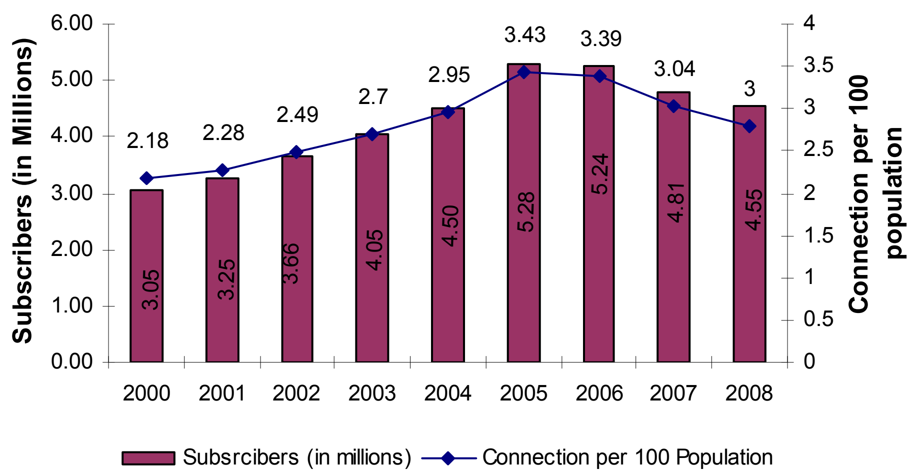
There was a considerable market entry in the fixed sector, which also include wireless local loop as well in the year 2004, right after when the sector was opened for competition.
The license for LDI services is nation-wide. For the FLL and WLL services, the territory of Pakistan was divided into 14 regions, and the licenses were issued on regional basis. Some companies got licenses for all 14 regions. As of now, 38 companies have been awarded licenses for FLL, 17 were awarded for WLL services and 14 were awarded LDI services. However, it may be noted that no new licenses were issued in the fixed sector during the period under survey.

Figure 9: No of Licensees and Companies Operating in Fixed Sector



Out of the 38 companies which were awarded FLL licenses only 10 companies are fully operational and 2 are partially operational. Such low number of companies becoming operational is attributed to "high cost of interconnection, transit exchanges and transmission media in addition to duties and taxes on import of communication equipment and obstacles in right of way and co-location."[27] In the WLL sector, operators are using 450 MHz, 479 MHz, 1900 MHz and 3.5 GHz bands. Operators using MHz, 1900 MHz and 3.5 GHz bands have launched their services. However, operators using 479 MHz have yet to launch their services due to lack of off shelf systems. LDI being a profitable segment, all the licensees are operational.

Figure 10: Fixed Line Subscriber-base and access paths/ 100 - 2008



[27] PTA, Annual Report 2007, at page 72.

Figure 11: WLL Subscriber-base and Access Paths/ 100 People - 2008

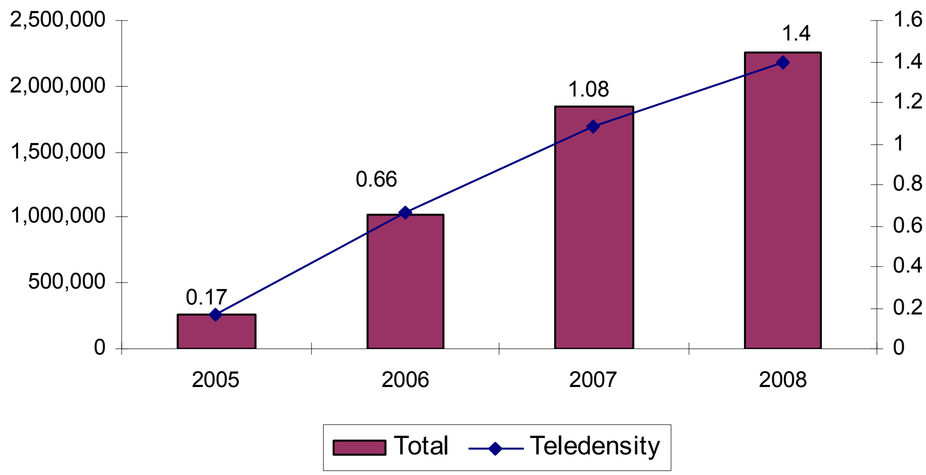
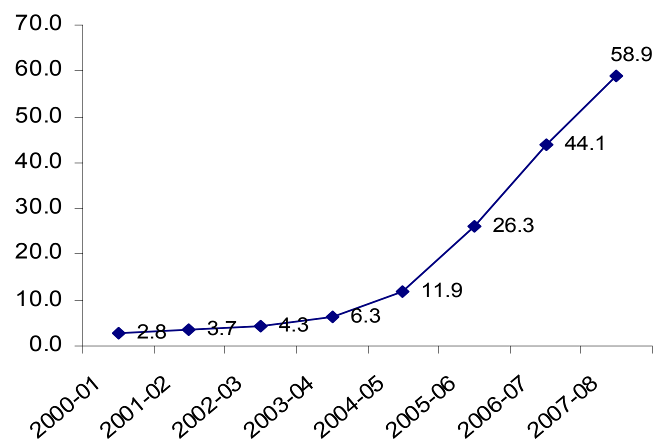


Figure 12: Total Access Paths/ 100 People (Fixed + WLL+ Mobile)



a. Broadband: Market players

Broadband in Pakistan is defined in as 'Always on internet connection with a minimum download speed of 128 kbps connectivity'.[28] The major players in providing broadband services are PTCL and National Telecommunication Company, Worldcall and Wateen. Other ISPs include Brain net, Micronet, Cybernet, Multinet, Dancom, HRI, Nexlinx, CubeXS, Nayatel, Supernet, Telecard and COMSATS, among others.[29]

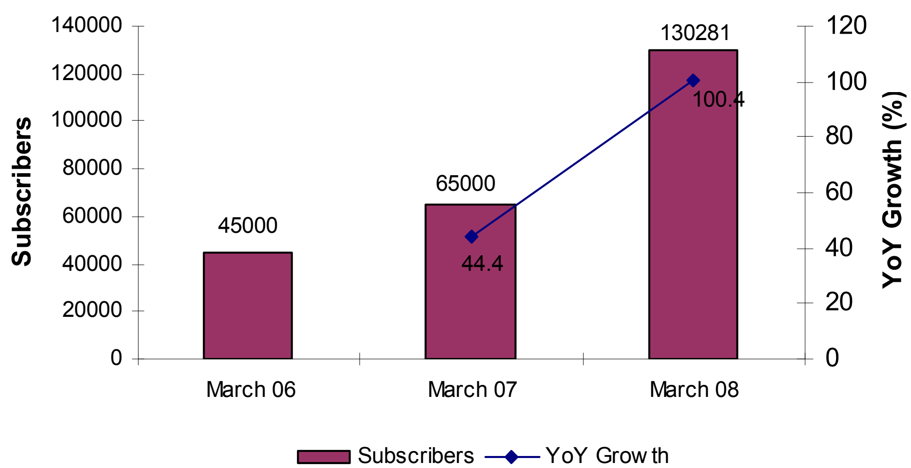
[28] Broadband Policy 2004

[29] *Current Scenario and Future Prospects: Is entire Pakistan underserved in Broadband Penetration?*, A Study by Ministry of IT, (December 2007) available at: http://www.ispak.com.pk/Downloads/MoITStudyonBroadbandPenetration.pdf

Table 6: Internet Facts[30]	
Internet users (estimated)	5 million
Broadband Internet users	150,000 (120,000 Digital Subscriber Line (DSL) and 30,000 Hybrid Fibre Coaxial (HFC))
Cost of 2 Mbps IP Backbone connection	US$ 1,200 per month
Internet bandwidth to Pakistan	~9,000 Mbits combined from PTCL and TWA
Operational ISPs	50 (approx)
ISPs providing DSL services	10
HFC Operators providing broadband Internet over cable	2
Undersea cables connecting Pakistan to rest of world	Two with PTCL (www.ptcl.com.pk), SMW3 and SMW4 One with TWA (www.twa1.com)
Domestic Fiber backbones	PTCL, Wateen Telecom (www.wateen.com), and Mobilink GSM each have their own backbone. A fourth backbone by www.multinet.com.pk is under construction.
Fiber to the Home (FTTH) Providers	There are two: www.nayatel.com and www.wateen.com
Domains Registered under .pk domain	~ 20,000

Mobilink GSM has launched WiMax from the first of July, 2008 in Karachi, and planning to launch in other cities by the end of 2008. .

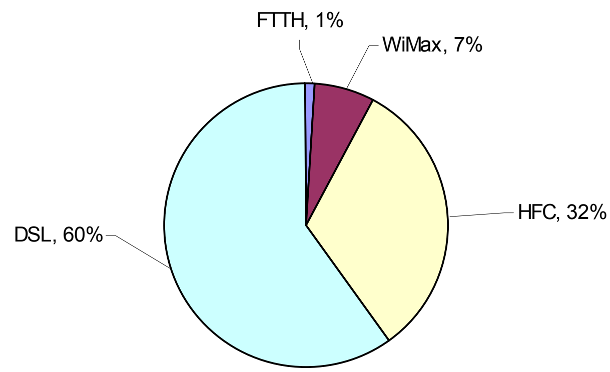
Figure 13: Broadband Subscribers as of March 2008



While internet users are around 5 million in the country, the number of broadband subscribers is rather thin standing at mere 130,281 of as end of March 2008. With the launch of WiMax services by Wateen and Mobilink GSM, broadband services will be available in areas which were not hitherto serviced by technologies using wireline (DSL, FTTH, and HFC). This will make the access to broadband open to a wider section of population thereby increasing the subscriber-base and bringing the prices down.

[30] http://www.ispak.com.pk/

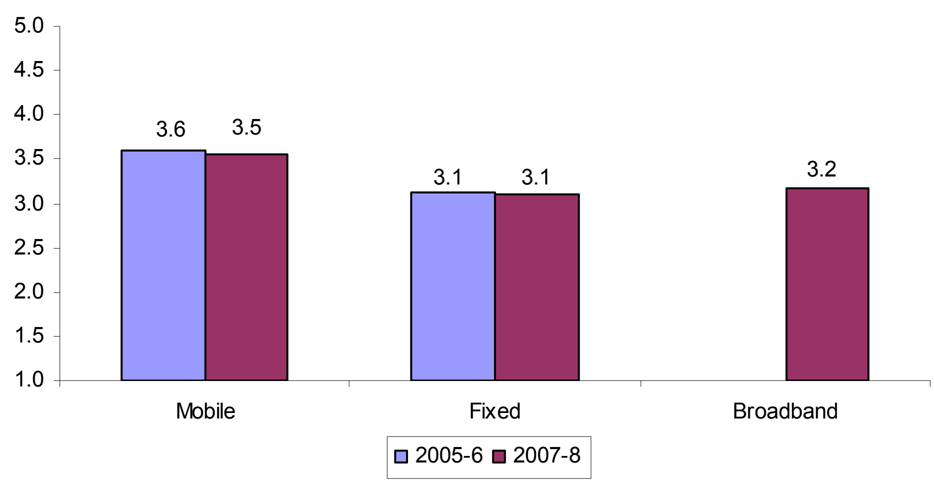
Figure 14: Broadband Subscribers Market Share by Technology as of March 2008



As of March 2008, WiMax has a market share of only 7%, but it is a candidate to take over the market-leader position in the near future.

ii. Access to Scarce Resources

Figure 15: TRE Survey Results for Access to Scarce Resources (2006 & 2008)



The TRE scores for Access to Scarce Resources remain unchanged, though the mobile sector shows a marginal and insignificant decline.

Section 2(qc) of the Telecommunication (Re-organization) Act 1996 defines scarce resources as:

- (i) radio frequency spectrum;
- (ii) right of way; and
- (iii) numbers.

Radio frequency spectrum is the main scarce resource, which is used by both the mobile sector and the fixed sector – wireless local loop being part of the fixed telephony in Pakistan. Section 4 of the 1996

Act requires the PTA to "receive and expeditiously dispose of applications for the use of radio-frequency spectrum." The Authority allocates radio-frequency spectrum through the Frequency Allocation Board under Section 42 of the Act. The Board acts in accordance with the recommendations of the International Telecommunication Union, its organs, and other international bodies.[31]

Para 4.4.8 of the De-regulation Policy required of the FAB to process applications for the allocation of radio spectrum (RS) within a period of 30 days. For expeditious dealing with RF application and for effective management and monitoring of RS, National Frequency Management and Monitoring System (NFMMS) is established. For monitoring spectrum interference among operators, a number of fixed and mobile monitoring stations have been set up, with state of the art monitoring hardware and software that enables the monitoring stations to effectively monitor the frequency spectrum in various frequency bands. On the management side, National Control Centres are established across the country with the capability of "performing real time and swift analyses of the applications / proposals of applicants and optimizing the use of the available spectrum while securing the license conditions." The legal requirement of processing applications within a period of 30 days, coupled with technological capability to assess potential interferences with other operators have allowed FAB to clear RS applications expeditiously.

Right of Way is required to roll out infrastructure required for providing telecom services. The PTA grants infrastructure licenses, under section 21 of the PTA Act, to establish and maintain the following Telecom Infrastructure Facilities:

(a) Earth stations & Satellite Hubs;
(b) Optic fibre cables;
(c) Radio communications links;
(d) Submarine cable landing centre within fifteen miles of costal area of Pakistan subject to approval by the Authority & clearance of Ministry of Defense and Ministry of Interior;
(e) Towers, poles, ducts and pits used in conjunction with other infrastructure facilities; and
(f) Such other telecommunication infrastructure as the Authority may, by Regulation, require.

The Infrastructure licensee may lease, rent out or sell end to end links to Telecom Operators licensed by PTA.[32]

Numbers being another scarce resource, the PTA has increased that resource by changing the numbering scheme from 7 digits to 8 digits for mobile cellular subscribers as of April 1, 2008.[33] In a 7 digit scheme, there are one million – one (9999999) numbers available for a single prefix. However, with 8 digits a single prefix will not have ten million – one (99999999) numbers available, an increase of 9 millions for each prefix. This is an enormous increase. The waste of the scarce resource of Numbers has been reduced with the implementation of Mobile Number Portability (MNP), which was launched in March 2007, and as of December 2007, 118,000

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[31] *Id.,* Sec 43.
[32] http://www.pta.gov.pk/index.php?option=com_content&task=view&id=770&Itemid=613
[33] http://www.pta.gov.pk/index.php?option=com_content&task=view&id=1108&catid=92&Itemid=301

subscribers have been successfully ported among cellular operators.[34] MNP allows subscribers to retain the number if they change the service provider. In the absence of MNP, when a subscriber switch to another service provider, her previous number sits in a graveyard for one to two year (depending on company's policy) giving the subscriber an opportunity to get back her original number should she wish to return to the first service provider. This keeps the numbers blocked and thereby reduces the availability of numbers for other subscribers to use.

It is hoped that the new numbering scheme and MNP will help to improve the perception of access to scarce resources at least from the subscribers/consumes' perspective. However, the fixed sector has scored lower than mobile and broadband; one reason for such low rating may be that participants may have included access to the incumbent PTCL's network as part of scarce resources, and therefore giving a negative effect on their perception.

For the broadband, the necessary (or scarce) resources are fiber optic networks, DSL and frequency spectrum. Pakistan Telecommunication Limited (PTCL) has its own optic-fibre backbone. Mobilink GSM also has its optic-fibre network, covering 8,500 kilometers.[35] DSL network is rather thin and is available in select areas of major metropolitans, such as, Lahore, Karachi, Islamabad and Rawalpindi. WiMax technology is rather new in Pakistan. Pakistan has earmarked frequency spectrum from 3G services, and will be inviting bids for same shortly.

iii. Interconnection

Figure 16: TRE Survey Results for Interconnection (2006 & 2008)

The perception of interconnections has significantly improved for the mobile and fixed sectors since the last TRE survey was conducted.

Rule 13 of the Pakistan Telecommunication Rules, 2000 [PTR] mandates each operator to negotiate an interconnection agreement with another operator who requests for such

[34] PTA., Telecom Quarterly Review, December 2007 at p. 5 available at http://www.pta.gov.pk/index.php?option=com_mediacenter&catid=94&Itemid=225

[35] http://www.dailytimes.com.pk/default.asp?page=2007%5C12%5C26%5Cstory_26-12-2007_pg5_11

interconnection.[36] As a general rule, operators are free to negotiate their interconnection agreements in accordance with the procedure laid down by the PTR. However, where an operator has attained significant market power (SMP),[37] it is then required "to produce a Reference Interconnection Offer (RIO) detailing the services and tariffs they provide to other licensed operators."[38] Thus, in the case of fixed telecom sector where PTCL has SMP, the PTA, under the Telecom De-regulation Policy of 2003, required a RIO from PTCL, which the latter issued on 15 April 2004. PTA after taking in account the stakeholders' views confirmed PTCL's RIO on 6 December 2004.[39]

The improved perception of interconnection both of mobile and fixed may be attributed to the effect and facilitation of disputes related to interconnection by the PTA.[40]

The perception of interconnection in broadband scored the lowest. There is a Pakistan Internet Exchange,[41] which was set up by PTCL in 2001 to handle traffic between internet service providers on PTCL's backbone. However, because of PTCL's dominance over the use of Exchange, there are some issues relating to DSL Interconnect Agreement between PTCL and other internet service providers. The Internet Service Providers Association of Pakistan[42] (ISPAK) has filed a case before the PTA for the removal of anti-competitive clauses from DSL Interconnect Agreement between PTCL and ISPs, which has not been decided so far.

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[36] **13. Interconnection between connectable systems. -** (1) Each operator hereinafter referred to as the "**relevant operator**", shall, on the request of another operator, negotiate an agreement to interconnect that other operator's telecommunication system to its telecommunication system.

[37] In order to determine operators who have an SMP status in the relevant markets, Rule 17 of the Pakistan Telecommunications Rules, 2000 has laid down the criteria as follows:

> *17- (1) An operator shall be presumed to have significant market power when it has a share of more than twenty-five per cent of a particular telecommunication market. The relevant market for these purposes shall be based on sector revenues.*
>
> (2) *The Authority may, notwithstanding sub-rule (1), determine that an operator with a market share of less than twenty-five per cent of the relevant market has significant market power. It may also determine that an operator with a market share of more than twenty-five per cent of the relevant market does not have significant market power. In each case, the Authority shall take into account the operator's ability to influence market conditions, its turnover relative to the size of the relevant market, its control of the means of access to customers, its access to financial resources and its experience in providing telecommunication services and products in the relevant market.*

[38] Mobile Cellular Policy, 2004 Section 5.10.

[39] http://www.pta.gov.pk/media/ptcl_rio_det.pdf.

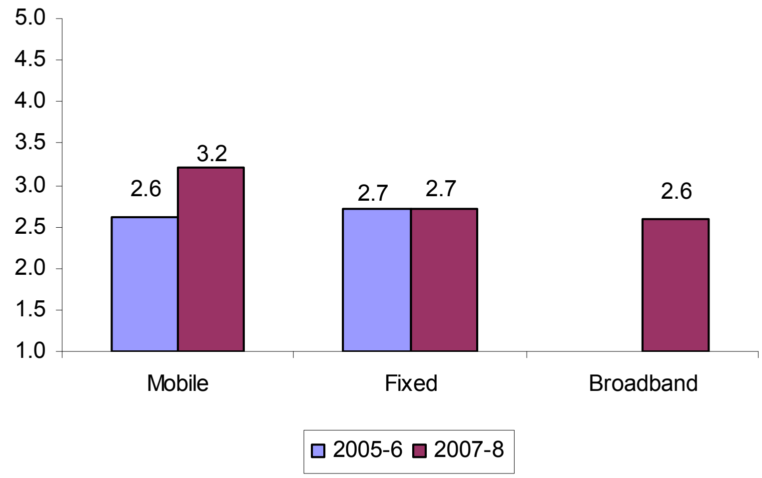
[40] *See for example:* Determination on M/S PTCL CED Case, http://www.pta.gov.pk/images/stories/kashif/PTCL_CED_Case.pdf; Dispute between PTCL & LDI operators Regarding Origination Charges on 'Non Revenue Time' of PCCS http://www.pta.gov.pk/media/Determinon_Non-Revenue_Time(Final).pdf; Nayatel vs. PTCL, http://www.pta.gov.pk/media/nayatel_ptcl.pdf; Cost-based Interconnection Charges for Fixed-line and Mobile Operators http://www.pta.gov.pk/media/det_cost_140508.pdf

[41] An Internet Exchange (IX) acts as a junction between multiple points of Internet presence. Here, peers are able to directly connect to each other to exchange local Internet traffic. http://www.spider.tm/aug2003/coverstory.shtml

[42] http://www.ispak.com.pk/

iv. Tariff Regulation

Figure 17: TRE Survey Results for Tariff Regulation (2006 & 2008)



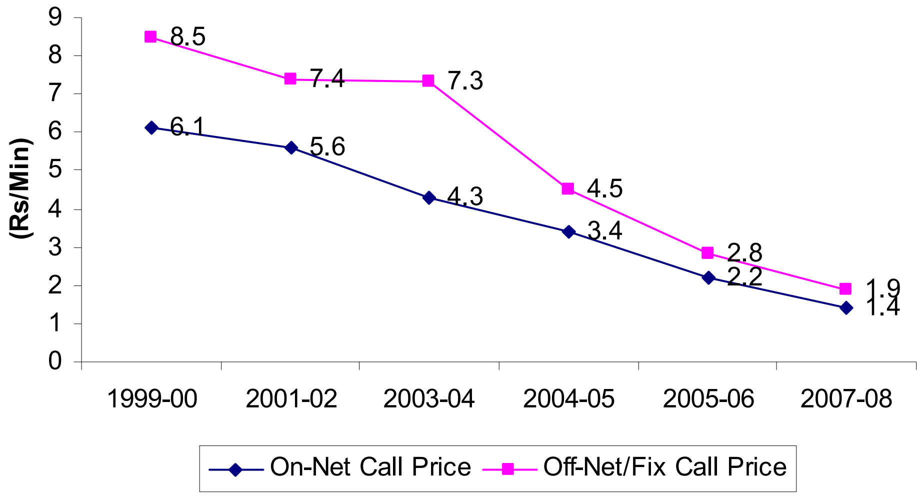
In the mobile cellular sector, a significant change took place in May 2001 when the tariff mechanism changed from Mobile Party Pays to Calling Party Pays. Since then there has been significant reduction in the cellular mobile tariffs.

Mobile cellular operators who do not enjoy a dominant position or SMP (defined as an operator with a market share of over 25%) are free to set and revise their tariffs. However, SMPs tariffs' are regulated by the Authority. In its Determination No. 15-46/01 (Tariff)/PTA dated 25th August 2004, the Authority has declared Mobilink GSM as the SMP in the mobile cellular telecommunications market across Pakistan, and PTCL as the SMP in the LL and LDI fixed line telecommunications market across Pakistan. In the case of SMPs, tariffs are regulated by the PTA.

Tariff may be regulated either through market forces or regulatory body. The market forces, where they are operative, that is, mobile sector have brought the tariffs down. Pakistan is one of the four countries (other three are: Bangladesh, India and Sri Lanka) that offer the cheapest rates in the mobile telephony.[43]

[43] *See Mobile Benchmarks by LIRNEasia available at* http://www.lirneasia.net/wp-content/uploads/2008/03/08-02-baskets-explained-v41.pdf; see also http://www.hindu.com/2008/06/15/stories/2008061555390900.htm

Figure 7: Tariff Reduction –Mobile
(Weighted Average Tariff Excluding Taxes)



For the fixed line sector, since Pakistan Telecommunications Company Limited (PTCL) enjoys the status of an SMP operator, and that there is not enough competition. The perception (TRE score) has declined since 2006 because tariffs in the fixed sector have gone upwards. PTCL has revised its tariffs, with the approval of the PTA, and reduced the time of the unit from 5 minutes to 2 minutes.

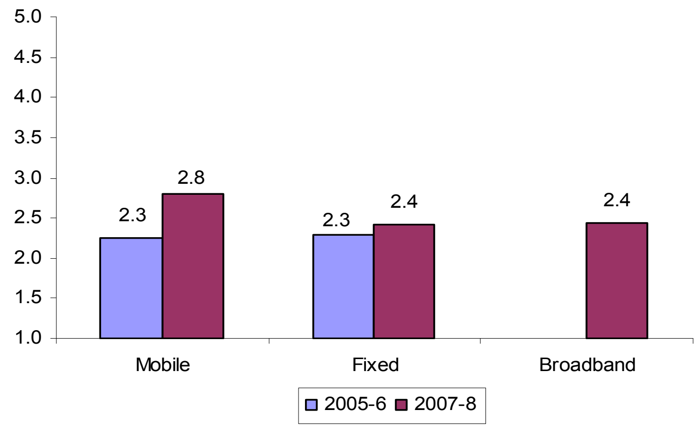
However, the PTA has announced cost-based interconnection (termination) charges for fixed-line as well as cellular mobile operators vide its recent determination. This has reduced Mobile Termination Rates (MTR) with effect from 1 June 2008 by 28% i.e. from PKR 1.25/- to PKR 0.90/- over a period of two and half years *i.e.*, by the end of 2010. “It is expected that the reduction in MTR would reduce fixed to mobile tariffs as well as off-net tariffs for cellular mobile operators resulting in more affordable telecom services for the general public.”[44]

For the broadband the prices have come down and are expected to come down even further with the launch of WiMax services. As of October 20th 2008, PTCL has offered pre-activated free dialup internet facility to all its subscribers.[45] While this move by PTCL will no doubt increase the number of internet users/subscribers in Pakistan, the effect could be to push all small ISPs out of the market.

[44] http://www.pta.gov.pk/index.php?option=com_content&task=view&id=1125&catid=92&Itemid=301
[45] http://www.ptcl.com.pk/contentp.php?NID=188

v. Regulation of Anti-Competitive Practices

Figure 18: TRE Survey Results for Regulation of Anti-Competitive Practices (2006 & 2008)



While the perception for regulation of anti-competitive practices has gone up for the mobile and fixed sectors, the score for all three sectors are below 3 and cannot be considered as good performance. Of the seven dimensions, this receives the lowest scores.

There is competition is most of the services offered by the mobile, fixed and broadband sectors as shown by Table 7.

Table 7: Level of Competition in Different Sectors[46]

Service	Competition
Local services	Full competition
Domestic fixed long dist	Full competition
Inter-national fixed long dist	Full competition
Wireless local loop	Full competition
Data	Full competition
DSL	Full competition
Cable modem	n/a
VSAT	Full competition
Leased lines	Full competition
Fixed Wireless Broad-band	Full competition
Mobile	Full competition
Paging	n/a
Cable TV	Full competition
Fixed sat	n/a
Mobile sat	n/a
GMPCS	Full competition
IMT 2000	n/a
Internet services	Full competition
Inter-national gateways	Full competition

The level of competition is partly dependent on the concentration in the market which is measured by looking at the market shares of the market player. Here below are market shares of the service providers in the mobile and fixed sectors.

[46] http://www.itu.int/ITU-D/icteye/DisplayCountry.aspx?countryId=182

Figure 19: Market share in Mobile Sector - 2008

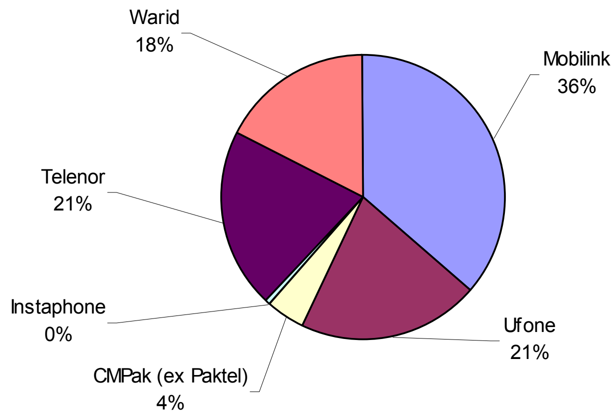


Figure 20: Market Share in Fixed Local Loop – 2008

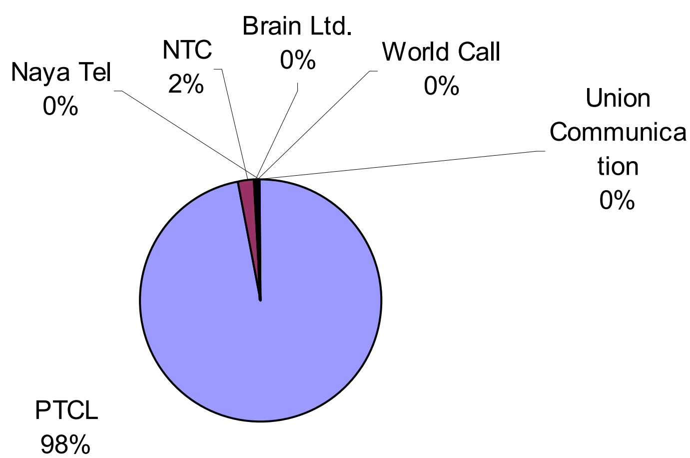


Figure 21: Market share in Wireless Local Loop - 2008

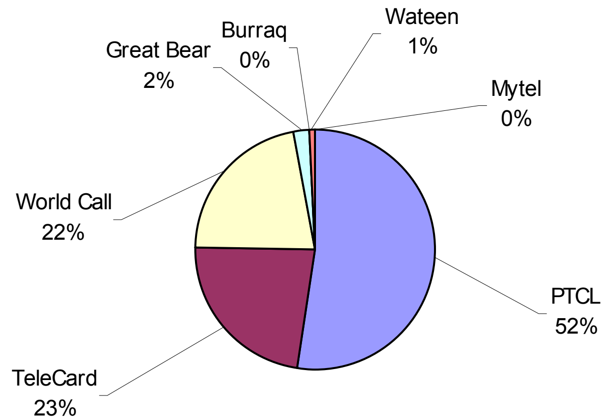
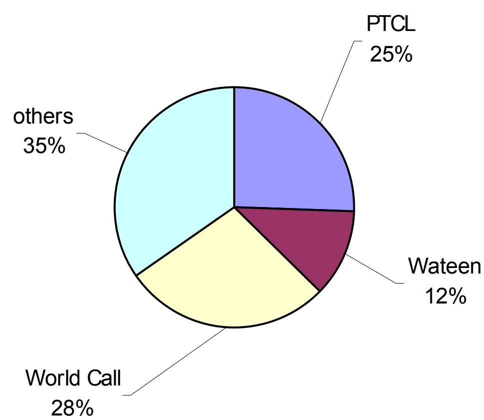


Figure 22: Market share in Broadband - March 2008



The Herfindahl-Hirschman Index (HHI) is an index that measures market concentration. The higher the HHI index, the less competitive the market is. In a highly competitive market, there may not be a single company enjoying dominant position therefore the chances of abusing dominant position are low. As of June 2008, the HHI for the mobile telecommunications market is 2518, which by international standards reflect a highly concentrated market.[47] In the fixed sector the HHI for FLL is 9608 which represent a monopolistic market and in WLL it is 3722 which again is a symbol of a highly concentrated market. The HHI for the broadband market, if measure for the top three companies (since other companies market shares are not know), is 1553, which represents a moderately concentrated market.

To strengthen the competition law regime, Pakistan promulgated the Competition Ordinance, in October 2007, which prohibits anti-competitive practices and established Competition

[47] According to US Merger Guidelines, an HHI of less than 1000 represents an unconcentrated market, an HHI of 1000 but below 1800 represents moderately concentrated market, and an HHI of over 1800 represents highly concentrated market.

Commission of Pakistan (CCP). The CCP since its birth has taken actions against Mobilink GSM, dominant player in the mobile telephony market, for tying its BlackBerry handset with internet services, and PTCL, dominant market player in the fixed telephony market, for engaging in deceptive marketing practices. [48]

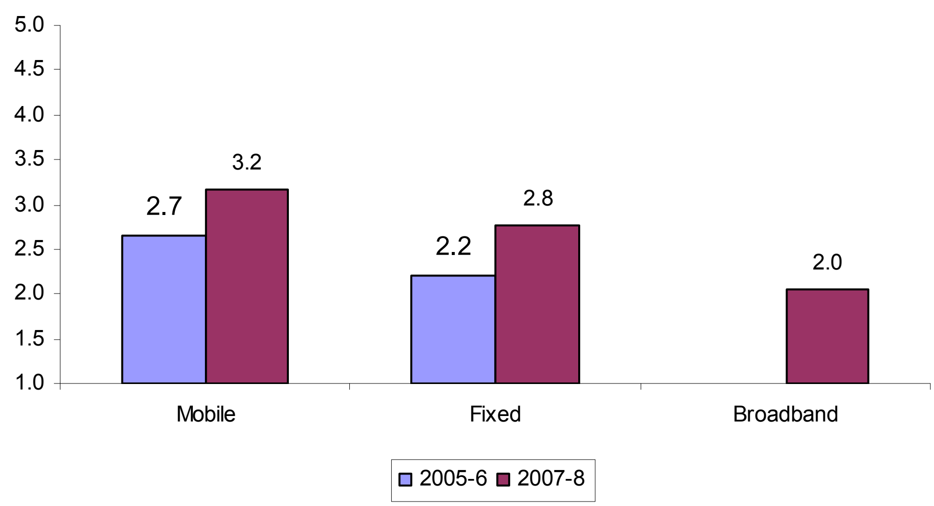
In the broadband market there are a number of complaints from the ISPAK against the dominant PTCL for engaging in anti-competitive activities. ISPAK has filed a case before the PTA for the removal of anti-competitive clauses, listed below, from DSL Interconnect Agreement between PTCL and ISPs.

- ISPs are prohibited to procure IP bandwidth and leased lines for DSL from any other company than PTCL;
- Blocking of value added services like video conferencing, VPNs, etc.
- No third party interconnects are allowed in PTCL co-locations

The matter is still pending with the PTA. It is hoped that with the enactment of Competition Law and the establishment of CCP, Pakistan will score better in anti-competitive practices parameter, in the future TRE survey.

vi. Universal Service Obligation

Figure 23: TRE Survey Results for Universal Service Obligation (2006 & 2008)



The perception regarding universal service obligation has improved by 0.5 both for the mobile and fixed sectors since last survey. This is significant improvement, which is primarily because the Universal Service Fund Company has become operative since May 2007.[49]

Section 4(d) of the 1996 Act requires of the Authority to "promote the availability of a wide range of high quality, efficient, cost effective and competitive telecommunication services throughout Pakistan." Section 3 of the De-regulation Policy of 2003 stipulates its objectives as follows:

[48] Millions of fixed line subscribers have requested PTCL to opt out of its Pakistan Package, that give the subscribers 5000 minutes of talk time across nation-wide calling for PKR 200.

[49] http://telecompk.net/2008/10/02/interview-with-usf-ceo-mr-parvez-iftikhar-part-1/

a. Increase service choice for customers of telecommunication services at competitive and affordable rates;
b. Promote infrastructure development, especially infrastructure that will increase teledensity and the spread of telecommunication services in all market segments (including voice, data and cellular etc);
c. . . .
d. . . .
e. Accelerate expansion of telecommunication infrastructure to extend telecommunication services to un-served and under-served areas.

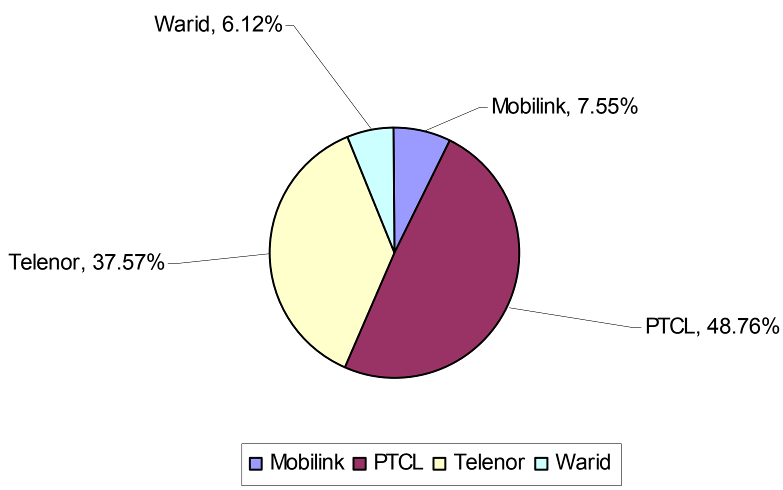
Paragraph 5.9 of De-regulation Policy of 2003 and paragraph 8 of the Mobile Cellular Policy of 2004 provide that the USF Charge will be limited to a maximum of 1.5% of gross revenue minus inter-operator and related PTA / FAB mandated payments as determined by the Government. Section 33A of the Pakistan Re-organization Act of 1996 requires PTCL to contribute to the USF Fund as well. Thus, all companies which got Local Loop ("LL") Wireless Local Loop ("WLL"), Long Distance and International ("LDI") or Telecommunication Infrastructure Provider ("TIP") Licence was issued after adoption of the Deregulation Policy (2003), and persons whose mobile cellular licence was issued or renewed after adoption of the Mobile Cellular Policy (2004), have an obligation to contribute 1.5% of annual gross revenues to the Universal Service Fund, less inter-operator fees and related payments mandated by the PTA or Frequency Allocation Board ("FAB"). Only those who contribute to the USF Fund are eligible to receive a subsidy from the USF Fund.

The Ministry of Information and Technology (MoIT) issued the Universal Service Fund Policy in 2005. In terms of the Policy, the primary goal is to "to make available and affordable voice telephony and data services suitable for Internet access, to progressively greater proportions of the Pakistan population at their home locations." The USF will be administered by an independent not-for- profit company, Universal Service Fund Company (USFCo), with a Board of Directors, comprising nine directors, representing government, consumers and the industry. The aim of the USF is to promote development of telecommunication services in un-served and under-served areas throughout the length and breadth of the country, to make available affordable voice telephony and basic data services to progressively greater proportions of the country's population at their home locations."[50] As of September 30, 2008, the USFCo has granted PKR 1177 million in subsidies to the following four companies.

[50] http://www.usf.org.pk/index.asp

Table 8: USF Subsidy Granted as of 30 September 2008 (Rs millions)[51]				
Bidder/Area	**Mobilink GSM**	**PTCL**	**Telenor**	**Warid**
Malakand	-	-	310	-
Sukkur	112	-	-	-
DG Khan	-	-	-	91
Pishin	-	175	-	-
Mansehra	-	300	-	-
Dadu	-	250	-	-
Bahawalpur	-	-	248	-
Total Subsidy Received	112	725	248	91

Figure 24: Precentage of Total USF Subsidy Won by the Bidders as of September 30, 2008[52]



a. Fixed Sector

PTCL won contracts to provide telecom services in the rural districts of Pishin, Dadu, and Mansehra and bags a majority of subsidy (48.76 %) granted by the USFCo as of September 08. This may have a bearing for the higher TRE score of the USO parameter for the fixed sector compared to the last survey's score.

b. Mobile sector

In October 2007, the USFCo signed a Pilot project Contract with Telenor to provide telecom related services in Malakand Division. In short span of three months, the USFCo signed another contract in January 2008 with Mobilink GSM to provide services to the un-served villages of Sukkur division. And then in February 2008, it entered into contract with Warid Telecom to provide telephony and data services to the mass population in un-served areas of Dera Ghazi Khan division. Telenor won another

[51] http://www.usf.org.pk/projects.asp last visited on 15 January 2009.
[52] http://www.usf.org.pk/projects.asp

contract to provide services in the district of Bahawalpur.[53] Grant of the subsidies to the mobile service providers have helped improve the TRE Score for the USO in mobile sector.

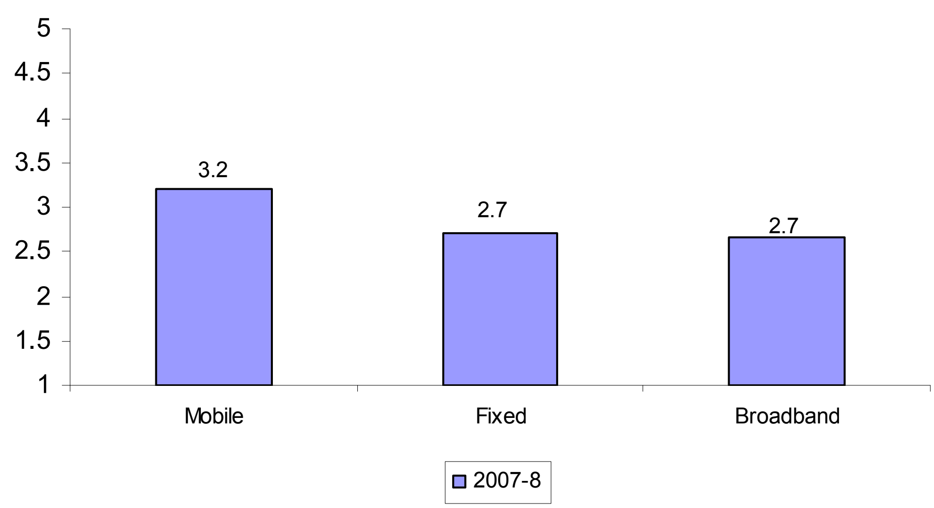
c. Broadband Sector

Universal Fund Service (USF) of Pakistan has planned to lay out optic fiber cable in every district of Pakistan that will enable rolling out of all kinds of telecom services (telephony, broadband, tele-centers, telemedicine etc.) in remotest parts of the country. A pilot project is started in Faisalabad connecting schools, libraries and dispensaries.[54] The first major project will be launched in the province of Sindh and at the conclusion of this project, Sindh will have no district without optic fiber. This project will be closely followed by similar projects in Baluchistan and NWFP. [55] The USF projects for broadband are still their early stages, and were launched after the survey was conducted; therefore, the TRE score for broadband is rather low.

However, with the proper implementation of the USF, whereby the cost of providing telecom services is subsidized, a large portion of Pakistan's population living in rural area now hope to have access to affordable telecom/broadband services in their villages.

vii. Quality of Service

Figure 25: TRE Survey Results for Quality of Service (2006 & 2008)



Quality of service (QoS), as defined in the International Telecommunication Union ((ITU) Technical recommendation E.800, is "the collective effect of service performances, which determine the degree of satisfaction of a user of the service."[56] The quality of service parameter is being surveyed for the first time. Mobile sector has fared better than fixed and broadband sectors.

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[53] http://www.usf.org.pk/projects.asp
[54] http://www.pta.gov.pk/index.php?option=com_content&task=view&id=1194&Itemid=301
[55] http://www.dailytimes.com.pk/default.asp?page=2008%5C09%5C10%5Cstory_10-9-2008_pg5_21
[56] See ITU-T Recommendation E.800, *Terms and definitions related to quality of service and network performance including dependability*, at http://www.itu.int/rec/T-REC-E.800.

Pakistan Telecom Authority seeks to ensure "that all service providers provide efficient, trouble free and affordable services to their subscribers."[57] Random quality surveys/inspections are conducted by the PTA in all parts of the country to check the QoS of all service providers, including fix line, cellular, WLL, card payphones and internet services providers. PTA follows the QoS standards/thresholds as recommended by the ITU.

a. Mobile Sector

The Mobile Cellular Policy of 2004 has special provisions for ensuring quality of service. Paragraph 6.3, reproduced for ease of reference below, stipulates in detail the essential parameters for ensuring mobile telephony's QoS.

6.3 Quality of Service
The GoP intends to ensure that licensees provide a good quality of service. The following table is indicative of the QoS measures to be included as an Annex to the Mobile Cellular Licenses. The PTA will set the QoS parameters after consultation with the Licensees before final issue of the license.

Indicator	Short Term (first 3 years)	Long Term (3 years on)
Air Interface Blocking	<= 4% in busy hour	<= 2% in busy hour
Call Completion Rate	> 96%	> 98%
Call Connection Time	<= 7 seconds	<= 5 seconds
Call Quality	MOS[3] Score > 3	MOS Score > 3
Network Down-time (averaged across all sites)	< 2% in any 1 calendar month < 1% over a 1 rolling year period	< 1% over a 1 month period
Cell-site Down-time (for each site)	Not longer than 48 hours	Not longer than 24 hours

In addition to the above QoS measures a limited number of targets will be set for service covering such areas as:

- Customer service time to answer
- Time to resolve complaints
- Billing accuracy
- Provision of interconnect ports
- Repair of interconnect ports

The PTA will after due consultation prepare a set of criteria which will be attached to the License. The Mobile Cellular licensees will be required to provide regular reports to PTA on quality of service.[58]

PTA regularly conducts surveys to ensure quality of service offered by mobile service providers to their customers. In November 2007, PTA conducted its fifth QoS surveys of Mobile Cellular Operators using recently procured state of the art monitoring equipment. The services of five GSM operators i.e., Ufone, Mobilink GSM, Telenor, Warid, and CMPak were checked in selected major and small cities. Service parameters including Network Accessibility, Service Accessibility, Access Delay, Voice Quality and SMS were checked with the automated monitoring tool.

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[57] PTA Annual Report 2004-05, at page 14.
[58] Para 6.3, Mobile Cellular Policy 2004, available at http://www.pta.gov.pk/media/MCP.pdf

Table 9: QoS Survey Results by Company (Voice)[59]						
Company	**Total Calls**	**Network Accessibility (%) Threshold (TH) =99.5%**	**Service Accessibility (%) TH=96%**	**Call Completion Ratio (%) TH = 96%**	**Avg Setup Time (sec) TH = 7 sec**	**Avg Mean Opinion Score (MOS) TH = 3**
Mobilink GSM	2436	99.90%	96.66%	97.50%	9	2.78
Ufone	2498	99.78%	94.85%	96.73%	8.43	2.5
Telenor	2488	99.47%	96.80%	93.02%	8.79	2.9
Warid	2501	98.22%	96.60%	97.49%	8.77	3.12
CMPak	2414	99.40%	96.52%	95.59%	8.59	2.96

The QoS survey shows that despite the high subscription, the operators are able to maintain acceptable quality of service.

It may be mentioned here that in June 2003, PTA imposed a penalty of PKR 60 million on Mobilink GSM for its poor quality of service. The Authority, in 2003, also issued show cause notices to then other cellular service providers, *i.e.*, Ufone, Instaphone and Paktel for unsatisfactory services and gave them directions to improve their QoS within 30 days.[60] Since 2003, the QoS has improved.

b. Fixed Sector

To monitor the quality of service in the fixed sector, PTA has issued *Monitoring and Reconciliation of International Telephony Traffic Regulations 2008* (MRITR).[61] Regulation 2 of MRITR stipulates the scope of the MRITS, which shall apply to all Long Distance International licensees for monitoring and accurate reconciliation of total traffic terminated on the network of each licensee in order to measure and record traffic, billing and quality of the licensed service.

Regulation 4(5) requires that all reconciliation system shall consist at a minimum of the following features:

(a) Capability to monitor, measure and record traffic in real time;
(b) Capability for complete record of billing; and
(c) Capability to accurately measure the quality of service; and
(d) Monitoring of grey traffic.

It is hoped that with the implementation of MRITR the quality of service in the fixed telephony will improve.

[59] PTA, Telecom Quarterly Report, December 2007 at page 1.
[60] *Mobilink fined Rs60m for poor service: Customers to get compensation* http://www.apnic.net/mailing-lists/s-asia-it/archive/2003/06/msg00018.html.
[61] http://www.pta.gov.pk/; S.R.O 1189(I)/2008, the Gazette of Pakistan (Extraordinary) 10th November 2008.

c. Broadband Sector

Paragraph 7.4 of Broadband Policy of 2004, reproduced below, mandated PTA to specify parameters for ensuring QoS in the broadband sector.

> 7.4 Quality of Service (QoS)
> 7.4.1 PTA, after studying various options/solutions, will specify parameters to ensure quality of service. QoS would cover entire range of services and would aim at protecting consumers' interests. The QoS standards would be reviewed periodically and these would be available on the website after a process of consultation and keeping in view the technological changes, international standards and best practices.

QoS of Internet Service Providers (ISPs) is continuously monitored by the PTA in order to ensure quality as per the license standards. QoS Survey of ISPs is conducted based on the following five parameters:

i. availability of service,
ii. connection setup time,
iii. download speed,
iv. download time; and
v. connection stability during busy hours.

A total of 50 marks were allocated to test and on the basis of obtained marks ISPs are categorized as Good, Average and Poor ISPs as per following criteria:[62]

ISP Category	Criteria
Good ISPs	80 % or above marks
Average ISPs	Greater than 70 % and less than 80 % marks
Poor ISPs	Less than 70 % marks

During October and November 2008, PTA conducted QoS survey of ISP in 17 major and small cities. A comparison of the survey results for the year 2007 and 2008 is given in Table 10 below:

Table 10: Comparison of the ISP Survey Results 2007 & 2008 [63]

Zones	Good (%)		Average (%)		Poor (%)	
	2007	2008	2007	2008	2007	2008
Lahore	40	76	40	15	20	9
Karachi	63	64	31	18	4.5	18
Rawalpindi	20	19	60	19	20	62
Peshawar	7.14	43	78	36	14	21
Quetta	100	100	0	0	0	0
AJ&K	-	0	-	100	-	0

[62] http://www.pta.gov.pk/media/qos_result_isp_2008.pdf
[63] Source: Id.

5. Concluding Remarks and Recommendations

The overall score of perception in 2008 has improved since the last survey in 2006. This is primarily because the results of deregulation and competition have now started to come to the fore. An important parameter to foster competition is the ease of market entry. Through an unbundled licensing regime, PTA has ensured a competition for all types of telecom services both in the fixed and mobile telephony.

One of the sought-after outcomes of competition is lower prices. The freedom to set prices has allowed the competitors to slash their margins in order to increase their subscriber-base. As a protection against abuse of dominant position by engaging in predatory pricing, the law empowered the PTA to set tariffs of the operators who achieved the status of significant market power. Pakistan now claims to have the lowest mobile tariffs in the world.[64] Mobile subscriber-base has increased manifolds to 88 million in few years. Prepaid cards costing less than US $0.50 per month, and post-paid available at US$ 0.2 per minute mean that owning a cell phone is no longer beyond the reach of the masses.

Another important step to promote competition, and first in the region, taken by the PTA to facilitate competition is the implementation of Mobile Number Portability (MNP), which became effective as of March 2007. With MNP in place, cell phone users can keep their phone numbers even after their six months of their prepaid card's expiry and can switch to other service providers without changing the number.[65] All these steps to further competition in the sector have led to increased foreign direct investment, and generated employment in the country.

Further more, w~~The major challenge that lies ahead for the government is to bridge the rural-urban and digital divide. Seventy per cent of Pakistan's total population resides in rural areas, where the fixed access paths are as little less than 2%.~~[66] ~~W~~ith the Universal Service Fund Company becoming operative and contracting out with operators to spread the network in rural areas, it is hoped that the rural-urban divide will be minimized in the times to come.

In August 2007, PTCL launched IPTV (Internet Protocol Television) service (Smart TV).[67] IPTV along with high-speed broadband internet and voice telephony is available on the subscribers existing telephone lines at the same time on one bill. The package bundles three services in one line, i.e., basic telephony, internet broadband and Interactive TV all on the same telephone line. There has eroded the boundaries among telephony, broadband and broadcasting, and has an impact on the future TRE Surveys. In future surveys, broadband may be categorized as a service provided under the mobile and fixed categories, rather than a stand alone category as it was done in the present TRE.

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64 Speech by Chairman, PTA. June 14, 2007.

65 PTA, Telecom Quarterly Review, March 2007, Page 5.

66 http://www.pakistan.gov.pk/ministries/NewsInfo.jsp?MinID=7&cPath=78&div=itandtelecom&file=031006.xml&path=ministries/moit/

67 PTCL's IPTV Service Gets Huge Response, 8/15/08 Frontier Star (AsiaNet-Pak.) (2008 WLNR 17346013) August 15, 2008.

With competition now getting mature in most areas of telecom sector, with the exception of local loop services, and given that lowest average score for dimensions is that of regulation of anticompetitive practices, competition provisions should be strictly enforced by both the Pakistan Telecommunications Authority and the Competition Commission of Pakistan within the scope of their respective mandates. In addition, the regulator needs to focus on improving the penetration and the quality of service for broadband services, in order to transform Pakistan into an "Information Economy" after having tapped and exploited to an extent the potential of voice telephony.

Key Events in the Telecom Regulatory Environment in PAKISTAN during 2007-2008

- Pakistan Telecommunications Authority launched Anti-Mobile Theft system, which blocks the handset once it is stolen, snatched or lost, by using the IMEI – International Mobile Equipment Identity. As of January 2008, PTA has blocked 182, 861 handsets.
- Implementation of Mobile Number Portability in March 2007.
- Activation fee for mobile connection reduced from PKR 2000 to PKR 500.
- Purchase of 100% share of Paktel by China Mobile in May 2007.
- Rural Telephony Project was launched under which 400 Rabta Ghar (Telecentres) are being established.
- Deregulation of telecommunications sector of AJK and Northern Areas was finalized, and licenses were awarded to both fixed and mobile operators. For the mobile services, licenses were awarded to Mobilink GSM, Warid, Telenor, Ufone, and Zong (ex-Paktel).
- Mobilink GSM's license was renewed for another 15 years, until 2022.
- The Universal Service Fund Company was established and it gave out contracts to Telenor, Warid and Mobilink GSM for rolling our telecom services in the rural and underserved areas.
- WiMax networks and Wireless Broadband services were launched.
- Mobile telephone numbering scheme changed from 7 digits to 8 digits.

Telecom Regulatory and Policy Environment in Sri Lanka: Results and Analysis of the 2008 TRE Survey

Malathy Knight-John

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***Abstract:** The 2008 TRE survey is a perception based assessment by informed stakeholders in the telecom industry regarding the efficacy of regulation and policy with respect to seven dimensions in the fixed, mobile and broadband sectors: market entry, access to scarce resources, interconnection, tariff regulation, anti-competitive practices, USOs and QoS. The results of the 2008 TRE survey indicate a below average score across six of the seven dimensions, with the exception being mobile sector USOs.

However, our analysis of the TRE scores for Sri Lanka indicates that these numbers are **not entirely** a reflection of regulatory and policy actions (as in the case of the comparative TRE scores for interconnection between 2006 and 2008 for instance) or of market dynamics (as in the case of tariff regulation for the period between 2006 and 2008 for instance). In addition, our analysis suggests that disparities between the definition of a particular parameter contained in the survey questionnaire and the **perception of respondents as to the definition of a particular parameter** could also bias the results of the TRE scores (as for instance in the USOs category).

***Keywords:** TRE Survey, Sri Lanka

November 26, 2008

Telecom Regulatory and Policy Environment in Sri Lanka: Results and Analysis of the 2008 TRE Survey

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List of Acronyms

ADSL	-	Asymmetric Digital Subscriber Line
BOP	-	Bottom of the Pyramid
BWA	-	Broadband Wireless Access
CAA	-	Consumer Affairs Authority
CCPI	-	Colombo Consumer Price Index
CDMA	-	Code Division Multiple Access
CFS	-	Consumer Finance Survey
CPP	-	Calling Party Pays
CSE	-	Colombo Stock Exchange
EGO	-	External Gateway Operator
FCC	-	Federal Communications Commission
FDI	-	Foreign Direct Investment
GATS	-	General Agreement on Trade in Services
GDP	-	Gross Domestic Product
GOSL	-	Government of Sri Lanka
HHI	-	Herfindahl- Hirschman Index
ICTA	-	Information and Communication Technology Agency of Sri Lanka
ISPs	-	Internet Service Providers
IP	-	Internet Protocol
ITU	-	International Telecommunication Union
MOU	-	Memorandum of Understanding
NSOs	-	National Statistical Organizations
NTT	-	Nippon Telephone and Telegraph
OECD	-	Organization for Economic Co-operation and Development
QoS	-	Quality of Service
PSTN	-	Public Switched Telephone Network
RPP	-	Receiving Party Pays
SLTL	-	Sri Lanka Telecom Limited
TRC	-	Telecom Regulatory Commission of Sri Lanka
TRE	-	Telecom Regulatory Environment
USOs	-	Universal Service Obligations

VOIP - Voice Over Internet Protocol

WLL - Wireless Local Loops

WiMAX - World Wide Interoperability for Microwave Access

1. Executive Summary

The 2008 TRE survey is a perception based assessment by informed stakeholders in the telecom industry regarding the efficacy of regulation and policy with respect to seven dimensions in the fixed, mobile and broadband sectors: market entry, access to scarce resources, interconnection, tariff regulation, anti-competitive practices, USOs and QoS. Key regulatory and policy episodes that occurred in the May 2007 to May 2008 time period provide a contextual background to the survey questionnaire. This report also compares the 2008 survey results with those of a similar survey conducted in 2006 to arrive at a better understanding of the dynamics underlying the TRE scores.

The results of the 2008 TRE survey indicate a below average score across six of the seven dimensions, with the exception being mobile sector USOs. The key facts that emerge from a comparison of the two survey periods, 2006 and 2008, is that overall TRE scores have improved marginally in both the fixed sector and in the mobile sector; scores for market entry in the mobile sector have shown a significant drop; scores for fixed sector interconnection have increased significantly; and, scores for USOs in both sectors have recorded increases.

However, our analysis of the TRE scores for Sri Lanka indicates that these numbers are **not entirely** a reflection of regulatory and policy actions (as in the case of the comparative TRE scores for interconnection between 2006 and 2008 for instance) or of market dynamics (as in the case of tariff regulation for the period between 2006 and 2008 for instance). In addition, our analysis suggests that disparities between the definition of a particular parameter contained in the survey questionnaire and the **perception of respondents as to the definition of a particular parameter** could also bias the results of the TRE scores (as for instance in the USOs category).

In general however, what emerges from our analysis is that market behavior – specific actions taken by operators – in spite of bad regulatory and policy actions – facilitated by the dynamics of competition, is driving the telecom sector. Initial pro-competitive reforms and liberalization efforts from 1980 until the mid-late 1990s created a momentum for competition that appears to have taken off, by-passing regulation.

The policy recommendations emerging from our analysis focus on the principles **regulation only where necessary; and, regulation for competition**. For instance, we argue that areas such as tariff regulation and QoS should be left to the market – according to the tenets of consumer choice and revealed preference, whilst areas such as interconnection, licensing and access to scarce resources need to be addressed in a systematic and transparent basis by the regulator.

2. Methodology and Limitations

The TRE instrument, which is a diagnostic tool designed to assess the efficacy of regulation and policies pertaining to a particular country's telecom sector was developed by LIRNE*asia* and is set out in detail in (Samarajiva et al, 2007). The TRE methodology was applied previously in Sri Lanka in 2004 and in 2006 for the fixed and mobile sub-sectors; this year's TRE survey includes the broadband sub-sector as a new component in the analysis of telecom sector performance. In this report, the TRE methodology is used to capture the perceptions of informed stakeholders on the telecom regulatory and policy environment of Sri Lanka, based on seven parameters: market entry; access to scarce resources; interconnection; tariff regulation; regulation of anti-competitive practices; universal service obligations; and, quality of service.

Survey respondents were asked to rate the quality of Sri Lanka's telecom regulatory and policy environment for each of the seven parameters on a Likert scale of 1 to 5, with 1 being highly unsatisfactory and 5 being highly satisfactory. A fact sheet of key policy and regulatory actions in the sector in the period May 2007-May 2008 (contained in Annex 1) was attached to the questionnaire (Annex 2) to provide some context to the survey.

The respondents of the TRE survey were divided into three categories as set out below:

- **Category 1:** Stakeholders directly affected by telecom sector regulation (such as operators, industry associations, equipment suppliers and investors)
- **Category 2:** Stakeholders who analyze the sector with broader interest (such as equity research analysts, credit rating agencies, telecom consultants and law firms)
- **Category 3:** Stakeholders with an interest in improving the sector to help the public (such as academics, research organizations, journalists, telecom user groups, civil society, former members of regulatory and other government agencies, donors, current government employees with knowledge on the telecom sector EXCLUDING those directly in the telecom regulatory and policy hierarchy – i.e. excludes anyone from the TRC and the Ministry of Posts and Telecom)

The total sample size of the survey was 124 and the **response rate was 78.22 percent.** The survey was conducted via different modes: online (web and email) and paper (in-person and fax). The rates of response categorized mode-wise indicate that a majority of the respondents (53.60%) preferred a web-based survey.

The response rates for Category 1, 2 and 3 were 58%, 79% and 91% respectively; stakeholders that are most directly impacted by telecom sector regulation showed the lowest rate of response, relatively. **Informal conversations with this category of stakeholders – in particular telecom sector operators – suggests that this group is rather skeptical, perceiving such exercises in relation to telecom sector regulation as being futile; several stakeholders in this category indicated that any positive outcome in sector performance, particularly in recent years, was <u>in spite</u> of bad regulation and policy.**

As per the TRE methodology each category must contribute equally to the final score. However, given that it is not always practically possible to obtain an equal number of respondents from each category, we use weights to equalize the contributions per category. These weights are shown in Table 1.

Table 1: Number of respondents and weights assigned to ensure equal contribution by each category to the final score

Category	No. of Respondents	Weights by LIRNE*asia*
1	22	1.617
2	23	1.4058
3	52	0.5985

The limitations we encountered in running the TRE survey in Sri Lanka are as follows:

- The operators – coming within the category directly affected by telecom sector regulation and policy – were the most difficult to get responses from.
- Specific questions were left unanswered – for example, questions on broadband interconnection and on USOs were left unanswered by most respondents.
- Respondents tended to misunderstand terms used in the survey – for instance, several respondents failed to keep in mind that the TRE assessment is on the **regulation of the market rather than on market performance per se**.

- Inability to obtain important, relevant and up to date indicator data from the TRC – the reason we were given was that there was an "internal technical malfunction" at the TRC.

3. Development of the Telecom Regulatory and Policy Environment

The Telecom Regulatory and Policy Environment study for Sri Lanka is based on the combined results of the 2008 TRE survey, on telecom indicator data from NSOs, telecom operators and the TRC and on key developments in the telecom regulatory and policy space in Sri Lanka in the period May 2007- May 2008. The principal research questions that this study aims to address are: how has the regulatory and policy environment pertaining to the telecom sector in Sri Lanka evolved over time; how has the telecom sector performed over time (as per the indicator data); to what extent is the performance of the telecom sector a result of regulatory and policy events; what do the results of the 2008 TRE survey point to with regard to the efficacy of regulatory and policy decisions in the fixed, mobile and broadband sectors; and what policy conclusions and recommendations can we draw from the results of this survey.

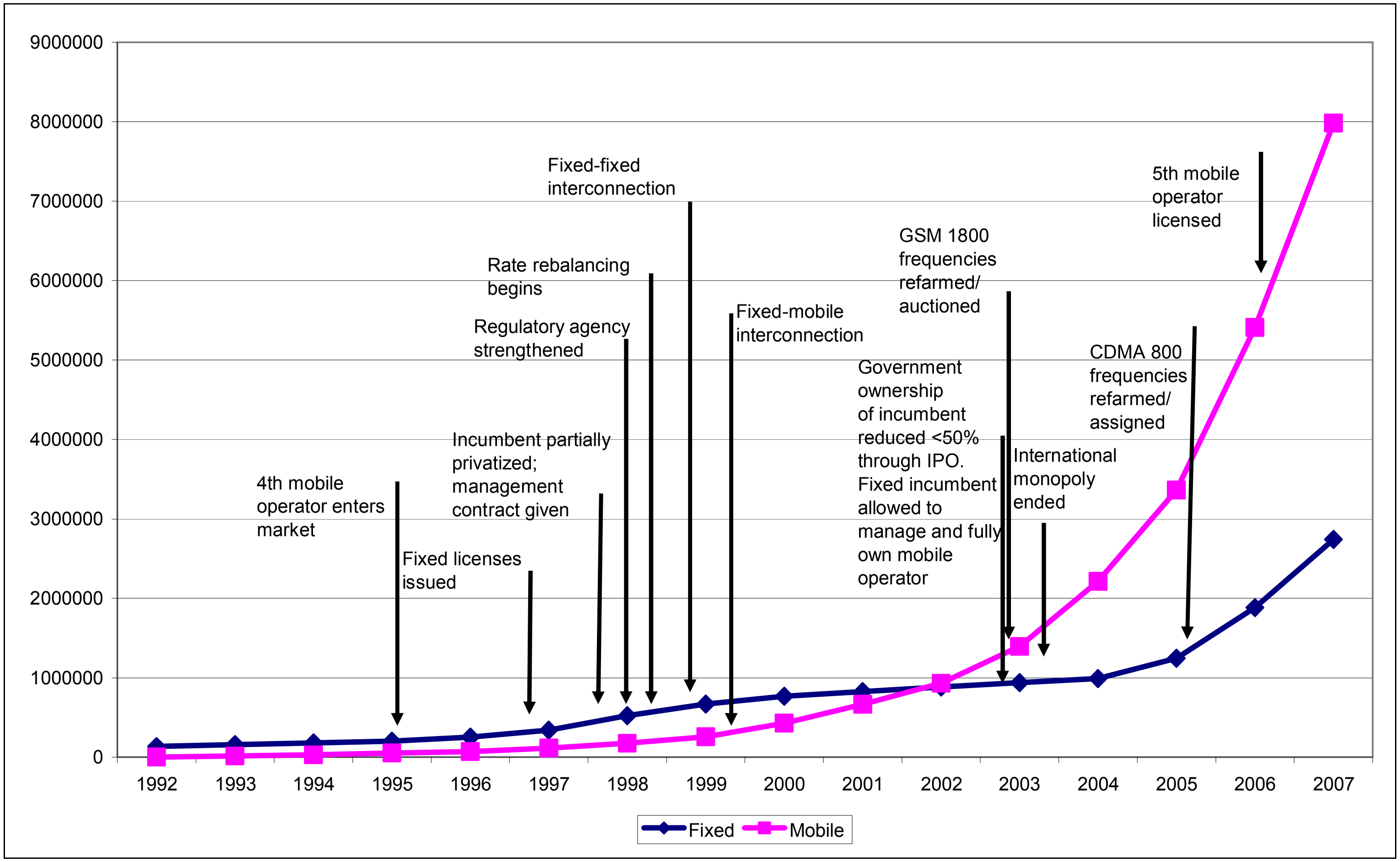
This section of the report focuses on the development of the regulatory and policy environment in Sri Lanka as shown in Table 2 and in Figure 1- picking on key events from 1980 (the year that marked the inception of telecom reform in Sri Lanka with the de-linking of posts and telecom service provision) to May 2008 – and on the performance of the telecom sector over time using 1996 as "Year One" (t=1), given the occurrence of significant reform and regulatory events such as the entry of the fourth mobile operator Dialog in 1995, the licensing of WLL operators in 1996 that posed a credible threat of contestability to the fixed sector incumbent SLTL, progressive amendments to the telecom regulatory legislation in 1996, and the partial privatization of SLT in 1997. Section 4 of this report analyzes the results of the 2008 TRE survey in an attempt to evaluate the efficacy of telecom policy and regulation in Sri Lanka and its impact on sector performance (based on the perceptions of informed stakeholders); and, to provide policy recommendations contained in Section 5.

Table 2: Key regulatory and policy events: 1980-2008

Year	Regulatory/policy event
1980	De-linking of posts and telecom service provision
1989	1st private operator enters market (Celltel- mobile operator)
1991	Legislation to set up regulatory agency (one-man-authority); Corporatization of incumbent
1994	National Telecom Policy issued by GOSL (covering USOs, cost-based tariffs, QoS etc.)
1996	Licensing of WLL operators (Suntel & Lanka Bell); Amendment to 1991 legislation (5-member Commission- however, Sec to Ministry as *ex-officio* Chair of TRC); (yet another) National Telecom Policy
1997	Incumbent (SLTL) partially privatized (NTT: 35%, GOSL: 61.5%, Employees 3.5%); GOSL commits to not issuing additional licenses for international telephony until August 2002; Sri Lanka makes WTO commitments
1998-1999	Fixed telephony interconnection determination issued by TRC; SLTL appeals determination in courts – fails to stay it (1999); 1st stage of tariff rebalancing commences (5 stage rebalancing exercise); TRC issues and implements fixed:mobile interconnection determination; Beginning of court cases w.r.t. interconnection
2002	SLTL acquires balance 60% shares of Mobitel, making it the sole owner of the mobile operator; SLT shares traded on the CSE (and subsequent re-mix of shares as: NTT 35.2%, Public 11.8%, Employees 3.5%; GOSL 49.5%);All court cases except one withdrawn
2003	Exclusivity on international telephony ends with issuance of EGO licenses (for a fee of USD 50,000); Interconnection Rules gazetted; First assignment by auction of 1800 GSM frequencies; Final tariff rebalancing implemented (a year late); ADSL broadband services launched by SLTL
2004	VSNL (a subsidiary of India's USD 29 billion Tata Group) that obtained an EGO license in 2003, commences operations in the international wholesale voice and data markets; TRC decision on the implementation of CPP was reversed by the *ex-officio* Chair of the Commission just hours before a news conference to announce a shift from RPP to CPP (the alleged reason given by the Chair was the political ramifications of the decision just before an election); Public hearing was held on the decision , the public hearing committee counted the number of pro and con submissions and concluded that the public was against CPP (although evidence pointed to the fact that the con submissions were orchestrated by a union)
2005	CDMA frequencies assigned; Court case between seven operators and ICTA with regard to alleged exclusivity clauses in regional telecom network licenses; Consumer lobby takes TRC and SLTL to court over 5th (final) tariff re-balancing exercise
2006	Sri Lanka's 1st commercial 3G mobile license issued; SLT foreign currency debt outlook revised from stable to negative by Fitch Ratings; TRC issues call for 5th mobile operator
2007	TRC issued license to a fifth mobile operator Bharti Airtel.; Mobile subs levy of 10 % of every bill imposed on mobile users; WiMax broadband services launched by Dialog
2008	Mobile subs levy extended to non-mobile wireless phones (CDMA); Malaysia's Usaha Tegas (UT) group bought over NTT's shares in SLTL (35.2%), GOSL shares in SLTL reduced to 49.5% with the balance 15.3% shares being owned by SLTL employees and the public; VSNL, which has 30% of Sri Lanka's outgoing voice traffic, rebrands itself as Tata Communications (Lanka) in a corporate strategy aimed at expanding its international service portfolio – in particular to leverage the Tata Global Network (one of the most advanced submarine and IP networks) to meet the country's demand for converged IP solutions; Lanka Bell invests Rs.3 billion to link to the 65,000 km FLAG undersea global fiber optic network owned by India's Reliance group.

Source: Complied using information from the TRC and from key stakeholders in the telecom sector.

Figure 1: Linking key regulatory and policy events to subscriber growth in the fixed and mobile sectors (1992-2007)



Source: TRC and industry information gathered from key stakeholders in the telecom sector.

3.1 Sri Lanka's Telecom Sector: A Macroeconomic Perspective

Sri Lanka's telecom sector has evolved over time to become one of the foremost drivers of economic growth in the country. According to data from the Central Bank of Sri Lanka, the telecom sector contributed 2.37 percent to GDP in 2004 with this figure increasing up to 3.04 percent in 2007.[1] Mid-year economic performance indicators for 2008 released by the Department of Census and Statistics also show that the telecom and posts sub-sectors grew at 23.2 percent in the second quarter of 2008 as against 21 percent in the corresponding period of 2007[2]; it is reasonable to assume that this growth momentum comes largely from the telecom – as opposed to the posts sub-sector – given the operating losses of Rs. 3,797 million reported by the Department of Posts in 2007 (Central Bank of Sri Lanka, 2007).

Moreover, as shown in Table 3, numbers cited in the Fiscal Management Reports of 2007 and 2008 -issued under the Fiscal Management (Responsibility) Act No. 3 of 2003 – further indicates that the telecom sector is one of the largest contributors to government revenues relative to other state-owned profit-making institutions.

Table 3: Telecom sector contributions to government revenue

Entity	**Contributed amount (LKR Millions)**		
	2005 (actuals)	**2007 (actuals)**	**2008 (projected)**
TRC	1,150	3,500	4,500
SLTL	449	1,000	2,000
Bank of Ceylon	1,150	1,673	1,846
People's Bank	818	1,368	1,316
National Savings Bank	1,310	1,310	1,560

Source: Ministry of Finance and Planning, Sri Lanka

[1] Central Bank of Sri Lanka, *Annual Reports,* various years.

[2] See http://www.statistics.gov.lk.

Reliable data on the quantum of investment flows that can be attributed to the telecom sector is not available in Sri Lanka, given that this information is not published by the NSOs or the TRC. However, statements made by the country's investment promotion office, the Board of Investment, suggest that the telecom sector accounted for most of the USD 425 million FDI flows in the first six months of 2008. [3]

The direct benefits that the telecom sector has on the public are illustrated in Figure 2 – which shows an increase in the number of subscribers both in the fixed and in the mobile sectors from 1992-2007. The growth in mobile sector subscribers shown in Figure 2 moreover, underestimates the actual figures to some degree as it is based on the number of SIM cards issued and does not capture usage patterns such as shared access. Positive trends in the telecom sector are also reflected in the reduction in regional (Provincial) disparities in access to services and in affordability – the lower cost of getting connected.

According to the Central Bank's Consumer and Finance Survey 2003-2004, whilst the Western Province had the largest number of households with telephones (44% in 2001 and 45.5 % in 2004), household access to telephones in hitherto neglected Provinces such as the Northern Province, Eastern Province, North Central Province, and the North Western Province increased from 3.5% to 19.5%; 9.5% to 14%; 7% to 14%; and from 9% to 23%, respectively in just three years between 2001-2004. (See Annex 3, 4 and 5 for a tabulation of district-wise fixed phones distribution as at December 2007; and, Dialog 3G and broadband coverage maps, respectively). Research conducted by (Zainudeen et al., 2007) further indicates that 41 percent of the poorest households – at the BOP – have telephones in their households; the CFS of 2003-2004 showed that 25 percent of all households in Sri Lanka (excluding the Killinochchi, Mannar and Mullaitivu districts) had either a fixed, mobile or both types of phones indicating a rapid increase in household connectivity in less than three years.

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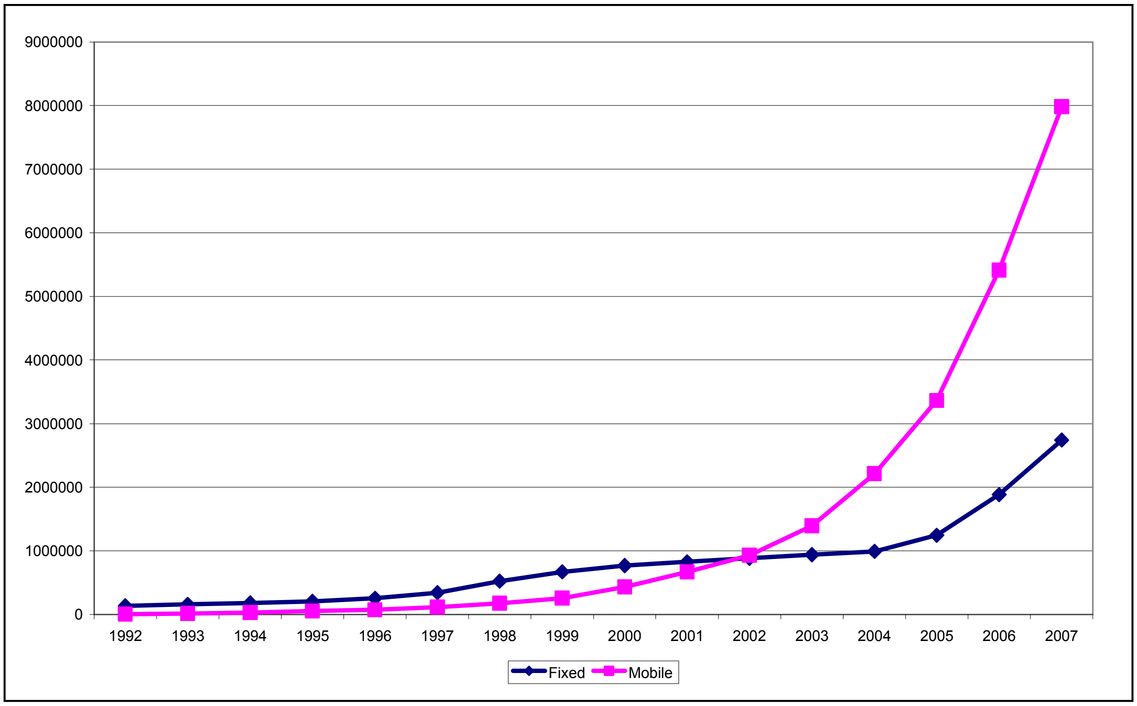
[3] Lanka Business Online. "Tele Domination", August 26th 2008 at: http://www.lankabusinessonline.com/fullstory.php?nid=319076034.

Figure 2: Fixed and mobile telephone growth in Sri Lanka, 1992-2007



Source: TRC

The benefits of liberalization and competition are also reflected in the costs of owning and using a telephone. For instance, international call charges dropped by approximately 70 percent following the ending of SLTL's exclusivity on international telephony services in 2003 (Knight-John, 2007). As at the time of writing moreover, Sri Lanka's second largest fixed access provider, Lanka Bell, has announced that it will pay back subscribers that receive international calls 50 cents for every minute, regardless of country of origin, number of calls received per day or call duration. Whilst company representatives describe this action as one of passing on some of the benefits from its Rs.3 billion investment in the FLAG undersea fiber optic cable network to its users, it is also clear that this move is a competitive strategy aimed at growing Lanka Bell's international telephony market.

Research conducted by LIRNE*asia* benchmarking mobile tariffs in South Asia – using OECD "basket methodology"[4] – also shows that Sri Lanka had relatively low mobile

[4] See http://lirneasia.net/projects/benchmarks.

prices, although not the lowest in the region, as at October 2008. However, recent actions taken by the mobile operators to slash prices on the lines of what could be termed a budget telecom network business model could well see a change in Sri Lanka's ranking in terms of mobile tariffs in the region. The past few months has witnessed a price war in the mobile sector initiated by Mobitel, (Sri Lanka's second largest mobile operator in terms of numbers of active SIMs), followed by Dialog (the dominant mobile operator) announcing a discount package that would extend to its entire customer base of 4.5 million users. More recently in October 2008, Tigo (Sri Lanka's third largest operator in terms of numbers of active SIMs) advertised a new tariff scheme that renders all incoming calls free, effectively ending the RPP regime in Sri Lanka. Given that the regulator has, since 1999, failed to put CPP in place for various rather dubious reasons – these actions by the operators are further evidence of solutions derived by the market in spite of bad regulation.

The results of a benchmarking exercise on broadband prices in South Asia, conducted by LIRNE*asia* in October 2008, show that Sri Lanka had the lowest prices for a 2MB broadband business connection and relatively low prices for a 256kbps broadband residential connection.[5] However, the benefits of lower costs are offset to some extent by the quality of broadband service in the country, with users actually getting less than the advertised download speeds they pay for.[6] As illustrated in Figure 3 moreover, the number of broadband subscribers lags behind internet subscribers, with dial-up being the more widespread mode of connecting to the internet.

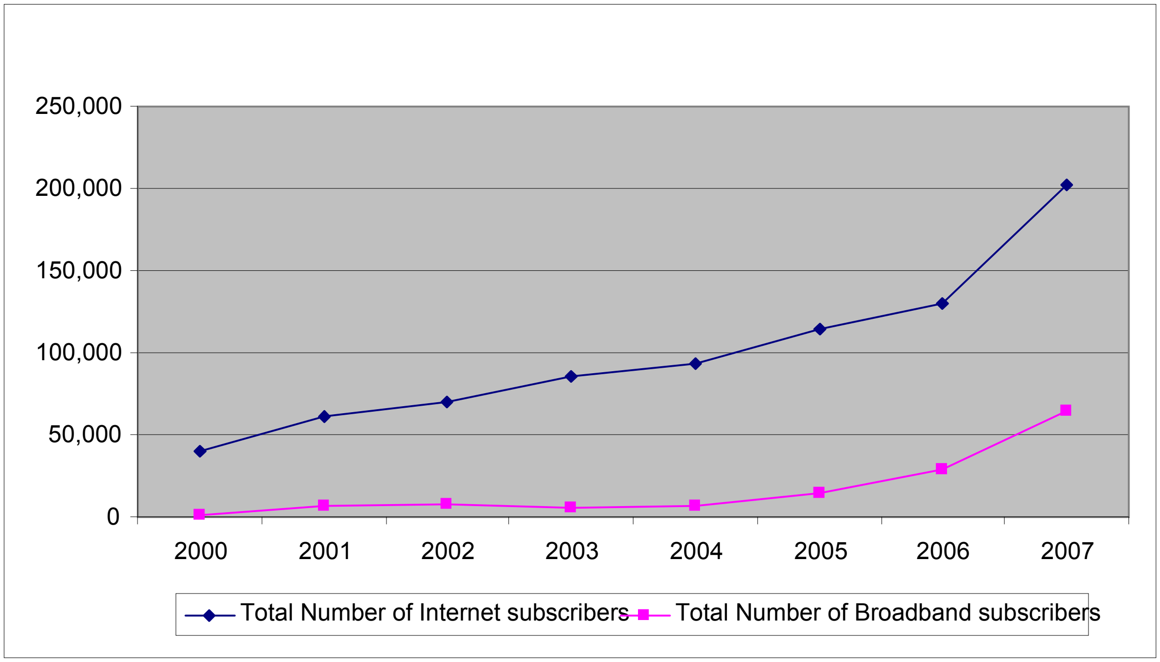
Currently, SLTL has a legal monopoly on the provision of ADSL services. However, there is some degree of competition in the market with operators providing broadband services using wireless technologies – for instance Lanka Bell and Dialog (WiMax) and Mobitel (3.5 G) A comparison of Figures 2 and 3 suggest that there is significant potential for growing the broadband market with Sri Lanka having only 200,000 internet subscribers compared to eight million mobile subscribers as at December 2007; the gap

5 See http://lirneasia.net/projects/benchmarks.

6 See http://lirneasia.net/2006/05/100000-adsl-connections-how-about-speed.

in the trend lines between internet and broadband subscribers illustrated in Figure 3 also indicates the presence of a huge untapped consumer base.

Figure 3: Internet and broadband subscribers 1995-2007



Source: TRC

3.2 Sri Lanka's Telecom Sector: Market Dynamics

A snapshot of the telecom sector in terms of the numbers and categories of operators as at December 2007 is shown in Table 4 below. The discrepancy between the reported number of licenses issued by the TRC and the actual number of active operators is a reflection, at least in two instances, of bad regulatory practice. First, the fact that Bharti Airtel is still not operational as at the time of writing despite the fact that it was issued a license in April 2007 does not send out positive signals to the investment community - particularly with the company issuing media statements to the effect that its entry into the Sri Lankan market is being blocked by a discriminatory stance adopted by the existing mobile operators in terms of interconnection. On the other hand, the issuance of the Airtel license for USD 4 million in itself did not adhere to Sri Lanka's procedural commitment to the GATS Reference Paper on the public availability of licensing criteria. Second, whilst 32 EGO licenses were issued at a fee of USD 50,000, only 19 of the licensed operators are in operation due to interconnection issues with the PSTN operators, with the TRC failing to implement the Interconnection Rules gazetted in March 2003 (Samarajiva, 2007).

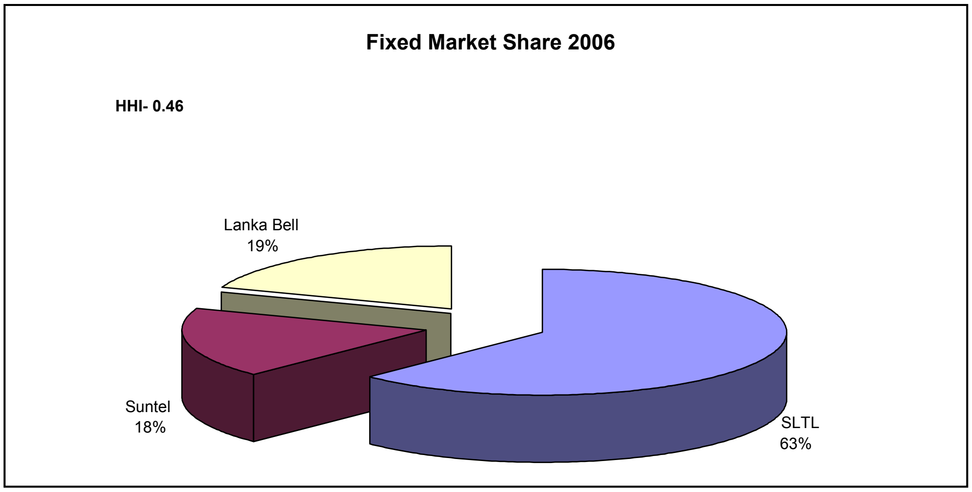
Table 4: A snapshot of Sri Lanka's telecom sector as at December 2007

Category of service	Number of licenses	Notes
Fixed telephony	4	SLTL, Lanka Bell, Suntel and Dialog CDMA
Mobile telephony	5	Dialog, Mobitel, Hutch, Tigo and Bharti Airtel (However Airtel is not operational in the market as at the time of writing despite the issuing of license in April 2007)
Data communication services (facilities based)	6	
Data communications services (non-facilities based) & ISPs	24	Only 19 are operational
Trunked mobile radio network services	2	
Leased line services	1	Dialog Broadband Network
Public payphone services	1	
EGOs	32	Only 19 are operational
Direct-to-home satellite broadcasting service	1	Dialog TV
Cable TV distribution network	1	Lanka Broadband Networks

Source: TRC

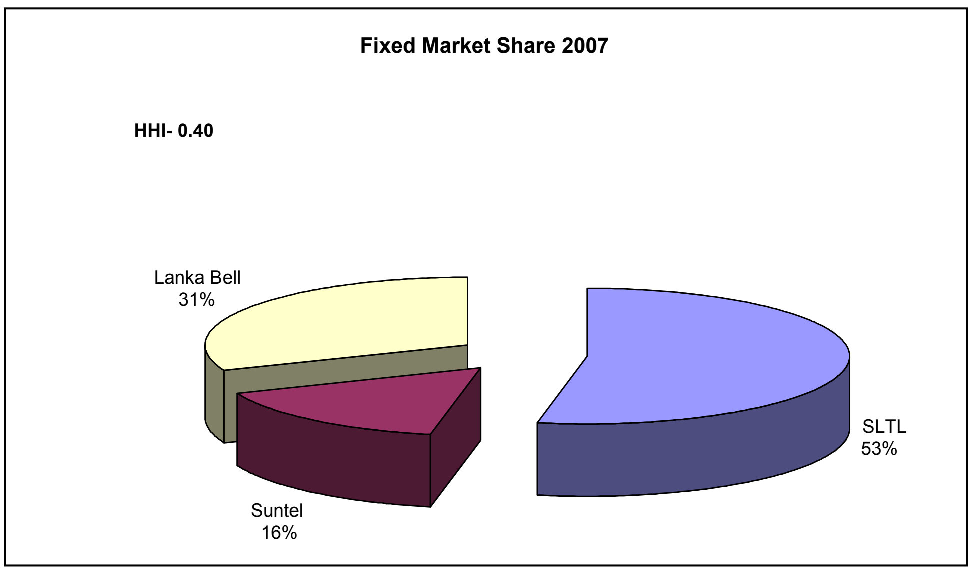
Figure 4 below shows fixed and mobile market shares and concentration ratios for the years 2006 and 2007. The picture that emerges from this calculation is that Lanka Bell has captured significant market share between 2006 and 2007; that the mobile sector is less concentrated than the fixed sector; and, that the level of concentration in the mobile sector has dropped between 2006 and 2007.

Figure 4: Fixed and mobile sector market shares: 2006 and 2007



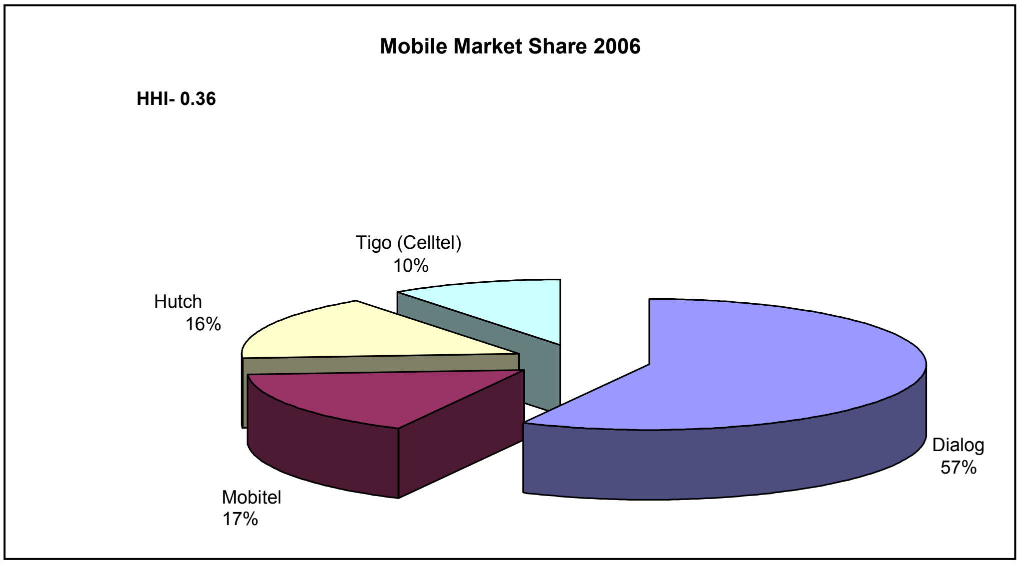
Note: Calculated based on subscriber numbers.

Source: Industry sources.

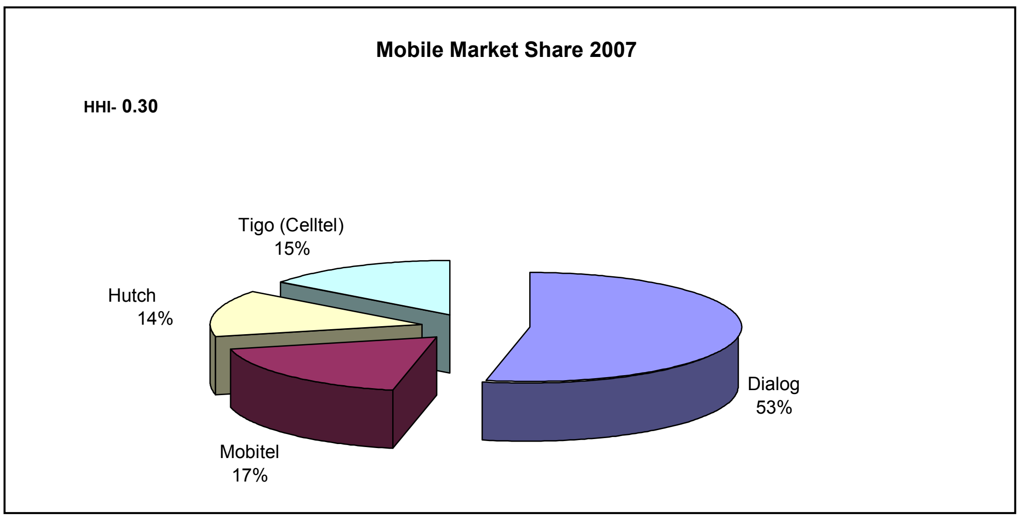


Note: Calculated based on subscriber numbers.

Source: Industry sources.



Note: Calculated based on subscriber numbers.
Source: Industry sources.



Note: Calculated based on subscriber numbers.
Source: Industry sources.

The development of Sri Lanka's telecom sector from one where it was a drain on public resources to one that is now one of the most important sub-sectors of the economy can be attributed to three key factors. First, early, pro-competitive reforms beginning in 1980 and continuing up to about the mid-late 1990s gave Sri Lanka an edge in terms of telecom sector performance – for instance, the outcome of the threat of contestability from the WLL operators from 1995 and the partial privatization of SLTL in 1997 is shown in fixed growth trends in Figure 1. Admittedly there were **isolated instances of sensible regulatory and policy actions** even after the mid-late 1990s such as the assigning of CDMA frequencies to all fixed operators in 2005 – the results of which are reflected in the growth spurt in the fixed sector shown in Figure 1 above. In addition, the growth momentum in both the fixed and mobile sector in the period between 2002-2005 was also a result of new business opportunities following the ceasefire of 2001 and the opening up of the Northern Province. Figure 1 also points to a steady upward growth trend line in the mobile sector in comparison to the fixed sector – again a reflection of the higher level of competition in the mobile sector (as is also seen in the mobile sector concentration ratios in Figure 4 above.)

Second, the liberalization of the sector facilitated the permeation of global technological practices– even bypassing obtuse regulations such as the previous ban on the use of VOIP by the TRC -with significant benefits to users; and third, competition amongst the sector operators has improved access and affordability– **in spite of bad regulation** such as the imposition of taxes on mobile phone users in September 2007, on CDMA phone users in April 2008 and more recently on fixed line users in the Budget proposals for 2009. Whilst it can be argued that progress has been made on the policy front by making the telecom tax technology neutral, the question remains as to the long-term rationality of taxing a sector that as pointed out in Table 3 above is already amongst the top contributors to the Treasury.

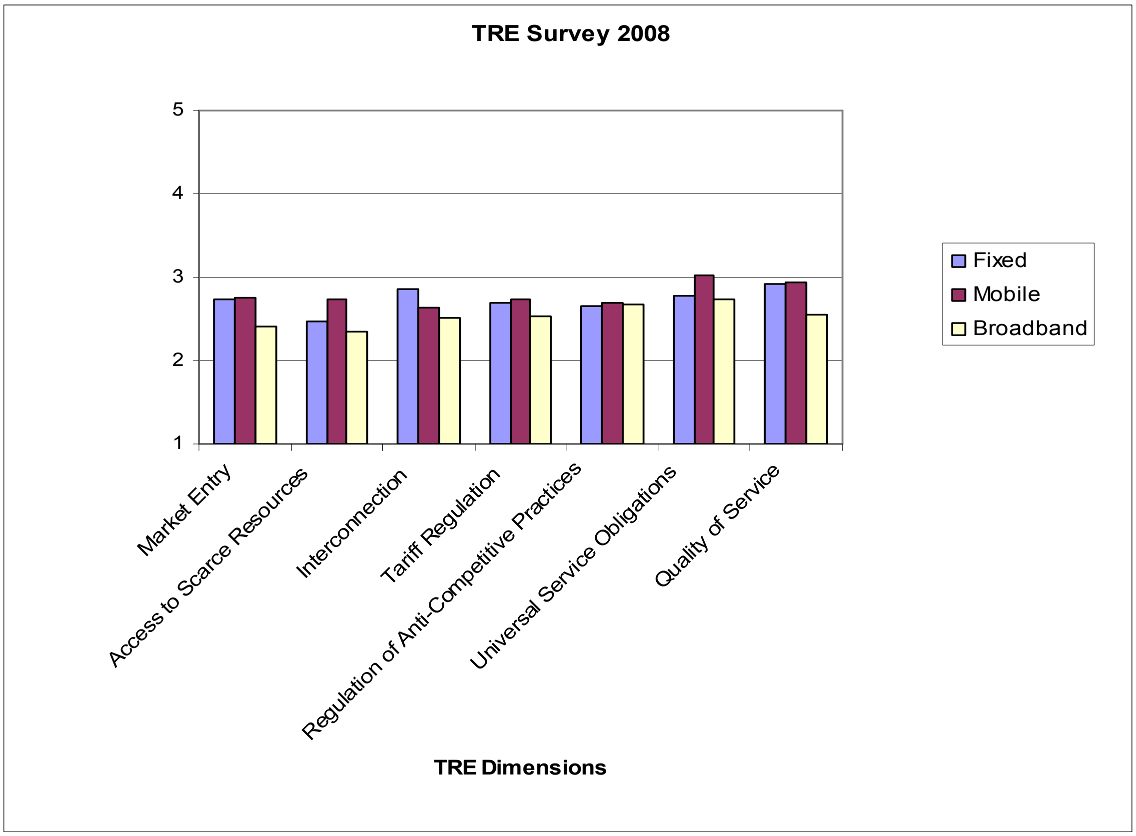
The imposition of telecom-specific taxes combined with the tripling of spectrum charges and macroeconomic factors such as rising inflation and high interest rates appear to already have had an impact on players such as Dialog – which has reported a loss of 192.4 million rupees for the September 2008 quarter, largely due to hemorrhages in its pay TV segment; and, Hutch – which has also reported a fall in profits and revenue growth. Moreover, research by LIRNE*asia* – (see for instance, de Silva and Zainudeen, 2008) shows that access to telecom services have a significant impact on users at the

BOP; in the event that telecom taxes impact on affordability it is these poorest users that will be affected the most.

4. Results and Analysis of the TRE Survey for Sri Lanka

4.1 Overall Scores

Figure 5: Overall TRE scores for 2008



The results of the 2008 TRE survey, as depicted in Figure 5, show that the mobile sector receives higher scores than the fixed sector for all dimensions excepting interconnection. In addition, the broadband sector lags behind both the fixed and mobile sectors in all but one of the parameters (regulation of anti-competitive practices). What also emerges in the results illustrated above is that all the sectors – other than mobile sector USOs – fall below the 3.00 average performance level.

Table 5 below compares the average scores for each parameter for the fixed and mobile sectors coming out of the TRE survey for 2008 with those of the 2006 survey. Given that

QoS was not included as a parameter in the 2006 questionnaire, this dimension is not included in the comparison set out below; the broadband sub-sector that was not a part of the TRE survey for 2006-2007 is also not included in this comparison. The key facts that emerge from the comparison contained in Table 5 is that overall TRE scores have improved marginally in both the fixed and mobile sectors between the 2005-2006 period and the 2007-2007 period; scores for market entry in the mobile sector have dropped from 3.1 to 2.8; scores for fixed sector interconnection have increased from 2.3 to 2.9; and, scores for USOs in both sectors have recorded increases.

Table 5: Comparing the average TRE scores for 2005-2006 and 2007-2008

TRE parameter	Fixed		Mobile	
	2005-2006	**2007-2008**	**2005-2006**	**2007-2008**
Market entry	2.7	2.7	3.1	2.8
Access to scarce resources	2.5	2.5	2.8	2.7
Interconnection	2.3	2.9	2.4	2.6
Tariff regulation	2.7	2.7	2.9	2.7
Anti-competitive practices	2.4	2.7	2.6	2.7
USOs	2.5	2.8	2.6	3.0
Overall	**2.5**	**2.7**	**2.7**	**2.8**

These scores are analyzed in detail – in the context of the policy and regulatory developments and market dynamics in the telecom sector highlighted in Section 3 – in the rest of this Section.

4.2 Market Entry

The TRE questionnaire for 2008 (contained in Annex 2), defines the scope of market entry largely in terms of the transparency of licensing and licensing conditions. As illustrated in Figure 6, the scores for all three sectors – fixed, mobile and broadband – indicate below average performance. What is more interesting however is the picture that emerges in Figure 7 – which compares market entry scores for 2006 and 2008 – indicating a significant drop in the scores pertaining to the mobile sector (3.1 to 2.8).

Figure 6: TRE scores for market entry: 2008

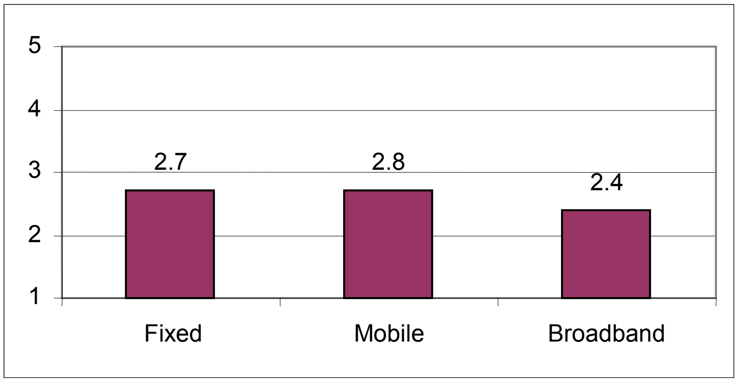
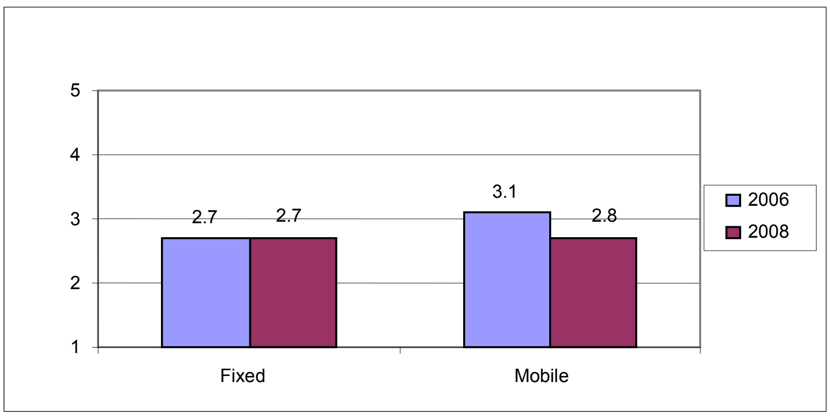


Figure 7: TRE scores for market entry: 2006 vs. 2008



We argue that the drop in mobile sector TRE scores between 2006 and 2008 is a result of specific regulatory actions described in Table 2 above. First, the non-transparent process by which the USD 4 million Bharti Airtel license was issued by the TRC in 2007, contrary to Sri Lanka's commitment to the GATS Reference Paper that specifies the public availability of licensing criteria. Second, the questionable manner in which WiMax licenses were issued in 2007, with the terms and conditions of individual licenses (including the specific reasons for denial of a license) not being made publicly available. For instance, whilst Dialog obtained a WiMax license in 2007, SLTL announced in May 2008 that it had decided to purchase stakes in Sky Network – a unit of UK's Lycatel group, to expand its broadband service network, due to inordinate delays (without specific reasons being cited) in obtaining a WiMax license from the TRC.

4.3 Access to scarce resources

An analysis of the TRE questionnaire responses that we received suggests that a majority of the respondents perceived access to scarce resources in terms of spectrum/frequency allocation and rights of way. As shown in Figure 8, all three sub-sectors show dismal performance in this category – as also indicated in Table 5 above, the 2008 TRE scores for scarce resources in the fixed sector is the lowest amongst the seven parameters.

Figure 8: TRE scores for scarce resources: 2008

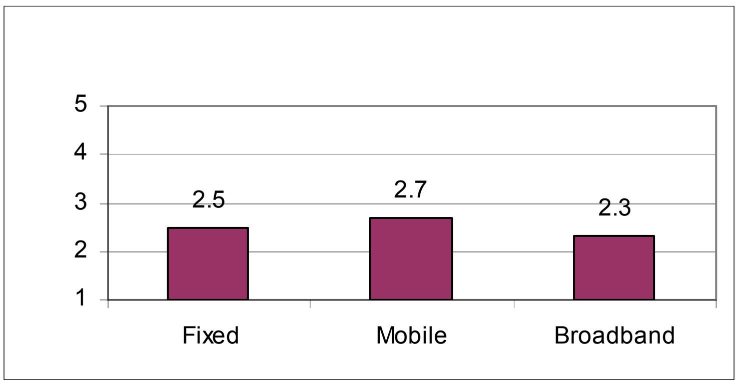
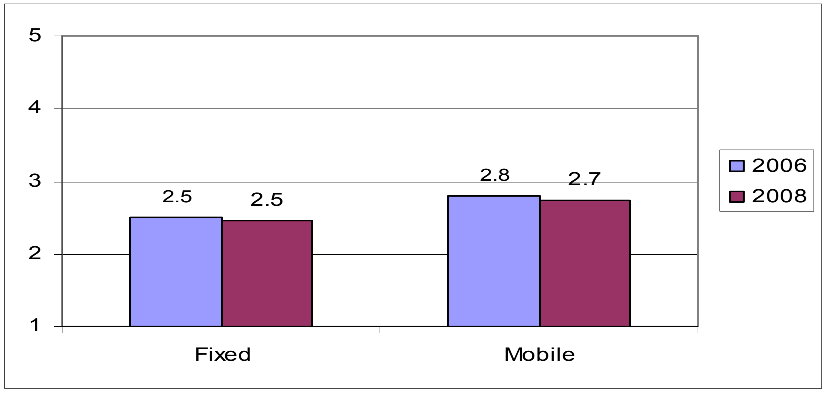


Figure 9: TRE scores for access to scarce resources: 2006 vs. 2008



As per Sri Lanka's commitment to the GATS Reference Paper, procedures for the allocation and use of scarce resources such as frequencies and rights of way have to be carried out in an **objective, timely, transparent and non-discriminatory manner**. However, these procedures still remain opaque in Sri Lanka; relatively simple exercises such as updating the Master Frequency Register published by TRC in 2003 are neglected – for instance, the CDMA frequency allocations of 2005 are not recorded in this Register even at the time of writing. Moreover spectrum allocation and refarming is done administratively on a relatively *ad hoc* basis - as opposed to a more transparent and methodical approach such as auctions (the one exception was the assignment of the 1800 GSM frequencies in 2003).

A key issue in terms of rights of way that may well explain the low TRE scores for the access to scarce resources parameter, is the fact that SLTL has exclusive access to the nation-wide optic fiber network (see Annex 6). As at the time of writing, there has been no regulatory or policy initiative to derive a cost-effective solution for other operators to access this backbone; infrastructure sharing is not mandated by the TRC. An example of market solutions that bypass regulatory inaction is reflected in the case of the Lanka Bell purchase of the FLAG global undersea cable – which effectively ended SLTL's exclusive hold in this segment.

4.4 Interconnection

The key elements contained in the TRE survey questionnaire on interconnection included the following: interconnection with a major operator being ensured at any technically feasible point in the network; quality of interconnection comparable to similar services offered by own network; and, reasonable rates for interconnection. The TRE scores for 2008 shown in Figure 10 indicate that all three sub-sectors perform below average in terms of this parameter – although fixed sector scores are relatively higher than those of the other two sectors. A comparison of the two survey periods in Figure 11 below indicates that both the fixed and the mobile sectors score higher in 2008 in comparison to 2006.

Figure 10: TRE scores for interconnection: 2008

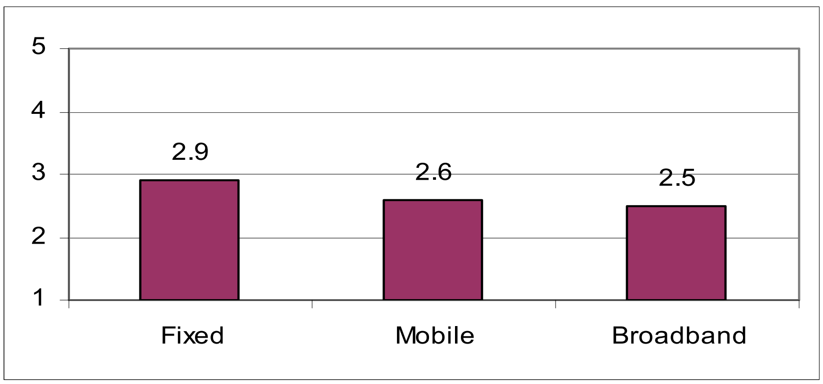
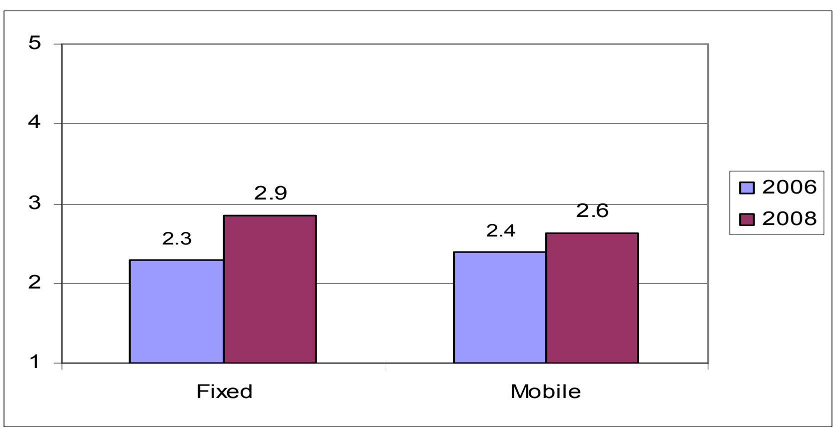


Figure 11: TRE scores for interconnection: 2006 vs. 2008



The relatively lower scores for mobile sector interconnection in 2008 is possibly a reflection of the interconnection imbroglio surrounding the entry of Bharti Airtel, with this fifth mobile operator issuing press statements to the effect that its entry into the market was blocked by the fact that all existing operators (with the exception of SLTL) had not responded to its request for interconnection in August 2007. More recent market information from stakeholders in the market, indicate that Bharti Airtel has reached an agreement with Lanka Bell to use its previous allocated numbers (beginning with the prefix 075) and is set to launch formal operations in March 2009. (However, these recent developments are obviously not reflected in the TRE results for 2008.)

More generally, interconnection remains a significant problem in the telecom sector despite the gazetting of Interconnection Rules in March 2003 in line with commitments to the GATS Reference Paper (Dharmawardena, 2004). The TRC has failed to implement these Rules effectively – as seen in for instance in the interconnection issues faced by the EGOs highlighted in Table 2 above; in the Bharti Airtel case; and, in the discriminatory stance with respect to interconnection rates – with mobile operators providing free termination services to fixed operators (cross-subsidizing these from origination services) and fixed operators effectively getting a free ride on mobile networks (paying termination fees only to other fixed operators and not to mobile operators).

This informal free-riding arrangement between the fixed operators could perhaps be the reason for the higher 2008 TRE scores that this sector shows in comparison to the mobile sector. However, the improved scores for both sectors between the two survey periods remains puzzling – and does run contrary to (bad/ineffective) policy and regulatory actions on interconnection.

4.5 Tariff Regulation

The TRE survey questionnaire defined this parameter as the regulation of tariffs charged from consumers. As per Section 5 (C) of Sri Lanka Telecommunications Act No. 25 of 1991, as amended by the Sri Lanka Telecommunications (Amendment) Act No. 27 of 1996, the **TRC has the powers to advise the GOSL on matters relating to telecommunications including policies on tariffs, pricing and subsidies**.

Figure 12: TRE scores for tariff regulation: 2008

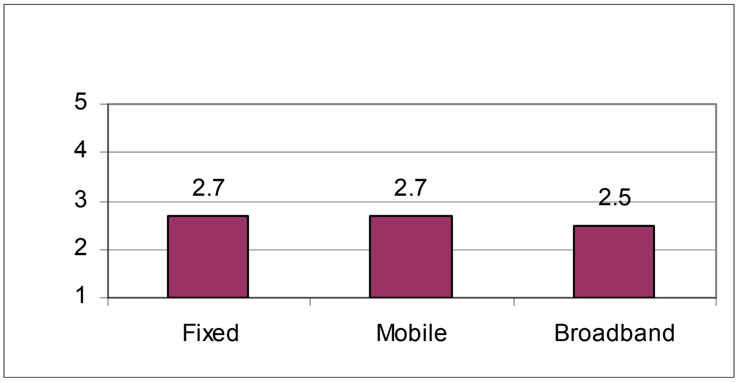


Figure 12 illustrates that there is no discrepancy between the 2008 TRE scores for the fixed and mobile sectors; however, the broadband sector shows much lower scores. The low scores for the broadband sector pose a conundrum – particularly given the data released by LIRNE*asia* and set out in Section 3 above indicating that Sri Lanka's broadband prices are amongst the lowest in the South Asian region.

Figure 13: TRE scores for tariff regulation: 2006 vs. 2008

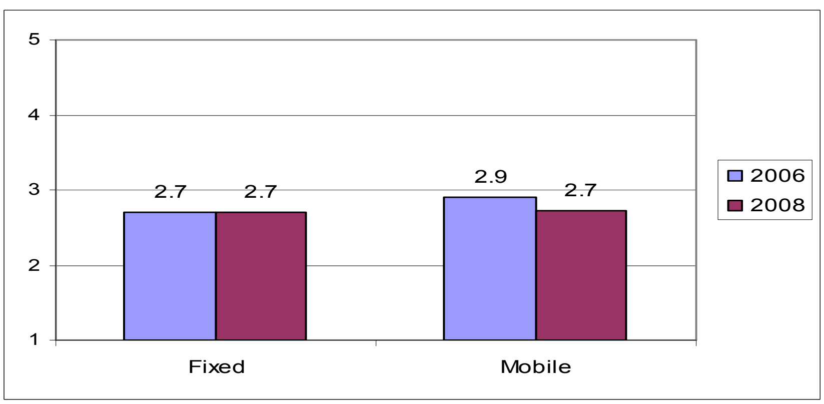


Figure 13 shows a comparison of TRE scores with respect to tariff regulation between the two survey periods. What is somewhat puzzling, is the drop in the TRE scores for mobile sector tariff regulation between 2006 and 2008 – particularly, in the context of the dropping of prices by Mobitel followed by Dialog and Tigo's action to make all incoming calls free.

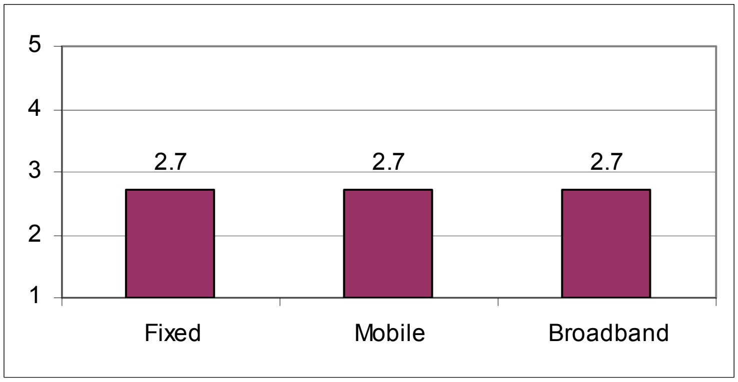
As per our interviews with industry stakeholders, the TRC does not in general intervene in the tariff packages and pricing strategies adopted by mobile operators (although it has the authority to advise the GOSL on tariffs as per the law). It is highly unlikely that this hand-off approach adopted by the TRC, which has largely been the practice in any case in the past with respect to the mobile sector, has any bearing on the lower 2008 TRE scores for mobile tariff regulation – implying a gap between regulatory and policy actions and the TRE data.

Even if market dynamics – as opposed to regulatory and policy actions – were to explain the TRE scores for this parameter, the dropping of prices in the mobile sector in 2008 would indicate a higher score between the two survey periods. As such, our analysis in the case of this parameter can only conclude that no meaningful explanation can be derived with respect to the fall in mobile sector TRE scores for this parameter either in terms of regulatory and policy actions or in the context of market dynamics.

4.6 Regulation of anti-competitive practices

The TRE questionnaire used for this survey included elements such as anti-competitive cross-subsidization, excessive prices, price discrimination and predatory pricing, refusal to deal with other operators and the sharing of towers and facilities by a parent company and subsidiaries in different segments of the market. The TRE scores for 2008 shown in Figure 14 below indicate below average performance in all three sectors. A possible reason for the below average performance – **which is reflected in the telecom environment for anti-competitive practices per se** - could well be the much publicized Airtel story where as mentioned above, most of the operators did not respond to this company's request for interconnection.

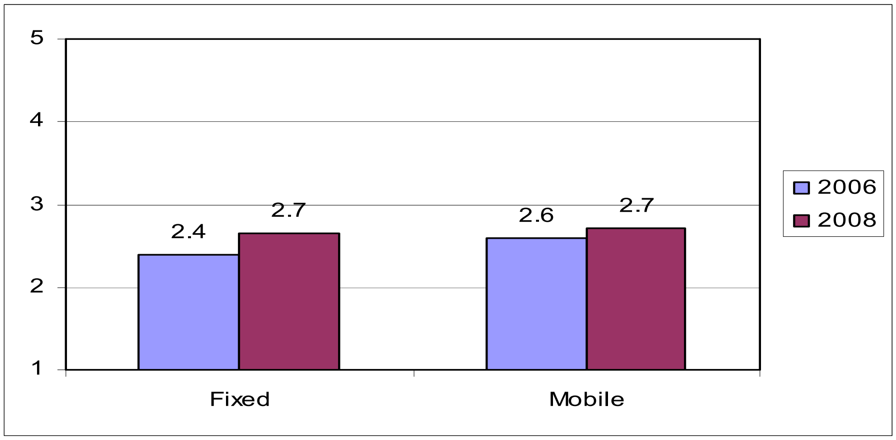
Figure 14: TRE scores for anti-competitive practices: 2008



Although the price war in the mobile sector is not an instance of predatory pricing as per the standard economic definition that describes this strategy as one carried out by a dominant firm to drive competitors out of the market by setting prices below average variable costs with the intention of raising prices and earning profits at a later time period once competitors have been driven out of the market or deterred from entering the market, comments from respondents did suggest that the price war (**which <u>we see</u> as an exercise of competition**) was viewed by several stakeholders as anti-competitive behavior.

Interestingly, the comparative scores for 2006 and 2008 shown in Figure 15 below indicate an improvement in both the fixed and the mobile sectors in terms of anti-competitive practices. Apparently, practices such as the sharing of facilities and cross-subsidization (although admittedly not definitively proven due to data gaps both at the TRC and in the figures published in the Company Annual Reports) in the SLTL group (SLTL and Mobitel) and the Dialog group (Dialog Telekom, Dialog Broadband, Asset Media) are not captured in stakeholder perceptions.

Figure 15: TRE scores for anti-competitive practices: 2006 vs. 2008



4.7 USOs

The key element defining the regulation of USOs as per the TRE questionnaire was the administration of the USO fund in a transparent, non-discriminatory and competitively neutral manner. As illustrated in Figures 16 and 17 and as is pointed out in Table 5 above, this category performs relatively well in all three sectors, with mobile sector scores recording above average performance in 2008 and both the fixed and mobile sectors showing improved scores between the two survey periods.

Figure 16: TRE scores for USOs : 2008

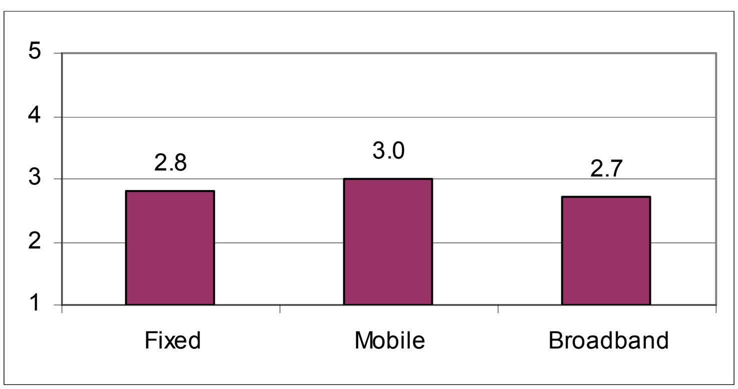


Figure 17: TRE scores for USOs: 2006 vs. 2008

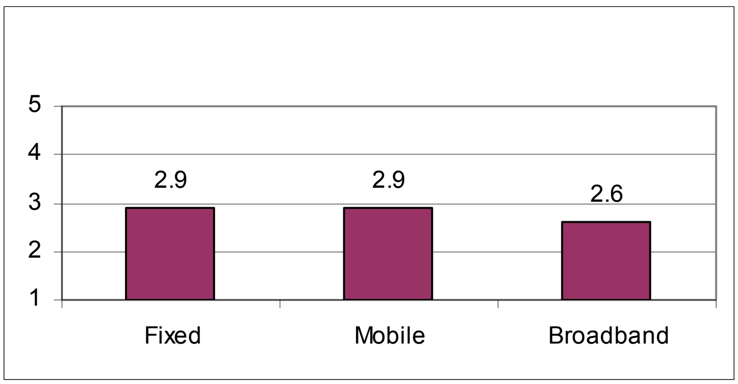
Whilst USOs were defined in the context of the administration of the USO fund in the TRE questionnaire, an analysis of the survey responses suggests that respondents answered this question in the context of access to services. Given the growth and expansion of telecom sector services described in Section 3 above therefore, the high TRE scores for USOs do not come as a surprise.

What is worrisome in this regard however, is the fact that a majority of the respondents – despite being informed stakeholders – were not aware of the details of Sri Lanka's USO fund. The practice in Sri Lanka since 2003, as gazetted by the GOSL, has been to use levies on international calls for the USO fund; a third of the income earned from a 1 minute international call (0.9 USD) is to be allocated for the fund. In view of the fact that this fund has been in place since 2003 and that the number of international traffic minutes has grown enormously since then, the fund is estimated (by industry analysts that do have information on the fund) to amount to billions of rupees. As per the gazette pertaining to the USO fund, these monies were to be re-distributed amongst operators as they achieved universal service targets set out in their licenses – for instance a particular number of connections in rural locations. As at the time of writing however, the USO fund has not been disbursed - with industry sources citing suspicions that these monies are being utilized for fiscal purposes rather than for the improvement of universal access.

4.8 QoS

The principal feature defining QoS in the survey questionnaire was the actual performance of a service with respect to what is promised. As shown in Figure 18 below, the TRE scores for the fixed and mobile sectors indicate relatively good performance (although marginally below the half-way mark) in this parameter. However, the broadband sector lags behind both the other sectors. We attribute the lower performance in QoS in the broadband sector to the gaps between advertized and actual speeds highlighted in Section 3 above.

Figure 18: TRE scores for QoS: 2008



5. Conclusions and Recommendations

The analysis contained in Sections three and four of this report leads to three key conclusions. First, growth and service expansion in the telecom sector and its evolution over the years to become one of the leading contributors to GDP and government revenue is for the most part a result of competitive actions by operators in spite of bad regulation and policy. Second, developments in the regulatory environment suggest that Sri Lanka has failed to live up to several of its commitments under the GATS Reference Paper – leaving the country open to legal cases with respect to violations of international treaty commitments. Third, from a methodological point of view, the TRE scores – both individually for 2008 and when comparing the 2006 and 2008 numbers – are not entirely reflective of developments in the telecom sector.

However, our research leads us to several key policy recommendations with respect to the telecom sector. First, given that improvements in the sector have largely been a result of competition and liberalization – as argued also in Section 3 above – the TRC needs to follow the basic principles of **regulating only when necessary and regulating for**

competition. Following from this tenet we argue that areas such as tariff regulation and QoS be left to the market forces of consumer choice and revealed preference.

Second, policy makers need to place the effective implementation of the GATS Reference Paper as a top priority in their agenda –a necessary action which has been lacking across successive policy regimes. This includes the following regulatory actions:

- Enforcing transparent licensing procedures
- Moving from an *ad hoc* administration of spectrum to auctions – which are a more transparent means of allocating and refarming frequencies and reducing the opportunities for rents
- Putting in place a cost-effective access sharing mechanism that would enable operators to share essential facilities such as the national backbone infrastructure

Third, Sri Lanka lacks an effective competition regime. Currently, anti-competitive practices in the telecom sector are governed by way of concurrent jurisdiction through two institutions – TRC and CAA. However, in effect, both these entities lack expertise on anti-competitive practices (with CAA for instance, focusing solely in recent months on curbing the prices of essential goods – based on a political agenda linked to the pre-election Budget of 2009). A solution in such instances would be to embed competition rules – such as for instance provisions with respect to the preferential treatment of Mobitel by SLTL with respect to access to essential facilities – in licenses.

Policy recommendations aside – and this applies across the board to all sectors and not merely the telecom sector – Sri Lanka has in general displayed a significant gap between policy rhetoric and actual implementation due to lapses in governance. In the final instance therefore, what actually gets implemented depends on interest group and stakeholder dynamics – and in particular political buy-in at the top levels of government.

6. Acknowledgements

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ANNEXURES

Annex 1: Fact sheet of key events in the telecom regulatory environment in Sri Lanka: May 2007-May 2008

Date	Event
May 2007	The TRC grants permission to 8 PSTN operators to appoint a third party to operate and maintain a public phone booth on a revenue sharing model.
September 2007	A new tax imposed on mobile users by the Finance Ministry. A 10 percent tax on all call charges was introduced in place of a 2.5 percent tax and the Rs. 50 monthly fixed tax was removed.
November 2007	TRC invites telecom operators to submit their requests and suggestions to remove technological limitations and allow them to share network resources to further liberalize the market.
January 2008	Sri Lanka Ministry of Transport gives approval to TRC to select telecom operators to lease the country's 1200 km rail track, after a study jointly conducted by the Ministry of Transport and the TRC.
April 1st 2008	A new tax imposed on CDMA phones by the Finance Ministry. Tax rate increased to 10 percent on call charges from the previous 2.5 percent.
April 4th 2008	TRC invites project proposals from the licensed ISPs to establish their own links for last mile access using wireless technologies operating in the 5.4 GHz and 5.7 GHz bands on a shared basis.
April 4th 2008	TRC publishes a consultation paper on "Planning and Implementation of National Fiber Backbone Network".
May 2008	TRC invites applications from entrepreneurs interested in obtaining a license to provide non-voice telephony services using cable distribution networks and satellite communication networks.

Annex 2: TRE Questionnaire

Questionnaire Number: ………………

Telecom Regulatory Environment for Sri Lanka

You are kindly requested to make your frank assessments of the telecom regulatory environment (TRE) for the year 12 months ending May,2008 for the fixed, mobile and broadband telecom sectors on a five-point scale.

The dimensions used in this questionnaire are broadly based on the WTO Regulatory Reference Paper (GATS Protocol 4) and are briefly described below. A fact-sheet of key events in the Telecom Regulatory Environment is also attached for your reference for the period May 2007– May 2008.

Completing the Questionnaire should take less than 5 minutes of your time. Please email the completed questionnaire to dilani@ips.lk or fax it to 0112431395. If you prefer, you can complete the same survey online.

Dimension	Aspects Covered
Market Entry	Transparency of licensing. Applicants should know the terms, conditions, criteria and length of time needed to reach a decision on their application. License conditions. Exclusivity issues.
Scarce Resources	Timely, transparent and non-discriminatory access to spectrum allocation. Numbering and rights of way: frequency allocation, telephone number allocation, tower location rights.
Interconnection	Interconnection with a major operator should be ensured at any technically feasible point in the network. Quality of interconnection comparable to similar services offered by own network. Reasonable rates for interconnection. Unbundling of interconnection. Interconnection offered without delay. Sharing of incoming and outgoing IDD revenue. Payment for cost of interconnection links and switch interface. Payment for cost of technical disruption of interconnection.
Tariff Regulation	Regulation of tariffs charged from consumers.
Regulation of Anti Competitive Practices	Anti-competitive cross subsidization. Using information obtained from competitors with anti-competitive results. Not making technical information about essential facilities and commercially relevant information available to competitors on a timely basis. Excessive prices. Price discrimination and predatory low pricing. Refusal to deal with operators and other parties. Vertical restraints. Technical disruption of interconnection. Sharing of towers and facilities by parent company and subsidiaries in different segments of the market.
Universal Service Obligation (USO)	Administration of the universal service program/fund in a transparent, non-discriminatory and competitively neutral manner and is not more burdensome than necessary for the kind of universal service defined by the policymakers.
Quality of Service (QoS)	The actual performance of a service with respect to what is promised, depending upon the network traffic control mechanisms. Specific criteria may be call quality (for mobile and fixed), connection speeds or throughput (for broadband)

FIXED SECTOR Telecom Regulatory Environment, for May, 2007 – May, 2008

Please **TICK** the number that best represents the **quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

F
1

Market Entry	**Highly ineffective**				**Highly effective**
	1 ☐	2 ☐	3 ☐	4 ☐	☐

F
2

Access to Scarce Resources	**Highly ineffective**				**Highly effective**
	1 ☐	2 ☐	3 ☐	4 ☐	☐

F
3

Interconnection	**Highly ineffective**				**Highly effective**
	1 ☐	2 ☐	3 ☐	4 ☐	☐

F
4

Tariff Regulation	**Highly ineffective**				**Highly effective**
	1 ☐	2 ☐	3 ☐	4 ☐	☐

F
5

Regulation of Anti-competitive Practices	**Highly ineffective**				**Highly effective**
	1 ☐	2 ☐	3 ☐	4 ☐	☐

F
6

Universal Service Obligation (USO)	Highly ineffective				Highly effective
	1 ☐	2 ☐	3 ☐	4 ☐	☐

F
7

Quality of Service (QoS)	Highly ineffective				Highly effective
	1 ☐	2 ☐	3 ☐	4 ☐	☐

Comments:					
	☐	☐	☐	☐	☐

MOBILE SECTOR Telecom Regulatory Environment, for May, 2007- May, 2008

Please **TICK** the number that best represents the **quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

M1

Market Entry	Highly ineffective				Highly effective
	1 ☐	2 ☐	3 ☐	4 ☐	☐

M2

Access to Scarce Resources	Highly ineffective				Highly effective
	1 ☐	2 ☐	3 ☐	4 ☐	☐

M3

Interconnection	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

M4

Tariff Regulation	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

M5

Regulation of Anti-competitive Practices	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

M6

Universal Service Obligation (USO)	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

M7

Quality of Service (QoS)	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

<u>BROADBAND SECTOR Telecom Regulatory Environment, for May, 2007-May, 2008 (Broadband = greater than 256kbps upload/download)</u>

Please **TICK** the number that best represents **the quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

B
1

Market Entry	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

B
2

Access to Scarce Resources	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

B
3

Interconnection	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

B
4

Tariff Regulation	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

B
5

Regulation of Anti-competitive Practices	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

B
6

Universal Service Obligation (USO)	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

B
7

Quality of Service (QoS)	**Highly ineffective** 1 ☐	2 ☐	3 ☐	4 ☐	**Highly effective** ☐

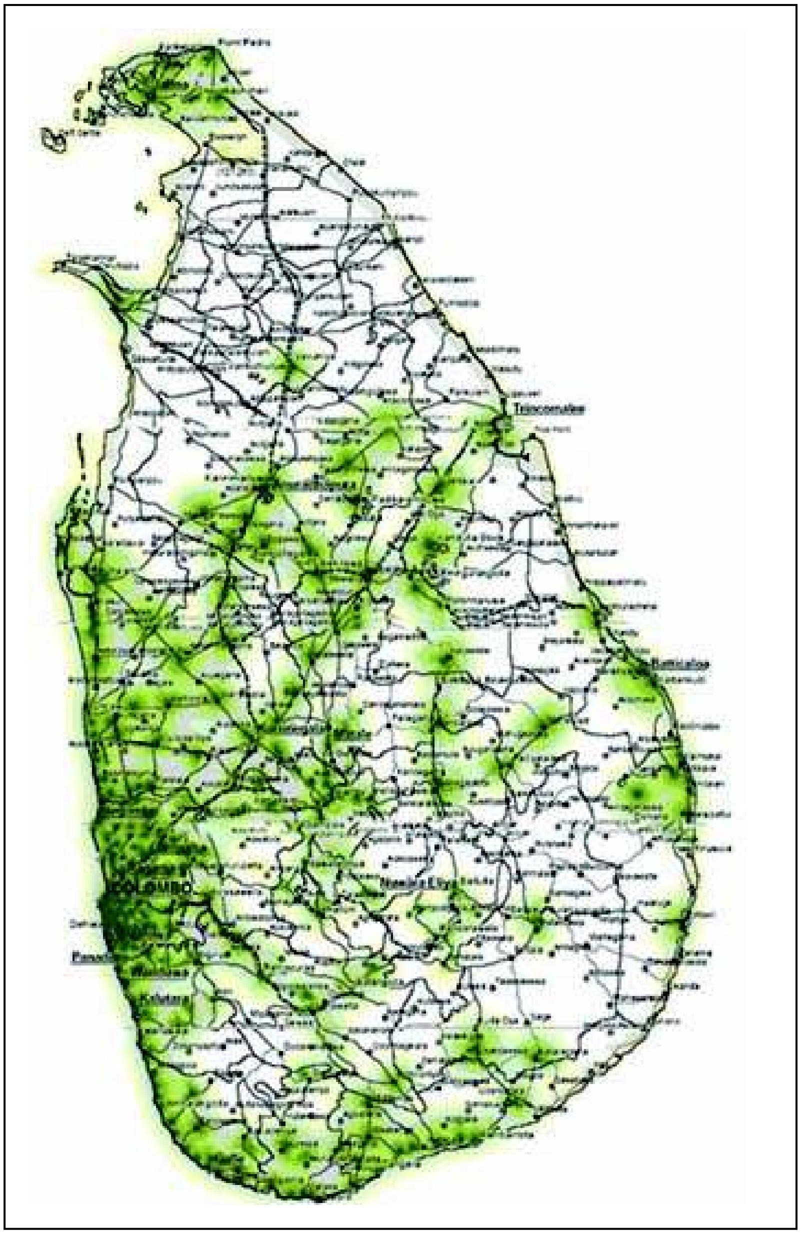
Comments:	☐	☐	☐	☐	☐

Annex 3: District-wise distribution of fixed phones (Non-CDMA and CDMA) as at December 2007

District	Non-CDMA	CDMA
Jaffna	10,367	2,472
Mannar	1,800	4,039
Vavuniya	5,561	11,817
Trincomalee	9,766	20,061
Batticaloa	11,911	21,131
Kalmunai	11,396	16,584
Ampara	4,233	20,106
Anuradhapura	16,554	98,948
Polonnaruwa	8,373	40,550
Puttalam	19,968	49,500
Kurunegala	42,757	134,719
Negombo	45,516	67,934
Matale	16,843	45,638
Kandy	45,488	97,633
Kegalle	17,505	54,723
Nuwara Eliya	6,118	25,657
Nawalapitiya	21,513	22,533
Hatton	6,375	25,895
Bandarawela	12,399	38,535
Badulla	10,829	54,035
Avissawella	12,048	40,723
Ratnapura	18,284	65,413
Moneragala	0	21,261
Galle	30,090	100,542
Matara	27,534	71,710
Hambantota	12,777	61,360
Colombo	479,015	365,477
Gampaha	53,599	48,093
Kalutara	64,607	101,541

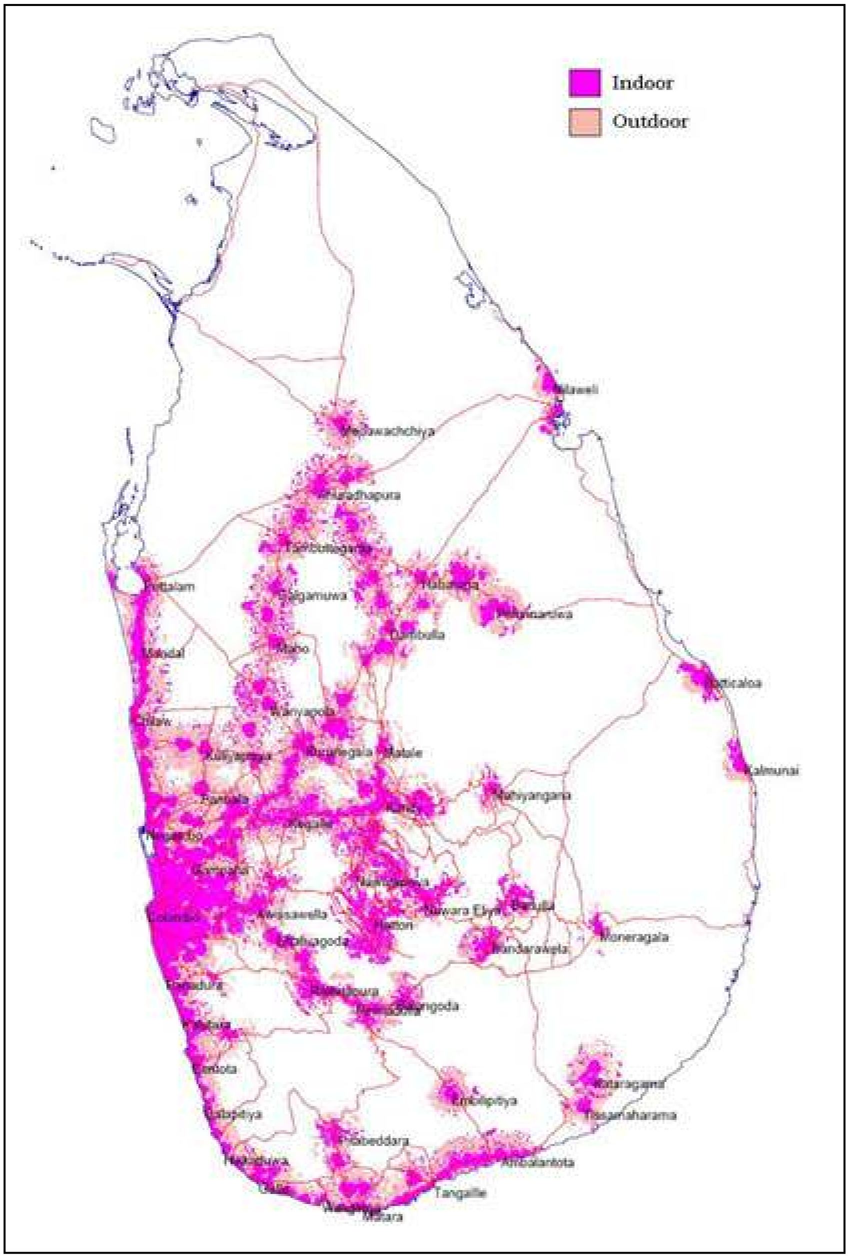
Source: TRC

Annex 4: Dialog 3G coverage map



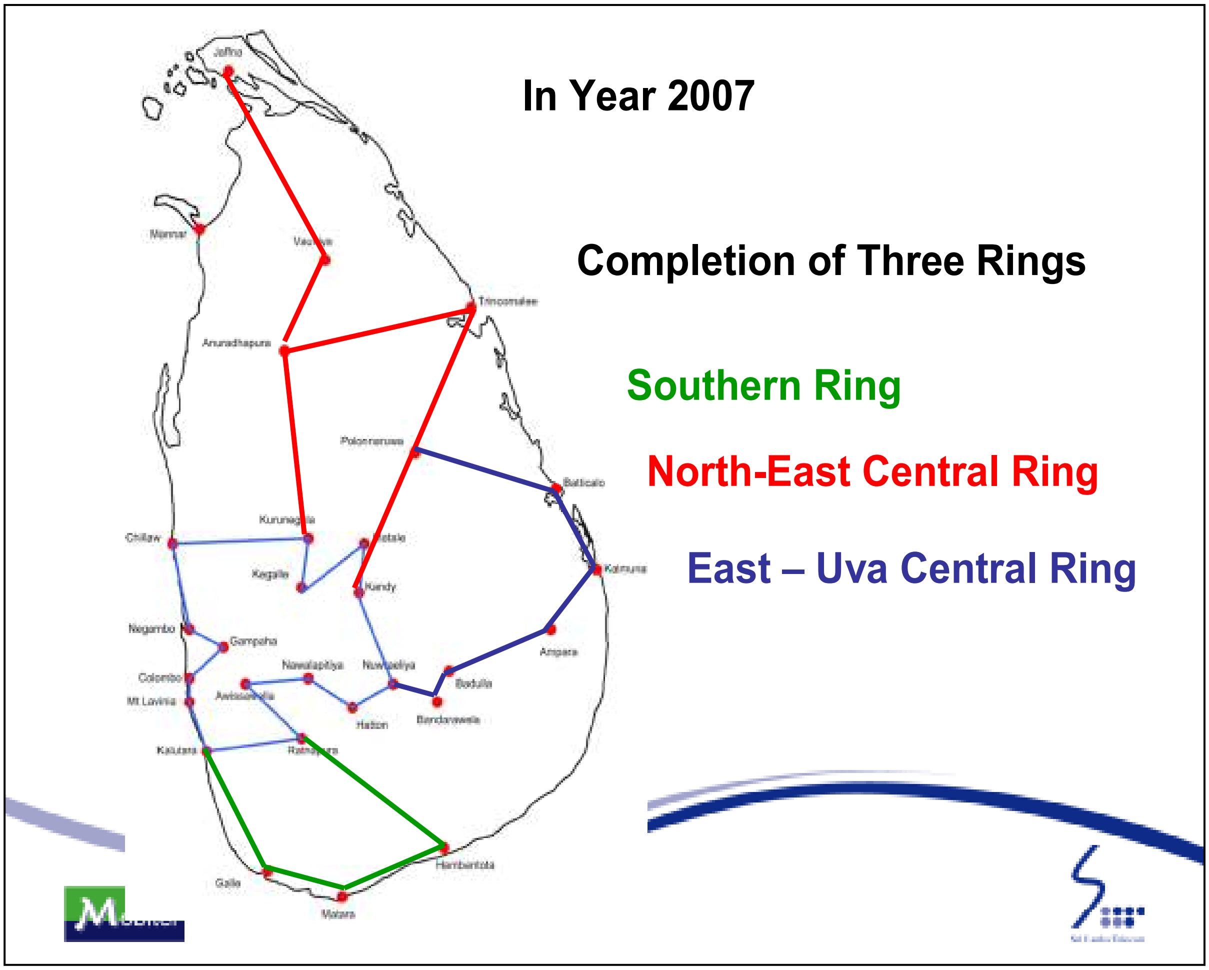
Source: Dialog Telekom, *Annual Report*, 2007.

Annex 5: Dialog broadband coverage map



Source: Dialog Telekom, *Annual Report*, 2007.

Annex 6: Fiber Optic Network Under SLTL



Source: SLTL, www.slt.lk[7]

[7] The five Metro Rings were in full service as at December 2007. The Central Ring will be further upgraded in 2008. (SLTL *Annual Reports*, 2006 and 2007).

Telecom Regulatory and Policy Environment in Afghanistan:
Results and Analysis of the 2009 TRE Survey

Sriganesh Lokanathan

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Telecom Regulatory and Policy Environment in Afghanistan

Results and Analysis of the 2009 TRE Study

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LIRNE*asia*

This research was carried out as part of LIRNE*asia*'s Telecom Regulatory Environment (TRE) Survey with research funding provided by International Development Research Centre (Canada) and the Department for International Development (UK).

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List of Acronyms

ATRA	Afghanistan Telecom Regulatory Authority
ARPU	Average Revenue per User
BULRIC	Bottom-Up Long-Run Incremental Cost
CDMA	Code Division Multiple Access
DCN	District Communications Network
GATS	General Agreement on Trade and Tariffs
GCN	Government Communication Network
GDP	Gross Domestic Product
GSM	Global System of Mobile
ICT	Information and Communication Technology
ISP	Internet Service Provider
ITU	International Telecommunication Union
Mbps	Mega bits per second
MCIT	Ministry of Communications and Information Technology
RIO	Reference Interconnection Offer
SIM	Subscriber Identity Module
SMP	Significant Market Power
STM-1	Synchronous Transport Module level-1
USO	Universal Service Obligation

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1.0 Introduction

Located in the center of Asia, the Islamic Republic of Afghanistan is a landlocked country surrounded by China, Iran, Pakistan, Tajikistan, Turkmenistan and Uzbekistan. Following the US led campaign (from 2001) to destroy the Al-Qaeda network in the country as well as to topple the Taliban led government, Afghanistan has shown incredible growth in its telecommunications sector. With a population of almost 29,021,099 people, Afghanistan is classified as a low income country with a per-capita GDP of USD 366 as of 2008 (World Bank 2008). Its telecommunications sector has brought communication access to large numbers of the population in a relatively short period of seven years. Total access paths per 100 people in Afghanistan have gone from a mere 0.17 percent at the end of 2002 to almost 27 percent by the end of 2008.

Despite this phenomenal growth, data on Afghanistan's telecommunications development is not easily available. Part of the purpose of this study is to establish a baseline dataset for subsequent analyses in the future. This study also attempts to conduct an analysis of the effectiveness of regulation in this nascent sector and thereby contribute to the limited knowledge base with respect to the telecommunications sector regulation in Afghanistan.

1.1 Methodology

In order to assess the regulatory and policy efficacy of telecommunications sector in Afghanistan, this study used the Telecommunications Regulatory Environment (TRE) instrument developed by LIRNE*asia*. The instrument utilizes a short survey to get the perception of informed stakeholders on the telecom regulatory environment in Afghanistan. The TRE can be used as a diagnostic tool to evaluate the efficacy of the laws and regulations affecting the telecommunications sector of a country. The detailed methodology is documented in Samarajiva et al (2007) with subsequent updates to the methodology documented in Galpaya et al (2009). While the TRE has been used in 2004, 2006 and 2008 for select countries in developing Asia, this study was the first application of the TRE to Afghanistan.

The TRE survey asks informed stakeholders to rate the efficacy of the regulatory environment with respect to seven dimensions affecting a particular sub-sector (i.e. Fixed, Mobile or Broadband). Due to the limitations outlined in Section 1.1.1, only the mobile sector of Afghanistan has been considered for this study. The seven dimensions evaluated are Market Entry, Allocation of scare resources, Interconnection, Regulation of anti-competitive practices, Universal Service Obligation (USO), Quality of Service and Tariff Regulation. The first five dimensions were derived from the General Agreement on Trade and Services (GATS) protocol. The latter two were added given their importance to the telecommunications sector. The rating is done on a Likert scale from 1 to 5 (with 1 being highly unsatisfactory and 5 being highly satisfactory). The questionnaire is intentionally parsimonious to facilitate responses from senior officials.

Potential respondents come from 3 different categories, and in all, the CxO level official is targeted:

- Category1: those directly involved in the sector such as operators, equipment vendors.
- Category 2: those indirectly impacted by the sector or those studying/observing the sector with broader interest such as consultants and lawyers.
- Category 3: those who represent the broader public interest such as media personnel, other government officials, retired regulators, civil society organizations.

The methodology specifies that for non-micro states like Afghanistan (i.e. those with a population of more than 2 million), the minimum number of respondents per category is 15. This requires a minimum of 45 responses from the Afghanistan TRE survey. However due to limitations outlined in Section 1.1.1 there were only a total of 11 responses counted in the calculation of the final scores (there were a total number of 15 respondents) . Of the eleven responses counted for this survey, seven were from Category 1, three from Category 2 and one from Category 3. Of the 11 responses counted, the final response rate response rates for Category 1, 2 and 3 were 35%, 75%, 20%.

According to the TRE methodology, each category should equally contribute to the final score and hence the scores from each category were weighted to equalize the number of respondents from each category.

1.1.1 Limitations

There were a number of limitations in conducting this study. Given that this was the first application of the TRE to Afghanistan, the number of potential respondents identified for this study was small. Prior to the commissioning of this study, both LIRNE*asia* as well as the researcher had only a couple of professional contacts (with the exception of the regulator) who were either familiar with, or working in the telecommunications sector in Afghanistan.

In the end nearly all the respondents contacted were via an introduction through regulator. This created problems in the administration of the TRE. Firstly the regulator had official letters of introduction sent to all the operators, which created the perception that this study was commissioned by the regulator. This meant that considerable effort was made in direct as well as phone conversations with respondents to clarify that the study was an impartial assessment by a researcher with no affiliation with the regulator. Despite the clarifications offered by the researcher, there were discrepancies noted during the administration of the survey. Some were unwilling to give ratings while in some cases the scores given by individual respondents were contrary to the comments gleaned from them during face to face interviews.

While the TRE measures the regulatory environment with respect to each of the sub-sectors i.e. fixed, mobile and broadband, only mobile was considered in the end. There were a number of reasons for this. Firstly Afghanistan's telecommunications sector is nearly completely driven by the mobile sector. Secondly the actual respondents were more familiar with the mobile sector and were reluctant to score the fixed and broadband sections of the questionnaire. Some respondents also only gave partial responses to the other two sectors. In the end there was only one viable response that could be utilized for the fixed and broadband sectors.

In the end only 15 TRE surveys were completed. Of these four were rejected. Two of these were rejected because their responses were deemed unreliable due to perceptions[1] that this study could affect their relationship with the regulatory and/ or government (both gave scores of 5 for each of the seven dimensions). One was rejected since it was deemed that the respondent did not have sufficient knowledge of the sector. The last was rejected for insufficient responses.

The low number of responses as well the potential biases created by the introduction to the respondents via the regulator, creates questions that affect the credibility of the final scores. However considerable effort was taken to probe each of the dimensions in detail in interviews either face to face or via the phone and by talking to the respondents multiple times to cross-check and verify facts. Hence the veracity of the underlying research and interviews conducted as a part of this

[1] This was gauged from the fact that the verbal comments revealed during the interview were in stark contrast to the scores given by these specific respondents.

study countered the potential credibility issues with respect to the scores. Where scores do not reflect the findings from the research, it has been noted.

2.0 The telecommunications sector in Afghanistan

Immediately following the US led campaign to oust the Taliban and Al Qaida, the telecommunications sector was targeted as a priority area for development. With a Compounded Average Growth Rate (CAGR) of 131 percent, total access paths per 100 people in Afghanistan have gone from a mere 0.05 percent at the beginning of 2002 to almost 27 percent by the end of 2008. This phenomenal growth has been spurred primarily by the mobile sector, with fixed access paths per 100 people accounting for a minimal fraction of the overall access paths per 100 population. Current estimates suggest that collectively the telecommunications sector brings in almost USD 100 million in revenues for the government (see Table 1). By far it is currently the most important sector for the country. Investment in the telecommunications sector has also continuously risen since 2002 and as of 2008 end, total investment in the sector stood at around USD 1.2 billion. The government estimates that the sector has created 8,000 new jobs in direct employment and a further 30,000 in indirect employment.

Table 1: Revenues to Government from the Telecom Sector

	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Revenues (USD in millions)	2.23	12.15	19.37	66.28	Not available	Not available	100.00 (estimate)

Source: Afghanistan Telecom Regulatory Authority (ATRA)

2.1 The telecommunications policy and regulatory environment

The Ministry of Communications and Information Technology (MCIT), the primary body for creating policy with respect to the telecommunications sector, has been in existence since 1955 when it was called the Ministry of Communications (MOC). The continuing wars until 2002 destroyed nearly the entire telecommunications infrastructure in the country. Since 2002, MCIT has been reinvigorated with donor assistance to chart the future strategy and policy for the telecommunications sector in the country. By mid 2003, the government had created a Telecommunications Regulatory Board (TRB) within the Ministry to oversee the regulatory aspects of the sector. After the passage in 2005 of the Telecommunications Services Regulation Act (hereafter referred to as the 'Telecom Act'), the TRB was restructured as separate independent regulatory body under the Ministry. This regulatory authority was the Afghanistan Telecom Regulatory Authority (ATRA) and was established in 2006. In addition to overseeing all regulatory aspects with respect to the sector (license issuance, renewal and modifications; monitoring of regulatory compliance; and protection of consumer interests) ATRA is also the main dispute resolution body for the sector.

Figure 1 gives a timeline of key regulatory and market actions since 2002.

2.1.1 Telecommunications Services Regulation Act of 2005

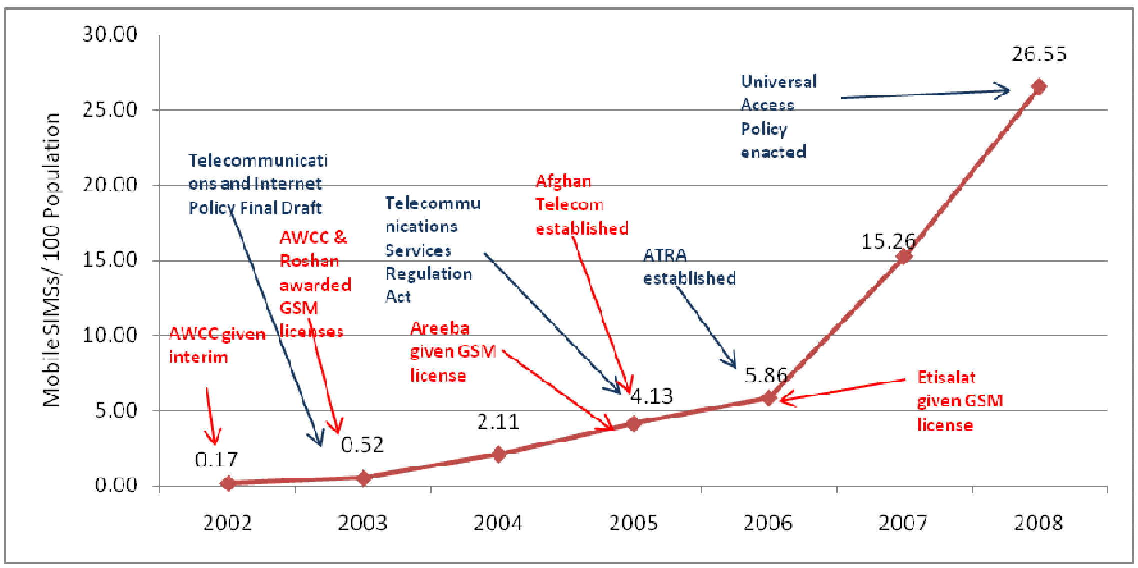
Overall the Telecom Act aims to provide a competitive environment for sector and covers aspects related to competitive process, classification of Significant Market Power (SMP) status, anti-competitive practices and guidelines for monitoring and stopping abuse of SMP status and anti-competitive behavior. While the Telecom Act is discussed further under each of the dimensions of the TRE in Section 3, some discussion of act which is not covered later is included here.

While Chapter 14 of the Telecom Act deals with consumer protection, protection of consumer interests is not specifically mentioned as one of the purposes of the Act (in ‘Article 2: Purpose’). Furthermore, given that the prevailing priorities of the government were geared towards privatization, the Telecom Act does not make a difference between public and private networks.

The Telecom Act articulates in Chapter 2 the establishment, organizational structure and activities of ATRA. Dispute resolution is part of ATRA’s mandated activities and is covered under Chapter 3. Chapter 3 further gives the right of appeal on ATRAs decisions which can be taken up by the Commission for Settling Financial Disputes established under the Central Bank Law. However the right of appeal is for private sector organizations and there is nothing specific mentioned about the right of appeal for consumers.

Consumer protection is covered under Chapter 14 of the Telecom Act, under the broad category of “User Protection, Privacy and Directory Information.” While Article 50, outlines several considerations that have to be undertaken when establishing terms of service, overall the act gives ATRA large discretionary power in determining them. Overall there are only limited provisions under the act for consumer protection. It is assumed that the terms of services which would be established under a separate procedure, but at the time of this study there was no evidence to suggest that existed.

Figure 1: Mobile SIMS/ 100 with key market and regulatory events



Source: Afghanistan Telecom Regulatory Authority (ATRA) and the author.

2.2 Operators

There are currently four mobile operators (GSM license holders) in operation in Afghanistan namely Afghanistan Wireless Communication Company (AWCC), Telecommunications Development Company of Afghanistan (TDCA, which operates under the trade name of Roshan), MTN and Etisalat. There is only one fixed wireline operator, the government owned Afghan Telecom. Afghan Telecom also owns CDMA 800 frequencies for the provision of fixed wireless services. However Afghan Telecom is a very small player compared to the mobile operators. The government also issued four special purpose Local Fixed Service Provider (LFSP) licenses which were intended to encourage rural rollout, but so far only Wasel Telecom was in operation as of end 2008.

AWCC was first mobile operator in the country. The government gave it an interim authorization to start mobile services in April 2002, prior to establishing a licensing authority and procedures. AWCC is a joint venture company with MCIT holding a 20 percent stake and the majority stake owned by a private sector company called Telephone Systems International, based in the US. Once licensing procedures were established, AWCC was awarded a fifteen year GSM license in July 2003 by paying USD 5 million in regulatory fees and a further USD 1.2 million in revenue sharing based on the previous interim authorization (from April 2002 to July 2003).

The second GSM license was awarded in July 2003, to TDCA (i.e. Roshan) for USD 40million. The Agha Khan Fund for Economic Development (AKFED) holds a majority share in TDCA with a 51 percent stake. Monaco Telecom International (MTI) has a 36.75 percent share and the rest of the shares amounting to a 12.25 percent stake is owned by MCT Corp.

Based on a duopoly agreement with AWCC and Roshan, the government did not issue any further GSM licenses till 2006. Two more GSM licenses were awarded subsequently, following a public bidding process in 2005, both for the fee of USD 40.1 million each. The third license was given to Watan Mobile which was a consortium consisting of Al Houbi Telecom (Saudi Arabia), Cellular One (USA) and Glove Communications (USA). The fourth license was given to Investcom in partnership with Alokozay FZE (United Arab Emirates) and they started operations under the brand name of Areeba in 2006. Areeba was subsequently bought over by MTN South Africa and renamed as MTN in 2008. Watan Mobile however withdrew from the market for unknown reasons, soon after winning their license. Hence the last (and what is now the fourth) GSM license was issued in May 2006 to Etisalat Emirates Telecommunications Company (which operates under the trade name of Etisalat).

Afghan Telecom was created in 2005 by presidential decree following an MCIT recommendation. Upon its creation all telecommunication assets owned by the government were transferred to the newly created entity which was at creation fully owned by the government with the intention that It was to be privatized at a later date. While Afghan Telecom holds no official license, it is free to offer any telecommunications service (which one would expect from the holder of a unified license). Afghan Telecom is expected to function as a fully independent entity and subject to the same laws and regulations as the other operators. Initially its mandate was to offer to fixed services to all government offices but it is free to offer services to the public as well. With the inheritance, soon after its creation, of MCIT's Government Communication Network (GCN) and District Communications Network (DCN) it technically has the widest coverage even if overall subscriber numbers are very low. It was also awarded CDMA800 frequencies in 2006 to offer fixed wireless services in 2006. Furthermore the government through Afghan Telecom has invested about USD 40 million in the Optical Fiber Cable (OFC) circular backbone network that is currently being built in Afghanistan. The World Bank has also provided financial assistance to build this backbone network to the amount of USD 65million. The government's intention was (and remains) to eventually privatize Afghan Telecom either partly or in whole at some future date. In fact one privatization round in 2008 was abandoned since it only attracted one bid which was deemed too low.

Wasel Telecom (owned by Dubai' based Modern Technologies International) was awarded an LFSP License (there are no fees for an LFSP license) in 2006 with CDMA 800 frequencies to provide telecom services in rural areas. The LFSP license was intended to take telecom services to the rural areas outside of the main towns and cities in Afghanistan, but so far has had limited success.

While there were many ISP licenses issued since 2002, as of 2008 only about 19 were in operation.

Table 2: GSM Licenses[2] and Frequency Allocation in Afghanistan

Operator	**Date of license issuance**	**Frequency Band (MHz)**		**Technology**
		Uplink (UL)	Downlink (DL)	
Roshan	09 Jan 2003	898.400-906.200	934.000-951.200	P-GSM 900
		1742.600-1748.400	1837.600-1843.400	GSM 1800
AWCC	10July 2003	829.2-898.0	935.2-943	P-GSM 900
		1730.200-1736.000	1825.200-1831.000	GSM 1800
MTN	12 Oct2005	906.000-910.600	951.600-966.600	P-GSM 900
		1710.200-1719.800	1805.200-1814.800	GSM 1800
Etisalat	30May 2006	911.000-915.000	956.000-959.800	P-GSM 900
		880.2000-884.2000		E-GSM-900
		1720.000-1729.800	1815.200-1824.800	GSM 1800

Source: Afghanistan Telecom Regulatory Authority (ATRA)

2.3 Mobile sector performance

In the mobile sector Roshan and AWCC are the current market leaders with Roshan having a slight lead over AWCC both in terms of revenue as well as subscriber numbers. Under the Telecom Act, any operator having a market share of at least 40 percent of revenue in a specific market is deemed as an SMP. An operator deemed to have an SMP status is then subject to additional regulations under the Telecom Act. However as is seen from Table 3, the mobile market in Afghanistan currently has no operator who meets the SMP classification. This raises the question of whether the "40%" floor for the determination of an SMP may be too.

Table 3: Market share of Mobile Sector by Revenue in 2008

Operator	**Market Share (%)**
Roshan	32
AWCC	29
MTN	23
Etisalat	16

Source: Estimates given by operators

As is evident from Table 4, the mobile sector has shown phenomenal growth in subscriber numbers since 2002. As of December 2008, the number of mobile SIMs per 100 population stood at around 26.46 percent.

Table 4: Mobile SIMS

	2002	2003	2004	2005	2006	2007	2008
Mobile SIMS	50,000	150,000	612,000	1,200,000	1,700,000	4,429,421	7,704,325

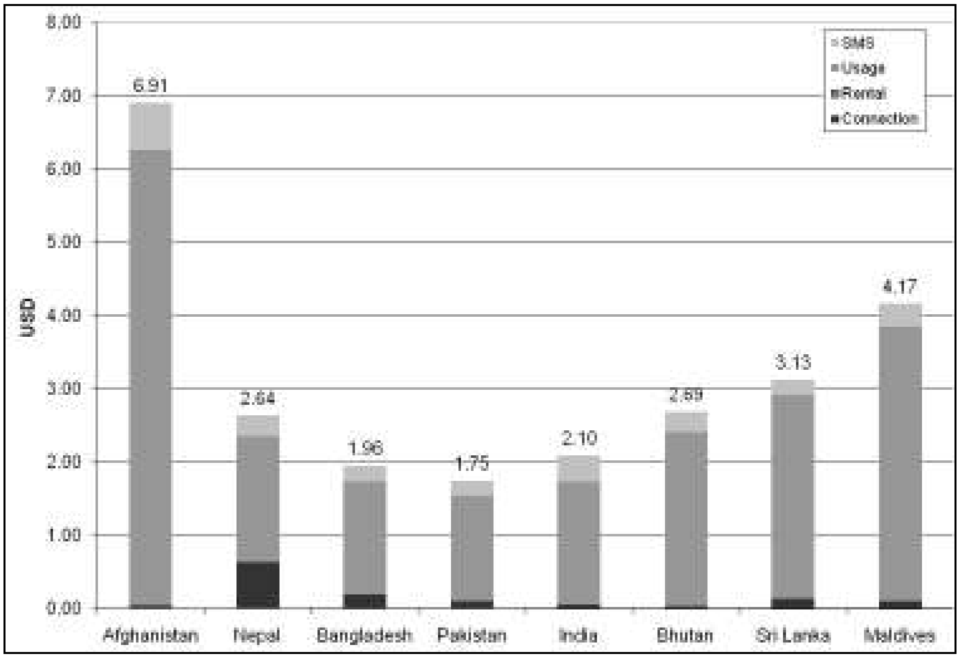
Source: Afghanistan Telecom Regulatory Authority (ATRA)

With the entire mobile market based on prepaid, mobile operators have an Average Revenue per User (ARPU) per month of USD 12-15 which is high when compared to other South Asian countries. For example prepaid ARPU/ month for Indian mobile operators are about USD 6 (Malik 2008). The only other South Asian country with similarly high ARPUs is Maldives where the prepaid ARPU/

[2] All licenses were issued for a period of 15 years from the date of the license issuance.

month is USD 12-13 (Galpaya 2008). Despite the high subscriber growth rates (CAGR for the sector as a whole is about 131 percent for the period 2002-2008), mobile tariffs are the highest in the South Asian region (See Figure 2).

Figure 2: South Asia Low User Prepaid Basket (USD) in Feb 2009



Source: LIRNEasia 2009a

Furthermore prices were much high prior to the entrance of Areeba (now MTN) and Etisalat in 2006. This may explain why Afghanistan also has some of the lowest average Minutes of Use (MOU) per user per month in the region (See Table 5).

Table 5: Average MOU per subscriber per month in Afghanistan for 2008

	Average MOU per user per month
Domestic incoming	33.41
Domestic outgoing	34.68
International Incoming	5.54
International Outgoing	3.04

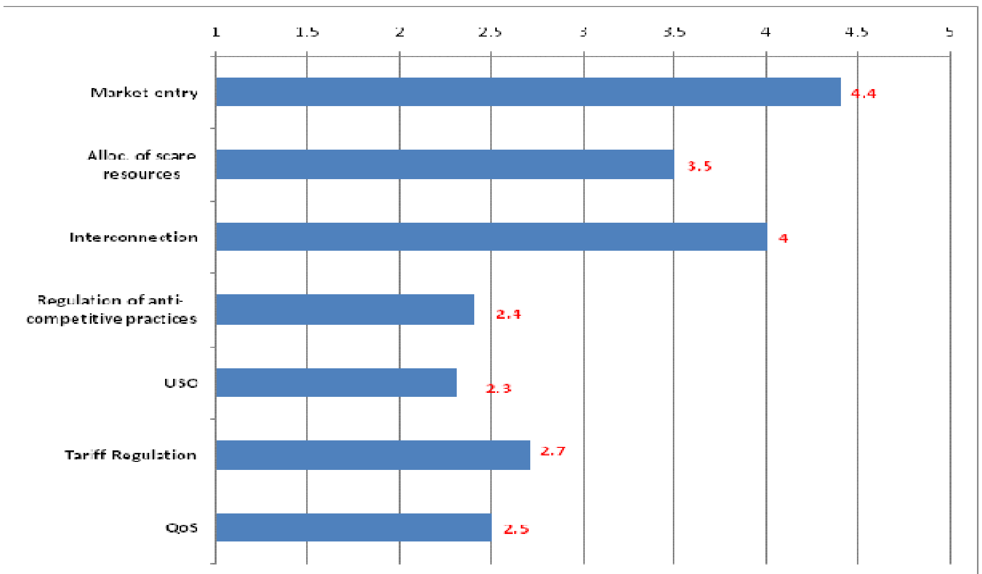
Source: Afghanistan Telecom Regulatory Authority (ATRA)

3.0 Results and analysis of the 2009 TRE study for the mobile sector in Afghanistan

The average TRE score for the mobile sector across all seven dimensions is 3.11. The high variation in the scores for each dimensions indicates a marked difference in opinion across the seven dimensions. The regulatory environment with respect to market entry, allocation of scare resources as well as interconnection were viewed quite favorably as opposed to regulation of anti competitive prices, Universal Service Obligation (USO) regulation, tariff and quality of service regulations.

With respect to the remaining dimensions which received low scores, the research carried out as part of this survey partly explains the low scores. However in the case of tariff regulation, the low scores are contrary to the other evidence. Hence the low score of 2.3 received for tariff regulation is considered an anomaly (for a further discussion see Section 3.6)

Figure 3: TRE scores for the mobile sector by regulatory dimension



3.1 Market entry

Market entry receives the highest score amongst all the regulatory dimensions (4.4), which reflects the regulatory body's relatively generous licensing policy. Given that the telecommunications infrastructure prior to 2002 was virtually non-existent, the government encouraged market entry with a generous licensing policy especially in the initial stages after 2002. These principles were then enshrined in the Telecom Act which states that the purpose of the act (under sub-paragraph 2 of "Article 2: Purpose") is "To promote non-discriminatory entry of Service Providers and Operators to the market." Survey respondents viewed general licensing procedures and market entry very positively both in their comments as well as the scores. Furthermore, the overall business environment is favorable towards foreign direct investment allowing for 100 percent foreign ownership of telecommunication companies as well as 100 percent profit transfer out of the country.

Even with respect to license fees there have been no complaints with three out of the four mobile operators having paid a standardized fee of USD 40.1 million. AWCC, the first entrant only paid USD 5 million.

Respondents indicated that (once they obtained a operating license) they did not face any issues with network rollout and rights of way and they could lay cables and erect towers without any delay. However there have been some issues with spectrum allocation (discussed further in section 3.2). The low variance of 0.36 amongst respondents' scores indicates relative consensus on this score.

Given that the telecommunications sector development has been primarily driven by pro-market dynamics and thinking, respondents did not indicate any problems with respect to exclusivity issues. An area of concern revealed during the interviews was the different licensing conditions between the first two licensees and the latter two licenses. The latter two had provisions on additional data reporting that wasn't covered under the first two licenses. However ATRA is in the process of standardizing reporting requirements, which have so far geared towards placing more reporting requirements on all operators even if not specifically covered by the license conditions. Operators in general are unhappy with the burden of monthly reporting requirements which have been continuously increasing in scope.

3.2 Allocation of scare resources

With a score of 3.5, allocation of scare resources is not viewed as favorably as market entry. While the Telecom Act mandates the creation of a national frequency allocation table and the provision of spectrum in a transparent mechanism, there are some concerns with the implementation of these rules. While the relative unhappiness with respect to this dimension is acknowledged, the high score variance of 0.93 is partly explained by legacy aspects. The first two licensees were awarded spectrum nearly two years before the Telecom Act was enacted and the creation of the regulatory authority. Operators who entered the market after 2005 had fewer options and had to contend with narrower bands in the preferred 900 MHz band (see Table 2). The process of allocating additional spectrum to accommodate subscriber growth seems to be also an area of concern with delays being mentioned as a problem. Frequency interference too has been a problem for operators (though not for all) with delays in the regulatory process in resolving the situation when interference issues arise.

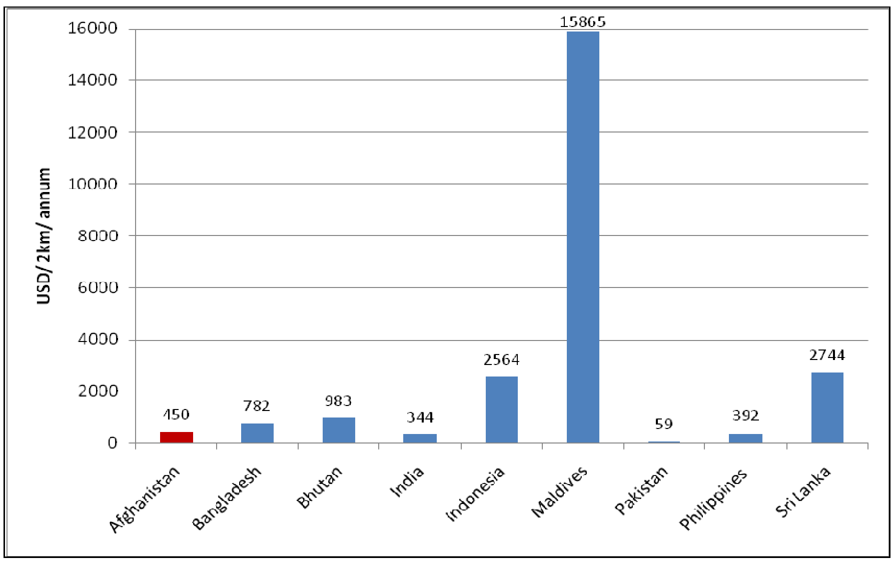
While the TRE scores are meant to reflect the telecom and regulatory for the previous year (in this case 2008), one potential issue that was on the horizon may have been reflected in the scores, partly because the issue had been brewing for some time. Afghanistan's OFC backbone network, already partly active, was scheduled for completion by 2010 and was to be made available for use by all operators. However it was meant to be run by Afghan Telecom which was spending USD 40million towards the construction. The government's first attempt at privatizing Afghan Telecom in 2008 had failed since it had attracted only one bid which was rejected for being too low. However the eventual privatization of Afghan Telecom is still on the Government's agenda. Other operators were not pleased that a competitor (i.e. Afghan Telecom even if it was currently a very small player in the market) would be controlling an essential facility such as the OFC. The preference in the sector was for the OFC operations to be spun out into a separate company that was not a part of Afghan Telecom. This was particularly important for the other operators since there was a perception which had not been denied by ATRA that all operators would be mandated to use the OFC. Currently all the mobile operators are using microwave links for their backbone network. The draft wholesale access rates that were being circulated (See Table 6) was also another area of concern for mobile operators since rates were deemed quite high.

Table 6: Draft prices for OFC backbone access

Distance (km)	2Mbps (i.e. one E1) (USD/km/annum)	45 Mbps (USD/km/annum)	155Mbps (i.e. one STM-1) (USD/km/annum)
0-200	225	3600	8550
200-600	190	3040	7220
> 600	160	2560	6080

When comparing the draft OFC rates with prevailing costs in the Asian region for an E1 tail circuit (i.e. 2kms), the draft rates were in fact some of the lowest prices in the region (See Figure 4). This was further corroborated by one of the officials involved in the construction of the OFC link, who claimed that the rates were prepared after an extensive study of method and prices in both India and Pakistan. He further claimed (though this was not confirmed by the mobile operators) that the current costs borne by mobile operator for backhaul traffic via microwave links was in fact higher.

Figure 4: Annual cost, 2Mbps, 2km DPLC (tail cost) in USD



Source: Afghanistan Telecom Regulatory Authority (ATRA) and LIRNEasia 2009b

Generally respondents have not had issues with numbering especially since the sector is still in its nascent stages. ATRA has established a National Numbering Plan with provisions for at least 5 more operators should the need arise in the future.

3.3 Interconnection

With an average score of 4, interconnection is seen quite favorably by respondents. With a variance of 0.22, this perception is generally shared by all. The Telecom Act mandates all operators to provide interconnection where needed in accordance with the act. However Article 25 of the Telecom Act which deals with Interconnection mainly deals with regulation for operators having SMP status, has clauses on providing interconnection at a technically feasible location and a reference interconnection offer, all only applying to the SMP. Currently there is no SMP, yet rules pertaining to SMP are applied to others as well.

The Telecom Act does not prescribe a specific model for the calculation of interconnection fees but the act requires that the interconnection rates be cost based, forwarding looking and non-discriminatory. Here too the specific clauses of the Act are applicable only to the operator with SMP, but in practice are generally applied to all. In practice currently ATRA has set up a standardized interconnection rate for all which it states were determined by using a Bottom-Up Long-Run Incremental Cost (BULRIC) method. Given that the rates are high, it is questionable whether the rates were in fact determined using a BULRIC method since the rates obtained under the method are generally for the most technically efficient operator.

Table 7: Interconnection costs in Afghanistan

	Rate (USD/ minute)
Until January 2007	0.050
January 2007 to December 2008	0.029
January 2009 onwards	0.026

Source: Afghanistan Telecom Regulatory Authority (ATRA)

Very few disputes have been reported with respect to interconnection. Most likely the results are actually indicative of the ease of establishing interconnection rather than the rates. While rates have been falling they are still high when compared to international benchmarks. Current interconnection rates have been standardized at 2.6cents a minute and are intended for 2009 (refer to Table 7). Both ATRA and the operators mention that the rates are high since there were additional costs involved in network maintenance that are unique to Afghanistan. With security and power for the towers a major issue especially in areas outside of the major cities, operators have to contend with additional costs related to fuel for private generators and security for towers.

Amongst the mobile operators and Afghan Telecom, there have been few if any disputes with respect to interconnection. However some LFSP providers have made frequent complaints about interconnection as was evidenced from the records on ATRA's decisions for 2008. Unfortunately due to time constraints, no LFSP providers were included in this survey. Had they been included the results might have been less favorable.

3.4 Regulation of anti-competitive practices

This dimension received the second lowest score (2.4) which suggest that the regulatory environment with respect to this dimension has fared poorly. In particular there was dissatisfaction with the establishment, monitoring and enforcement of anti-competitive practices.

The Telecom Act covers issues related to competitive processes, determination of Significant Market Power (SMP), abuse of SMP, anti-competitive practices and guidelines for dealing with these issues.

However vertical price squeeze, predatory pricing, and discriminatory interconnection access and rates are only covered under clauses meant for operators classified as having an SMP status[3]. The only provision for dealing with anti-competitive practices that is applicable to all is “Article 22: Anti-Competitive Practices” which states:

> No Person shall engage in a practice restricting or distorting competition in telecommunications markets, including the following:
>
> 1. Fixing prices or other terms or conditions of service in telecommunications markets;
>
> 2. Determine which person will win a contract in a telecommunications market;
>
> 3. Apportion, share or allocate telecommunications markets.
>
> (Telecommunications Services Regulation Act, 2005, pg 15)

Such provisions are not by any means comprehensive and there did not seem to be sufficient guidelines for actual implementation or for the creation of transparent rules and regulations applicable to all. Enforcement mechanisms are also limited (covered under Article 8, 9 and 10). The actual GSM licenses themselves do have some provisions for mandatory interconnection, fair trade and competition as well as for the arbitration process as well. Collectively however the implementation of these has been found lacking by interviewees. Complaints include a general lack of clarity in existing rules and very poor enforcement with respect to regulation of anti-competitive practices.

The Telecom Act does specify the definition of a Significant Market Power as any service provider who earns 40 percent or more of the gross revenues in a specific telecommunications market as defined by ATRA. Current market share data suggest that there is no SMP as per the definition for the mobile sector.

Even with respect to tariffs, some operators have been accused of using predatory pricing to attract new customers, but surprisingly no complaints have been lodged with the regulator and neither has the regulatory authority taken up the issue (ATRA technically doesn’t require a complaint to be lodged before it takes up the issue). Part of the reason for this may be the fact that the operators in question have comparatively low market share. The hassle of the dispute regulation mechanism in practice has hindered complaints and dispute resolutions except in the most serious of cases. But this problem is also an issue of definitions. In the absence of implementing guidelines that clearly specify what “fair” or “predatory” means, service providers cannot assess whether, say, a price cut would be deemed unfair or anti-competitive rather than competitive. The subjectivity and prevailing unpredictability of issues pertaining to fair trade practices is probably what bothered most respondents.

Furthermore the capacity and transparency of the regulator is of some concern to the service providers. On the latter, the research conducted as part of this study revealed one potential conflict of interest whereby the funds for the regulator’s capacity building activities (under a World Bank grant) is managed by an official in Afghan Telecom.

The respondents’ scores for this dimension show a very low variance (0.43) which suggests that the unfavorable perception of regulation with respect to this dimension is shared by most.

[3] These are dealt with Article 21, 23 and 24 of “Chapter 7: Competition” of the Telecom Act. But as already noted, no operator currently falls within the definition of SMP, therefore these are not applicable to any operator

3.5 Universal Service Obligation (USO)

Survey results indicate that USO regulation receives the lowest score (2.3).

A universal service charge of 2.5 percent of net revenues has been levied on all GSM operators since 2003. LFSP licensees only have to pay 1.5 percent of their revenues. However the actual Universal Access Policy as well the Manual of Operating Procedures for the utilization of the Telecom Development Fund (TDF) didn't come till late 2008. The delay in coming up with a mechanism to disburse the collected funds has been a source of dissatisfaction for quite some time and the results from this survey are probably indicative of this legacy of confusion with respect to the Telecom Development Fund (TDF). The dissatisfaction was more acute in the past because of the pressure on operators to roll out services to the rural areas without access to the TDF. Even after the establishment of the Universal Service Policy and the operating procedures on how the fund will be used, there is a general lack of clarity with respect to the rules and regulations amongst the respondents. With some estimates indicating the almost USD 26 million is available for disbursement from the fund, the operators have been unhappy with the delay in implementation.

The Universal Access Policy also makes provisions for the creation of a separate Universal Access Department (UAD) within ATRA to administer the disbursement of the funds. At the time of this survey this department had already been created. However respondents mentioned some concern with respect to the capacity of the UAD to effectively administer the Universal Access program. There was some concern with respect to the transparency of implementation with respect to disbursement however these concerns were minor and only shared by few respondents.

The effectiveness (if at all) of the new regulations is not captured in this survey since it was established so close to the time of this survey and actual implementation had yet to occur.

3.6 Tariff Regulation

This dimension received a low score of 2.7.

The Telecom Act sets out procedures for regulation of tariffs for only the SMP, with provisions for publishing and filing the latest tariffs with ATRA. Prior approval is required from ATRA before changes to the tariff structures are announced by the SMP (or if new services are to be established). Furthermore the Act stipulates that the SMP cannot subsidize tariffs. Given that the latest market share data indicates that there is no designated SMP none of the operators' tariffs are technically subject to review.

In actuality, the latest reporting requirements on all licenses require them to submit their entire tariff sheets including roaming and international rates. As Figure 1 shows, Afghanistan's tariffs are some of the highest in the region currently. But the interviewees suggested that the higher rates were reflective of the difficult macro-economic conditions of a post-conflict region. Furthermore high energy and security costs were attributed as some of the reasons for higher costs. Most, including the regulatory authority did not consider the current tariffs to be too high and were generally satisfied with it.

Despite cases of predatory (below cost) pricing occurring, no action has been taken since the operators in question did not have an SMP status. Neither have any of the other operators raised this issue up with ATRA. However, these issues do not sufficiently elucidate why the scores were so low and hence it is the researcher's contention that the score for this dimension are not entirely accurate and might be an anomaly. This is further reinforced by the fact that this weighted score had a high variance of 1.2.

3.7 Quality of Service (QoS)

QoS regulation received a low score (2.5) and the negative perception is shared by most (with a low variance of 0.45).

The Telecom Act makes frequent references to quality of service. Furthermore the individual GSM licenses do cover required benchmarks for various aspects of service delivery including dropped calls and network availability. Interviews with the respondents as well as with ATRA suggest that the basic measures have now been set forth, but transparency and accuracy in monitoring and enforcement are lacking. Actual monitoring of the basic network quality of service indicators such as call drop rates, congestion ratios, and throughput are only recently being actively monitored by ATRA according to some but this was contrary to what was reported by the regulator who claimed to be monitoring the QoS benchmarks actively since the beginning. The capacity of the regulator to suggest, monitor and implement QoS measures and regulations is questioned by the respondents. The respondents clearly view the regulator as lacking in understanding of what the overall goals and mechanisms should be with respect to quality of service for the sector. One troubling example observed by this researcher, further points to this. One particular operator had recently started a mobile money service. The instinct of the regulator was to shut down the service till ATRA could get further clarifications of this service and assess if this new service would affect call completion ratios. While the regulator eventually refrained from following this course of action, this anecdote further underscores the across-the-board concern with respect to the regulator's capacity.

There is also a question in the minds of the respondents as to whether the regulatory authority fully appreciates the difficult circumstances in which they operate. For example the research revealed that in many remote areas, especially in those of Taliban dominance, phone towers are frequently switched off (especially at night) by either the government or the US led allied forces. This means some areas lose connectivity while in other areas undue burden is placed on towers which aren't switched off leading to poor quality of service. In light of such a situation, respondents feel that the regulator should give operators more leeway in the QoS standards imposed on them.

4.0 Conclusion and policy recommendations

The telecommunications sector represents one of Afghanistan's biggest success stories and continues to remain one of the main engines of its growth. It is currently the government's largest sources of non-donor revenue. The phenomenal growth in penetration achieved within six short years is also an indication of the government's pro-market policies especially with respect to telecommunications. Afghanistan has tried to follow a path of utilizing international best practices in telecommunications sector reform and has embraced an open market regime based on private sector participation.

Despite the success in connecting the people, challenges remain. Tariffs are the highest in the South Asian region. The current macro-economic situation as well as the security issues (especially outside of the main cities) is not very conducive for investment. Furthermore transparency remains an issue, with the perception of potential collusion between the regulator, ministry and Afghan Telecom. This is further exacerbated by the need for extensive capacity building activities at the regulatory authority.

While being cognizant of the fact that the overall socio-economic and security issues in Afghanistan will need to be addressed, the study has revealed certain priority areas with respect to the regulation of the telecommunications sector that need to be addressed

4.1 Capacity building of the regulatory body

The major concern raised by the respondents is the capacity of the regulator. Despite great strides in coming up with policies based on international best practices, regulatory capacity with respect to monitoring, dispute resolution and enforcement has so far lagged behind. With the majority of the knowledge base on economic regulation residing amongst the six board members of the ATRA board, other regulatory staff still lacks the basic tools and knowledge in economic regulation principles. Donor agencies and concerns by respondents have played a major role in bringing the urgency of these capacity building initiatives to the forefront. In fact ATRA with assistance from World Bank funds is in the process of initiating a wide-scale capacity building effort throughout the entire organization.

4.2 USO policy implementation

The study revealed that implementation of the universal service program and the utilization of the USO fund was the major area for concern. In fairness, due the short time between the publication of the Universal Access policy as well as the manual for how the TDF fund was to be utilized, the survey may have failed to appreciate the recent movements by the regulator on this matter. Irrespective, proper implementation, information dissemination and continued consultation with the private sector operators remain key if Afghanistan is to push the penetration to poorly developed rural areas. The existing LFSP licenses, despite being intended to bring telecommunications to at least an additional 300,000 people has so far not been successful, with preliminary estimates suggesting that the number of new connections in the rural areas where the LFSP licensees operate being in the range of ten to twenty thousand. There has been a lack of clarity as to how the new policies enacted in 2008 with respect to USO, will affect the LFSP providers.

4.3 Comprehensive competition legislation

The regulation of anti-competitive practices which received the second lowest score requires improvement in monitoring and enforcement. The overall legislative framework still lacks a comprehensive competition policy and this has translated into frequent issues with respect to anti-competitive practices. Sector growth is possible without good governance, but sustained growth and overall sector performance as defined by improved connectivity, choice, quality and decreasing prices cannot be achieved without good policy coupled with good governance.

Regulation of anti competitive practices will be more important as the sector matures. While the general pro-competition outlook of the governance mechanisms has so far enabled phenomenal sector growth during the current nascent stages of development, they lack teeth to handle specific issues that will become a major problem in the near future. For example issues related to predatory pricing have so far been ignored especially with respect to minor players. Furthermore even the benchmark for having an SMP status should also be lowered from the existing 40% floor. The lack of trust in the dispute resolution mechanism due to the overall lack of regulatory capacity as well as potential non-transparency issues (vis-a-vie the relationship between the regulator and Afghan Telecom) will need to be addressed. However, even if governance, monitoring and enforcement are improved the sector still requires a comprehensive competition policy.

Acknowledgements

The researcher wishes to thank all those completed the TRE questionnaires as well as those who granted detailed interviews while conducting this study. Furthermore the assistance of Afghanistan Telecom Regulatory Authority is gratefully acknowledged in both the collection of indicator data for the telecommunications sector as well as in introducing the researcher to relevant stakeholder in the sector.

This research was conducted as part of LIRNE*asia*'s Telecom Regulatory Environment Survey. Research funding was provided by the International Development Research Center of Canada.

Annex 1: Regulatory and policy events/ actions in 2008 in Afghanistan

March 2008	MCIT issues request for Expression of Interest in the sale of 80% of Afghan Telecom
April 2008	Telecom Equipment Importer License issued to Salar Shahkib Ltd
May 2008	Telecom Equipment Importer License issued to Afghan ITT
	LFSP License issued to Speenghar Telecom
	Technical & Technology Solution Provider License issued to Asia Consultancy Group (ACG)
	Privatization of Afghan Telecom is started
June 2008	Base Transceiver Station (BTS) Installation Procedure Approved
July 2008	Telecom Equipment Importer License issued to TSC
August 2008	Telecom Equipment Importer License issued to Wahdat International
September 2008	Dispute resolved between Wasal Telecom and Afghan Telecom about international gateway access
	National ISP License issued to ASIX
	National ISP License issued to Afghan ICT
October 2008	Dispute resolved between Wasal Telecom and MTN about interconnection prices
	Dispute resolved between GSM operators with regards to activation of free short code for election registration.
	Universal Access Policy document released to set forth policies for rural telecommunications development in Afghanistan.
	Manual of operational procedures for Telecommunications Development Fund (TDF) is released.
November 2008	National ISP License issued to MTN
December 2008	National ISP License issued to Netzone

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***Title: Prospects of Volunteer Computing model in performance data gathering for Broadband Policy Formulation: A Case study from South Asia**[1]

***By:** Chanuka Wattegama and Nilusha Kapugama

***Date:** 2009

***IDRC Project Number:** 104918-001

***IDRC Project Title:** Advancing evidence-based policymaking and regulation in the emerging Asia-Pacific to ensure greater participation in ICTs (Phase II)

***Country/Region:** Asia

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***Abstract:** The recent unprecedented growth of telecom facilities has offered the Internet users in most Asian countries a flavour of broadband. Yet, despite rosy promises by telcos, the user experience has often been less than ideal. High cost of infrastructure, particularly of international links, prevents them from enjoying undisturbed access to internet. These challenges can only be overcome by right policy decisions based on evidences. Thus, monitoring the broadband Quality of Service Experience (QoSE) becomes more than an attempt to ensure quality delivery. It also creates a basis for policy formulation.

The first approach to monitoring QoSE, is the regulator reaching deep into the innards of the telecom network to install monitoring equipment and taking remedial actions, specified under the licenses or the governing statute, when the data indicate below-standard performance. Dearth of financial and human resources can be the key challenge in such a direct approach. The second approach is based largely on user activism. Educated users are expected to voluntarily contribute their time and computing resources towards building a performance database which in turn will be used in creating the bigger picture.

A comprehensive methodology to benchmark Broadband Quality of Service Experience (QoSE), based on the latter approach has been developed jointly by LIRNE*asia* and TeNet group of Indian Institute of Technology (IIT) Madras. While there is no barrier for regulators to use it, the methodology is largely user centric. Instead of depending on one time pinging, this methodology

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The paper was presented at the Experts Workshop; Beyond Broadband Access: A data based information policy for a new administration, 22-24 September 2009, Washington DC, organised by the New America FOundation

uses AT-Tester, an a open source based software tool to monitor all crucial QoSE broadband metrics over a longer period, on both week days and week days covering peak as well as off peak traffic. The traffic is also monitored within segments, ISP, local and international.

The methodology adapts the concept of Volunteer Computing (or Public Service Computing), where complex computing tasks are broken up into small chunks and are then run in the background of large numbers of computers of volunteers who are simultaneously engaged in other tasks. AT-Tester is installed in a large number of computers that are connected to the Internet and run in the background. The outcome is aggregated in real-time on a server and made available through site www.broadbandasia.info. This approach would take the quality of the results to a whole different level, averaging out anomalies and allowing continuous coverage. The paper analyses how this approach could be used in broadband policy formulation taking examples from Bangladesh, India and Sri Lanka, the three countries where the experiments have been conducted.

***Keywords:** Volunteer Computing, Broadband QoSE

1.0. Introduction

International Telecommunication Union (ITU) refers to broadband as 1.5 – 2 Mbps (ITU, 2003) while, Organisation for Economic Cooperation and Development (OECD) accepts 256kbps as the threshold (OECD, n.d.).[2] A publication by Partnership for Measuring ICT for Development (2009) defines broadband as an Internet service of at least 256 kbps in one or both directions. The US Federal Communication Commission has specified 768 kbps as the minimum speed for Broadband (Kang, 2009).

It has been noted in the available literature that provision of broadband would enable the diffusion of certain services to the public. Services such as e-gov, e-health (tele-medicine) and distance education require broadband connectivity (Ramierez, 2007). Broadband has also enabled cheaper communication through Voice over Internet Protocol (VoIP). The impact of broadband is now beginning to appear on the economic statistics (Kruger & Gilroy, 2008). According to Arbore and Ordanini (2007, p. 83), “The importance of broadband in the business sector is related to the higher potential for data interchange and multimedia applications”.

According to the latest OECD data, as at Q4 2008, broadband access per 100 inhabitants in OECD countries stood at 22.35 with Denmark being the highest, 37.18. According to an OECD report some countries have already reached 100% coverage, and prices have fallen since 2006. According to the same report, “Data on penetration, price, speed and usage of the Internet highlight how member countries have promoted competition, encouraged investment and worked together with the private sector to increase connectivity” (OECD, 2008, p. 08).

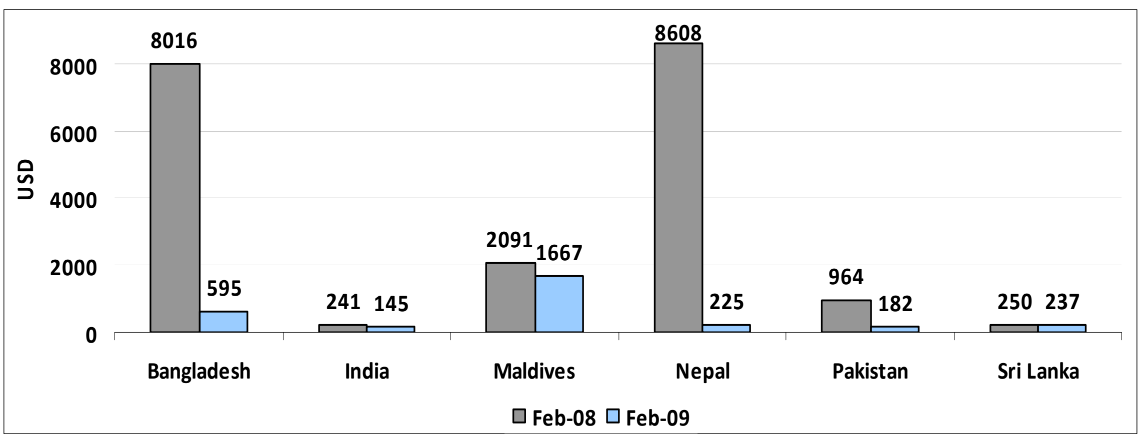
In comparison to the OECD, broadband penetration in emerging Asia is low.[3] However, two of the fastest growing markets, Philippines and Vietnam, grew at rates of 68.47% and 60.94%,

[2] ITU definition for Broadband: Recommendation I.113 of the ITU Standardization Sector: “transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 Megabits per second (Mbits)”.
[3] This is according to the available data on ITU database, 2008

respectively during the period 2007-2008 (Silva, 2009). Overall, prices have come down making the service more affordable.

A similar pattern is seen in South Asia (India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, Maldives and Afghanistan). According to the ITU, the total number of fixed broadband subscribers has grown by 68.5% from 2007-2008 and the number of mobile broadband connections grew by 218%. In between February 2008 - February 2009, the price of a 256kbps fixed broadband connection has reduced in all South Asian countries (LIRNEasia, 2009 & LIRNEasia, 2008). As shown in figure 1, the biggest change in price was seen in Nepal and Bangladesh.

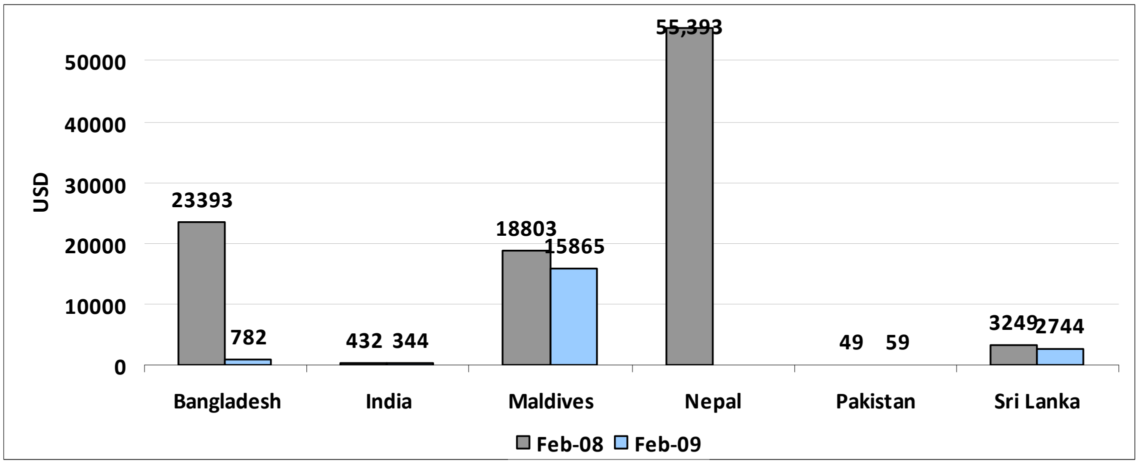
Figure 1: Annual cost, 256kbps Broadband business connection (unlimited download)



Source: LIRNEasia Broadband Benchmarks, February 2008, February 2009

The drop in retail prices in South Asia, as shown in figure 1, has been made possible, in part, by a drop in whole-sale prices though the price drops are not as large as the retail sector. The drop in whole sale prices between February 2008 and February 2009 is shown in figure 2. Bangladesh exhibited the most significant drop.

Figure 2: Annual cost, 2Mbps, 2km DPLC (tail cost) – Wholesale



Source: LIRNEasia broadband Benchmarks, February 2008, February 2009
Note: Data for Nepal for February 2009 is not available

The data, as shown above, depicts an increase in demand for broadband, yet increased demand and usage have posed challenges in terms of Quality of Service Experience (QoSE)[4]. Complaints about quality have been voiced in the emerging markets for some time.
User complaints are not the only thing driving interest in QoSE – there's increasing recognition that certain QoSE levels need to be maintained in order to enjoy the full economic and social benefits of broadband. As such, policy makers and regulators too have turned their attention to QoSE. Recently, the European Union commissioned a study on the quality of service provided within the region.[5]

The approaches taken by different regulators to monitor or ensure QoSE are quite different. Further in this paper, we examine these approaches and present a particular method that has been developed and tested by LIRNEasia and the Indian Institute of Technology, Madras (India). The paper also proposes a model that helps monitor QoSE with minimal regulatory action.

2.0. Different Approaches of monitoring Broadband QoSE.

Even without strict regulations, broadband quality monitoring and benchmarking provides the necessary information for the users to make an intelligent choice in a competitive environment.

As noted, approaches to monitoring and regulating QoSE differ from country to country. Some countries use a mix of approaches. Table 1 classifies some of the commonly found modes of regulation.

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[4] Quality of Service Experience (QoSE), used mainly in the field of telecommunications, is the actual measure of user's experience with an operator in terms of delivered quality with or without reference to what is being promised. This is measured technically and not subjective. So it is different from Quality of Experience, sometimes also known as "Quality of User Experience," which is a subjective measure of a user's experiences with an operator. QoSE also differs from Quality of Service (QoS) which, in the field of computer networking and other packet-switched telecommunication networks, refers to resource reservation control mechanisms rather than the achieved service quality. Quality of service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow.
[5]The study has just been commissioned and the call for proposals can be found at the link: http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=5001&utm_campaign=isp&utm_medium=rss&utm_source=newsroom&utm_content=tpa-3 Accessed on 14 August 2009

Table 1: Different approaches to broadband QoSE monitoring/regulation

	Regulation/Monitoring approaches			
	Self Regulation by operators	Monitoring by regulators	User satisfaction surveys	Demand side (user) testing
Level of Intrusiveness (on the network)	None	High	None	Negligibly Low
Regulator participation	Medium to Low	High	Varies depending upon who conducts the surveys	None
Operator participation	High	High	Varies depending upon who conducts the surveys	None
User participation	None	Low	High	High
Subjectivity of results	Medium to Low	Low	High	Low

Source: Authors

2.1. Self Regulation by Operators

This mode is mostly used when quality is relatively better. The regulator expects self-regulation by operators instead of other stringent measures.

Office of Communications of UK (Ofcom) had requested the broadband service providers to follow a voluntary code when promoting broadband speeds (Ofcom, 2008). It published a report in July 2009 on broadband, which compares advertised vs. actual speeds (Parker, 2009).

2.2. Monitoring by regulators

Regulators are placed ideally to monitor broadband QoSE. They can play a key role in specifying the standards for operators and conducting frequent tests to make certain they are followed.

Singapore is one of the few Asian countries which regulate broadband QoSE. Infocomm Development Authority (IDA), Telecommunication Regulator in Singapore, has been publishing quarterly data on the identified QoSE measures since 2006. The Telecommunication Regulation Authority of India (TRAI) and Malaysian Communication and Multimedia Commission (MCMC) have followed suit and has since published QoSE standards similar to Singapore.

All three regulators have specified the matrices;

1. Network availability
2. Local network latency
3. International network latency
4. Bandwidth utilisation

The Indian and Malaysian regulators have included packet loss as an indicator. Non-compliance of these regulation leads to fines for the operators.

Of the above matrices, network availability, latency and packet loss can be tested at the consumer end. However, bandwidth utilization information has to be provided by the operators. While the Singapore regulator allows operators to use up to 90% of the available bandwidth, the Indian and Malaysian regulators only allow up to 80%. IDA also specifies the permissible Round Trip Time (RTT) within the national segment of network and up to the first entry point in USA.[6]

However, not every country has such regulatory arrangements to ensure broadband QoSE. The absence of a stringent regulatory environment in many developing countries makes it easier for telecom operators to use higher contention ratios there by lowering bandwidth than stipulated. Ordinary user, possessing neither the equipment nor the technical knowledge to ascertain this, most of the times has no alternative other than taking the word of the operator. Data for this is gathered from the supply side. Regulatory agencies are required to place necessary monitoring equipment in operators' or service providers' systems. This requires operator interaction and can be a cumbersome process. It can also be too costly in terms of equipments and personnel.

2.3. User surveys

User surveys, conducted either by the regulator (usually) or a third party (rarely) does not measure quality per se, but user perception. The users rank the operators based on their satisfaction/dissatisfaction of usage experience.[7]

2.4. Demand side (user) testing

Measuring the performance of the broadband service from the consumer end provides an alternative mechanism to quality monitoring by the regulator. No special equipments will be required for this except a software application that can measure the required metrics.

The Web provides a gamut of applications that can be used to test the quality of a broadband link. Gonsalves & Bharadwaj (2009) analyses some of the most popular testers including www.speedtest.net (what is popularly known as Speedtest), Speedtest2, www.speedtest2.com, and internetfrog, www.internetfrog.com. In addition, the report also does an overview of eight relatively less popular online testers.

[6] RTT per se is not a measure of the throughput of the link but indicates the bottlenecks in the path. For example, if the packets are pinged from Sri Lanka or India there will be a significant delay from the local exit point to the first international entry point. This is because the key issue these countries face is constraints in international bandwidth.

[7] Quality of Experience (QoE), some times also known as "Quality of User Experience," is a subjective measure of a customer's experiences with a vendor. Used typically by organisations providing services, such as hotels and hospitals.

The applications for testing QoSE of broadband were rated according to technical merit and the convenience of using the application. All three popular testers focus on download, upload and latency or ping. They are the metrics an average user is most familiar with. However, the absence of other parameters like jitter, packet loss and availability makes the testers technically incomplete as the test results give an incomplete picture.[8] Another drawback seen in all three testers is that it averages the data or results, regardless of whether or not the testing was conducted at peak or off peak times. This would undoubtedly give distorted results.

In spite of its drawbacks the testers are relatively easy and quick to use and the results of the tests are displayed in graphical manner which makes it easy for a non-expert to understand.

To address some of the common drawbacks in these popular testers for measuring the broadband QoSE, a methodology to measure five metrics was designed by LIRNEasia and IIT-Madras. AT-Tester, a software application downloadable from www.broadbandasia.info is used for the testing.

3.0. User-centric Methodology with AT-Tester

The methodology developed by LIRNEasia and IIT-Madras falls into the 'user testing' category. It is an application that is available freely via web which can be downloaded and installed by users on their computers. The AT-Tester software measures a total of five metrics: Throughput (download and upload speeds), Round Trip Time, jitter, packet loss and availability. Each is defined below:

- **Throughput (kbps):** Throughput is the "actual amount of useful data sent on a transmission" (Dodd, 2005, p. 14). Defined by the ITU as "an amount of user information transferred in a period of time" (ITU, 1997, p. 15), more commonly referred to as download or upload speeds.

    - Download speed is a key metric advertised in broadband services. It defines how much information a user receives.

    - Upload speed defines the rate a user can send information to a server. It plays a significant role in responsiveness and real-time applications like VOIP.

  Throughput varies depending on the location of the server that hosts the content. If the location is local, such as an ISP server, the throughput may be higher than it would be for an international server. Therefore the testing has included throughput for both local (ISP) and international servers.

- **Latency or RTT (ms):** "Latency refers to delays when voice packets transverse the network" (Dodd, 2005, p. 60). This is significant in systems that require two-way interactive communication, such as voice telephony, or ACK/NAK [acknowledge/not acknowledge] data systems where the round-trip time directly affects the throughput rate, such as the Transmission Control Protocol (TCP). The ITU definition states that

[8] Commercial version of Speedtest measures jitter and packet loss

"Latency means transmission delay for FEC (Forwarding Equivalence Class) encoding, decoding, interleaving and de-interleaving" (ITU, 2004a, p. 9),

- **Jitter (ms):** "Jitter is uneven latency and packet loss" (Dodd, 2005, p. 60). It is the variation of end-to-end delay from one packet to the next within the same packet stream/connection/flow. Jitter is more relevant for real-time traffic like VOIP. Ideally, the figure should be low

  Also defined by ITU as "Short-term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time" (ITU, 1993, p. 6).

- **Packet Loss*:* (%):** The ratio of packets that does not reach the destination to the sent. Degradation can result in noticeable performance loss with streaming technologies, VOIP and video conferencing. ITU states that "In general, IP-based networks do not guarantee delivery of packets. Packets will be dropped under peak loads and during periods of congestion. In case of multimedia services, when a late packet finally arrives, it will be considered lost" (ITU, 2004b, p. 6),

- Availability: The number of times the user is able to access the Broadband services. Availability = (1–F/T) x 100

Depending on the application, different combinations of the above metrics become important. Table 2 below gives the degree of importance of each metric with regards to different applications.

Table 2: Importance of the matrices across applications

	Throughput		Delay		
Service	Download	Upload	RTT	Jitter	Loss
Browse (Text)	++	-	+	-	-
Browse (Media)	+++	-	+	-	-
Download file	+++	-	+	+	+
Upload file	-	+++	-	-	-
Transactions	+	+	++	+	+
Streaming Media	+++	-	+	++	++
VoIP	+	+	+++	+++	+++
Games	++	+	+++	++	++

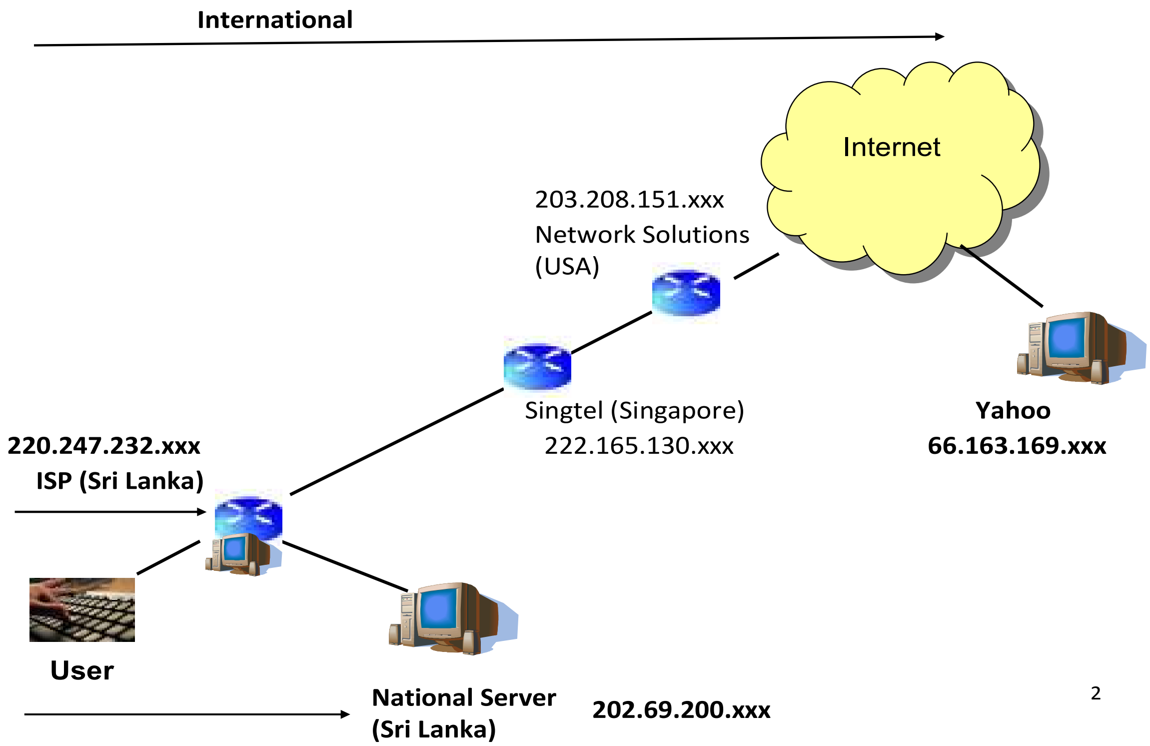
Source: Gonsalves & Thirumurthy, 2008

Note: +++ Highly Relevant ++ very relevant + relevant - not relevant

The above metrics are measured separately for three domains; ISP, national, and international. From the user to the Internet Service Provider (ISP) is the ISP Domain. (aka 'last mile' or 'first mile'). From the user to a website hosted within the geographical boundaries of the user's country is the National Domain. This is an important metric in countries such as Japan where most of the local content is hosted on local servers (i.e. within servers located within the country). Most of the content that a typical Japanese user accesses resides on servers within

Japan, and language constraints prevent most Japanese users looking for content elsewhere. For users from India or Bangladesh, this might not be the case given the lack of local content and higher percentage of persons speaking English. The final domain is the International Domain, defined as being from the user to a server or website hosted outside the country of testing. Figure 3 presents this information.

Figure 3: Three domains of testing



Source: LIRNEasia
Note: In the above example, the user is situated in Sri Lanka. The two ISPs shown (SLT and Dialog) are shown in Sri Lanka (the user's own ISP is SLT, while Dialog is a competing ISP). International content may be accessed from Singapore or USA (as shown) or any other location outside of Sri Lanka

4.0. Volunteer computing as a means of data gathering

The LIRNEasia/IIT Madras broadband QoSE monitoring project was largely based on the concept of Volunteer Computing for data gathering purposes.

Volunteer computing is defined as "a form of distributed computing in which the general public volunteers processing and storage resources to computing projects" (Anderson, 2009, p. 1). It becomes necessary as computationally intensive research activities requires outside resources. It allows researchers to use the resources (such as processing speeds and storage capacity) of computers connected via the internet, that would be otherwise unavailable to them (Toth and Finkle, 2007). One of the first projects to benefit from the volunteer computing is 'Great Internet Mersenne Prime Search', (GIMPS)[9], a mathematics project on finding the prime numbers. The project began in 1997. According to Anderson & Reed (2009) volunteer computing is now used in a wide variety of fields; physics, molecular biology, medicine, chemistry, astronomy, climate dynamics, mathematics, and the study of games. Most typically, volunteer computing is used either in academic or popular public interest projects like climate change and

[9] More details about the project can be found in their website; http://www.mersenne.org/ Accessed on 2 September 2009

cancer research. Christensen et al (2005) details how volunteer computing has aided in the research into climate change. In one of the most popular 'volunteer computing' modes, volunteers are required to download a software application from a project website and install it. From there on the processes are largely automated where the software does the required tasks of computations, communicating with the main server and uploading the results. In the initial stages that involved some human interaction. Now most of the tasks are automated.

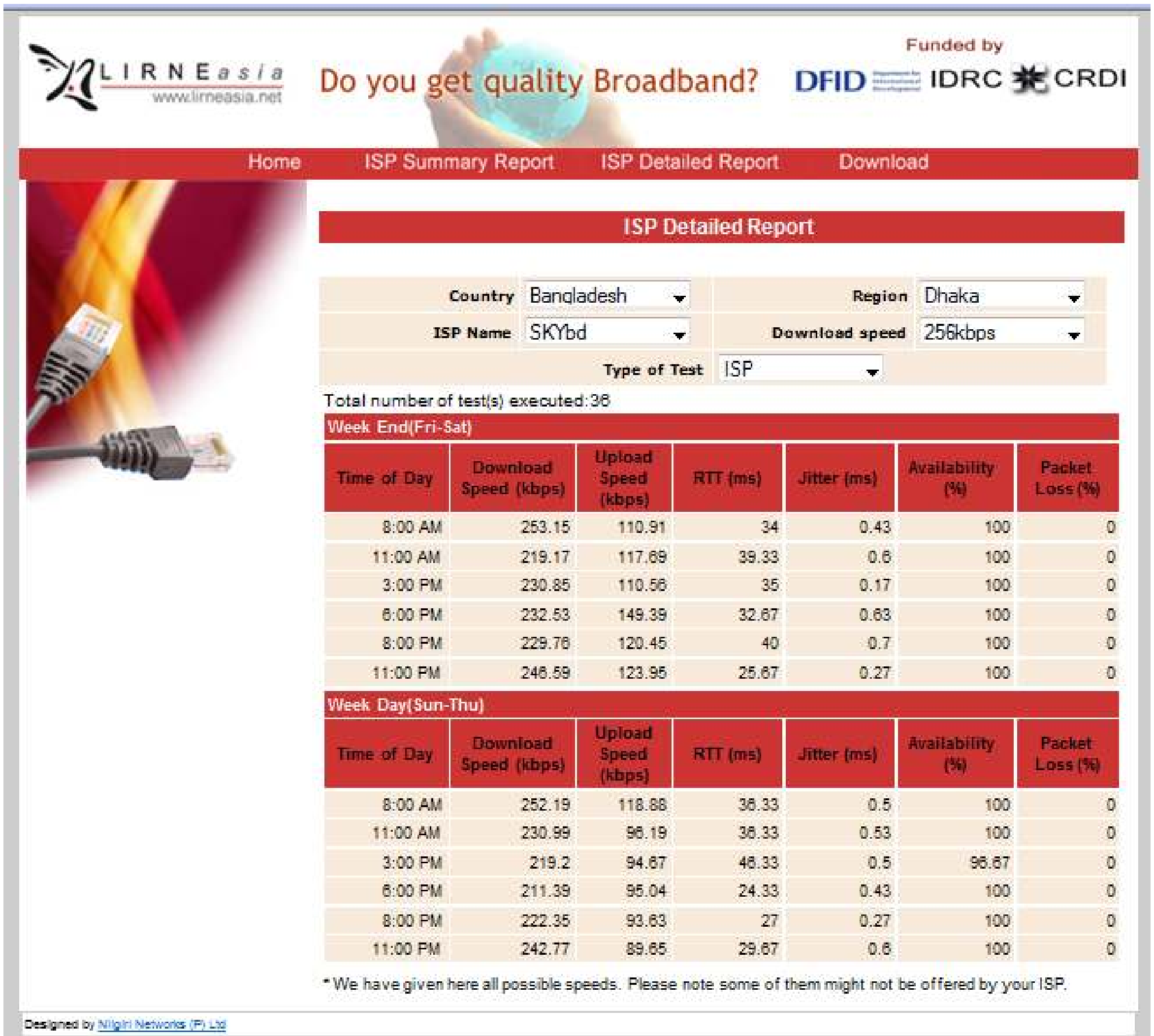
Volunteer computing requires a trust between the volunteers and the project managers. Anonymous volunteers will not and cannot be held accountable for incorrect data. In turn, the volunteers trust the project to be within legal standards such as security, privacy and intellectual property laws. In spite of the advances in the relative ease of taking part in a volunteer computing, it has been estimated that only about 1% of world's computers participate in it. As the literature suggests, obtaining volunteers is easier when the project holds public appeal Volunteer computing Projects should be designed to ensure minimum inconvenience to the volunteers. (Christensen et al, 2005).

5.0. Volunteer Computing in Broadband QoSE measurements

Inherent interest of users to know the quality of their broadband links was the foundation for the LIRNEasia/IIT Madras research project. The AT-Tester assumed therefore that the general public would be interested in downloading, installing and running a software that enables them to measure broadband quality. Provided that the process was user-friendly and the application (and provider) was trustworthy.

The value of the tester lies not just in getting a user to test his or her connection quality. Rather to enable the user to compare his/her metrics with a group of other users (or an average).This is facilitated by having the measurement data automatically uploaded to the website (www.broadbandasia.info, the same website from where the user downloads the application from). The user of the software (or anyone else, for that matter) is then able to view the data reported by all other users. Results are available on country and city basis, where applicable. The averaged results of all tests conducted are reported. Figure 4 shows a sample of data from Bangladesh. The key to success of course is in having as many users reporting data as possible.

Figure 4: Sample test report from broadbandasia.info



L I R N E a s i a www.lirneasia.net Do you get quality Broadband? Funded by DFID IDRC CRDI

Home ISP Summary Report ISP Detailed Report Download

ISP Detailed Report

Country: Bangladesh | Region: Dhaka
ISP Name: SKYbd | Download speed: 256kbps
Type of Test: ISP

Total number of test(s) executed: 36

Week End(Fri-Sat)						
Time of Day	Download Speed (kbps)	Upload Speed (kbps)	RTT (ms)	Jitter (ms)	Availability (%)	Packet Loss (%)
8:00 AM	253.15	110.91	34	0.43	100	0
11:00 AM	219.17	117.69	39.33	0.6	100	0
3:00 PM	230.85	110.56	35	0.17	100	0
6:00 PM	232.53	149.39	32.67	0.63	100	0
8:00 PM	229.76	120.45	40	0.7	100	0
11:00 PM	246.59	123.95	25.67	0.27	100	0

Week Day(Sun-Thu)						
Time of Day	Download Speed (kbps)	Upload Speed (kbps)	RTT (ms)	Jitter (ms)	Availability (%)	Packet Loss (%)
8:00 AM	252.19	118.88	36.33	0.5	100	0
11:00 AM	230.99	96.19	36.33	0.53	100	0
3:00 PM	219.2	94.67	46.33	0.5	96.67	0
6:00 PM	211.39	95.04	24.33	0.43	100	0
8:00 PM	222.35	93.63	27	0.27	100	0
11:00 PM	242.77	89.65	29.67	0.6	100	0

* We have given here all possible speeds. Please note some of them might not be offered by your ISP.

Designed by Nilgiri Networks (P) Ltd

Source: www.broadbandasia.info

6.0. Examples of Data Analysis

The project was initiated in 2008 when the AT-Tester software was first developed and used. The project has been continuing since. QoSE information on broadband packages of several countries has been recorded since then.

Given that the project is still in early stages, not all data comes from volunteers. At times the research team from LIRNEasia had to employ testers in order to ensure that data from multiple locations were collected at the same time, in order to facilitate benchmarking.

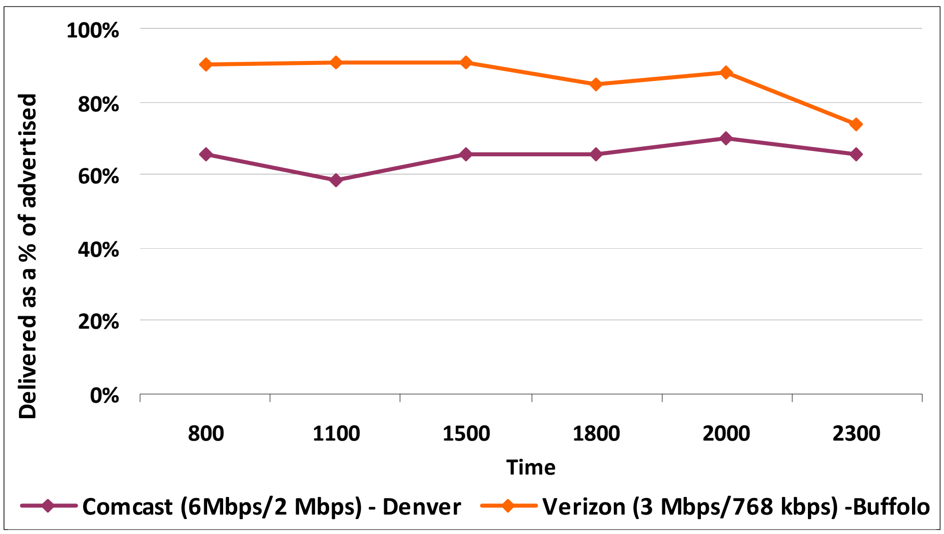
The following are examples of the type of information that can be extracted by analyzing the data gathered and the policy interventions it could lead to.

6.1. Results for the USA

In USA, QoSE results for two unlimited broadband packages, in two cities are available, Verizon and Comcast. Comcast, tested in Denver, has an advertised download speed of 6 Mbps and upload of 2 Mbps and it is priced at USD 59.95 per month. Verizon, tested in Buffalo, New York has an advertised download and upload speeds were 2Mbps and 768 kbps respectively and a monthly cost of the connection is 29.99. The tests were conducted in August 2009, 6 times a day in order to capture the peak and off peak times.

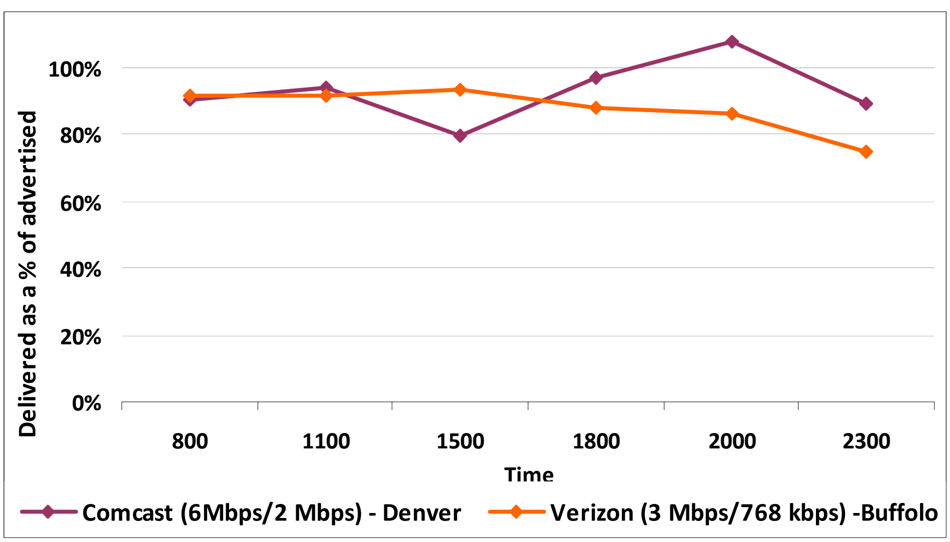
The download test results (as percentages of advertised speeds) are given in figures 5, 6 & 7

Figure 5: Download from ISP domain – US operators, August 2009



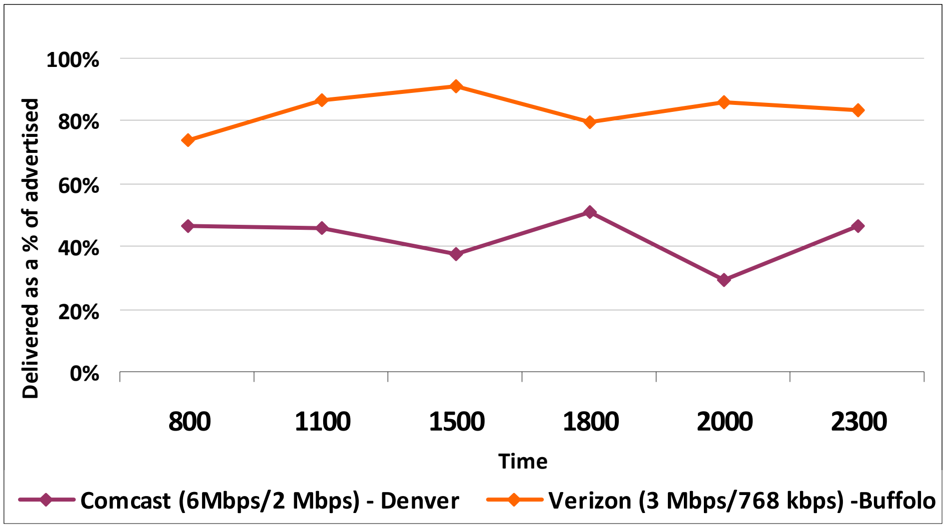
Source: LIRNEasia test results, August, 2009

Figure 6: Download from National domain – US operators, August 2009



Source: LIRNEasia test results, August, 2009

Figure 7: Download from International domain – US operators, August 2009



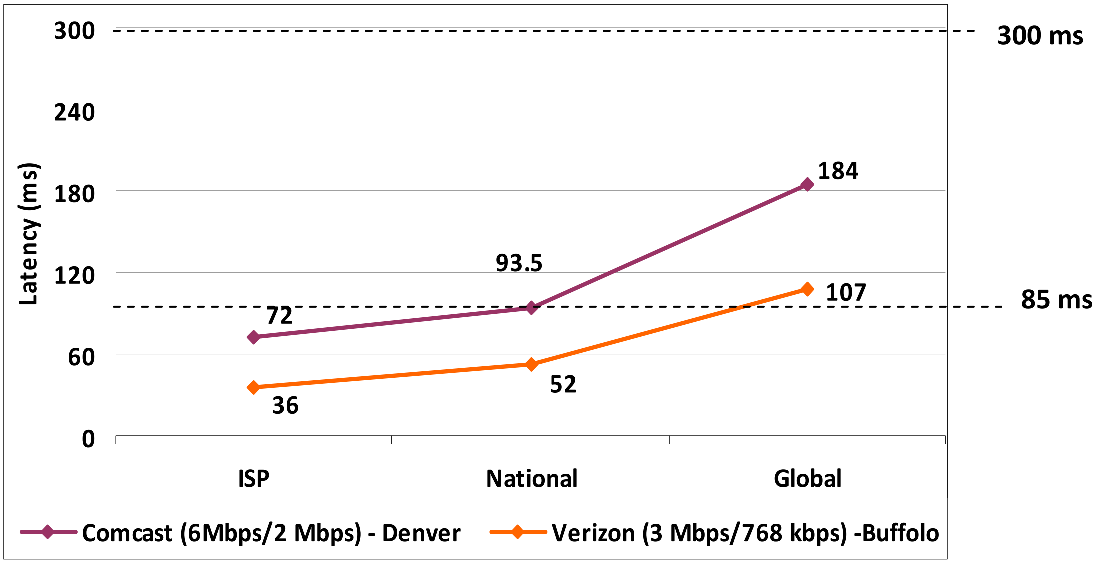
Source: LIRNEasia test results, August, 2009

In all three graphs, figures 5, 6 and 7, the download speed data shows Verizon performs better than Comcast. This is more significant in the international segment. Ideally, the speeds should have been close to 100%, but no serious performance drops are observed.

Performance is seen falling below 75% for Comcast in figure 7. Its users might be experience this drop in quality when accessing an international server. This indicates possible bottlenecks in the trans-Atlantic link used by Comcast.

A typical download speed graph for a package not prone to congestion, shows drops during 'peak' periods, usually around 11 am (business peak) and anytime between 6 pm to 11 pm. (residential peak) Absence of such an inverted hump characteristics mean the networks are not overly congested, or right contention ratios are applied.

Figure 8: Round Trip Time to ISP, National and International domains (in ms) – US operators, August 2009

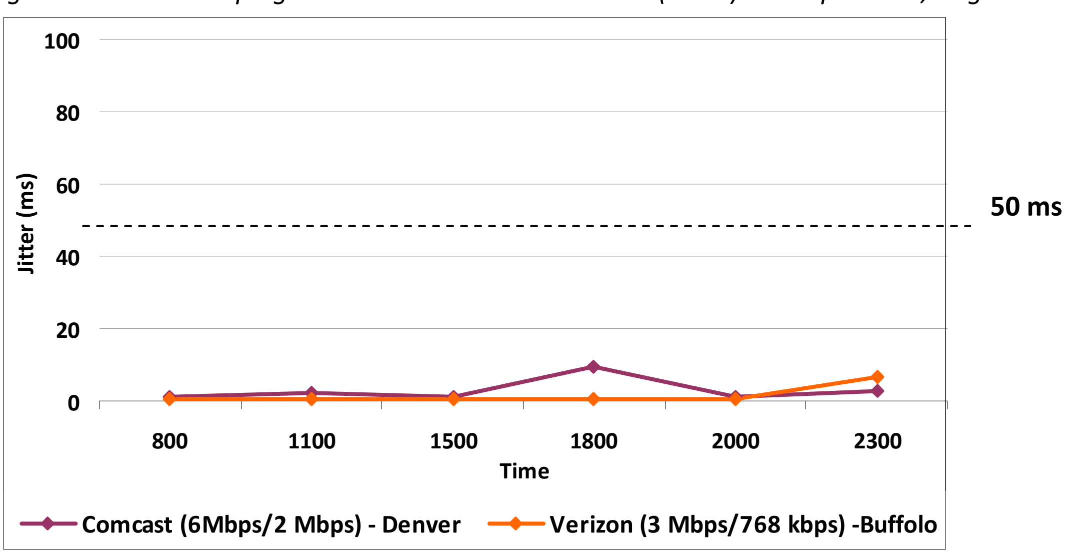


Source: LIRNEasia test results, August, 2009

Latency (RTT) plays a major role in the real time or interactive applications. The specified limit for the Singaporean operators by the Infocomm Development Authority (IDA) is 85 ms for local network segment and 300 ms for international segment (until the first entry point to USA from Singapore.)

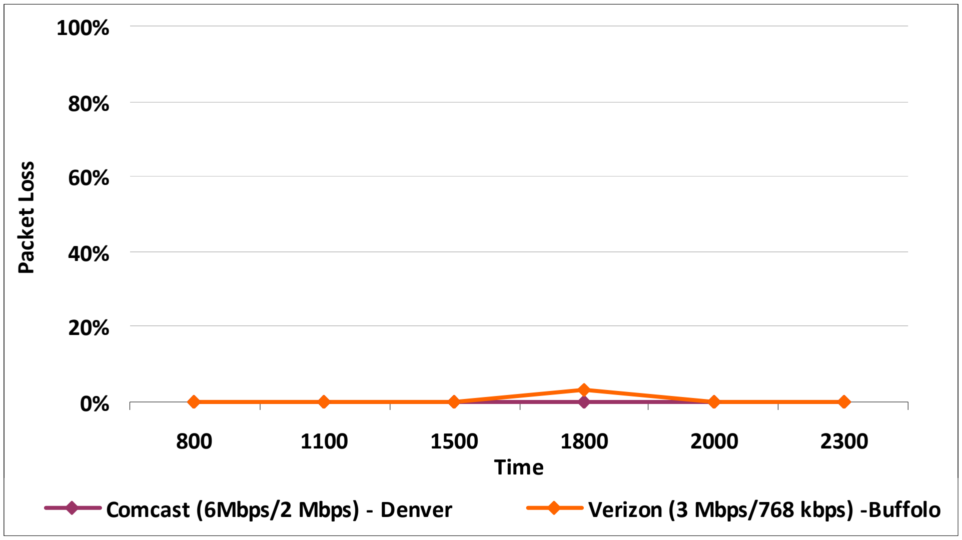
Out of the two US operators, while Broadband Verizon complies with both, Comcast meets the national standard only in certain cases. (NB. USA is taken as the 'international' destination for users from most of the countries. For USA and Canada, Germany is taken as the 'international' destination, representing a server in Europe.)

Figure 9: Jitter when pinged to the international domain (in ms) – US operators, August 2009



Source: LIRNEasia test results, August, 2009

Figure 10: Packet loss when pinged to international domain – US operators, August 2009



Source: LIRNEasia test results, August, 2009

Neither universal acceptance levels nor national standards exist for jitter and packet loss. The limits depend upon the applications too. Idea will be 0 ms jitter and 0% packet loss. For practical purposes LIRNEasia has adopted 50ms and 3% as standards. Performances of both operators are within these overall limits.

Based on the above results (which are all within reasonable or acceptable range), there is little need to call for policy interventions. The only improvement might be to expand the international link capacity for Comcast in order to obtain better download speeds when accessing content overseas.[10]

6.2. Results from South Asia

The results of testing from South Asia, in contrast, show that there is much to be desired, and therefore point at opportunities for regulatory intervention.

Under its Rapid Response program LIRNEasia makes quick responses to specific requests for training/advice by governments/entities in the region on telecom policy and regulatory issues. One form of response is a written submission (e.g., to a public consultation or to media). On several occasions data from broadband QoSE database has been used as the basis of these rapid responses.

i) Bangladesh: Comparing the tests done in September/2008 to the ones done in February 2009 in Dhaka, Bangladesh showed a marked deterioration in download speed within these 6 months (Figure 11). These results were used in the policy recommendations made by LIRNEasia to Bangladesh Telecommunication Regulatory Commission (BTRC) in August 2009.

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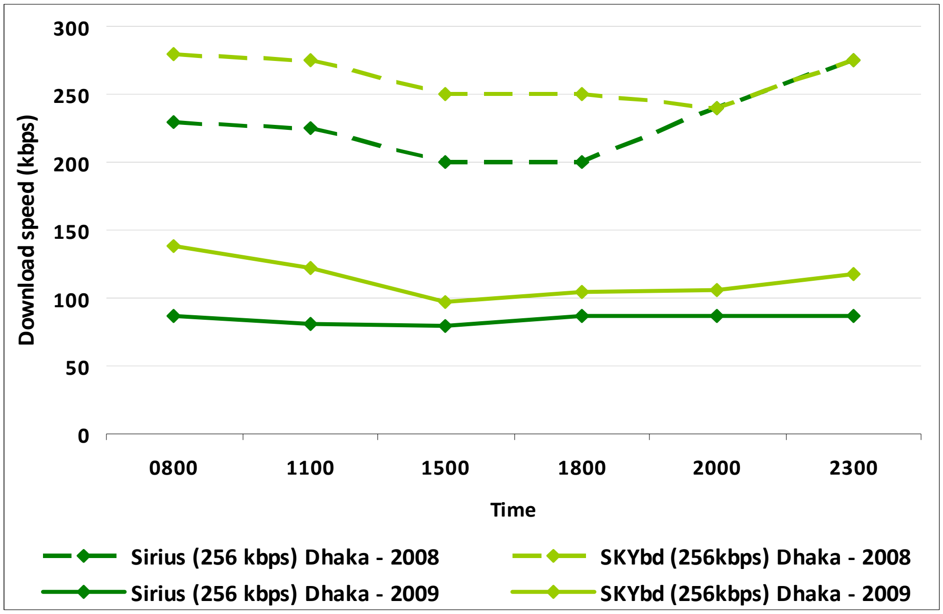
[10]However, given the propensity for even international data to be hosted in the US, it is likely that the International Domain is the least accessed by US-based broadband users.

Figure 11: Download Speed in International domain, Bangladesh

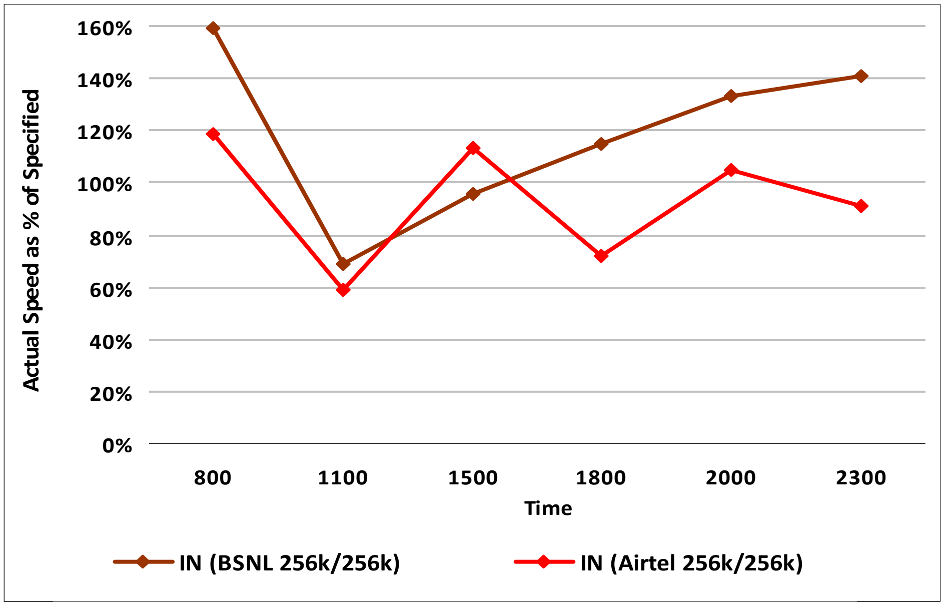


Source: *LIRNEasia Broadband Test Results,* Sept 2008 and Feb 2009

The possible reasoning was the immediate expansion of the broadband user base in Bangladesh, following the rapid drop in prices (Please refer Figure 1), perhaps without allowing the operators to expand their infrastructure. LIRNEasia recommended the approach regulators should take in adopting broadband regulatory measures based on its experiences in QoSE research in South Asia.

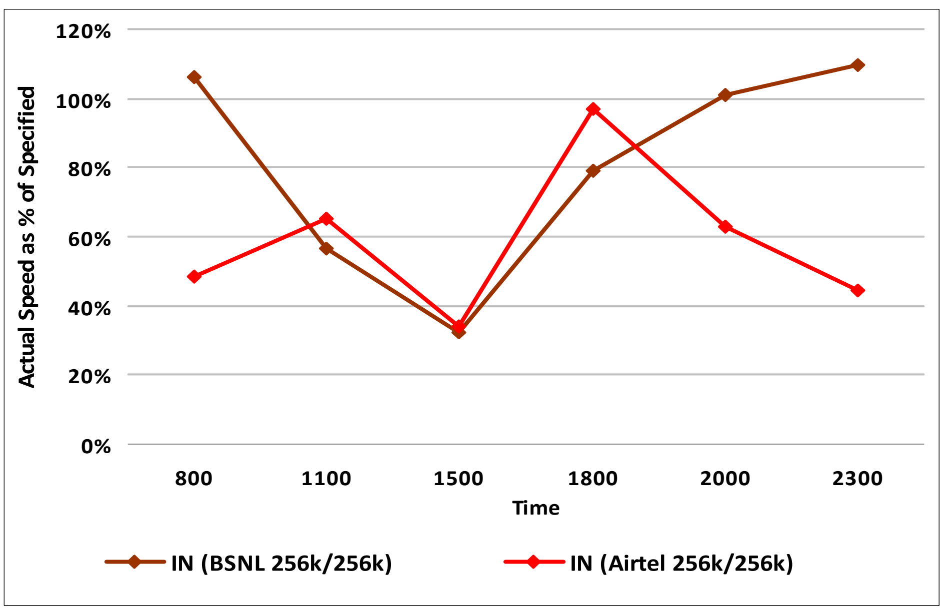
ii) **India:** Recommendations were made to Telecommunication Regulatory Authority in India (TRAI) too based on the erratic patterns observed in download speeds offered by the Indian operators.

Figure 12: Download Speed in ISP domain for Chennai



Source: LIRNEasia test results, Sept 2008

Figure 13: Download Speed from International domain for Chennai



Source: LIRNEasia test results, Sept 2008

Prima facie, this appears a case of over-delivery but only because TRAI has specified the local operators to advertise based on the minimum speeds rather than a range. In spite of the higher percentages, in actual terms the speeds are low and behave in an erratic pattern. This normally happens when there are significant variations in the number of users sharing the same link.

LIRNEasia's key recommendation here was to specify the contention ratios, 1:20 for business and 1:50 for residential, for the operators. They have adopted 1:30 (business) and 1:50 (residential).

7.0. Observations on the use of volunteer computing model

The following are the observations for a period of nearly a year of operation.

1. The response rate was not as high as expected. The anticipated level of traffic, based on the presumed broadband user activism in South Asian countries was not seen. The data received now largely appears to be from one-time users.[11]

2. The model seems to work better for certain countries than the rest. Response rate is best for Sri Lanka and India.

3. The number of requests to register for testing higher[12], as indicated by the site statistics, than the number that completes the process.

4. More test results are observed being fed immediately after the awareness creation workshops by LIRNEasia and IIT Madras.

It is too early to deduce the success/failure of the model. The low rate of response can be due to multiple reasons. Perhaps activism per se was not adequate to entice users contribute the anticipated time and effort. It also may be due to the less awareness.

Some users have commented on the aspects of user-friendliness of the software application. The need to first time registration discourages many users but it is essential as the ISP information needs to be fed to the system. It cannot be the user's responsibility for two reasons. An ordinary user might not be aware of the technical details of the ISP. Then it is too risky to entirely depend on the data fed by a volunteer with no guarantee about the accuracy.

8.0. Conclusion

LIRNEasia has used the data gathered through the AT-Tester software application for four rapid responses it made to South Asian regulators for policy intervention purposes. Two of these are shown above. Though not all data gathered was through volunteer computing, this illustrates the potential.

The volunteer model as it is might not be the best for an exercise of this nature. The additional time and effort, compared to other examples that use the same model makes a big difference. Users cannot be expected to make this contribution without any return. They need to be compensated, not necessarily in financial terms, but at least in kind. A non financial incentive needs to be added to the model to expect better response rates.

[11] Since it is not mandatory for a user to input results to the database, the number of records in the database is not a reflection of the number of tests conducted, which has to be higher.
[12] The application needs pre-registration. The user has to provide the ISP, country and package information.

The other improvement can be awareness creation. It will not be practical to expect users to spend time doing a test on a site they find on a casual search. A casual user does not fit into the ideal profile of a 'volunteer'. Rather the volunteers need to be carefully nurtured. Awareness creation plays a major role there. Increase in the response rate following awareness creation workshops indicates that would be a good exercise, but other modes too can be tried.

Overall, these trends suggest the need to slightly deviate from the volunteer computing model is indicated. Participation requires the broadband users to contribute both his/her time and computer resources to the project. So it might be too much to depend fully on activism. An additional incentive should compensate the user effort.

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***Title: Comparison of AT-Tester with Other Popular Testers for Quality of Service Experience (QoSE) of an Internet Connection**

***By:** *Timothy A. Gonsalves & Anuraag Bharadwaj*

***Date:** August 2009

***IDRC Project Number:** 104918-001
***IDRC Project Title:** Advancing evidence-based policymaking and regulation in the emerging Asia-Pacific to ensure greater participation in ICTs (Phase II)
***Country/Region:** India

***Full Name of Research Institution:** LIRNE*asia*

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***Abstract:** Internet service providers (ISPs) offer various broadband packages to their subscribers. They typically specify the minimum, maximum or range of bandwidths that the subscriber could obtain on the last-mile link. The ISP may also use Quality of Service (QoS) techniques to ensure a minimum service level, say 256 kb/s on the broadband link [QoS09]. In practice, the achieved bandwidth may differ significantly from the advertised bandwidth as subscribers are more interested in the overall quality of their service experience (QoSE) when using Internet services such as browsing, VOIP, streaming video, etc. This includes the end-to-end path through the Internet to a distant server, in addition to the last-mile. QoSE is the actual measure of the user's experience with an operator in terms of delivered quality with or without reference to what is being promised. This is measured quantitatively and not subjective [QoSE09].

The TeNeT Group of IIT-Madras and LirneAsia, Colombo have developed the *AshokaTissa* (AT) Tester Methodology by which a subscriber can measure his/her quality of service experience. A freely downloadable tool is available (currently for Windows) by which the subscriber can run the tests and generate a report on the QoSE of his/her broadband connection. The results are stored on a server from which the average performance of all subscribers of each ISP are publicly available.

While there are a large number of free broadband speed testers available, there are practically no critical evaluations of them. There are reviews of individual testers (see e.g. [Fisher]). One of the few reports on multiple testers merely only gives a terse description of each of 6 test tools [Mitchell].

In this document, we review some of the popular tools that are available for testing the performance of a subscriber's Internet connection. In the next section, we review the test methodology and the factors that influence the QoSE. In Section 3, we give a detailed evaluation of the more popular testers and the AT-Tester. This is followed by a summary table and our conclusions in Section 4. The Appendix lists the features and our rating of all the other testers that we have surveyed. Note that we only review tools that are free to use.

***Keywords:** Broadband, Speed testing, Quality of Service Experience

Table of Contents

1. Introduction

Internet service providers (ISPs) offer various broadband packages to their subscribers. They typically specify the minimum, maximum or range of bandwidths that the subscriber could obtain on the last-mile link. The ISP may also use Quality of Service (QoS) techniques to ensure a minimum service level, say 256 kb/s on the broadband link [QoS09]. In practice, the achieved bandwidth may differ significantly from the advertised bandwidth as subscribers are more interested in the overall quality of their service experience (QoSE) when using Internet services such as browsing, VOIP, streaming video, etc. This includes the end-to-end path through the Internet to a distant server, in addition to the last-mile. QoSE is the actual measure of the user's experience with an operator in terms of delivered quality with or without reference to what is being promised. This is measured quantitatively and not subjective [QoSE09].

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2. Experimental Methodology

2.1 Metrics

Different applications make different demands on the Internet connection. For example, browsing a photo gallery requires high download speed while a networked game requires low round trip delay. Hence, the AT Tester Methodology [AT08] defines a comprehensive set of 6 performance metrics that should be measured in each experiment. Note that these metrics are similar to the metrics defined by ITU-T [ITUT02] and the IETF [IETF09] for operator-centric QoS. The 6 metrics are briefly described below.

Download speed (kbps) — The maximum rate at which data can be received from the Internet. This is measured by downloading a large file over about 1 minute, in order to average out temporary fluctuations in speed. It is an indicator of the basic browsing experience.

Upload speed (kbps) — This metric defines the speed at which the subscriber can send data to the Internet. It plays a significant role in responsiveness of real-time applications like VOIP.

Round trip time or **RTT (millisec)** — Time taken for a packet to reach the destination and return. This is significant in systems that require two-way interactive communication such as online commerce and gaming.

Jitter (millisec) Jitter is the variation of end-to-end delay from one packet to the next within the same packet stream/connection/flow. Jitter is more relevant for real-time traffic like VOIP.

Packet-Loss (%) The fraction of packets which do not reach the destination. This can result in noticeable performance degradation with streaming traffic such as video where retransmission is not done.

Availability (%) This measures the number of times we are able to access the Broadband services. If *T* attempts are made to connect to the Internet, and if *F* attempts fail, then
Availability = $(1–F/T)\times 100\%$

These 6 metrics help the subscriber to estimate the quality of experience with various applications in a qualitative manner. This is done using Table 1 below.

Table 1: Relevance of Metrics to Various Internet Services
Legend: +++ highly relevant, ++ very relevant, + relevant, - not relevant

Service	Speed		Delay		Loss
	Down	Up	RTT	Jitter	
Browse (text)	++	-	++	-	-
Browse (media)	+++	-	++	+	+
Download file	+++	-	-	-	-
Transactions	-	-	++	+	-
Streaming media	+++	-	++	++	++
VOIP	+	+	+++	+++	+++
Games	+	+	+++	++	++

2.2 Factors Affecting the Measurements

There are many factors that can influence the Quality of Service Experience perceived by the subscriber. These include:

a) The theoretical maximum data transfer rate of the subscriber's Internet connection (last mile)
b) The nature of the last-mile medium (copper, optical fibre, wireless or satellite)
c) Sharing of the last mile by any other users
d) The number of links and number of ISPs between the source and the destination, and the congestion on these links
e) The number of other requests being handled by the remote server.
f) The presence of interference in the last mile due to lightning, electrical noise, loose connections, etc.
g) Subscriber's computer configuration and other applications running on it
h) Time of day and day of week (peak business time, national holiday, etc).

Many of the factors vary dynamically. For example, a backbone link serving a business area may be heavily congested at 10 a.m. but may have almost zero traffic at 2 a.m. Likewise, a short thunderstorm may cause severe degradation of performance for a few minutes. Hence, it is clear that *a single measurement is meaningless*. Any experiment must be repeated at different times of day, different days of the week, with different servers (some nearby, some distant), etc. Only with such a systematic experiment can the subscriber get a true picture of the quality of the Internet connection.

To account for the effects of these factors, the experiments should be by each subscriber as follows:

Type of day Week day, week end, holiday (local/national)

Time of the day Peak/non-peak business hours, peak/non-peak residential hours

Location of server

- ISP Level Test – to/from a server in the subscriber's ISP
- Country Level Test – to/from a server in the subscriber's country but hosted by a different ISP
- Global Level Test – to/from a server outside the subscriber's country.

In all cases, the server chosen should be a widely-used one so that it is representative and is likely to have high-bandwidth network connections.

3. AT-Tester and Other Popular Testers

We now describe the AT-Tester and 3 other popular testers. Each tool is described under the following headings:

1. **Description**: This describes the tool and its salient features.
2. **Performance Metrics:** The metrics that are quantified by the tool.
3. **Drawbacks:** The various important drawbacks of the tool.
4. **Rating:** A good tool must satisfy two requirements:
    a. *Technical merit:* it must use a sound methodology to measure a comprehensive set of QoSE metrics. The test results must be analysed to produce meaningful summaries.
    b. *Convenience:*
    Use: the tool must be easy for a non-technical subscriber to use
    Results: must be presented in a form that such the person can easily understand.

For each of these parameters, we rate the tool as *Poor*, *Marginal*, *Average*, *Good* or *Excellent*

3.1 AT-Tester (http://www.broadbandasia.info)

Description

The client software referred to as the AT-Tester is pre-installed in the user PC for measuring the QoSE metrics periodically. Results can be viewed locally and uploaded to the www.broadbandasia.info server. The tool is written in VBScript. The tests are done using ping, download of files from selected servers, and upload of files to the www.broadbandasia.info server.

The AT-Tester allows the subscriber to test against 3 different servers: global, national and ISP. Widely-used servers are selected for each country and ISP. This allows the subscriber to assess the QoSE for services hosted in different parts of the Internet cloud.

- ISP Level Test – to/from a server in the subscriber's ISP
- Country Level Test – to/from a server in the subscriber's country but hosted by a different ISP
- Global Level Test – to/from a server outside the subscriber's country.

Salient features of the AT-Tester:

- The client application supports registration, scheduling of tests, manual running of tests, viewing and uploading of results (see Figure 1).

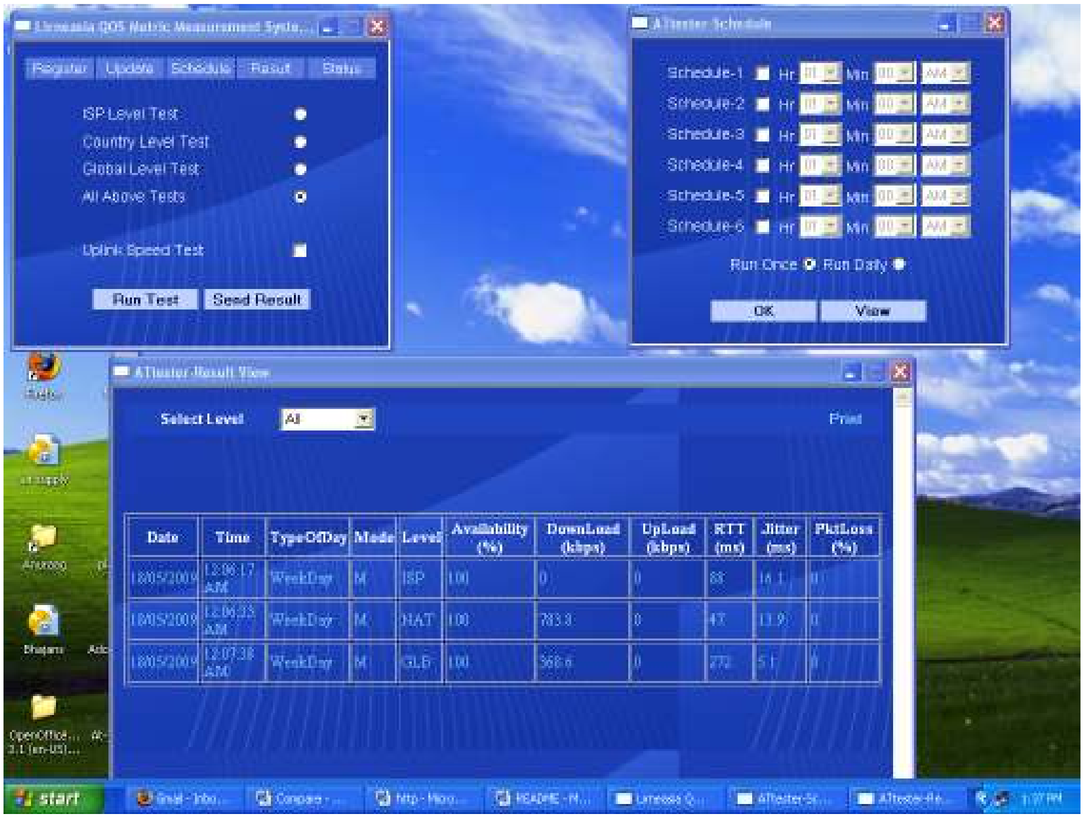

Figure 1: AT-Tester main window, scheduler, local results (clockwise from top-left)

- During registration, the subscriber selects his/her location, ISP and tariff package
- Tests can be run manually, or can be run by the scheduler at selected times
- Results are stored on the PC and can be viewed locally.
- The results are uploaded manually to the www.broadbandasia.info server. There they are aggregated with other results for the same ISP and location, and the aggregate results are publicly viewable (see Figure 2).
- Results for different service providers can be compared.
- It tests the throughput to three servers, namely (a) the local ISP (b) another server within the same country and (c) a global server outside the country (this is located in Germany for the US and in the US for all other countries)
- Care is taken to ensure that there is no other network traffic on the subscriber's link during the tests.
- Both the test methodology and the source code for the AT-Tester are open.

Week End(Sat-Sun)						
Time of Day	**Download Speed (kbps)**	**Upload Speed (kbps)**	**RTT (ms)**	**Jitter (ms)**	**Availability (%)**	**Packet Loss (%)**
8.00 AM	1471.35	0	327	0.9	100	0
11.00 AM	547.43	0	297.71	1.97	95.72	4.28
3.00 PM	692.92	0	305	1	100	0
6.00 PM	609.41	0	343.25	3.12	100	0
8.00 PM	853.6	0	309.2	1.34	100	0
11.00 PM	783.46	0	312	3.25	100	0

Week Day(Mon-Fri)						
Time of Day	**Download Speed (kbps)**	**Upload Speed (kbps)**	**RTT (ms)**	**Jitter (ms)**	**Availability (%)**	**Packet Loss (%)**
8.00 AM	870.76	0	292.6	2.18	100	0
11.00 AM	1310.18	67.27	285.86	1.25	100	0
3.00 PM	1220.36	12.2	304.33	2.1	100	0
6.00 PM	1081.47	13.91	288.5	1.1	98.75	0
8.00 PM	1198.59	20.24	298.09	1.08	100	0
11.00 PM	1198.81	27.06	287.87	1.82	100	0

* We have given here all possible speeds. Please note some of them might not be offered by your ISP.

Designed by Nilgiri Networks (P) Ltd

Figure 2: AT Tester aggregate global server results for an ISP at various times of day

Performance Measures

The *AshokaTissa* methodology includes all the 6 key metrics described, viz. download speed, upload speed, RTT (latency), jitter, packet loss and availability. See the figure below for a sample report of the aggregate statistics for one ISP. The times of the tests cover peak/non-peak business and peak/non-peak residential use.

Drawbacks

- Total time taken for each test is about 5 minutes. The complete test suite consists of 6 tests day on at least 2 days.
- At the time of registration, if the subscriber's ISP is not in the configured list, s/he has to wait for it to be configured by the www.broadbandasia.info admin and only then can tests be run
- The user interface could be better, e.g. results are presented only in tabular form

Rating

Table 2: AT-Tester Rating

Measure	*Score*	*Comments*
Technical merit	Excellent	Covers all metrics, multiple well-defined servers, meaningful aggregation of statistics, sound experimental methods
Convenience	Use: Average Results: Good	Results are useful to a technically savvy person, not so easily used by a non-technical person. Tedious registration process.

3.2 Speedtest.net (http://www.speedtest.net/)

Description

Speedtest.net is provided by Ookla (www.ookla.com), a company that is focused on web-based network diagnostic applications. Ookla provides network speed testing applications for an annual license fee ranging from $400-$2,000. The services of the speedtest.net website, reviewed here, are provided free.

Salient features of Speedtest.net:

- This tool allows you to check the performance of their connection to and from hundreds of locations around the world.
- The tool is browser-based, there is no application to be installed on the PC
- The tester is implemented in Adobe Flash which must be installed in the browser. Flash is freely available for all PC browsers, and is installed in most browsers.
- The tests are done against a server which is selected from a large list. There are about 100 servers each in N. America and Europe, and about 100 in the rest of the world. Servers are available in all continents. There are 2 servers in India (Mumbai and Delhi) and one in Sri Lanka (Colombo).

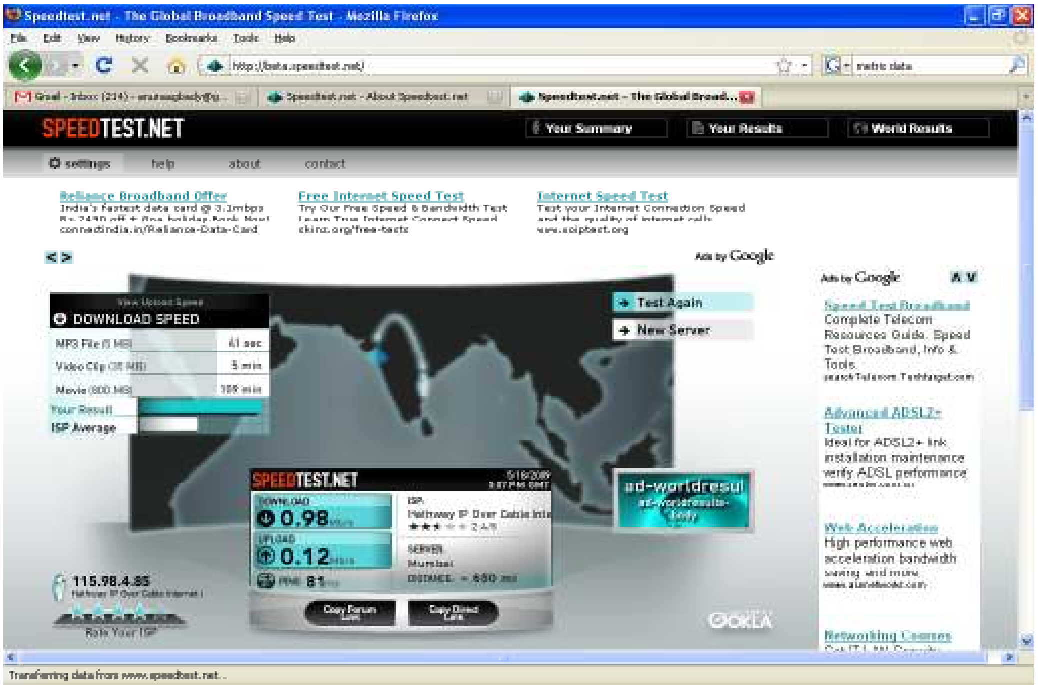

Figure 3: Speedtest.net: test results for top ISPs in India

- It is very user friendly. It also shows the ISP name, IP address and the physical distance between your system and the selected server. Results are shown in an attractive graphical form (see Figure 3).
- World results can be viewed and compared easily on basis of download and upload speed. It also shows the top 10 results (Only the best test scores are used for the ranking) of the world/continent/country/city.
- The subscriber can see a summary of his/her Internet speed, including past results, and compare with the ISP's average, and with other ISPs nationally (see Figure 4) and around the world (see **Error! Reference source not found.**)
- It allows the subscriber to upload results and rate the ISP
- Total time taken for the test is less than one minute
- Speedtest.net also allows individuals and organizations to register their servers in the list of available servers. This requires some configuration of the server.
- Speedtest,net can also be used from an iPhone

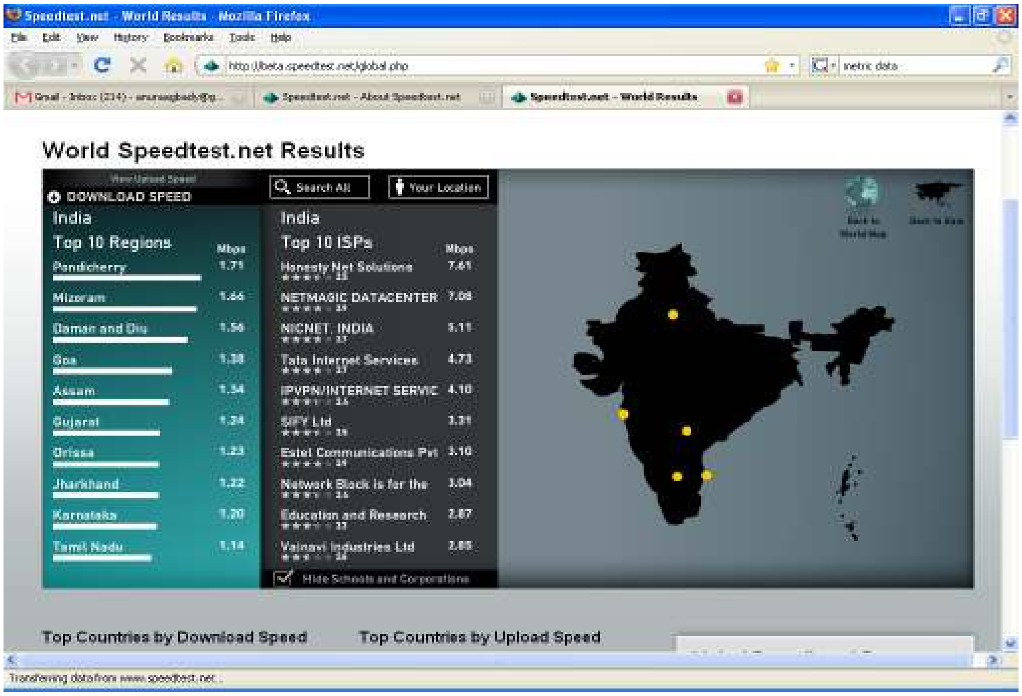

Figure 4: Speedtest.net: Top ISPs in India

Performance Measures

Speedtest.net performs three measurements, viz. download speed, upload speed and round trip time (RTT) out of the 6 metrics defined above. (Note: the commercial versions of the tester also measure jitter and packet loss.)

Drawbacks

- Only three parameters Download Speed, Upload Speed and Latency are considered for generating the result whereas other parameters like Jitter, availability and packet loss are not considered
- Results are averaged over different times of day and different days. Hence they can be misleading if one ISP is tested at peak time and another at off-peak time.
- Results are averaged across the large number of servers chosen by each subscriber.

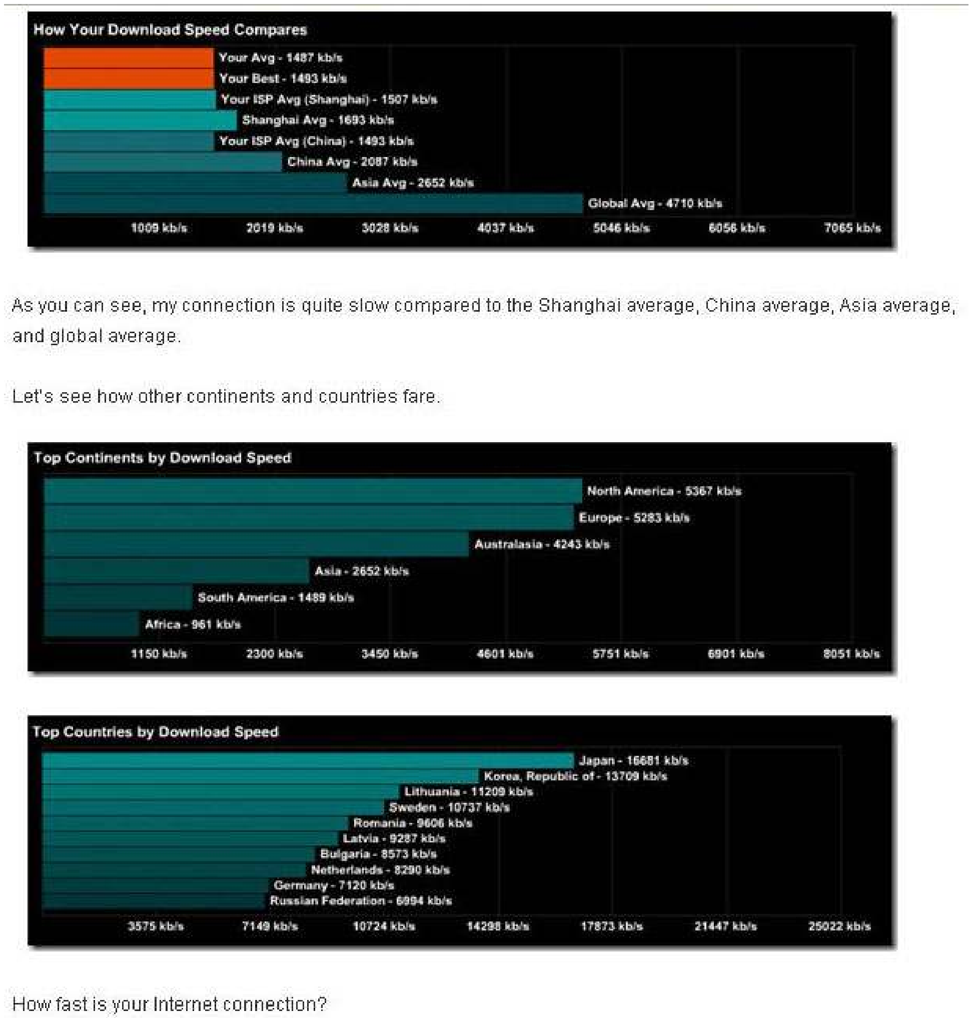

Figure 5 Speedtest.net: Summary of world-wide results

Rating

Table 3: Speedtest.net Rating

Measure	*Score*	*Comments*
Technical merit	Average	Covers 3 metrics, many servers around the world; aggregation of statistics misleading
Convenience	Use: Excellent Results: Average	Effective graphics. Results are easily understood by a lay person, but could be misleading. Large database of test results.

3.3 Speedtest2.com (http://www.speedtest2.com)

Figure 6: Speedtest2: Summary of test results

Description

Note: this tester is quite distinct from Speedtest.net, though it appears to have been inspired by it (user interface, metrics and Flash implementation).

- Very user friendly with a good GUI, the ISP name and location are automatically determined (see Figure 6)
- The tool is browser based
- No registration is needed, the subscriber selects a server and the test is run immediately
- Total time taken is less than one minute
- It allows the subscriber to upload results and rate the ISP
- Global summaries can be displayed
- An individual or organization can register their server to be used. This requires about 100 MB of disk space and PHP support.

Performance Measures

Speedtest2.com performs three key measurements used to determine the overall quality and performance of Internet connection, which are download Speed, Upload Speed and Ping (Latency).

Drawbacks

- Only three parameters Download Speed, Upload Speed and Latency are considered for generating the result whereas parameters like Jitter, availability and packet loss are not considered
- Results are averaged over different times of day and different days. Hence they can be misleading if one ISP is tested at peak time and another at off-peak time.
- Results are averaged across the large number of servers chosen by each subscriber.
- The number of servers (10) is small compared to Speedtest.net: there are 5 servers in Poland, 3 in the rest of Europe, 1 in the US and 1 in Kolkata, India.

Rating

Table 4: Speedtest2.com Rating

Measure	*Rating*	*Comments*
Technical merit	Average	Covers 3 metrics, limited servers around the world; aggregation of statistics misleading
Convenience	Use: Good Results: Average	Effective use of graphics. Results are easily understood and used by a lay person, but could be misleading

3.4 Internetfrog (http://www.internetfrog.com/mypc/speedtest/)

Description

- The Internet Frog has many tools for webmasters, domain owners, network administrators, and website developers.
- The tool is browser based.
- The measured speed is compared with a speed guide (see Figure 7)
- The time for downloading a file (1MB, 10MB or 100 MB) from the Internet is estimated, to help the subscriber understand the speed results
- It also shows the Quality of Service in percentage, which is not seen in other tools.
- Total time taken is less than one minute

Performance Measures

It provides information regarding download and upload speeds, RTT, max pause (longest gap between successive packets) and "Quality of Service" (a percentage measure of the consistent download capacity).

Drawbacks

- Jitter, availability and packet loss are not considered
- A single pre-determined server is used
- The tester uses a Java applet and hence will not run on browsers that do not have the correct version of Java installed.

Rating

Table 5: Internetfrog Rating

Measure	*Score*	*Comments*
Technical merit	Marginal	Covers 3 metrics, many servers around the world
Convenience	Use: Good Results: Marginal	Results are easily understood and used by a lay person, but aggregation is misleading

4. Comparative Evaluation

We now compare the above 4 broadband testers. A good tool must satisfy two requirements, technical merit and convenience (see Section 3).

Technical Merit

ISPs advertise only the bandwidth of a broadband service and most of the testers concentrate only on this metric. However, subscribers use the Internet for a diversity of uses, each making different demands on the network. In this regard, the AT-Tester is superior to the other testers.

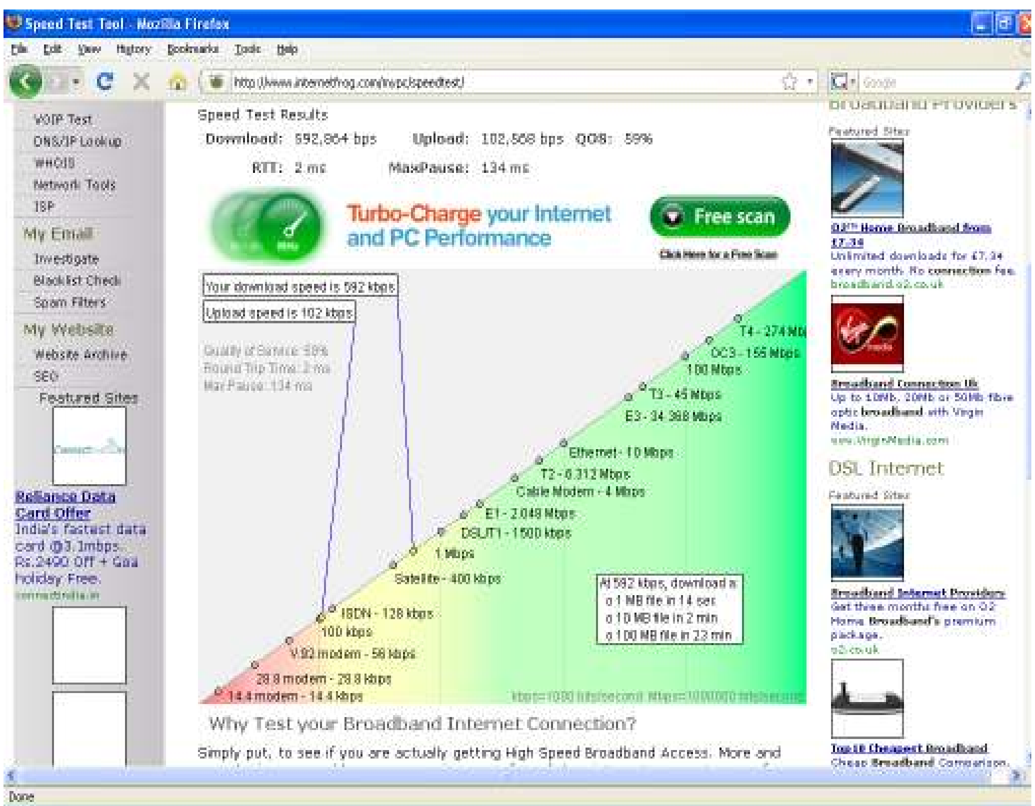

Figure 7: Internetfrog.com: Test results

As discussed earlier, *a single experiment is meaningless* given the number of factors that could affect the experiment. Again, the AT-Tester scores much above the other testers in the rigour of its experimental methodology. All the other testers take single tests done by uncoordinated users and average them to yield a single *figure of merit*. The AT-Tester gets each user to repeat the tests at least 12 times as carefully chosen times and days with each of 3 different servers. The results are averaged across multiple users only when other factors are the same. This produces a set of numbers that define the QoSE of each ISP. The detailed performance is also available at a click of a button.

A single figure of merit may seem attractive but is often meaningless. Suppose that a user in Delhi is considering a 6 Mb/s ADSL service. The “fact” that Tata Internet Services achieves 4.73 Mb/s vs. 3.31 Mb/s for SIFY (from the Speedtest.net website) may give a false picture. It may be that the SIFY tests were done at peak business hours with high congestion while the Tata tests were done during the early morning with light load. Likewise, the Tata testers may have had high-speed packages, while the SIFY testers could have had lower speed packages. The AT-Tester which gives time of day, type of day, ISP, package, and region allows the user to do an apples to apples comparison.

Table 6 compares the technical merit of the 4 testers. We consider several issues. First is the number of metrics. As discussed in Section 2.1, a comprehensive set consists of 6 metrics. Next is the experimental method. Does the tester attempt to compensate for uncontrolled factors such as line quality, thunderstorms, etc? The third issue is repetition of the test from the same location to account for daily and weekly variations. Next, we examine the servers used for the testing. Another issue is the degree of openness, which enabled the public to understand and criticize the methodology. Next, we consider the issue of the analysis. Is this done to produce meaningful and useable summaries? Finally, based on these issues, we give our overall rating on a scale of 1-5.

Table 6: Comparison of Technical Merit of 4 Testers

Issue	AT-Tester	Speedtest.net	Speedtest2.com	Internetfrog
Metrics	6 (download and upload speed, RTT, jitter, packet loss, availability)	3 (download and upload speed, RTT)	3 (download and upload speed, RTT)	3 (download and upload speed, RTT)
Experimental method	Tests done with large files, ping repeated 100 times, other network activity stopped	File size and ping repetitions not known. Browser may generate spurious network traffic.	File size and ping repetitions not known. Browser may generate spurious network traffic.	Large file size used. Ping repetitions not known. Browser may generate spurious network traffic.
Repetitions	Each test is repeated at 6 times of day, and on 2 days (weekday and weekend)	Depends on the subscriber, typically only one test is done	Depends on the subscriber, typically only one test is done	Depends on the subscriber, typically only one test is done
Servers	Carefully chosen servers, per ISP, each country and global. ISPs and countries added on demand.	About 300 servers in N. America, Europe and ROW. Most countries covered.	Only 10 servers (5 of which are in Poland)	Many servers around the world
Analysis	Uploaded data is manually scanned for any obvious inconsistencies. Data	Averaging is done across all subscribers to produce a single figure of merit for one	Averaging is done across all subscribers to produce a single figure of merit for one	Averaging is done across all subscribers to produce a single figure of merit for one

Issue	AT-Tester	Speedtest.net	Speedtest2.com	Internetfrog
	is averaged in a meaningful way: for the same time of day, type of day, ISP, country, etc. to produce detailed summaries.	ISP or one country. No distinction is made for time of day, type of day, etc.	ISP or one country. No distinction is made for time of day, type of day, etc.	ISP or one country. No distinction is made for time of day, type of day, etc.
Openness	Methodology and source code are fully public. Public seminars are conducted to disseminate and discuss results. Results are shared with ISPs.	Metrics and some details of the methodology are described on the website.	Metrics and some details of the methodology are described on the website.	Metrics and some details of the methodology are described on the website.
Rating	Excellent	Average	Marginal	Marginal

Convenience

In convenience, all the testers except AT-Tester run entirely within the browser. There is no need for registration. The tester automatically determines the subscriber's ISP name and location. Extensive use of graphics enhances convenience and appeal. The user can run a test in about 1 minute. With the AT-Tester, one test takes about 5 minutes and the complete suite of tests requires 2 days.

In the presentation of the results, again all the testers except AT-Tester present a single number. This is easy to use but as discussed above can be very misleading. The AT-Tester summaries contain more detailed information that avoid misleading data but require more effort on the part of the user.

The use of a browser has a downside. The browser may have tabs open that use the network in the background, eg. for periodic refresh of content. This will affect the accuracy of the readings. The AT-Tester runs stand-alone and cautions the user to stop all network activity.

Automatic determination of ISP information is a convenience that is not always useful. For example, the IP addresses for BSNL (a large nationwide ISP in India) are sometimes listed as "NIB (National Internet Backbone)" and sometimes as BSNL. The automatic algorithm thus mistakes BSNL as two ISPs. Most users who see a report for NIB will not know that this in fact is a part of BSNL.

Finally, developed by an academic group, TeNeT of IIT-Madras, and LirneAsia, an NGO, the AT-Tester screens are completely devoted to test information. In contrast, all the other testers include ads that distract the user and may consume bandwidth!

Summary

In summary, the AT-Tester is the best tester for broadband QoSE in technical merit compared to all other testers surveyed (above and see the Appendix below). AT-Tester lacks in ease of use, and could be enhanced by better use of graphics and perhaps a browser version.

We note that results of a few technically rigourous studies of broadband performance have been published by academic groups (e.g. [Dischinger07]). However, these are not readable by the general public, the test tools are not freely available, and the results only cover the US and Europe. The AT-Tester makes technically rigourous measurements available to the general public, with a focus on South Asia.

Appendix: Other Test Tools

Here, we describe some of the other test tools that are available for free use on the Internet. These are generally less useful than the ones surveyed above. Each tool is described in the same format as in Section 3 above.

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1. BBC News (http://news.bbc.co.uk/2/hi/technology/7416471.stm)

Description

- This tool, provided by BBC News, UK, is browser based
- It provides the speed at which a small file (e.g. song) and a big file (e.g. movie) could be downloaded from the BBC website only
- It allows the subscriber to plot his/her location and speed on a map and upload a message.
- Total time taken is less than one minute.
- It displays the pattern of results submitted from across the UK

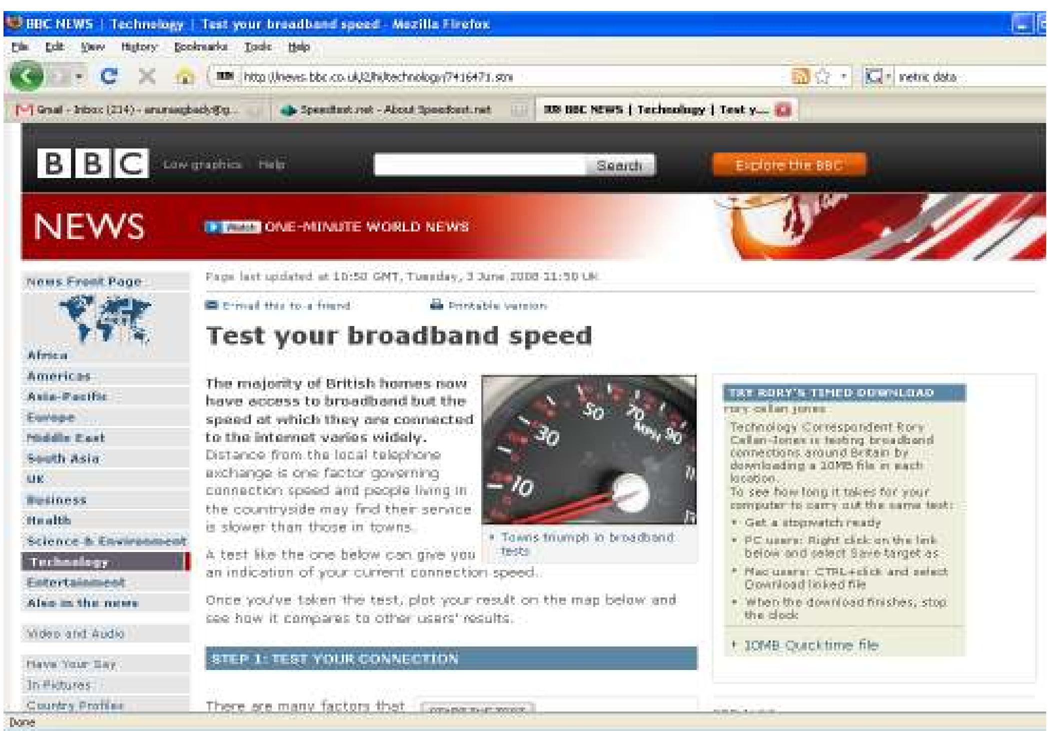

Figure 8 BBC News Speed Tester

Performance Measures

- It only measures download speed

Drawbacks

- Only one parameter i.e. download speed, that too from only one BBC server
- Upload Speed, Latency, Jitter, availability and packet loss are not considered

Rating

Table 7: BBC News Tester Rating

Measure	*Score*	*Comments*
Technical merit	Poor	Single metric, single server
Convenience	Use: Good Results: Very Poor	Useful to a user of the BBC website only

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2. ZDNet UK (http://resources.zdnet.co.uk/speedtest)

Description

- This tool is provided by zdnet.co.uk
- The tool is browser based
- Total time taken is less than one minute
- Once the test is conducted it plots the speed along with the expected speed for comparison

Performance Measures

It only provides the information regarding download speed and the total time taken.

Drawbacks

- Only one parameter, download speed, is provided from a single pre-determined server
- Upload speed, latency, jitter, availability and packet loss are not considered for generating the results.

Rating

Table 8: ZDNet UK Rating

Measure	*Score*	*Comments*
Technical merit	Poor	Single metric, single server
Convenience	Use: Good Results: Very Poor	

Figure 9 ZDNet UK broadband speed tester

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3. Toast Internet Service (http://performance.toast.net/)

Description

- Average bandwidth results from other ISP users that use this testing site are displayed
- It allows testing of the Internet connection from about 20 locations (1 in Syria, the others in the US).
- It allows adding of a server
- It maintains a list of the fastest ISPs and web host
- The tool is browser based
- History of the subscriber's past tests are not maintained in the free version
- Total time taken is less than one minute

Performance Measures

Both upload and download speeds are measured from any one of the list of servers.

Figure 10 Toast.net: List of servers available for testing

Drawbacks

- Only two parameters, download speed and upload speed, are considered.
- Latency, jitter, availability and packet loss are not considered
- Almost all the servers are located in the US

Rating

Table 9: Toast Internet Rating

Measure	*Score*	*Comments*
Technical merit	Marginal	2 metrics, several US-centric servers
Convenience	Use: Very Good Results: Marginal	Aggregation could be misleading

---

4. Thinkbroadband (http://www.thinkbroadband.com/speedtest.html)

Description

- The tool is browser based
- It takes 2 to 3 minutes for the test to complete.
- Results are logged for statistical purposes and are an indication of the connection speed only.
- Results can also be shared with the service provider to help troubleshoot problems or improve their service.
- To use this tester, Java must be installed and enabled
- The subscriber is cautioned not to use the Internet during a test

- Download is done from a single pre-determined server

Performance Measures

It only provides the download speed from a single pre-determined server. Files ranging from 5 MB up to 1 GB in size are provided for downloading. A *Rough Speed Guide* is provided for comparison:

ADSL Speed	*Typical Download*	*Typical Upload*
512 Kbps	460 Kbps	200-240 Kbps
1 Mbps	920 Kbps	200-240 Kbps
2 Mbps	1840 Kbps	200-240 Kbps
8 Mbps	7000 Kbps	400-750 Kbps

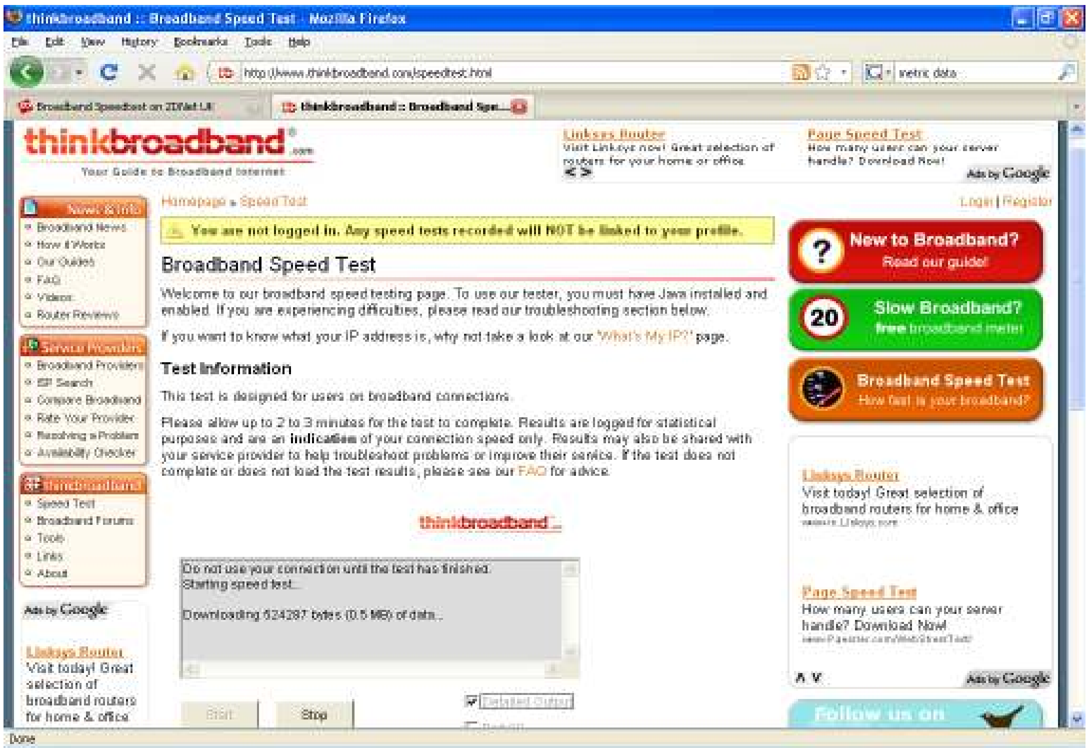

Figure 11 Thinkbroadband: Home page with test running

Drawbacks

- Only one parameter, download speed, is provided, from a single pre-determined server
- Upload speed, latency, jitter, availability and packet loss are not considered
- Total time taken is slightly higher than many of the other testers
- Downloading the Java applet takes time and it will not run unless the browser supports the right version of Java

Rating

Table 10: Think Broadband Rating

Measure	*Score*	*Comments*
Technical merit	Poor	Single metric, single server

Convenience	Use: Good Results: Very Poor	

5. Broadband DSL Reports (http://www.dslreports.com/)

Description

- DSLreports.com claims to be the largest online community based on interest in consumer broadband (and related) information, news and tools.
- It allows one to compare and identify the most popular service provider in any region of USA and Canada.
- The tool is browser based
- Total time taken is less than one minute.

Performance Measures

It only provides the information regarding download speed. It has a list of servers of USA and Canada to choose from, to check the speed. It provides a detailed comparative report of various ISP in different categories to compare the results and the performance.

Drawbacks

- Only one parameter, download speed, is measured.
- The tests are specific to USA and Canada.
- Upload Speed, Latency, Jitter, availability and packet loss are not considered

Rating

Table 11: Broadband DSL Reports Rating

Measure	*Score*	*Comments*
Technical merit	Poor	Single metric, N. American servers only
Convenience	Use: Good Results: Poor	

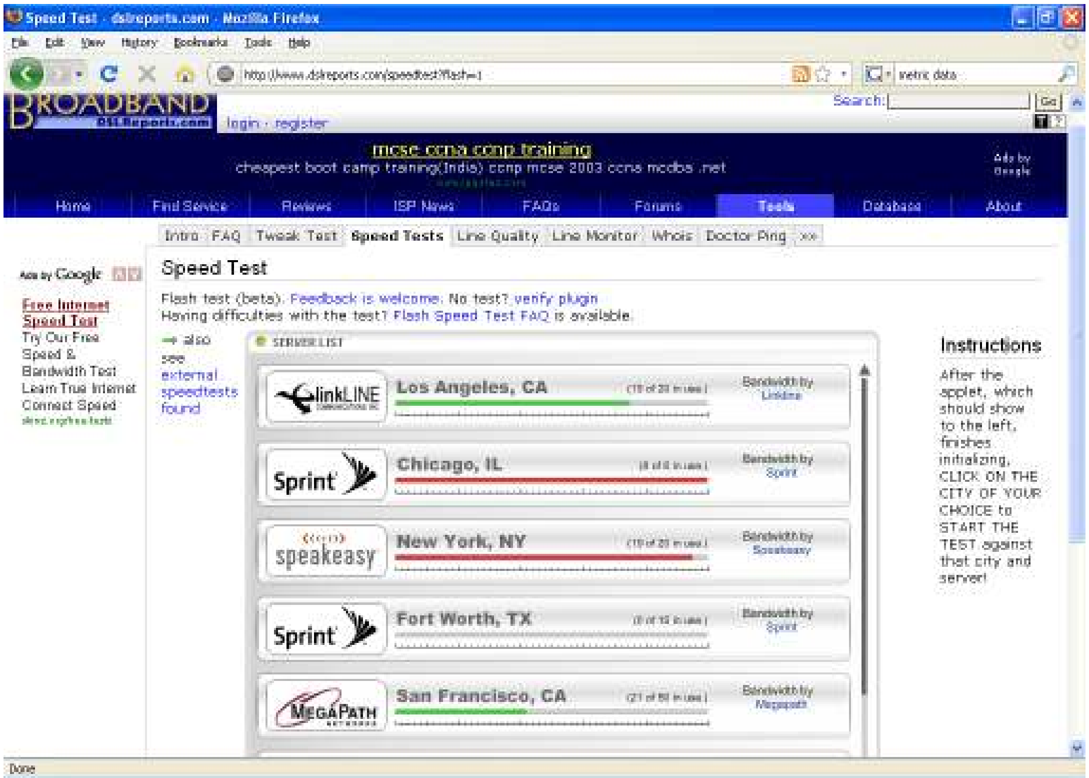

Figure 12 DSL Reports: speed of various US-based ISPs compared

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6. Auditmypc (http://www.auditmypc.com/internet-speed-test.asp)

Description

- The tool is browser-based. Both Flash and Java versions are available
- Testing is done using the *packet-pair* technique rather than downloading of a file. This gives an approximate estimate of the throughput but uses less bandwidth compared to the more common file download method.
- It provides a speed guide for comparison
- The tests are done with one pre-determined server

Performance Measures

It only measures upload and download speeds.

Drawbacks

- Only two parameters i.e. upload and download speed are provided
- Latency, Jitter, availability and packet loss are not considered
- A single pre-determined server is used

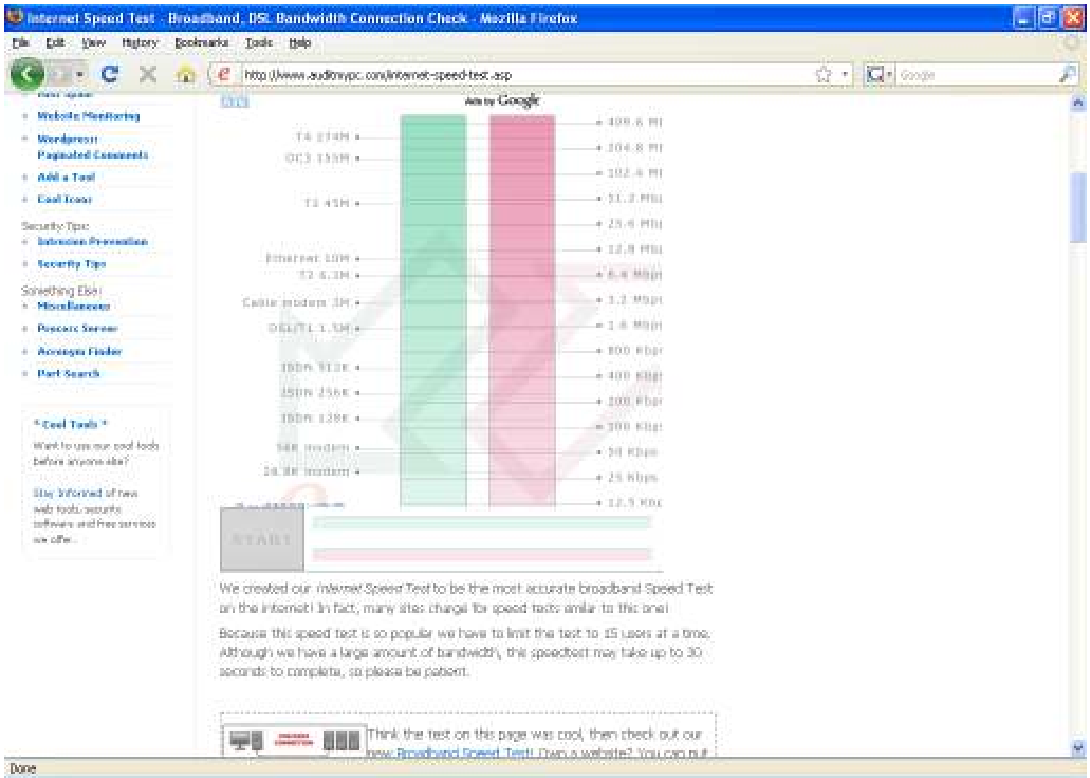

Figure 13 Auditmypc speedtest results

Rating

Table 12: Auditmypc Rating

Measure	*Score*	*Comments*
Technical merit	Poor	Two metrics, single server
Convenience	Use: Good Results: Poor	

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7. Voiptest (http://www.voiptest.org)

Description

- This test measures the quality and performance of Internet connections for Voice over IP by simulating real VoIP sessions between 5 pre-determined servers and the subscriber's PC
- Total time taken is less than one minute.
- The tool is browser based

Performance Measures

It only provides the information regarding latency, upload and download speed, over five different servers located in different continents.

Figure 14 Voiptest.org testing in progress

Drawbacks

- Only latency, upload speed and download speed, specific to only five servers in the world, are measured
- Jitter, availability and packet loss are not considered

Rating

Table 13: Voiptest Rating

Measure	*Score*	*Comments*
Technical merit	Marginal	3 metrics, but few servers
Convenience	Use: Good Results: Average	One of the few testers that considers an application (VOIP)

8. BSNL Free Broadband Speed Checker

Description

- This is a tool provided by Dataone Broadband, BSNL to test Dataone connections
- The tool is browser based
- Total time taken is less than one minute
- The test is done to a local Dataone server
- Testing is done with 128 KB of sample data
- The measured speed is compared with the speed guide.

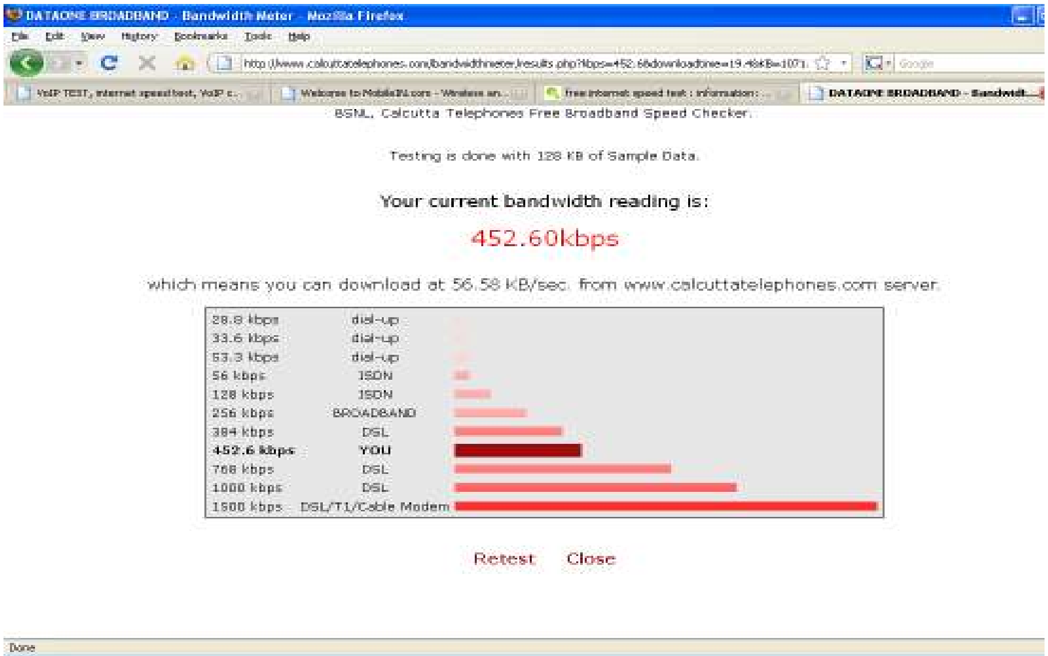

Figure 15 BSNL Dataone broadband speed test results

Performance Measures

It only provides the download speed from a specific server in the local region of BSNL, eg. in Kolkata the server is www.calcuttatelephones.com.

Drawbacks

- Only one parameter, download speed from a specific ISP server is provided.
- Upload Speed, Latency, Jitter, availability and packet loss are not considered

Rating

Table 14: BSNL Dataone Tester Rating

Measure	*Score*	*Comments*
Technical merit	Poor	Single metric, single ISP, single server
Convenience	Use: Good Results: Poor	Useful to a BSNL subscriber only

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Banded Forbearance:

A New Approach to Price Regulation in Partially Liberalized Telecom Markets

Rohan Samarajiva and Tahani Iqbal

Report Type: Research paper (Prepublication; an updated version of this paper was published in the International Journal of Regulation and Governance (2009, 9:1)

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__Country/Region__:* South Asia

*__Full Name of Research Institution__: LIRNE*asia*

*__Address of Research Institution__: 12 Balcombe Place, Colombo 8, Sri Lanka

*__Name(s) of Researcher/Members of Research Team__: Rohan Samarajiva and Tahani Iqbal

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*This report is presented as received from project recipient(s). It has not been subjected to peer review or other review processes.

***Abstract:** Fast growing telecom markets, especially in the developing world, are attracting new types of users, especially those at the Bottom of the Pyramid (BOP). Innovative pricing is needed to respond to this increasingly heterogeneous demand. However, many regulators still claim to regulate prices using methods from the monopoly era, despite lacking capacity to effectively regulate proliferating tariff plans. What actually happens is that tariffs are "approved" for the most part without proper review.

One response has been asymmetric regulation/forbearance, wherein the regulator determines that certain operators do not have significant market power (SMP) and frees them from regulatory burdens, including, in many cases, tariff regulation. This still leaves a few operators (possibly one each in different markets such as fixed, mobile, and broadband) under tariff regulation. They are required to file tariffs, and if not go through formal proceedings, at least go through a staff review. Given the leakiness of most regulatory agencies, this puts them at a significant disadvantage because their competitors can prepare precisely targeted and timed responses, unencumbered by regulation.

Forbearance was included in the 1997 legislation that created the Telecom Regulatory Authority of India (TRAI) prior to the EU asymmetrical regulation model being fully developed. Possibly as a result, TRAI did not forbear from tariff regulation on the basis of SMP: all tariffs in urban areas were forborne, with some limited regulatory authority retained in rural areas. The results were some of the lowest tariffs in the world (Nokia, 2008a; LIRNEasia, 2008, 2009).

Based on this lesson, it is proposed that "banded forbearance" be introduced, even in countries with far fewer competitors than in Indian circles (licensing areas). In this form of benchmark regulation, the regulator will: define a benchmarking methodology such as an adaptation of the OECD basket methodology, including peer countries and weights; define a band of allowed variance above and below, what is likely to be a moving benchmark, within which prices will be fully forborne; and specify competition-related criteria that will be used to evaluate price movements below the lower band (e.g., limited to tests on predation and price squeeze). Durations of validity for the bands and default outcomes can also be specified in order to reduce uncertainty.

The introduction of bands and specified criteria will allow operators to use innovative marketing strategies, while allowing the retention of regulatory safeguards that may be important in markets with few competitors and possibly significant control over essential facilities by incumbents. It will also result in refocusing regulatory energies on creating the conditions for competition rather than sterile calculations of the X in RPI-X. The production and timely dissemination of standard price, minutes-of-use, and call-distribution data needed for OECD type benchmarking will also result in reducing the opacity of pricing for consumers, thus sharpening competitive pressures and improving the customer experience.

***Keywords:** TRE Survey, banded forbearance

Banded Forbearance:

A New Approach to Price Regulation in Partially Liberalized Telecom Markets

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(Prepublication)

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Abstract

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One response has been asymmetric regulation/forbearance, wherein the regulator determines that certain operators do not have significant market power (SMP) and frees them from regulatory burdens, including, in many cases, tariff regulation. This still leaves a few operators (possibly one each in different markets such as fixed, mobile, and broadband) under tariff regulation. They are required to file tariffs, and if not go through formal proceedings, at least go through a staff review. Given the leakiness of most regulatory agencies, this puts them at a significant disadvantage because their competitors can prepare precisely targeted and timed responses, unencumbered by regulation.

Forbearance was included in the 1997 legislation that created the Telecom Regulatory Authority of India (TRAI) prior to the EU asymmetrical regulation model being fully developed. Possibly as a result, TRAI did not forbear from tariff regulation on the basis of SMP: all tariffs in urban areas were forborne, with some limited regulatory authority retained in rural areas. The results were some of the lowest tariffs in the world (Nokia, 2008a; LIRNEasia, 2008, 2009).

Based on this lesson, it is proposed that “banded forbearance” be introduced, even in countries with far fewer competitors than in Indian circles (licensing areas). In this form of benchmark regulation, the regulator will: define a benchmarking methodology such as an adaptation of the OECD basket methodology, including peer countries and weights; define a band of allowed variance above and below, what is likely to be a moving benchmark, within which prices will be fully forborne; and specify competition-related criteria that will be used to evaluate price movements below the lower band (e.g., limited to tests on predation and price squeeze). Durations of validity for the bands and default outcomes can also be specified in order to reduce uncertainty.

The introduction of bands and specified criteria will allow operators to use innovative marketing strategies, while allowing the retention of regulatory safeguards that may be important in markets with few competitors and possibly significant control over essential facilities by incumbents. It will also result in refocusing regulatory energies on creating the conditions for competition rather than sterile calculations of the X in RPI-X. The production and timely dissemination of standard price, minutes-of-use, and call-distribution data needed for OECD type benchmarking will also result in reducing the opacity of pricing for consumers, thus sharpening competitive pressures and improving the customer experience.

1.0 INTRODUCTION

Fast growing telecom markets, especially in the developing world, are attracting new types of users, especially those at the Bottom of the Pyramid (BOP) (Nokia, 2008b; Prahalad, 2004). Innovative pricing is needed to respond to this increasingly heterogeneous demand. Yet many regulators are still attempting to regulate prices using methods from the monopoly era, despite lacking capacity to effectively regulate proliferating tariff plans.

This article investigates the feasibility of regulating prices in telecom markets, focusing on approaches such as regulatory forbearance and asymmetric regulation. It then proposes a regulatory mechanism termed '*banded forbearance*', derived from benchmark regulation and especially useful for regulating prices in microstates with few competitors, but with possibly broader application.

Section 2.0 reviews the relevance of present price regulatory practices in fast-growing markets, and is followed by an explanation of the proposed regulatory tool, banded forbearance, in Section 3.0. Section 4.0 discusses the suitability of this approach in microstates, and the article concludes with a comparative analysis of banded forbearance in Section 5.0.

2.0 PRICE REGULATION IN DYNAMIC TELECOM MARKETS

Liberalization in the telecom sector

From 1990 to 2003, 128 developing countries allowed private participation in their telecom markets (Izaguirre, 2005), moving from monopolistic to partially or fully competitive market structures. According to the International Telecommunication Union's World Telecom Regulatory Database, only 10 percent of the developing economies do not allow competition in mobile telephony. Liberalization, including, but not limited to, the privatization of state-owned incumbent operators, has yielded significant improvements in sector performance (Dasgupta, Lall & Wheeler, 2001; Megginson & Netter, 2001; Gutierrez, 2003; Samarajiva, 2002); the presence of an independent regulator in addition to competition and privatization has also proven to be beneficial to telecom sector growth (Wallsten, 2001; Ros, 2003). These market reforms have had positive impacts in terms of increasing access paths per hundred people, operating efficiencies, and improvements in the quality and price of telecom services (Megginson & Netter, 2001), and are also claimed to contribute significantly to overall economic growth (Röller & Waverman, 2001).

Dasgupta, Lall and Wheeler (2001) claim that liberalization and privatization in the 1990s increased telecom penetration significantly, with most growth occurring through the spread of mobile phones.[3] Many of these new connections come from the lowest social strata or the BOP (de Silva, Zainudeen & Ratnadiwakara, 2008) who are highly value conscious. As such, service providers are increasingly under pressure to innovate with packages and prices in order to meet the growing heterogeneous demand.[4] Ramirez (1998), Samarajiva (2001) and others discuss how regulatory mechanisms are hobbled by administrative, financial and operational problems, which inhibit effective and timely action. Accordingly, some regulators are prioritizing and shedding low-priority tasks where possible. The importance of this for effective regulation is detailed in Melody (1999).

Regulatory forbearance

Based on the premise that there is little need for intervention as the number of service providers grows and competition increases in a market place, regulators can refrain or forbear from intervening or imposing controls in a market. Schultz (1994) considers this a means to give new firms without market power the space needed to flourish.

Deeming sufficient competition to exist in the Indian telecom sector, the Telecom Regulatory Authority of India (TRAI) forbears from price regulation in urban areas, although it does regulate some prices in rural areas. The Authority requires that all operators who provide basic, national long distance, or international long distance services, file a standard postpaid tariff[5] and a prepaid recharge card tariff[6] at least five days prior to their taking effect; if the Authority does not act on the submission within the

[3] There was an approximately 25-fold increase in China, 33-fold increase in India, and five-fold and two-fold increases in Latin America and Sub-Saharan Africa respectively.

[4] http://www.ictregulationtoolkit.org/en/Section.2196.html.

[5] Termed the "Reference Tariff Package of the Service Provider"; the plan has to include a monthly rental and airtime charge per minute, with a pulse duration for airtime charge of 30 seconds.

[6] The denomination of recharge card has to be less than INR 300 (approx. USD 7) with a corresponding validity of at least one month.

five days, the plans can be implemented by the operator without any explicit approval from the regulator (Sinha, 2002).

India now has some of the lowest mobile tariffs in the world (LIRNE*asia*, 2008, 2009; Nokia, 2008a) and a flourishing mobile market – the compound annual growth rate for 2000-2005 for mobiles was 90.6 per cent (International Telecommunications Union, 2007). The findings of the Telecom Regulatory Environment (TRE) assessments[7] carried out by LIRNE*asia* in 2006 and 2008, indicate that India received the highest scores on the tariff regulation dimension among the countries studied (Prem & Baburajan, 2009), indicating that TRAI's approach is appreciated by informed stakeholders.[8]

Forbearance does not necessarily mean that the regulator relinquishes all responsibility for regulation; the regulator may choose to forbear on certain aspects only based on assessments of market power and potential for predatory pricing; and regulation may be re-imposed if justified. In the case of regulating the markets for terminal equipment, wireless services and toll services, the Canadian Radio-Television Commission (CRTC) forbore from regulating these markets deeming them 'workably competitive'. In the terminal equipment market, the Commission forbore on the sale, lease and maintenance of single-line, multi-line and data equipment. In the wireless services market, regulatory forbearance was enforced in markets for mobile phones and data and wireless devices; however conditions were included to safeguard customer confidentiality with regard to interconnection (Organization for Economic Cooperation and Development, 2002). The toll-services market, on the other hand, was only partially forborne, with the CRTC requiring price and cost filings only in the market for long distance tolls. To decide on the competitiveness of a market, the Commission took

[7] The TRE assessment is a is a perceptual index which gauges regulatory performance across six (and in 2008, seven) dimensions, based on the elements of regulation identified by the Reference Paper of the GATS Protocol 4 (Market entry, management of scarce resources, interconnection, universal service, and enforcement of competition and regulatory rules) with an additional dimension: tariff regulation. Quality of service regulation was added in 2008. It is based on the perceptions of efficacy, by informed respondents.

[8] In 2006, India obtained 3.5 out of 5 for mobiles and 3.7 out of 5 for fixed connections, while the other five countries obtained scores between 2.2 and 2.9 for both mobile and fixed connections. In 2008, the score was 3.9 out of the maximum possible 5.

into account the market share of the largest firm, the price elasticity of demand and the contestability of the market.[9]

In another example, the Office of the Telecommunications Authority (OFTA) in Hong Kong, removed some regulations imposed on PCCW's prices in 2005, exempting the dominant operator from having its prices, plans for discounts and other responses to price competition approved by OFTA prior to execution, but maintained that the operator had to have any amendments to published interconnection tariffs, including tariffs for broadband services and virtual private network (VPN) services approved. PCCW has to still meet its accounting separation requirement as well as supply information to OFTA to make decisions regarding costs (Painter & Wong, 2007).

The level of competition is a defining factor for the success of regulatory forbearance and the reason for India's accomplishments can be attributed to the fact that it has the highest levels of competition in the South Asian region,[10] as well as at the Circle (or intra-regional) level.[11] But there are concerns that need to be addressed regarding regulatory forbearance in less-than-perfectly competitive markets. For instance, there are the potential risks of predatory pricing and/or a vertical price squeeze.

Asymmetric regulation

In a newly liberalised market a single operator, usually the incumbent, is better positioned than any new entrants to the market as it already has an established customer base and infrastructure in place. In such a case, it would seem most appropriate to implement asymmetric regulation, so as to deter this service provider from hindering competition. With this kind of regulation, authorities place certain restrictions on the tariffs and other aspects of service provision of the incumbent or the operator with significant market power (SMP), while all others are exempted from regulation. It may also be the case that regulatory burdens are imposed on fixed operators (only one service provider most of the

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[9] http://www.crtc.gc.ca/archive/ENG/Decisions/1994/DT94-19.HTM, http://www.crtc.gc.ca/archive/ENG/Decisions/1996/DT96-14.HTM and http://www.crtc.gc.ca/archive/ENG/Decisions/1995/DT95-19.HTM.

[10] According to the Hirschman-Herfindahl Index (HHI) for December 2007, India ranks lowest (0.16), followed by Pakistan (0.27), Bangladesh (0.31) and Sri Lanka (0.36) (Source: Authors).

[11] Circle-wise HHIs for India indicates that the figures for March 2007 are much lower than those for September 2003 (Source: TRAI).

time) while mobile operators remain unregulated. As part of being regulated, the dominant service provider may have to supply cost information to the regulator, and access to its networks to competitors (Liu, 2001; Bourreau & Dogyan, 2001).

Pakistan follows such an approach with somewhat encouraging results. The Pakistan Telecommunications Authority (PTA) identifies the SMP operator in the mobile market and imposes a requirement to file all tariff plans. Once the authorities review them, the SMP operator may implement the plans. If the PTA fails to respond within a certain period of time, the tariff plan is considered approved and goes into effect. While the findings of LIRNE*asia*'s Mobile Benchmarks study (2008) showed that Pakistan's mobile tariffs are even lower than India's, the TRE Assessments indicate that PTA's efforts are not fully appreciated by informed stakeholders in Pakistan.[12] Interestingly, for the SMP operator's tariffs are not set using price-cap or rate-base rate of return regulation. What may actually be in operation is forbearance.

Similarly, the Moroccan regulator, Agence nationale de réglementation des télécommunications (ANRT), imposes price controls for basic fixed services offered by the incumbent operator, Maroc Télécom. For other value-added services such as mobile and data, the regulator monitors the situation and intervenes only when required (ITU, 2001).

PCCW, the incumbent operator in Hong Kong SAR, came under tariff orders in 1993 and 1998 respectively (Chou & Liu, 2006). However, as discussed above, OFTA partially forbore on regulation in 2005. In China, regulators imposed tight tariff regulation on China Unicom, the SMP, in order to level the playing field in its duopoly telecom market (Gao & Lyytinen, 2000).

In Europe, the United Kingdom was among the earliest to initiate asymmetric regulation on its dominant carrier in 1984; Germany, France, and Portugal then followed in 1993, 1995, and 1998 respectively. The United States of America also began asymmetric regulation of AT&T in 1989 (Chou & Liu, 2006). These cases and others have been discussed in detail in several studies, including

[12] Pakistan scored 2.7 out of 5 in the fixed market, and 2.6 out of 5 in the mobile market.

those of Baak and Mitusch (2005); Crandall, Sidak and Singer (2002); Crandall and Hazlett (2000); Dewenter and Haucap (2003); Knieps (1997); and Peitz (2005).

There are several reasons for applying asymmetric regulation in newly competitive markets. In addition to the rationale based on prioritization, Schankerman (1996) states that this regulatory approach is most suited when the incumbent has the capacity to strategically deter entry into the market, and is the least costly way in terms of efficiency to correct the problem. However, there are concerns about the long-term applicability and implementation of asymmetric regulation.

Given the leakiness of most regulatory agencies, dominant operators are at a significant disadvantage because their competitors can prepare precisely targeted and timed responses, unencumbered by regulation; in their paper, Besen and Farrell (1994) mention that unregulated rival operators will charge prices slightly below that of the SMP, causing discontent among dominant operators as well as not passing on the benefits of competition to consumers.

In addition to these problems, asymmetric regulation is resource intensive, due to the administrative work involved in establishing criteria for determining the SMP operator. There is a need to identify the incumbency advantage and its impact on market outcomes (Peitz, 2005), and regulators lack information to do so.

It is also of concern that regulators may end up favoring some operators over others (Schankerman, 1996), damaging competition (Paredes, 2005), hurting the incumbent financially, and allowing inefficient firms into the market (Armstrong & Sappington, 2006; Gual & Trillas, 2003). Lyon and Huang (1995) assert that the asymmetric regulation approach may stifle innovation in general, as it creates an environment such that only unregulated firms find it profitable to innovate. Accordingly, the benefit of implementing such regulation in a market is lost as it will have a significant negative impact on investment and growth of the telecom network (Paredes, 2005).

As differences between operators diminish and conditions for competition set in, there is less need for the regulation of a single service provider; according to Perrucci and Cimatoribus (1997) this kind of regulation can distort this transformation and impact the overall efficiency of the market.[13] On the same lines, Crandall, Sidak and Singer (2002) claim that asymmetric regulation usually leads to "managed competition" which can be said to be far more difficult to sustain than traditional monopolistic regulation. Deciding which tool to employ for regulating tariffs is also problematic, as price-caps and rate of return (ROR) regulation, the two most common tools for regulating tariffs in telecom markets, each have their own limitations.

In price-cap regulation, regulators enforce a cap or limit on the average prices an operator can charge for each of its services; the cap is adjusted for inflation over time and is commonly called the X-factor (Littlechild, 1983). This gives operators stronger incentives to cut production overheads and improve operating efficiencies (Bernstein & Sappington, 1998), while allowing some pricing flexibility (Abel, 2002) and curtailing abuse of market power (Armstrong & Sappington, 2006). However, the calculation of X in the price-cap formula RPI-X[14] can be tedious and almost impossible to work out[15], and is generally ineffective as a regulatory tool where inflation is high or volatile.[16] For the most part, the X is negotiated based on cost studies or otherwise. Iozzi (2004) discusses how price-capping can limit the development of competition.

ROR regulation, on the other hand, focuses on capping the earnings of an operator (Weisman, 2002), and as such provides the least amount of flexibility for operators to set their tariffs/prices (Guthrie, 2006). Unlike in price-cap regulation where the caps are adjusted relatively frequently, ROR regulation is not conducive to such change and revision, and therefore it is no longer appropriate in today's context of fast changing mobile markets. Given these issues, the approaches and tools used in regulating tariffs in the telecom sector need reconsideration.

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[13] Baumol and Sidak (1994) and Sappington and Weisman (1996) discuss in further detail the impacts on efficiency due to the imposition of asymmetric regulation.

[14] Where RPI is the Retail Price Index and X is the value of inflation over time.

[15] Regulators have little guidance from the economic literature in calculating the X factor, say Bernstein and Sappington (1998).

[16] Adjusting the price cap too frequently can have a negative impact on an operator's planning, and can mean over-regulation, while maintaining a fixed cap over a long period of time can mean that the prices are capped either too high or too low at some point (Acton & Vogelsang, 1989).

3.0 A NEW APPROACH TO PRICE REGULATION: BANDED FORBEARANCE

Even though formal forbearance and asymmetric regulation (in practice, informal forbearance) have yielded both low prices and high satisfaction among stakeholders, this does not mean that regulators should completely abandon regulating prices in the telecom sector. In the case of markets that have no sustainable or effective competition, or where there exists a service provider with significant market power (SMP), some kind of regulatory mechanism to ensure that competitors are not harmed by abuse of market power is necessary. '*Banded forbearance*' is proposed as such a mechanism.

What is banded forbearance?

Derived from benchmarking regulation, banded forbearance lies between complete forbearance and asymmetric regulation. Banded forbearance entails identifying a peer group, selecting a benchmarking methodology to compare tariffs across the group, and defining the band within which the tariffs can move. Regulators will also specify competition-related criteria that will be used to evaluate price movements below the lower band. Differential treatment of below-the-band pricing by operators with market power versus those without may also be specified. The differentiation could be simply based on control of essential facilities that may short-circuit esoteric debates on defining significant market power.

How does it work?

To begin with, we will explain what benchmarking is in terms of tariff regulation: to benchmark is to set the price of an individual service based on the rate at which the same service is charged for in a jurisdiction or jurisdictions that have been identified as a standard. For instance, SingTel, the largest mobile operator in Singapore, benchmarks its mobile tariffs against those in neighbouring Asian countries, and selected major metropolitan regions.[17] Similarly when the dominant fixed operator BTC in the Bahamas rebalanced its prices under regulatory direction, the company benchmarked their international long distance (ILD) prices against those of sixteen countries in the region (Public Utilities Commission of the Bahamas, 2005).

[17] http://www.ictregulationtoolkit.org/en/Section.2149.html.

There are five main steps that must be followed in order to implement banded forbearance for the purpose of regulating tariffs. Each step is described in detail below, using mobile prices in Bhutan, a micro state which recently introduced a second mobile operator, as a test case.

1. *Identification of the indicator to be benchmarked*
   - *Identification of the methodology and definition of the indicator; the regulatory authority should ensure that it is comparable and representative.*

We first consider the monthly cost of using a mobile phone as the indicator for benchmarking. There are three widely used indicators of mobile price/cost. One is set out in '*The Core ICT Indicators document, Partnership on Measuring ICT for Development*' which takes into account the cost of 100 minutes of use per month, and is intended to represent an average use basket which is applicable to individual consumers.[18] The '*ITU basket of call charges*' considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call. The most comprehensive indicator, however, is the '*Organization for Economic Co-operation and Development (OECD) T-basket*', which applies usage charges (voice, SMS and more recently MMS), line rental, connection charges (depreciated over a three year period), and applicable taxes to low, medium and high use levels, for the computation of the average monthly cost of using a mobile phone.[19] This methodology takes the most holistic approach of the three indicators, providing accurate and comparable results that are potentially useful to regulators and operators (for benchmarking monthly mobile phone costs), and consumers (for reliable price/cost comparisons on any given tariff plan).

Given the significant differences in mobile usage between the OECD and the developing South Asian region including Bhutan,[20] the use of unmodified OECD price baskets is problematic. Accordingly we use LIRNE*asia*'s modfication of the basket methodology to South Asia which better reflects the monthly costs of using a mobile phone in the region.[21] The methodology is applied to the eight

[18] http://www.itu.int/ITU-D/ict/partnership.

[19] http://www.teligen.com/t_basket.asp; Similar baskets are calculated for the use of fixed phones and Internet.

[20] For example the present OECD medium-user basket is 119 Minutes of Use (MoUs)/month and 50 SMS/month, with no differentiation between prepaid and postpaid. The South Asian prepaid medium-user basket is made up of 175 MoUs/month and 23 SMS/month and a postpaid medium-user basket is 535 MoUs/month and 39 SMS/month.

[21] The most recent findings are at http://lirneasia.net/wp-content/uploads/2007/08/09-02-sa-baskets-explained-v1-0.pdf.

member states of the South Asian Association for Regional Cooperation (SAARC), and provides comparable indicators for mobile prices within the region.[22] The findings show that Bhutan's monthly mobile prices are higher than the norm, at all levels of mobile phone use.

2. Identification of a peer group

A suitable peer group is identified, as this will be the basis of defining an appropriate benchmark (Step 3). Table 1 gives a non-exhaustive list of the many different ways in which a peer group can be selected.

There are many ways to classify a peer group and in the case of the Bahamas, as discussed in the example above, the sixteen regional peers for benchmarking ILD prices were selected based on the level of competition that existed in those telecom markets, as well as their economic importance, per capita income, and economic structures in relation to the Bahamas (Public Utilities Commission of the Bahamas, 2005). Peer groups can also be defined by geographic or demographic criteria.

The monthly mobile price derived from LIRNE*asia*'s South Asian mobile basket methodology may be adopted as the indicator for benchmarking tariffs in Bhutan, making the SAARC[23] the peer group. Though these countries represent a single region, the geographical, economic and other differences within the group may call for alternatives. For example, the Maldives and Bhutan have significantly higher costs in providing telecom services simply because of their different and difficult topographies, when compared with the costs of providing the same services in Pakistan or India. There are differing levels of competition in all these markets. For the purposes of benchmarking, however, comparisons of this nature are necessary and there will always be an error factor given that no two countries are absolutely similar. It is advisable to select the peer group through a broadly consultative process that involves all stakeholders, in order to enhance the legitimacy of the final choice.

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[22] There had been no significant variance between the levels of phone use of OECD countries and those in South America, according to DIRSI. Therefore,, DIRSI makes use of the OECD methodology without any adjustments. The findings are at: http://www.dirsi.net/english/files/background%20papers/affordability_english_2.0_final.pdf.

[23] The South Asian mobile benchmarks are calculated for the members of SAARC, namely, Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka.

Table 1: Criteria for selecting peers for benchmarking

Criteria	Description
GDP per capita	Countries with similar GDP per capita
Geography	Countries with similar geographical attributes, such as land-locked countries, or island nations, countries located in a single region, microstates
Market structures	Countries which have either monopolistic, duopolistic or competitive telecom markets
Market size (by subscribers)	Countries with similar numbers of fixed or mobile subscribers

3. Defining the benchmark from among the peer group

Once the indicator and an appropriately-selected set of peers have been identified, the benchmark needs to be determined; this will be dependant on how well the country ranks in relation to its peers. The benchmark can be set based on the lowest or even highest, or average figure among those in the peer group. The European Union (EU) uses the third from the bottom as its benchmark. In our example, we take the benchmark as the average of all countries other than Bhutan in the SAARC region; for a medium (or average) user, this means that the benchmark figure works out to approximately USD 11. How often the benchmark is revised (annually or biennially) can also be decided at this stage.

4. Determining the bands

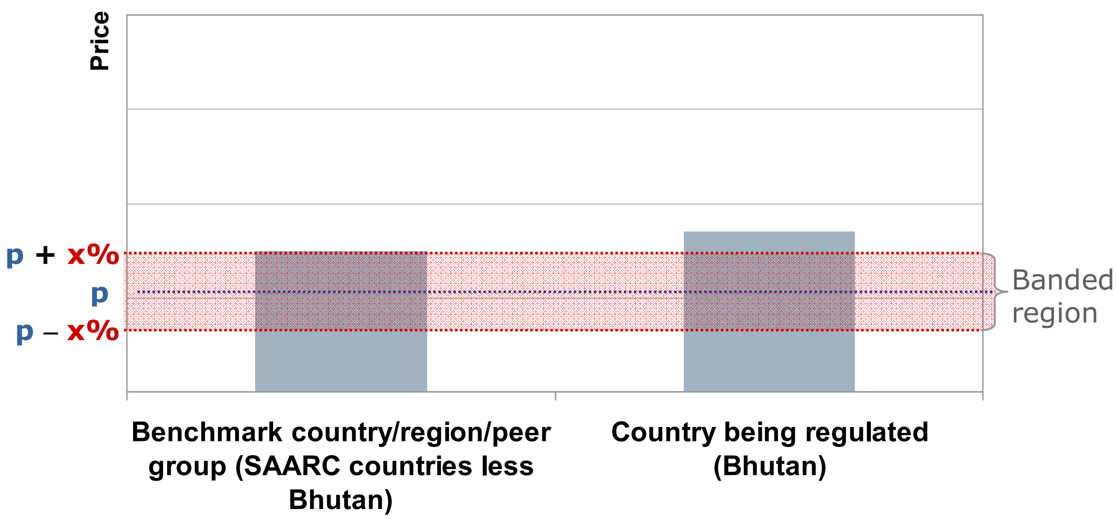
The next step in applying banded forbearance is to determine the workable band or margin of allowed variance around the defined benchmark. The floor and ceiling values will determined after taking into account differences between the country being regulated and the benchmark country (or countries). The effective price change that the regulatory authority wishes to have will also be a factor in determining the margin of variance. This is most likely to be a moving band, driven by prices changes and exchange-rate movements, within which prices will be fully forborne.

In our example, there was a USD 3 difference between the actual monthly mobile cost in Bhutan and the benchmark at the point the study was done. Taking into account the fact that there is currently very limited competition in the mobile sector in Bhutan[24], the regulatory authorities can/should define a narrow band that does not fall too far below the current costs prevalent in Bhutan as this would be unfair to the new entrant. The imposition of a narrow band, in this case, will limit the larger operator from behaving anti-competitively. Accordingly, the proposed upper limit can be determined to be 15 per cent (i.e. upper limit = benchmark + 15 per cent) and the lower limit can be equated to the benchmark value (lower limit = benchmark);[25] this would mean that both operators will have to ensure that an average user is charged between USD 11-15 a month.[26]

Figure 1 is a graphical representation of the benchmark, *p*, and the specified band is between *p* ± *x per cent*.

Figure 1: Setting the bands

Figure 1: Setting the bands



5. Regulating the operators

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[24] B-Mobile, the incumbent mobile service provider, has been in operation since 2002, while Tashi Cell, the only other mobile operator in Bhutan, was licensed to provide mobile services only in 2007 (retrieved from http://www.bicma.gov.bt/telecom/telecom.html).

[25] These percentages are arbitrary in this example and can be determined in a have been taken as examples and need not be the case every time.

[26] Bands can also be calculated for low as well as high users based on the above specifications.

The benchmark and the defined margins should be communicated to all operators along with clear rules on how tariff plans will be evaluated as falling within or outsidethe band. Authorities can impose the requirement that all proposed price plans have to be filed and approved before taking effect. They will also have to specify competition-related criteria for approving price movements below the banded limit, and explicate the consequences of predatory pricing or price squeezing.

Key considerations

Getting the peer group right at the start is a worthwhile investment. In the interests of reducing uncertainty, it is important that the peer group be constant over a long period. Flexibility can be provided by the band.

Furthermore, the regulator needs to determine specific intervals for setting and revising benchmarks and bands. This may be determined based on the rate of inflation or level of competitiveness in the market. For instance, the intensely competitive environment in South Asia has seen rapid declines in prices; meaning that the benchmark and bands identified in our Bhutan case have to be revised more regularly (annually or even biannually) in order to reflect these declining tariffs.

Regulatory authorities should avoid making sudden and extreme changes to benchmarks and bands. All price revisions should be gradual. Stakeholders should be consulted and kept involved in the decision making process of setting benchmarks and defining the bands.

4.0 APPLICABILITY TO MICROSTATES

Although there seems to be no consensus on the definition of a microstate in the literature, we consider the definition used by the United Nations in this article. According to Rapaport, Muteba and Therattil (1971) a microstate is defined by United Nations as a country with a population below one million.[27] In such countries, the markets for telecommunications as well as for other goods and services are significantly smaller than elsewhere. Despite a few micro states such as Iceland and Macau successfully supporting multiple operators, most of these telecom markets are duopolies.

[27] Examples include Bahrain, Bhutan, Maldives, Qatar, and Samoa.

The constraints of a microstate preclude a large regulatory agency, with abundant human capacity and financial resources. Therefore, regulators in these countries must be highly disciplined in allocating limited regulatory resources to the most important tasks.

Banded forbearance, therefore, provides a suitable solution to the problem of regulating tariffs in a microstate. All operators in the telecom market are required to file tariffs with the regulatory agency and this will not put unreasonable pressure on only the dominant operator to do the same as in the case of asymmetric regulation. The band will provide safeguards against predation and vertical price squeeze.

5.0 COMPARATIVE ANALYSIS OF BANDED FORBEARANCE

Banded forbearance is more efficient in terms of allocating limited regulatory resources. The use of banded forbearance for regulating tariffs will result in refocusing regulatory energies on creating the conditions for competition rather than the sterile calculations of the X in RPI-X for price-cap regulation. It is superior to the status quo of de facto forbearance that prevails despite the appearance of asymmetric regulation and formal tariff regulation, because it reduced uncertainty for the companies and removes the likelihood of arbitrary pressures being exerted on operators.

While asymmetric regulation also conserves regulatory resources by deregulating non-dominant operators, there is still cause for concern as this type of regulation breeds discontent on the part of the SMP or dominant operator and creates opportunities for rent-seeking within the regulatory agency. In any case the regulator has difficulty properly regulating the tariffs of the dominant operator through price-cap or ROR methods. Due to evolving market structures, regulators have to constantly reassess their markets and alter the regulations in place, especially if they are regulating asymmetrically. In oligopolistic and or duopolistic conditions, non-dominant operators may just shadow the incumbent’s prices reducing the competitiveness of the sector.

Banded forbearance on the other hand, applies to all operators and conserves regulatory resources . It enables the deregulation of the SMP player and safeguards against predation and vertical price squeeze. Although regulatory agencies will incur some search costs in obtaining accurate information from multiple sources, this will be far lower than the cost of hiring consultants to make the necessary calculations for RPI-X or ROR regulation, and even to conduct SMP reviews.

Forbearance within benchmark limits allows for intelligent and responsible regulation, in a manner less intrusive than other types of tariff regulation, and is conducive to the Budget Telecom Network business model implemented in South Asia.[28] The introduction of bands and specified criteria will allow operators to use innovative marketing strategies, while retaining safeguards that may be important in markets with few competitors and possibly significant control over essential facilities by incumbents. The production and timely dissemination of standard price, minutes-of-use, and call-distribution data needed for OECD type benchmarking will also result in reducing the opacity of pricing for consumers, thus sharpening competitive pressures and improving the customer experience.

India has shown that complete forbearance on tariff regulation combined with lots of market entry can yield good sector performance. Yet there is concern that complete forbearance in the absence of India-like concentration ratios, could lead to new entrants and small players being wiped out by the incumbent's aggressive pricing. Banded forbearance allows for safeguards against this possible outcome, creating the conditions for a transition to full forbearance.

As with all policy solutions, the devil is in the details. If the band is defined very narrowly and long durations are adopted, one may not realize flexibilities. Similarly, rigid applications may preclude a new entrant from offering prices based on disruptive innovation (Christensen and Raynor, 2003), sabotaging the original intent of creating space for innovative pricing strategies.

However, it must be noted that for banded forbearance to be applied effectively, there is a need for accurate and timely operator-level data, such as minutes of use per month, call distributions by

[28] The Budget Telecom Network has resulted in the lowest Total Costs of Ownership (TCO) in the world and is likely to spread through the developing world (Nokia, 2008a and Nokia, 2008b).

destination and time, etc. The data also has to be comparable to ensure the trouble-free computation of the benchmark value around which the band is centred on. Without these prerequisites, the application of banded forbearance will be a challenge.

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***Title: Measuring Effectiveness of Telecom Regulation Using Perception Surveys**[1]

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***Abstract:** The Telecom Regulatory Environment (TRE) survey presented in this paper is a tool to evaluate the effectiveness of the Telecom Regulatory and Policy Environment of a country. It asks senior stakeholders to assess the effectiveness (efficacy) of the regulatory and policy environment in the telecom sector of a country along seven dimensions. The dimensions are based on the General Agreement for Trade in Services (GATS) regulatory reference paper on telecommunications, with some additions. Three telecom subsectors of fixed, mobile and broadband are evaluated separately. The evaluation is done on a Likert scale of one to five. The stakeholders are selected to represent in a balanced manner those directly affected by regulation and policy (such as operators and equipment manufacturers), those observing the sector with broader interest and affected by its overall performance (such as lawyers, consultants, investment analysts) and those representing consumer interests (such as civil society organizations, other government institutions). Equal weight is given to each sub-group of stakeholders in order to ensure that a range of views are represented in the final score.

The results can be used to diagnose the positives and negatives of a country's regulatory environment. When multiple countries are surveyed, resulting comparisons can give insight into best or worst

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practices and act as tool for leaning. For investors who are evaluating investment options in multiple countries, the TRE scores can act as a proxy indicator for regulatory risk.

The paper surveys the literature on measuring regulatory performance in infrastructure sectors, describes the TRE methodology and discusses the results from implementing the survey in 2006 and 2008 in a number of South and South East Asian countries

***Keywords:** regulatory performance, infrastructure, South and South East Asian countries

1.0 Introduction: Measuring regulatory effectiveness

Networked infrastructure industries such as electricity, telecommunications and water have historically been subject to regulatory oversight.   Certain characteristics of these sectors (such as extensive economies of scale and scope, large sunk costs relative to fixed and variable components, and provision of services deemed essential) have necessitated and justified regulatory action in order to ensure consumer welfare as well as to encourage private-sector participation.   These sectors which were government-owned integrated monopolies in many countries have undergone significant changes through institutional reforms that include vertical and horizontal restructuring, privatization and the establishment of effective regulation.   Though experience has varied considerably across countries and sectors, as Kessides (2004) summarizes, for the most part reforms have significantly improved infrastructure performance, as measured by increased investment (leading to increased coverage), service quality, productivity, cost effectiveness and prices that are more closely aligned with underlying costs. The actions of the regulator after such reforms have taken place are also important. These factors are true in developed as well as developing countries. For example, Fink et al (2002) study of 86 developing countries across Africa, Asia, Middle East, Latin America and the Caribbean show that competition, independent regulation and privatization (and the correct sequencing of these actions) produced the most positive effects.

Given the importance of regulatory and policy action in the performance of networked infrastructure industries, significant attention is paid to measuring the impact of such regulation.   The literature that analyzes, quantifies and compares the impacts of regulation on networked infrastructure industries is therefore substantive, with contributions made by the traditional academic disciplines and researchers within multilateral donor agencies (the latter's presence in the literature is not surprising because these institutions are involved in funding regulatory reform in numerous countries). Later in the paper we will situate the TRE in relation to other methods for evaluating regulatory effectiveness by scanning the current literature. But first, we describe the TRE methodology and describes how it is implemented.

2.0 The TRE methodology

The TRE provides measure of stakeholder perception of a country's regulatory environment. The TRE instrument/survey asks informed stakeholders to rate (on a Likert scale of 1 to 5, 1 being highly unsatisfactory, 5 being highly satisfactory) the Telecom Regulatory and Policy Environment in a country along 7 dimensions.

Seven Dimensions: The seven dimensions are the regulation of the following: market entry, allocation of scarce resources, anti competitive behavior, interconnection, tariff regulation, universal service obligations and quality of service. Five of the seven dimensions are based on the GATS (General Agreement for the Trade in Services) reference paper on telecommunications, the widest consensus globally on what constitutes "good regulation" and adopted by over 80 countries.

Three telecom sub-sectors: The three sub-sectors of telecom – mobile, fixed and broadband – are evaluated separately. In other words, the stakeholders are asked to evaluate the effectiveness of the regulatory environment as applicable to the fixed telephony sector along 7 dimensions, the mobile sector along 7 dimensions, and the broadband sector along seven dimensions. So a total of 21 responses are requested from each respondent

Three categories of survey respondents: The respondents to the survey fall into 3 different categories:

- Category 1: those directly involved in the sector such as operators, equipment vendors.
- Category 2: those indirectly impacted by the sector or those studying and those observing the sector with broader interest such as consultants and lawyers.
- Category 3: those who represent the broader public interest such as media personnel, other government officials, former regulators and staff, and civil society organizations.

Current telecom regulators and telecom policy makers are not surveyed because the goal is not to obtain a self-evaluation, but to evaluate how those impacted by the regulators and policy makers feel.

Number of respondents: The larger the number of respondents, the less biased the survey. However, the goal of the TRE is to measure perception among informed stakeholders, those who have expert, in-depth knowledge about (or first-hand experience in dealing with and navigating) the various aspects of the regulatory and policy environment in a given country. Therefore the pool of potential respondents is limited to the senior level decision makers in various organizations. For example for Category 1, questionnaires are only sent to (and responses only accepted from) CxO level employees (e.g. Chief Executive Officers, Chief Regulatory Officers, Chief Marketing Officers, etc) at telecom operators or equipment manufacturers. If a team of consultants were hired by the regulator, the team leader is the ideal potential respondent in Category 2. While such respondents do provide more knowledgeable set of responses, they are few in number. But in order to minimize bias within a Category and across the whole, a minimum number of responses have been specified, and without meeting this minimum the TRE survey is considered incomplete. The minimum number of responses per category is 15, resulting in a minimum of 45 responses being required per country. Our experience from implementing TRE surveys in 2006 and 2008 (in 6 and 9 Asian countries, respectively) shows that this is a reasonable target, achievable by a researcher or a research organization with a sufficiently prominent profile within the country. For micro-states (those with less than 1 million population), the above target is impossible.

Therefore the minimum acceptable per category is 5 responses and minimum per country is 15. Experience in surveying the Maldives (population of 300,000, duopoly in each of the 3 sectors fixed, mobile and broadband) in 2008 showed it was possible though extremely difficult (specially if the rule of only surveying CEOs of the operators is followed).

Equal weight to each respondent category: The stakeholders have different incentive structures, and will therefore have differing opinions of whether specific regulatory actions are "good", since what is suitable to one party (say, companies) may not be suitable to others (say, consumers). Yet in order keep the result as objective as possible and to avoid over-representing one point of view, each respondent category should contribute equally to the final TRE score. However in these types of surveys it is not possible to control how many completed questionnaires will be returned by respondents in each category. Therefore statistical weighting is used to equalize the contributions made by each category.

Administering the survey: The survey (consisting of 21 statements/questions, and space for option comments) is administered through multiple modes: via the internet, through personal meetings, through mail or fax. All responses are confidential and anonymous (only the category of the respondent is recorded, for purposes of calculating above-mentioned weights and keeping track of minimum-number of response requirements). Attached to each survey is a listing of significant regulatory and policy events that took place in the past year, written in bland language. The purpose of this is to refresh the respondent's memory. The bland language is used to ensure the respondent is not positively or negatively influenced by the content. Surveys are carried out at the same time in multiple countries in order to ensure that cross-country comparisons can be done with least variations in external factors. A description of each dimension is also provided with each questionnaire. For example, Interconnection is described as and includes "Interconnection with a major operator should be ensured at any technically feasible point in the network. Quality of interconnection comparable to similar services offered by own network. Reasonable rates for interconnection. Unbundling of interconnection. Interconnection offered without delay. Sharing of incoming and outgoing IDD revenue. Payment for cost of interconnection links and switch interface. Payment for cost of technical disruption of interconnection".

The questionnaire, a sample of Significant Regulatory Events from an actual survey, and other documents used in the survey are given in Annex 1.

Desk Research and Interviews: In addition to the survey, interviews with experts (stakeholders) and a detailed review of the regulatory landscape (desk research) are done. This enables depth analysis of the TRE scores, in order to identify why scores for certain dimensions are low or high, why scores have changed from previous surveys and so on. Particular attention is paid if the regulatory actions and regulatory framework (as revealed by the desk research) are contradictory to the TRE Scores (e.g. legal rulings on tariff regulation may be reveal them to be "sound" and in keeping with international best practice, but TRE scores for tariff regulation are low). Reasons for such results may be varied – for example, the best-practice regulatory actions may have been taken recently and not yet made an impression on the stakeholders (perception is a measure of cumulative impression over a longer period of time), or the impact of regulatory action may not yet be visible to stakeholders (certain policy and regulatory changes do take time to impact the industry) and so on. The analyzed results are documented in a detailed country-report.

Using the TRE results (TRE scores): We believe the best use of TRE results (scores) is as a diagnostic tool, to identify which areas need attention. Country results, when compared historically, can also indicate improvements or declines over time of regulatory effectiveness.

As a rule, only aggregate scores per dimension are reported and the scores are not broken down further (e.g., by respondent category). For example, for a given country, the TRE score for Tariff Regulation is reported, even though that score is made up of the scores given by each of the 3 respondent categories. This is to further ensure confidentiality – in certain markets (often in those with a dominant incumbent, few new entrants and a new entrant and a politically charged regulatory environment), revealing Category-wise TRE scores may reveal (or strongly hint at) the identity of respondent or their firms. However, if a researcher is successful in obtaining a sufficiently large number of responses per category, disaggregation may be possible, and may provide for rich analysis[2].

Another use of the TRE scores is to benchmark regulatory regimes in multiple countries. However, different biases may influence respondents in different countries when assigning scores, therefore comparing TRE scores across countries is less defensible, in theory. Yet, cross-country comparisons can be informative and useful as a learning tool. It can also help evaluate regulatory risk, and thereby help the decision making of investors who are examining several countries to invest in. While regulatory risk is not the only concern of investors, it is an important one. Potential investors will often engage in regulatory due-diligence which involves not just scanning the laws and regulations, but also interviews with local experts. The TRE can now quantify the relative regulatory risks in countries - ceteris paribus, a country with lower TRE scores in all dimensions poses lower regulatory risk than a country with higher TRE scores.

3.0 Situating the TRE in literature on measuring regulatory effectiveness

The literature on measuring regulatory effectiveness is rich and varied. The intent of this section is not to cover every study, but to scan the different approaches taken in various studies, to analyze the differences in their approaches along various dimensions (such as what they evaluate, whether objective or subjective data is used etc) and to identify how and where the TRE is similar or different. We also limit ourselves to the assessment of hard infrastructure industries/sectors[3].

3.1 What to assess - sector outputs or regulatory system?

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[2] For example in 2006, over 100 responses were received in the Sri Lankan survey. With over 30+ responses per category, disaggregation of the scores of each dimension by respondent category might have been feasible without compromising confidentiality

[3] If we were to expand our literature to include studies that evaluate any type of regulatory system (not just limited to infrastructure or hard/networked infrastructure), a good starting point is Berg's (2009) paper. It analyzes approaches taken by over 8 different studies to evaluate diverse regulatory systems. The TRE assessment is also one of the methodologies covered in his paper.

In theory, it is possible to take two completely different approaches to measuring effectiveness of regulatory actions. At one end of the spectrum, is the view that measuring sector performance (along varied dimensions such as increasing coverage, quality and choice and decreasing price) is the best or a sufficient proxy for regulatory performance. After all, if good regulation leads to good sector performance (and bad regulation leads to bad performance), the results of the regulator's effectiveness is ultimately reflected in a country's telecom sector's performance. Yet regulation is just one element that impacts sector performance. As Berg's (2000) detailed framework shows, industry conditions (including economies of scale and scope), market structure (including vertical integration), historical Experience and many other factors interact together to impact the regulatory system and sector performance. And as Levy and Spiller (1994) concluded, political institutions and economic conditions interact with, and have an impact on, regulatory processes. It may be possible for regulatory actions to be "good" or optimal (i.e. stand up to best practices in regulation when evaluated theoretically), but sector performance be bad, due to negating influence of the larger political or policy climate. The converse (that regulatory actions are sub-par, but the sector itself performs well) is also possible. As is anything in between (for example three of the countries in Spiller and Levy's study function under "less than ideal" economic and political conditions, but are able to achieve results of good regulation because they at least able to constrain arbitrary administrative actions). Therefore at the other end of the spectrum is the view that regulatory action cannot simply be evaluated by looking at final sector performance, and that it needs to be done through a more insightful or different manner.

The TRE methodology is closer to this latter approach, in that it asks respondents to evaluate the overall regulatory *environment*. Note that depending on the country, some dimensions in the TRE (e.g., universal service obligations) may be under the purview of the policy maker, not the regulator. So in fact the TRE is an assessment of the regulatory and policy environment, not of the regulatory agency.

3.2 Assessment Framework

Various criteria or evaluation frameworks have been used by evaluators of regulatory regimes. Brown et al (2006) clearly point out that evaluation of both governance (the formal and informal processes involved in regulation, legal and institutional frameworks) and substance –(the content of actual regulatory decisions) are important. But in most popular studies, the framework focuses on criteria to evaluate regulatory governance. But on the positive side, there appears to be strong agreement among authors on what good regulatory governance entails – most emphasize clarity of assignment of functions, regulatory autonomy, accountability and transparency (Stern & Cubbin, 2005). For example, a NERA (1998) study uses a framework consisting of six elements - clarity of roles and objectives, autonomy, participation, accountability, transparency and predictability - to assess the impact of governance and regulatory reforms in six Asian countries[4]. One year later, Stern and Holder (1999) used the same data set to further elaborate the evaluation framework (for example, separating the 6 criteria

[4] Performance of the chosen regulatory regime in a country can vary from and A to E or 1 to 5 (E being best possible performance and A being the worst). For example, under the "clarity of roles and objectives", the sector receives an A if "no specification of any separate regulatory functions or responsibility is apparent, there is no primary law covering regulatory issues, and no effective distinction between policy and regulation" and receives an E if "the regulatory function is well articulated, well enshrined in primary legislation, and separated from the policy and commercial functions in practice".

into formal/legal accountability and informal accountability). Noll's (2000) framework for evaluating regulatory governance includes some of the above components (accountability, transparency), but also include capacity and competency as well. The UK Better Regulation Task Force's principles of good regulation are a slight variation on the above – the criteria include transparency, accountability, proportionality, consistency and targeting.

The TRE Survey asks respondents if the country's regulatory system is effective along different dimensions, and describes very briefly the elements involved in each. It does not necessarily specify what "effective" means, at least not in any detail. Therefore it is up to the respondent to decide. It is likely that the responses are influenced by the respondents' experiences with and perceptions of both regulatory governance *and* substance. For example, consumer groups are unlikely to think a tariff order that increases prices is effective (substance), yet may think that a public consultation process that enabled their views to be heard as effective (process, part of regulatory governance).

Above mentioned studies more-or-less converge on a similar framework - i.e., close agreement is reached by different researchers on what criteria constitute good regulatory governance. Such convergence is useful because the framework is then made usable to other researchers, who can apply it to different infrastructure sectors globally.

In contrast, the European Competitive Telecommunications Association's (ECTA) Regulatory Score Card for European Countries[5] is designed to specifically evaluate regulatory effectiveness in the telecom sector in one region of the world. The ECTA Score Card assesses countries on adherence to the principals set out in the *2003 EU Communications Framewor*k and associated guidelines and recommendations of the European Commission and European Regulators Group. The assessment is based on three components: 1) the overall institutional environment (scored out of 155 points), 2) the general market access conditions (scored out of 142 points) and 3) effectiveness of regulation and competitiveness in four key access markets and services (scored out of 189 points). It evaluates not just the regulator, but the broader environment – for example the first component (institutional framework) assess not just the regulator but also the legislator, dispute settlement body (if different from NRA) and appeal system. While the ECTA evaluation is comprehensive (the latest assessment contained 118 different aspects of the regulatory environment), its Euro-centric nature is likely to limit its application to a broader set of countries. This is because key evaluation criteria (and questions) such as "timely transposition of the EU regulatory framework" are only applicable to the EU where a common regulatory framework is found – a criteria not applicable in any other region so far[6].

The TRE asks respondents to individually evaluate (by assigning a score between 1 and 5) seven different aspects or seven different dimensions of the regulatory environment are effective. Five of these

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[5] See http://www.ectaportal.com/en/basic651.html

[6] Note that ECTA is the trade body for telecom operators that compete with incumbent former monopolies. As such, the rankings have been disputed by ETNO (European Telecommunications Network Operators association), the trade body representing incumbent operators (https://publicaffairs.linx.net/news/?p=619) . It has also been critiqued by some for being subjective in the manner in which weights are assigned and in the assessment of regulation in the key markets (Weeks and Williamson, 2006; Edwards and Waverman, 2006). Weeks and Williamson (2006) also critique the ECTA scorecard for conflating more regulation with effective regulation without considering the level of competition in the particular market

dimensions (regulatory activity related to market entry, allocation of scarce resources universal service, interconnection, anticompetitive practices) are taken directly from the General Agreement for the Trade in Services (GATS) regulatory Reference Paper on telecommunications[7]. This document largely reflects "best practice" in telecoms regulation. More importantly, it is one that has been painstakingly negotiated and represents the broadest consensus on telecom regulation. At time of writing, 82 WTO member countries had signed up to the regulatory principles spelled out in it. The sixth dimension in the TRE is tariff regulation – added simply because regulating tariffs is one of the primary responsibilities of any telecom regulator, and because regulation of tariffs has a direct impact on sector stakeholders. As such, the 6 (of 7) dimensions of the TRE framework are applicable to most countries. We cannot claim that the seventh dimension (regulation of quality of service) is a global concern yet. It was added to the TRE framework in 2008 because regulators in Asia are finally paying attention to aspects of quality of service. It was a response to requests from regulatory agencies.

3.3 Evaluating Theory (what is written down) vs. Practice (what really happens)

Researchers can examine the laws, regulations and orders related to a particular industry and make a conclusion about the effectiveness of the regulatory system. But what actually happens may be quite different to what it prescribed or intended in the rule (or indeed spirit) of the law. So at a minimum, many well-regarded studies will use (local) researchers or experts who have in-depth country knowledge. This is the approach taken by the NERA (1998) study mentioned earlier. The evaluation framework (and associated detailed questionnaire) are applied to each of the 12 sectors across the 6 countries by NERA staff who have previously worked in these countries, or local specialist advisors who worked with NERA staff (page 23, NERA, 1998). The questionnaire primarily focused on questions about the legal framework, but did contain questions that pointed towards practical implementation. Yet Stern and Cubbin (2005, page 15) conclude that because many of regulatory bodies studied were too newly established to have established to have enough of track record, "the results are heavily weighted to aspects of the law and legal obligations relative to actual regulatory practice". They also point out that "data based on analysis of laws without collection information on practice, are at best, seriously problematic; and, at worst, may be biased and misleading". A later study by the Prayas group (Prayas, 2003) mitigates such criticisms by first surveying regulators themselves (by sending out a questionnaire to the electricity regulators, covering such issues as regulatory staff and resources, use of consultants, transparency and participation. The information was further supplemented by examination of minutes from regulatory body meetings, scans of websites and so on. The resulting study highlights the difference between theory (well designed regulatory frameworks, established in the past with sufficient time to evolve) and practice (state governments and incumbent electricity companies working collusively to remove the treat of regulation, incumbents who resist providing data or provide wrong data, grossly inadequate staff resources and so on) to be quite significant.

The TRE is a survey of stakeholder opinion. But instead of surveying the opinions of regulators, it surveys the opinion of those directly or indirectly impacted by regulatory actions. The respondents fall into three categories that together represent the full spectrum of incentives that are found in the

[7] See http://www.wto.int/english/tratop_e/serv_e/telecom_e/tel23_e.htm

telecom sector. For example, Category 1 (those directly involved in service provision within the sector such as operators, equipment vendors equipment manufacturers) have incentive to maximize profits of individual firms. Within Category 1, the incumbent's incentives may or may not be aligned with those of new entrants, depending on the situation. Category 3 (those who represent the broader public interest such as media personnel, other government officials, retired regulators, civil society organizations) will often have a very different opinions of what a good regulatory action is. By assigning equal weight to each of the three categories, the TRE attempts to ensure that the final assessment is not biased towards one point of view. By eliminating the level of subjectivity, we argue that the TRE provides a better assessment of a country's regulatory environment.

4.0 Analysis of TRE scores form recent implementations of the TRE surveys

The original TRE instrument was designed to assess regulatory effects on investment (Samarajiva & Dokeniya, 2003). It proposed assessing 2 sectors (fixed and mobile) separately, along 5 dimensions. It was first piloted in 2005 in Sri Lanka (Samarajiva & Dokeniya, 2005). After the pilot study, a sixth dimension was added and the survey was carried out in 6 countries (India, Pakistan, Sri Lanka, Indonesia, Philippines and Thailand) in 2006. The results have been documented in a paper by Samarajiva, et al. (2007).

Following detailed discussions with the multi-country research team in 2008, it was decided that a third sector (broadband) should be evaluated separately, and that another dimension (effectiveness of regulation of Quality of Service) should be added. The updated TRE survey was then implemented in 9 countries in the 3rd quarter of 2008. Of the original 9 countries identified for the 2008 study, only 8 (India, Pakistan, Sri Lanka, Maldives, Bangladesh, Indonesia, Philippines and Thailand) were completed in time. Annex 1 provides the full set of results (TRE Scores) from 2008 survey.

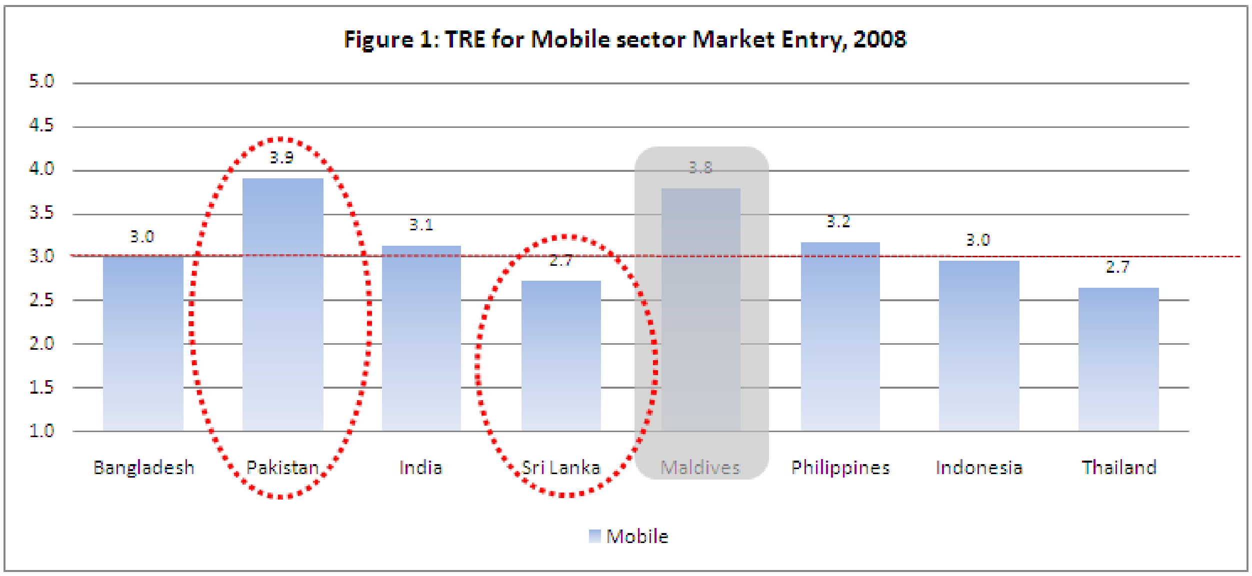
In 2006 and 2008, detailed reports were written for each country surveyed. These reports (Malik, 2008; Wilson, 2008; Wattegama et al, 2008; Khaled, 2008; Knight-John, 2008; Galpaya, 2008; Alampay, 2008; Nikomborirak & Cheevasittiyanon, 2008) analyze the results and give in-depth country-specific information.

The purpose of this section is not to repeat the analysis that is already done in the country papers, but to highlight the types of analysis that is possible with the TRE surveys. For example, the TRE studies are an effective method to identify best and worst practices across countries. They are also a good way to track how regulatory action (or inaction) is perceived by stakeholders over time. Several such examples are given below. The graphs shown are ordered by region (South Asian countries on the left, South East Asian on the right). Though the scores of Maldives are presented in each cross-country graph, comparability of scores between Maldives and the other (much larger) markets is questionable. The respondents from the small island nation where most people know each other showed significant concerns during the survey. Even though the market is a duopoly and stakeholders express unhappiness during personal (private) interviews, on paper (in responding to the TRE survey), they rate each dimension of regulation as very effective (i.e. give high scores, close to 4 out of a possible 5, and certainly higher than the midpoint of 3). For these reasons, though TRE scores for the Maldives are presented in the graphs below, they are visually marked with a gray colored box and are not used in the benchmarking or the identification of best and worst practices.

4.1 Best and Worst Practices revealed through the TRE assessments

4.1.1. Market Entry

The Market Entry TRE scores reflect stakeholder perceptions about the conditions for entering and operating in the market. Transparency of licensing, ease of obtaining a license, barriers to entry and growth are included under Market Entry.



Excluding Maldives (for reasons given above), the clear winner is Pakistan, getting a high TRE of 3.9 for Market Entry (Figure 1). Indeed Pakistan has one of the fastest growing mobile industries in the world (estimated to be the 3rd fastest growing, behind India), with 58.9 access paths per 100 people (compared to 26.22 in India; but with some downward corrections needed for inactive SIMs). Growth has been driven by investments, primarily very large foreign direct investments. Wilson (2008) identifies several factors that contribute to making Pakistan's telecom attractive to investors.

- The conditions for obtaining a new mobile license or renewing and exiting one are straightforward - each operator has to pay USD 291 million. Though this fee is high, once it was announced, it has eliminated discretion on the part of the regulator and therefore nearly eliminates regulatory risk – as long as an operator can pay the fee, access to the market (in the form of a new license or a renewal of existing/expiring one) is guaranteed.
- The unbundled licensing regime for fixed services has encouraged investors to enter the market and offer services in the area of their choice.

- There are no limitations on foreign ownership of telecom companies and no restrictions on merger and acquisition activity.
- Mobile number portability was implemented in 2007, thereby enabling increased competition amongst players, and giving a reasonable shot at success even for new/smaller players.

The above actions have made Pakistan's telecom sector an attractive destination for regional and international investment. For example, during the time-frame evaluated in this study (2007 -2008), China Mobile acquired 100% of Paktel, Orascom increased its ownership stake in Mobilink to 100%, SingTel purchased 30% Warid Telecom and OmanTel purchased 60% of World Call. The total paid by the acquiring companies in the above deals was over USD 1.5 billion. All firms have already started making significant investments in new infrastructure or upgrades. As a result, during 2007-2008 Pakistan's telecom sector attracted over USD 1.4 billion in investments that amounted to around 27% of total FDI into the country.

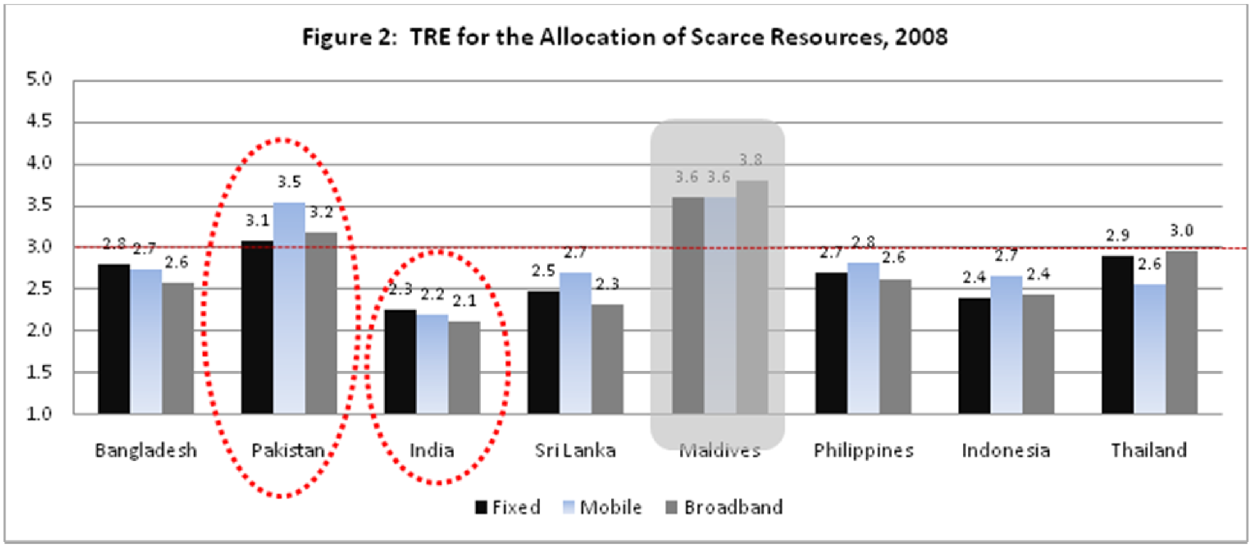
Sri Lanka and Thailand receive the lowest TRE score for Market Entry in the mobile sector. Sri Lanka's low score can be explained by the non-transparent nature of the licensing process used in the most recent license. Bharti Airtel was awarded a new license in April 2007. No auction mechanism was used and the criteria for selection were never explicitly stated. Furthermore, after obtaining the license, it was a good 21 months before Airtel was able to become operational due to setbacks and delays related to rights of way, interconnection and a host of other issues. At the time the TRE survey was carried out in Sri Lanka, most stakeholders (and even the general public) were expressing concern over the difficulties Airtel was having in starting its operations.

Thailand too suffers from less-than ideal market entry conditions in the mobile sector, giving it one of the lowest scores in the region. There are 3 private concessionaires operating in the Thai mobile sector. But this number is low, given the total size of the market, and the level of competition as measured by HHI is well above 3,500, indicating a low level of competition. No new mobile licenses have been issued since the original three concessions were granted. Furthermore, political wrangling and related legal problems have prevented (or at least significantly delayed) the roll out of 3G services.

4.1.2 Allocation of Scarce Resources

Though scarce resources were defined as spectrum, rights of way and numbering, it is likely that spectrum is foremost in the minds of stakeholders. After all, subscriber growth in all three sub-sectors (fixed, mobile and broadband) in all the countries has been driven by wireless technologies, making spectrum a valuable and often scarce resource.

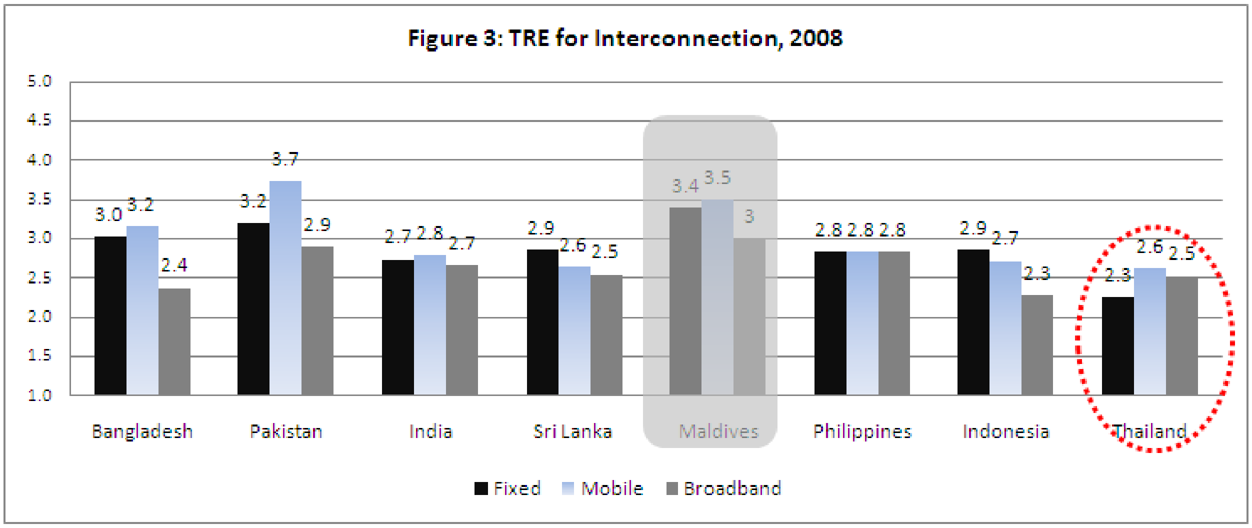
Once again, Pakistan was the top performer, receiving the highest scores in all three sub-sectors. Pakistan in fact is the only country that receives above average (i.e. above 3.0) scores. The 1996 Telecom Act requires the regulator (the Pakistan Telecom Authority) to "receive and expeditiously dispose of applications for the use of radio-frequency spectrum". The Frequency Allocation Board is required to process applications for spectrum within 30 days, by law. In addition, real-time frequency monitoring takes place, ensuring that license conditions are enforced. Finally, in April 2008 Pakistan changed the numbering scheme for telephones from 7 digits to 8 digits, thereby lowering the scarcity of this resource.



In contrast to Pakistan, India receives the lowest scores in this dimension in all three sub-sectors. India was the lowest performer in the previous (2006) TRE survey also. In fact India's latest TRE scores for this dimension have even marginally decreased since 2006. At a fundamental level, this is due to the purely administrative (as opposed to economic) allocation of spectrum that is practiced in India. Repeated recommendations to auction spectrum have gone unheeded. The amount of spectrum allocated to each operator is linked to the subscriber numbers, not usage. Even here, the regulator (Telecom Regulatory Authority of India) and the policy maker (Department of Telecommunications, DoT) were in disagreement for most of the 2007-2008 year on what the appropriate subscriber-linked formula should be. There is no policy for allocating spectrum beyond the 10MHz that is already allocated, even though most GSM operators have loaded their spectrum well beyond benchmark levels and the CDMA operators are close to reaching that point. The average frequency allotted to an Indian mobile operator is 6.2 MHz, compared to the world average of 17.18 MHz. Even if further allocation is agreed upon, there is no spectrum free to allocate: government and defense users are currently occupying valuable bands, making re-farming difficult (Malik, 2008). In addition to all of the above, before and during the time the TRE survey was being carried out in 2008, India's telecom space was abuzz with the controversies related to 2G and 3G spectrum allocation. Accusations by various parties about undue advantage or preference being given to the other, and the DoT ruling out auction mechanisms for the allocation of 2G and other related issues were being publicly and widely debated. Given all this, India's low score in this dimension is not surprising.

4.1.3 Interconnection

TRE for Interconnection assesses aspects related to interconnection rates, mechanism for setting those rates, interconnection locations, time taken to obtain interconnection, mechanisms for sharing of related revenue and related costs.



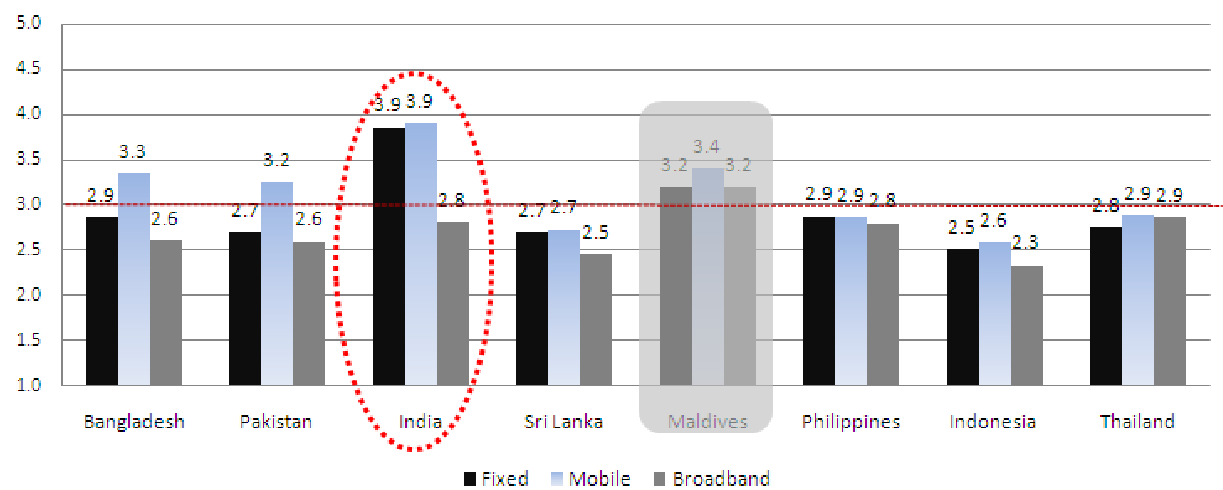
Pakistan is the best performer. The rules in Pakistan mandate each operator to negotiate and interconnection with another operator who makes such a requests. And in practice, operators indeed negotiate their interconnection rates mutually. However the players with significant market power (SMP) are then required to produce/publish a Reference Interconnection Offer (RIO) detailing the terms they offered to other players. SMP is defined as any operator who has more than 25% of the revenues in a specified market. Of the countries in the study, Pakistan is one of the few countries that mandate RIOs to be published on a regular basis (though others such as the Maldives published RIOs once when new operators entered the market). Pakistan's TRE score for Interconnection has increased by nearly a point since the 2006 TRE study (for the mobile sector it was 2.8, compared to 3.7 now). This could be due to the increased efficiency with which interconnection disputes are mediated and resolved by the regulator.

In contrast Thailand performs poorly in all 3 sectors. The reasons are to be found in the conflicting rules and regulations, the lack of clear authority on the part of the regulator and the discriminatory nature of interconnection rules. The Thai Business Act (TBA) states the interconnection is mandatory, that interconnection charges be negotiated privately and that the interconnection terms should be non-discriminatory, and fair. TBA even sets out procedures for dispute resolution and mandates decisions to be given within 30 days. All this is for naught however, because all concession agreements are exempt from such rules. And all private mobile networks operate under concession agreements with the two state enterprises TOT and the CAT, and are legally owned by these two entities. Since private operators are mere concessionaires, all interconnection charges must be negotiated and paid by the two legal license holders only. The terms imposed on the concessionaires are onerous and discriminatory – for example the concession mandates that all private concessionaires of CAT (namely DTAC and True Move) pay TOT a hefty flat fee of 200 baht (about USD 5.8) per month for each post-paid subscriber and 18% of revenue for each pre-paid subscriber, while TOT's own concessionaires do not have to pay such a fee. In protest, the two mobile operators had stopped paying interconnection charges to TOT since 2006, and in 2007 the three private concessionaires agreed to interconnect amongst themselves. TOT has filed a law suit against at least one of the private operators as a result (Nikomborirak &Cheevasittiyanon, 2008).

4.1.4 Tariff Regulation

This dimension evaluates the regulatory environment related to consumer price regulation.

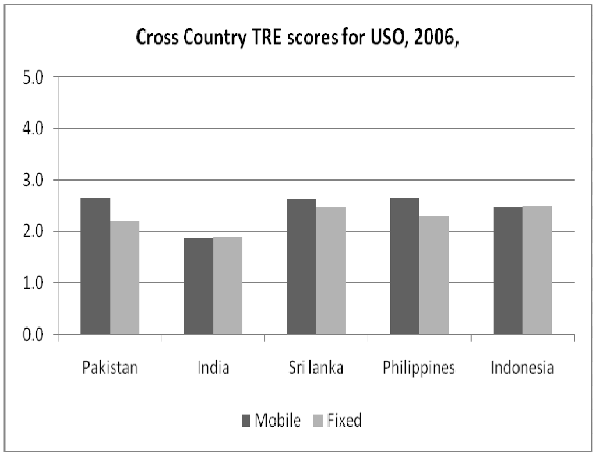
Figure 4: TRE for Tariff Regulation, 2008



In both fixed and mobile sectors, India is the clear leader. In the 2006 survey too India was heads and shoulders above others. India's TRE scores for Tariff Regulation have even *improved* since 2006 (fixed has increased from 3.7 to 3.9; mobile has increased from 3.5 to 3.9). In 2002, TRAI stated that emerging market forces could effectively regulate mobile tariffs and that the regulator could therefore step aside. Since then, TRAI has practiced forbearance in regulating most tariffs. Only integrated operators are required to seek prior approval for their tariffs. Despite early opposition from the policy maker and the government, the regulator has proved that its approach was right - with increased competition, Indian consumers today enjoy some of the cheapest tariffs in the world (Nokia 2008 and 2009). In the survey, the stakeholders reward the regulators approach by giving it high scores. In recent times, regulations to slash roaming rates have been enacted.

4.2 Changes in regulatory practice over time reflected in TRE scores

In the 2006 TRE survey, among all the countries, India received the lowest scores in the Universal Service dimension (Figure 6). Universal Service was also the lowest scoring among the dimensions within India itself (Figure 7).



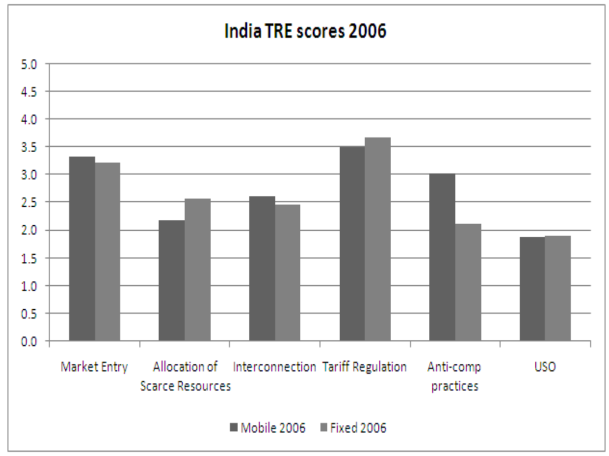


Figure 6

Figure 7

India's low performance in USO (within the country and in comparison to other countries) is attributable to its universal service fund. Until March 2007, only fixed line operators could qualify to receive funds from the universal service funds, even though mobile operators were being charged 5% of their gross revenue as a contribution to the fund. The terms of the fund disbursement was such that only the incumbent would qualify to receive funds in each round of disbursement. The result was, in essence, a subsidy to the incumbent fixed operator by the mobile industry. Yet, mobile was driving nearly all of the rural growth in access lines in India (Figure 8). So the low TRE scores was no surprise. In addition to this, at the time, India had the world's second largest universal service fund with over USD 4 billion collected yet undisbursed (Malik 2007, Malik 2008).

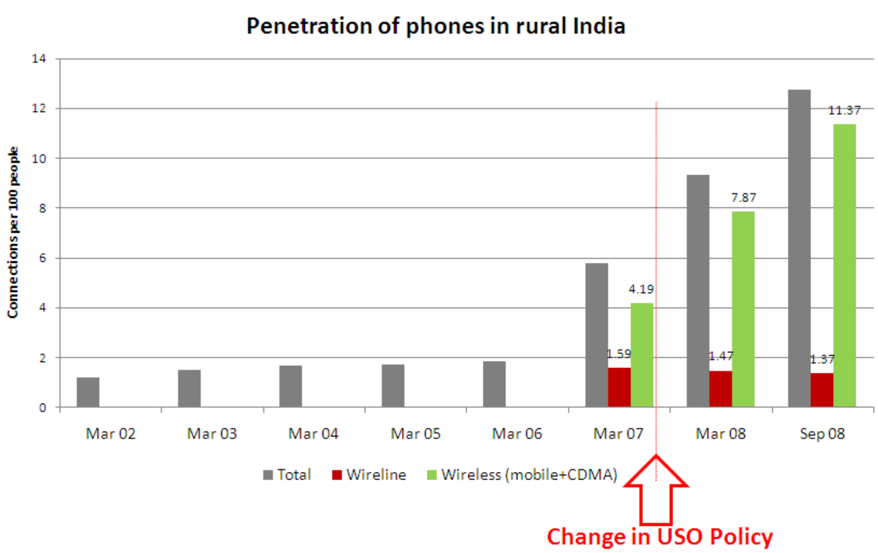


Figure 8. Author, based on data from the Telecom Regulatory Authority of India

In March 2007, the certain sections of the universal service policy were finally changed, enabling mobile operators to bid for last-mile connectivity funds. In theory (to an outsider) this is a positive move by the regulator and the policy maker. If the TRE reflects the reality of stakeholders, the TRE scores should also show an improved (positive perception) after the policy change. Indeed this is the case – the 2008 TRE survey in India (conducted 14 or so months after the USO policy changed) show increased scores in the USO dimension (Figure 9). The mobile score increases by 64%. This is the biggest increase in TRE scores seen yet, for any dimension in any country.

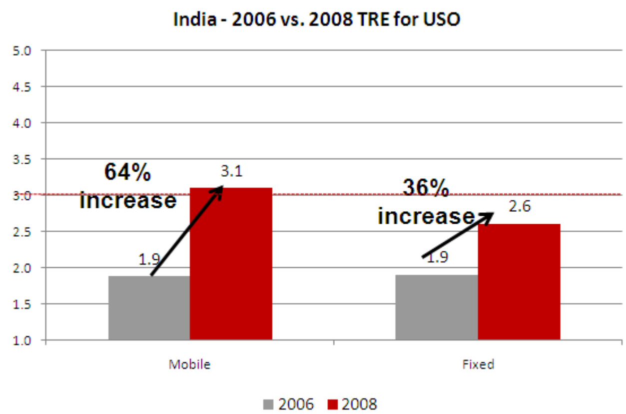


Figure 9

While things have improved, India still accounts for nearly 50% of the undisbursed universal service funds in the world. Operators are still charged 3% of gross revenues towards the USO fund. While TRE scores improved hugely when compared to 2006, we see this less-than-perfect situation reflected in the fact that the average (of fixed, mobile and broadband) TRE score for USO in India is still only 2.6, well below the 3.0 point of average performance

5.0 Discussion of methodology and future research

In implementing the TRE survey in three cycles since 2005, the methodology has evolved gradually. The 2005 pilot only contained five dimensions. In 2006 it was increased to six, and in 2008 to seven. While increasing the dimensions allows for finer analysis of the regulatory environments, it has several negatives. First, new dimensions that are not taken from the GATS regulatory reference paper may de-legitimize the universal applicability of the TRE framework. Second, adding new dimensions increases the length of the questionnaire. While one extra question may not be an issue in most surveys, it might be a problem for the TRE. The target respondents of the TRE survey (CEOs of companies, for example) are persons whose time and attention is extremely difficult to command, even for the 7 minutes it takes to complete the survey on average. A questionnaire that is too long risks being thrown away, or being assigned to a junior person to fill.   Therefore shorter questionnaires are preferred. Yet in 2008, the research team added 7 extra questions, by introducing a new subsector (broadband) in addition to the two that existed before (fixed and mobile).

The evaluation of subsectors separately, specially the evaluation of fixed and mobile sub-sectors separately, has also been debated for reasons unrelated to increasing length of the questionnaire.

Fixed-mobile convergence is increasingly making it meaningless to separately view the two sectors. Further, in nearly all the countries surveyed, fixed line growth is stagnant or negative, while mobile phones and SIM growth is exploding. For consumers the fixed sectors appears to be of low importance. Some operators too have refused to complete the fixed sector questions in the TRE survey. And most countries have one or two fixed operators only. As a result, respondents in Category 1 are mostly from mobile companies. All these reasons point towards merging the two sectors and evaluating them as one (or eliminating the fixed sector). Yet, regulation of fixed sectors still remains different to the regulation of the mobile sector in several countries. Therefore analyzing them separately may be quite important. A decision will be taken in the near future, taking these issues into consideration.

Using a survey as a research tool carries some inherent methodological problems. Perception bias is one. Certain biases can be controlled for – for example, balanced representation by stakeholders who are likely to have opposing incentive structures is ensured through the assignment of weights. It is possible that homogenous groups (e.g. all respondents from a particular country) carry other types of biases. For example, cultural factors in a particular country may create a tendency to exaggerate, or a tendency to not be completely forthcoming. Analyzing dimensions within such country is still possible, even if such biases exist (since the bias carries through to all scores across all dimensions). But caution is needed if that country is compared to another country, one whose stakeholders have a different bias.

Finally, in an ideal survey, internal consistency (does a respondent evaluate similar questions in a similar manner) can and should be checked. Yet the TRE questionnaire must be kept short, in order to ensure senior stakeholders respond. Therefore it is not possible to design (a longer) question that tests for internal consistency.

6.0 Conclusions

The paper presents a method to capture stakeholder perceptions about the dimensions of the telecom regulatory and policy environment in a country.

The results, once analyzed in the context of each country, can identify best practices and worst practices. Within one country, the results are useful for diagnosing the finer problems of the regulatory system. The results are also useful to track the evolution of regulation over time. Because it is a measure of perception, regulators may use the results understand how their actions (or inaction) is perceived by stakeholders.

Future work points towards testing the TRE scores against sector performance. For example, do higher TRE scores necessarily result in increased connectivity, increased choice etc, after controlling for other factors (such as the political climate, economic conditions)? Goswami & Malik (2007) analyze the 2006 TRE results and sector performance for Indonesia and India and show that despite good TRE scores relative to Indonesia, a key component of India's sector performance as measured by mobile and fixed lines per 100 people lags behind significantly. However, they conclude that Indonesia's good performance (in spite of the poorer regulatory environment, as indicated by TRE scores) is likely to be the exception rather than the rule. Further work needs to be done on the correlation of TRE scores to performance. But such work has to be done keeping in mind that there will nearly always be a lag between regulatory action and final sector performance. As the ITU (2007) states, referring to the 2006 TRE results, "Their evaluation of the regulatory environment is in general agreement with sector performance, as measured by the DOI [Digital Opportunity Index]. However, the fit is not perfect: for instance, Sri Lanka actually gained two places in the DOI, but it lagged behind, ranked fourth out of the six countries in regulatory performance. This suggests lags in relating changes in the regulatory environment to sector performance".

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6.0 Annex 1: TRE survey results (weighted final scores) for 2008

Scores are presented by country. Total number of respondents in 2008 was 412.

Bangladesh

Dimension	Fixed	Mobile	Broadband
Market entry	3.4	3.0	2.6
Allocation of scarce resources	2.8	2.7	2.6
Interconnection	3.0	3.2	2.4
Tariff regulation	2.9	3.3	2.6
Regulation of anti-competitive practices	2.8	2.9	2.3
Universal service obligation	2.2	2.3	2.0
Quality of Service	2.5	3.1	1.9

Indonesia

Dimension	Fixed	Mobile	Broadband
Market entry	2.6	3.0	2.4
Allocation of scarce resources	2.4	2.7	2.4
Interconnection	2.9	2.7	2.3
Tariff regulation	2.5	2.6	2.3
Regulation of anti-competitive practices	2.4	2.5	2.4
Universal service obligation	2.1	2.1	2.2
Quality of Service	2.5	2.3	2.3

India

	Fixed	Mobile	Broadband
Market entry	2.7	3.1	2.8
Allocation of scarce resources	2.3	2.2	2.1
Interconnection	2.7	2.8	2.7
Tariff regulation	3.9	3.9	2.8
Regulation of anti-competitive practices	2.3	2.7	2.4
Universal service obligation	2.6	3.1	2.1
Quality of Service	2.8	2.8	2.2

Maldives

Dimension	Fixed	Mobile	Broadband
Market entry	2.9	3.8	3.5
Allocation of scarce resources	3.6	3.6	3.8
Interconnection	3.4	3.5	3
Tariff regulation	3.2	3.4	3.2

Regulation of anti-competitive practices	2.8	3.1	2.8
Universal service obligation	3.6	3.5	2.9
Quality of Service	3.6	3.8	3.5

Pakistan

	Fixed	Mobile	Broadband
Market entry	3.0	3.9	3.2
Allocation of scarce resources	3.1	3.5	3.2
Interconnection	3.2	3.7	2.9
Tariff regulation	2.7	3.2	2.6
Regulation of anti-competitive practices	2.4	2.8	2.5
Universal service obligation	2.8	3.2	2.0
Quality of Service	2.7	3.2	2.7

Philippines

Dimension	Fixed	Mobile	Broadband
Market entry	2.9	3.2	3.0
Allocation of scarce resources	2.7	2.8	2.6
Interconnection	2.8	2.8	2.8
Tariff regulation	2.9	2.9	2.8
Regulation of anti-competitive practices	2.7	2.5	2.6
Universal service obligation	2.7	2.6	2.5
Quality of Service	2.9	3.2	2.7

Sri Lanka

Dimension	Fixed	Mobile	Broadband
Market entry	2.7	2.7	2.4
Allocation of scarce resources	2.5	2.7	2.3
Interconnection	2.9	2.6	2.5
Tariff regulation	2.7	2.7	2.5
Regulation of anti-competitive practices	2.6	2.7	2.6
Universal service obligation	2.8	2.9	2.6
Quality of Service	2.9	2.9	2.5

Thailand

Dimension	Fixed	Mobile	Broadband
Market entry	3.1	2.7	3.4
Allocation of scarce resources	2.9	2.6	3.0

Interconnection	2.3	2.6	2.5
Tariff regulation	2.8	2.9	2.9
Regulation of anti-competitive practices	2.6	2.6	2.8
Universal service obligation	2.6	2.5	2.4
Quality of Service	2.9	3.0	2.8

7.0 Annex 2: Samples of documents from the TRE survey

7.1 Questionnaire

Questionnaire Number : ………………

Telecom Regulatory Environment for <Country>

You are kindly requested to make your frank assessments of the telecom regulatory environment (TRE) for the year 12 months ending <Month, Year> for the fixed, mobile and broadband telecom sectors on a five-point scale.

The dimensions used in this questionnaire are broadly based on the *Reference Paper of the Fourth Protocol of the General Agreement on Trade in Services* and are briefly described below. A fact-sheet of key events in the Telecom Regulatory Environment is also attached for your reference for the period <start month> – <end month> <year>.

Completing the Questionnaire should take 5-7 minutes of your time. Please email the completed questionnaire to <email address> or fax it to <fax number>. If you prefer, you can complete the same survey online by simply going to <URL, unique>.

Please find a below a table defining the Dimensions covered in the survey for your reference while completing the survey to follow.

Dimension	**Aspects Covered**
Market Entry	Transparency of licensing. Applicants should know the terms, conditions, criteria and length of time needed to reach a decision on their application. License conditions. Exclusivity issues.
Scarce Resources	Timely, transparent and non-discriminatory access to spectrum allocation. Numbering and rights of way: frequency allocation, telephone number allocation, tower location rights.
Interconnection	Interconnection with a major operator should be ensured at any technically feasible point in the network. Quality of interconnection comparable to similar services offered by own network. Reasonable rates for interconnection. Unbundling of interconnection. Interconnection offered without delay. Sharing of incoming and outgoing IDD revenue. Payment for cost of interconnection links and switch interface. Payment for cost of technical disruption of interconnection.
Tariff Regulation	Regulation of tariffs charged from consumers.
Regulation of Anti Competitive Practices	Anti-competitive cross subsidisation. Using information obtained from competitors with anti-competitive results. Not making technical information about essential facilities and commercially relevant information available to competitors on a timely basis. Excessive prices. Price discrimination and predatory low pricing. Refusal to deal with operators and other parties. Vertical restraints. Technical disruption of interconnection. Sharing of towers and facilities by parent company and subsidiaries in different segments of the market.
Universal Service Obligation (USO)	Administration of the universal service program/fund in a transparent, non-discriminatory and competitively neutral manner and is not more burdensome than necessary for the kind of universal service defined by the policymakers.
Quality of Service (QoS)	The actual performance of a service with respect to what is promised, depending upon the network traffic control mechanisms. Specific criteria may be call quality (for mobile and fixed), connection speeds or throughput (for broadband)

7.2 Questionnaire

Below is the sample questionnaire for the fixed sector. Similar pages are attached for the other 2 sectors (mobile and broadband). Only the title of the page is changed to represent the sector

MOBILE SECTOR Telecom Regulatory Environment, for <start-month, Year- <end-month, Year>

Please **TICK** the number that best represents the **quality of the regulatory environment** for each dimension. The lower number represents Highly Ineffective and the higher number represents Highly Effective. If you feel you do not have sufficient information about a particular question, you may choose to leave it blank.

		Highly ineffective				Highly effective
M1	**Market Entry**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
M2	**Access to Scarce Resources**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
M3	**Interconnection**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
M4	**Tariff Regulation**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
M5	**Regulation of Anti-competitive Practices**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
M6	**Universal Service Obligation (USO)**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
M7	**Quality of Service (QoS)**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Comments:

7.3 Summary of Recent Regulatory and Policy Events

The following is the document used in India in the 2006 survey. It covers the significant events for the 12 months preceding the survey.

Key Regulatory Events for India; June 2005-June 2006

Date	**Subject**
2006	
27 June	Study Paper on Financial analysis of Telecom Industry of China and India.
16 June	Consultation Paper On Admissibility of Revenue Share between Visiting Network and Terminating Network for Roaming Calls. The key issue in this paper is that in case of roaming, whether the terminating network service provider should get only the prescribed termination charges or in view of higher roaming charges, should there be any revenue share arrangement between the visiting network service provider and the terminating network service provider.
13 June	Consultation Paper on Interconnect Usage Charges (IUC) for Short Message Service (SMS). This consultation paper mainly discusses the need for regulatory intervention for Interconnect usage charges, specifically for SMS carriage and termination charges.
12 June	Consultation paper on Allocation and pricing of spectrum for 3G services and Broadband Wireless Access. This paper discusses 3G spectrum allocation and pricing related issues, issues related to spectrum for Broadband Wireless Access. These technologies hold great potential for the rapid and comparatively inexpensive deployment of broadband services especially in rural India.
6 June	Proposed amendments in the Cable Television Networks (Regulation) Act, 1995 and the existing Telecom Licenses for facilitation of growth of IPTV services
24 May	Consultation Paper on Fixing the Benchmarks pertaining to Quality of Service for Broadband. This paper discusses the various issues relating to Broadband Quality of Service parameters, the international practices, various broadband access technologies and also suggests various Quality of Service parameters for Broadband and their benchmarks.
21 April	Consultation Paper on Issues relating to Commercial Tariff.
21 March	The Telecommunication Tariff (Forty third Amendment) Order 2006 (3 of 2006).

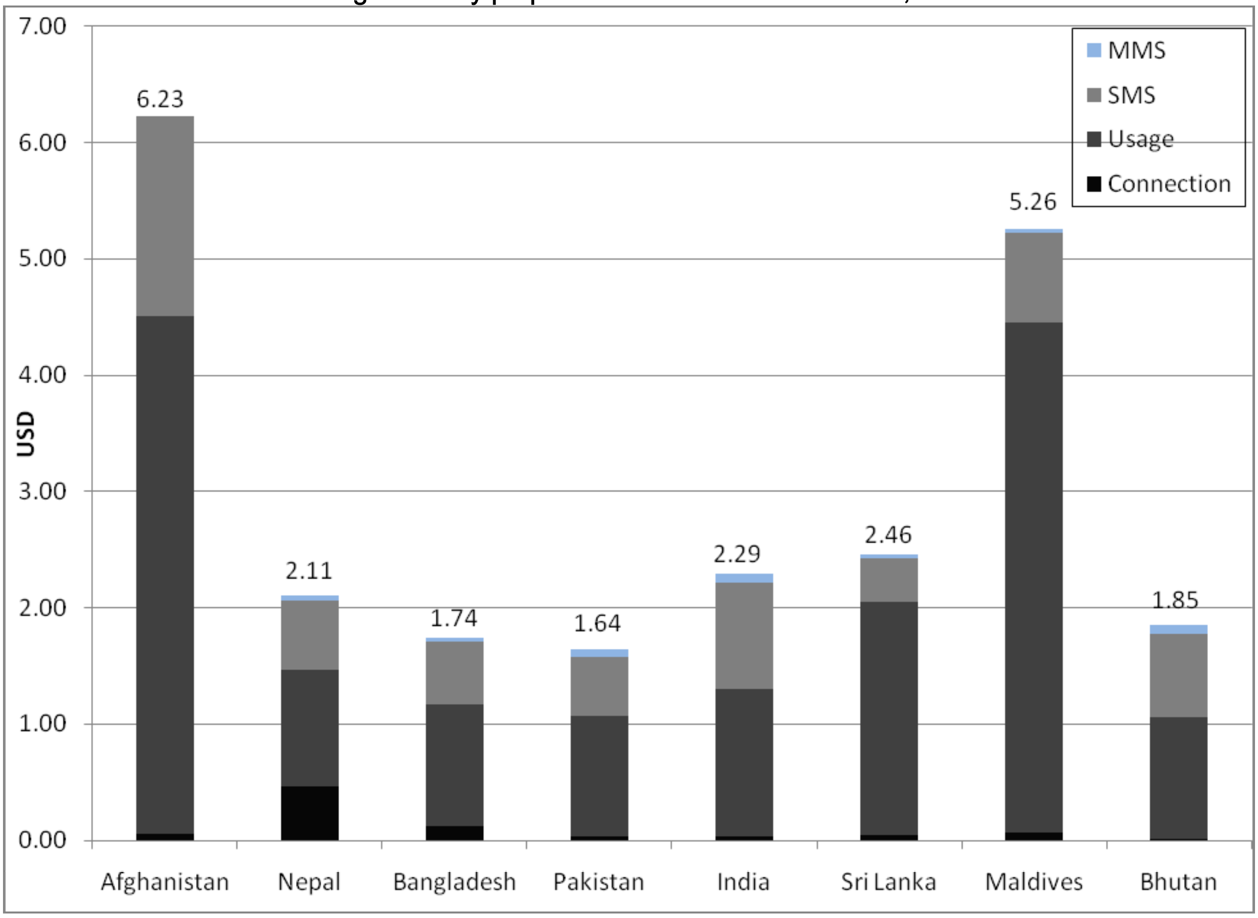
21 March	Regulation on Code of Practice for Metering and Billing Accuracy. http://www.trai.gov.in/trai/upload/Regulations/44/regu21mar06.pdf
20 March	TRAI releases Recommendations on Next Generation Networks (NGN)
10 March	The Telecommunication Interconnection Usage Charges (Seventh Amendment) Regulation (2 of 2006) In Schedule III of The Telecommunication Interconnection Usage Charges Regulation, 2003 (4 of 2003), the following entries shall substitute the existing entries relating to paragraph 3.2.2:- 3.2.2 For calculating ADC , Adjusted Gross Revenue shall have the same meaning as given in the respective licenses; PROVIDED that in calculating the ADC as a percentage of Adjusted Gross Revenue (AGR) of a Universal Access Service Licensee/Basic Service Operator, the revenue from Rural Fixed Wireline subscribers shall be excluded."
8 March	TRAI provides its recommendations on mobile number portability: Mobile Number Portability implementation process should be initiated in our country. A time frame of 12 months between the acceptance of recommendation by the Government and launch of this facility is recommended. It is recommended that this facility should be available to mobile subscribers tentatively by 1st April 2007.
7 March	The Telecommunication (Broadcasting and Cable) Services (Second) Tariff (fourth Amendment) Order 2006 (1 of 2006). To give effect to this a Tariff Amendment Order has been issued in which the words Ordinary Cable Subscriber, Commercial Cable Subscriber has been defined and the definition of 'charges' has been amended and a new clause to give effect to the relevant date for determining the ceiling in respect of commercial cable subscriber has been introduced. The proposed amendment is intended to be a short-term measure and would be reviewed on the basis of detailed examination as indicated in para 3.
27 Feb.	Direction to Mobile Service providers in the States of Maharashtra, Tamil Nadu, West Bengal and Uttar Pradesh not to charge differential tariffs for calls terminating in BSNL network and other service providers networks
23 Feb	The Telecommunication Interconnection Usage Charges (Sixth Amendment) Regulation 2006 (1 of 2006) **Salient features** • The total amount of ADC shall be reduced to Rs.3335 crore and estimated ADC for BSNL would be Rs. 3,200 crore. Substantial reduction (about 33%) in the amount of ADC • There will not be any ADC on per minute basis on domestic calls. • ADC on International Long Distance traffic shall continue to be on per minute basis but at a reduced rate of Rs 1.60/minute (more than 50% reduction) for Incoming International calls, this in turn will reduce arbitrage and hence grey market. ADC on outgoing international calls have been reduced to Rs.0.80/minute (reduction more than 65%). • All licensees of Unified Access Service, Cellular Mobile Telephone Service, National Long Distance Service and International Long Distance Service shall

	pay **1.5**% of their AGR as ADC to the BSNL. BSNL will retain ADC chargeable as percentage of its AGR. Unified Access Service Licensee/BSOs retain ADC as percentage of AGR of wireline subscribers and the balance shall be paid to the BSNL. • For estimation of ADC as a percentage of AGR, of access providers, the revenue from the rural subscribers shall be subtracted. • The UASLs/BSOs other than BSNL would retain ADC in terms of percentage of AGR and also on outgoing international calls from their wireline subscribers. • No change in mobile and fixed termination charges from the existing level of Rs.0.30 per minute. • Death of distance acknowledged by moving over to a ceiling carriage of Rs. 0.65/minute irrespective of distance. • No ADC charge on rural revenue of operators to incentivise penetration of telecom services in rural areas. • Strengthening of monitoring mechanism of payment & receipt of ADC by operators.
16 Jan	TRAI issues Consultation Paper on "Tariff Plans with Life Time Validity"
12 Jan	Consultation Paper on Issues pertaining to Next Generation Networks (NGN) Issues : **-** • **Awareness and relevance**: Is NGN relevant for India? When should the industry migrate? For which category of stakeholders is NGN relevant? • **Regulatory approaches**: Is there need for regulatory initiatives on NGN? Should there be 'light touch' regulation or are there areas needing more detailed regulation? What regulatory incentives could help boost benefit from NGN and reduce risks? Will a move to NGN in rural areas reduce the gap between urban and rural tele-densities? If yes, how to push NGN to rural India? What interconnection regime needs to be developed in the NGN context? • **Migration issues**: Is there a role for Regulator to ensure smooth migration?
2 Jan	Consultation Paper on Issues relating to Convergence and Competition in Broadcasting and Telecommunications.
2005	
2 Dec	The Register of Interconnect Agreements (Broadcasting and Cable Services) (Second Amendment) Regulation 2005 (12 of 2005). TRAI has decided to amend the existing clause 6 and make consequential amendments in clause 5 of the above regulation so as to enable the Authority to specify a particular procedure in regard to the manner of filing of data or information; to the form or formats of filing; to the number of copies to be filed; and, to such other procedural aspects connected and incidental to the filing of details of interconnect agreements through a simplified process instead of the need to amend the regulations every time whenever a change in procedure is necessitated.
2 Dec	Draft Regulation on Intelligent Network Services in Multi Operator, Multi Network Scenario Regulation 2005

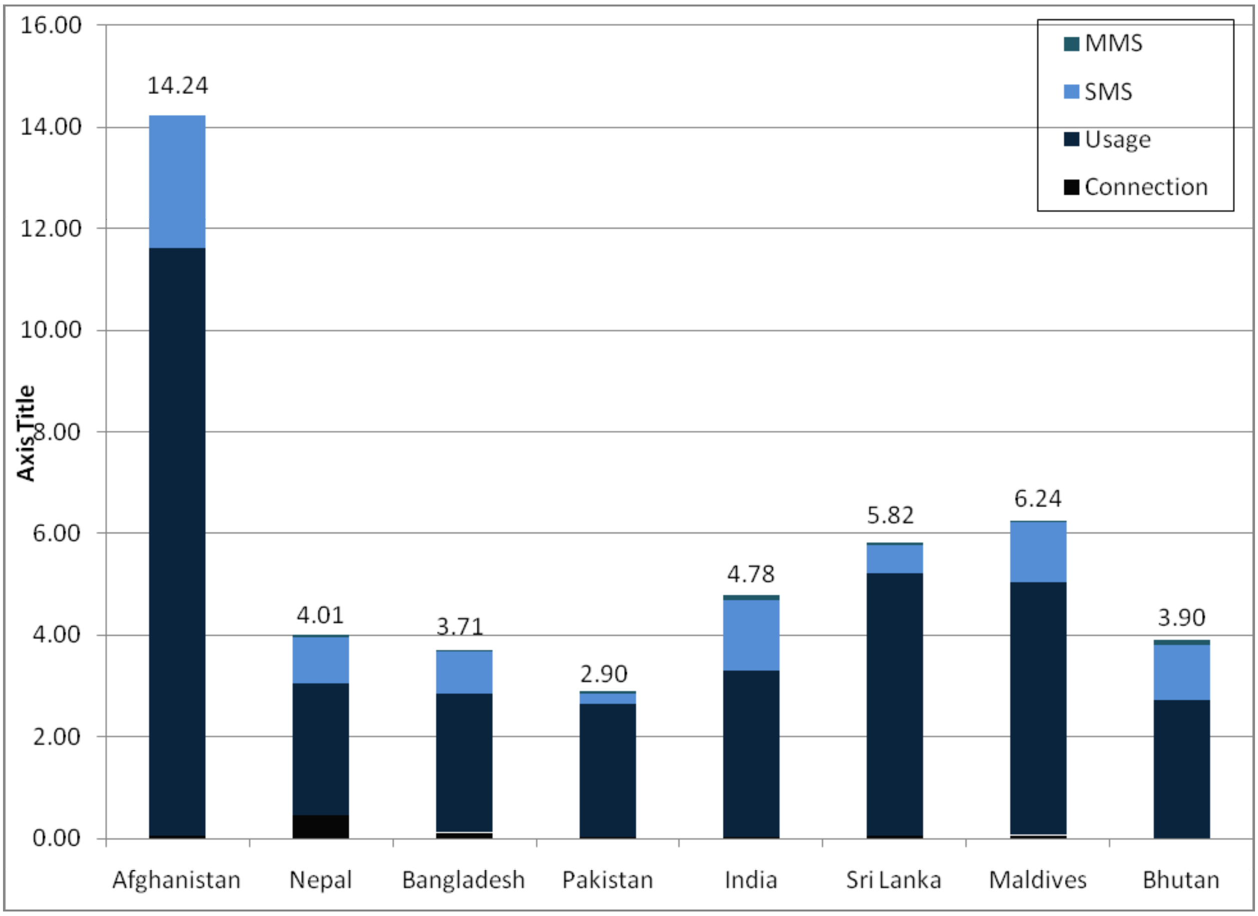
	Salient Features : • All telecom consumers in the country shall have access to Multi-Operator Multi-Service Intelligent Network (IN) Platform of their choice and no Operator should be allowed to block his consumers from accessing IN platforms of his choice. • It shall be the Access Providers' prerogative to deploy their Intelligent Network (IN).
30 Nov	TRAI issues Direction to Cellular Mobile Service Providers for ensuring Quality of Service that the Quality of Service parameters, including the level of POI congestion, in its network should be strictly within the benchmark laid down by the Authority.
3 Nov	TRAI reiterates its Recommendations pertaining to Local Loop Unbundling and Fiscal Incentives for Broadband.
3 Oct	TRAI provides its recommendations on growth of telecom services in rural India
16 Sept	The Telecommunication Tariff (fortieth Amendment) Order 2005, (7 of 2005) In exercise of the powers conferred upon it under sub-section (2) of the section 11 read with section 11(1)(b)(i) of the Telecom Regulatory Authority of India Act, 1997, the Telecom Regulatory Authority of India.
8 Sept	The Telecommunication Tariff (thirty ninth Amendment) Order 2005, (6 of 2005). re-fixed IPLC tariffs. The new ceiling tariffs for three most commonly used capacities i.e. E-1 (Speed of 2 Mega Bits Per Seconds), DS-3 (Speed of 45 Mega Bits Per Seconds) and STM-1 (Speed of 155 bits per seconds)
1 July	Regulation on Quality of Service of Basic and Cellular Mobile Telephone Services, 2005 (11 of 2005) modify some parameters, some deleted and also introduce some new parameters.
24 June	Consultation Paper on Issues related to Entry Fee & Annual License Fee for ISP (Internet Service Provider) License with Virtual Private network (VPN). This consultation paper presented a scenario in the country as well as international scenario of some other countries and different types of VPN's & background about principles of license fee for various telecom services.
6 June	Consultation paper on Measures to promote competition in International Private Leased Circuits segment in India; This paper presented a scenario in the country as well as international scenario of some other countries, and the technical issues & regulatory concerns arising out of the current situation.

Mobile price baskets (USD)

Average monthly prepaid mobile cost for a Low User, USD

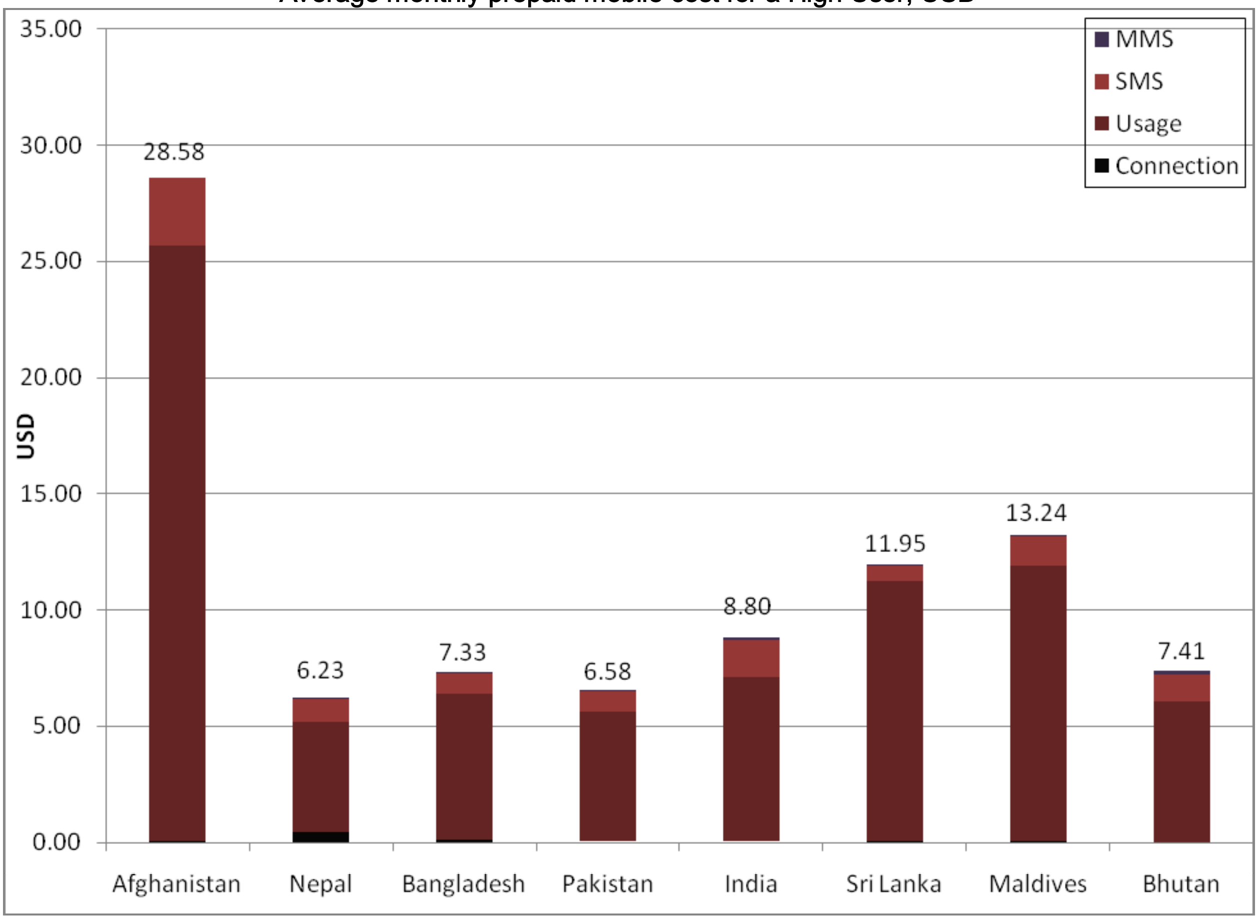


Average monthly prepaid mobile cost for a Medium User, USD

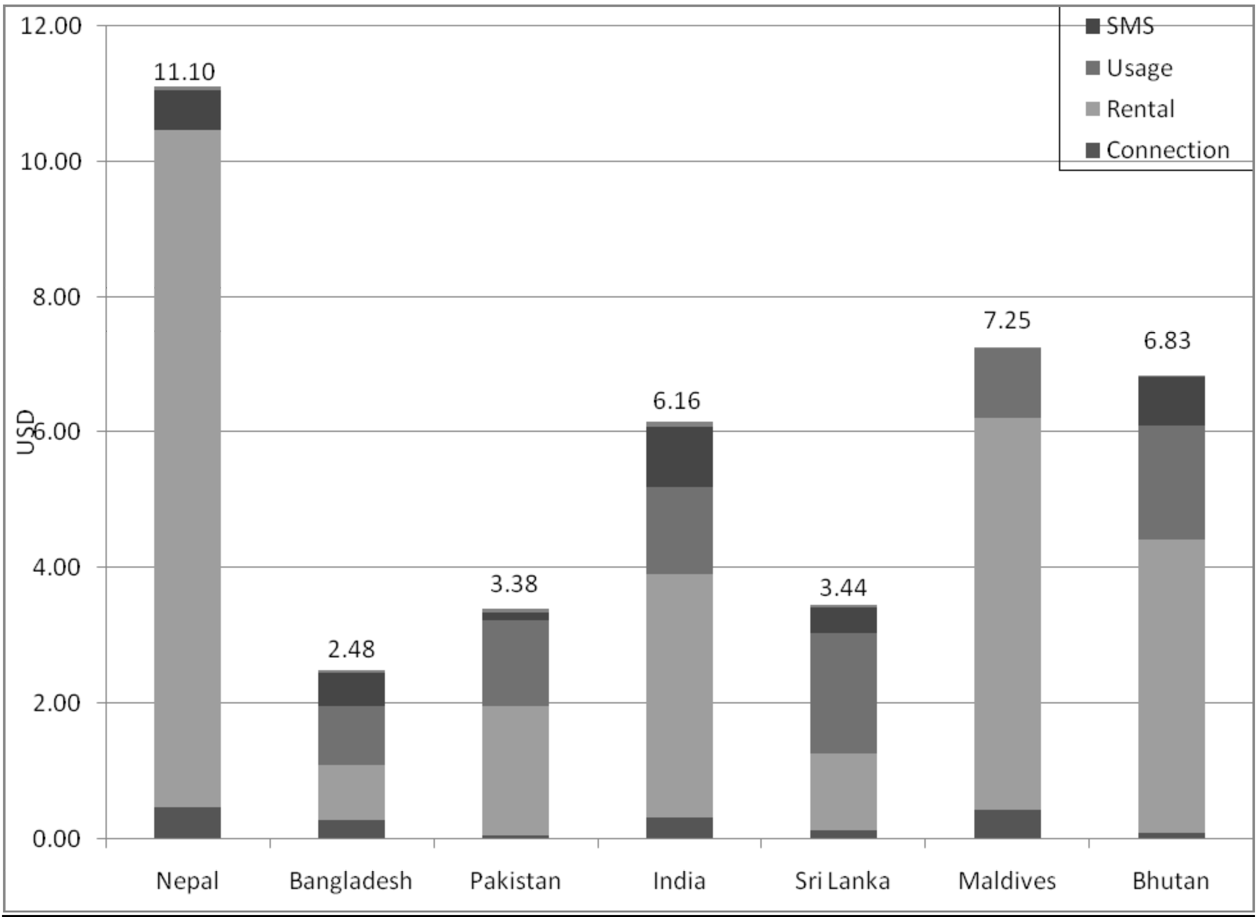


www.lirneasia.net

Average monthly prepaid mobile cost for a High User, USD



Average monthly postpaid mobile cost for a Low User, USD



Average monthly postpaid mobile cost for a Medium User, USD

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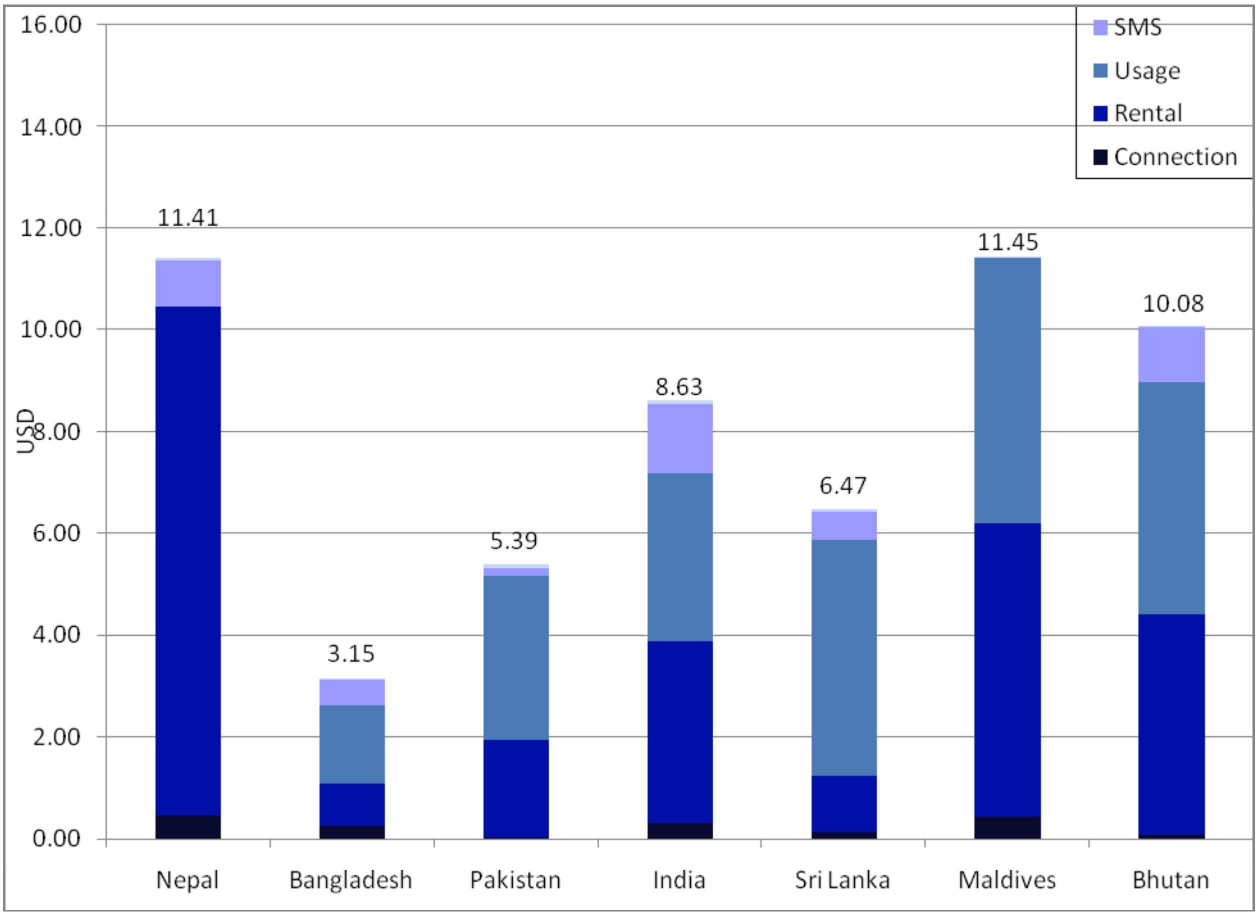

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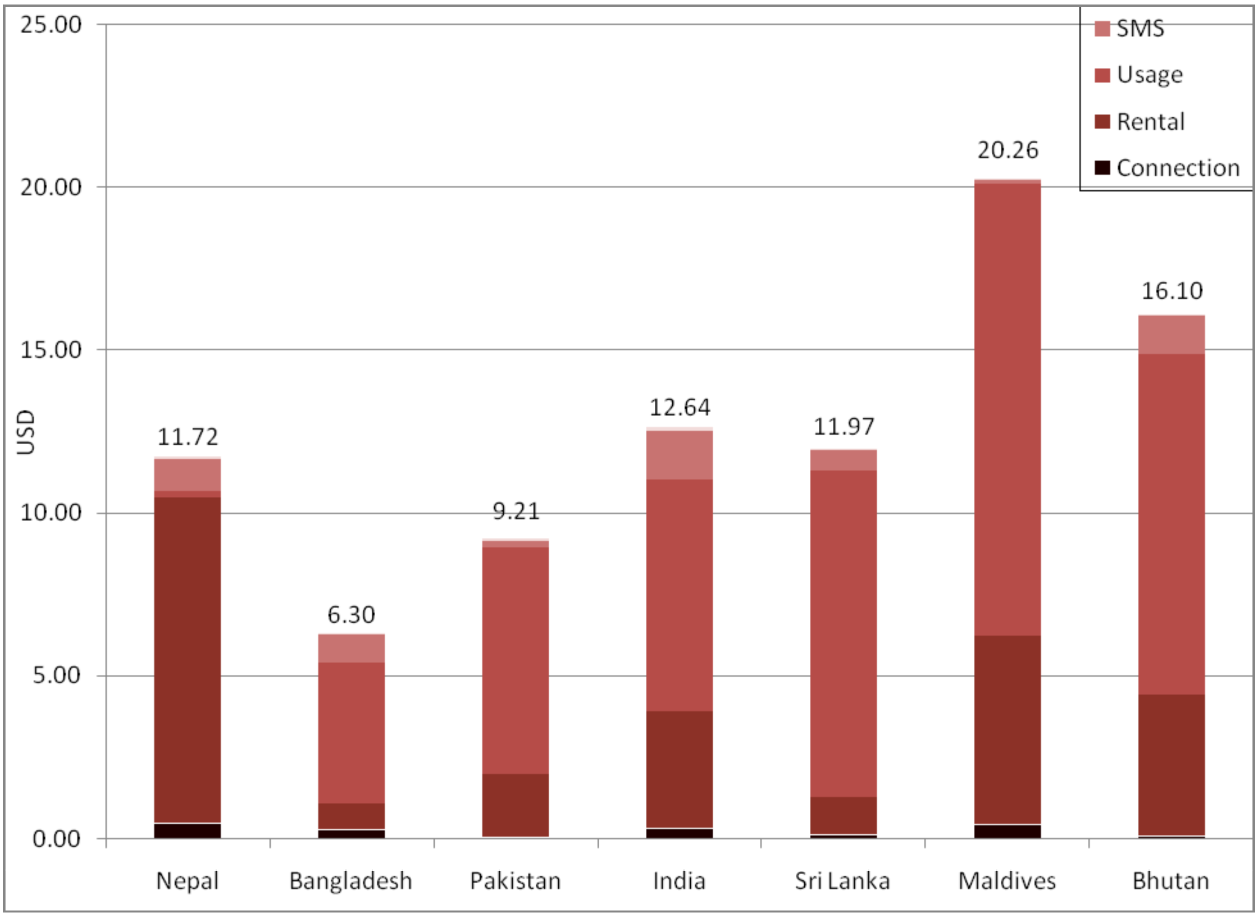
Average monthly postpaid mobile cost for a High User, USD



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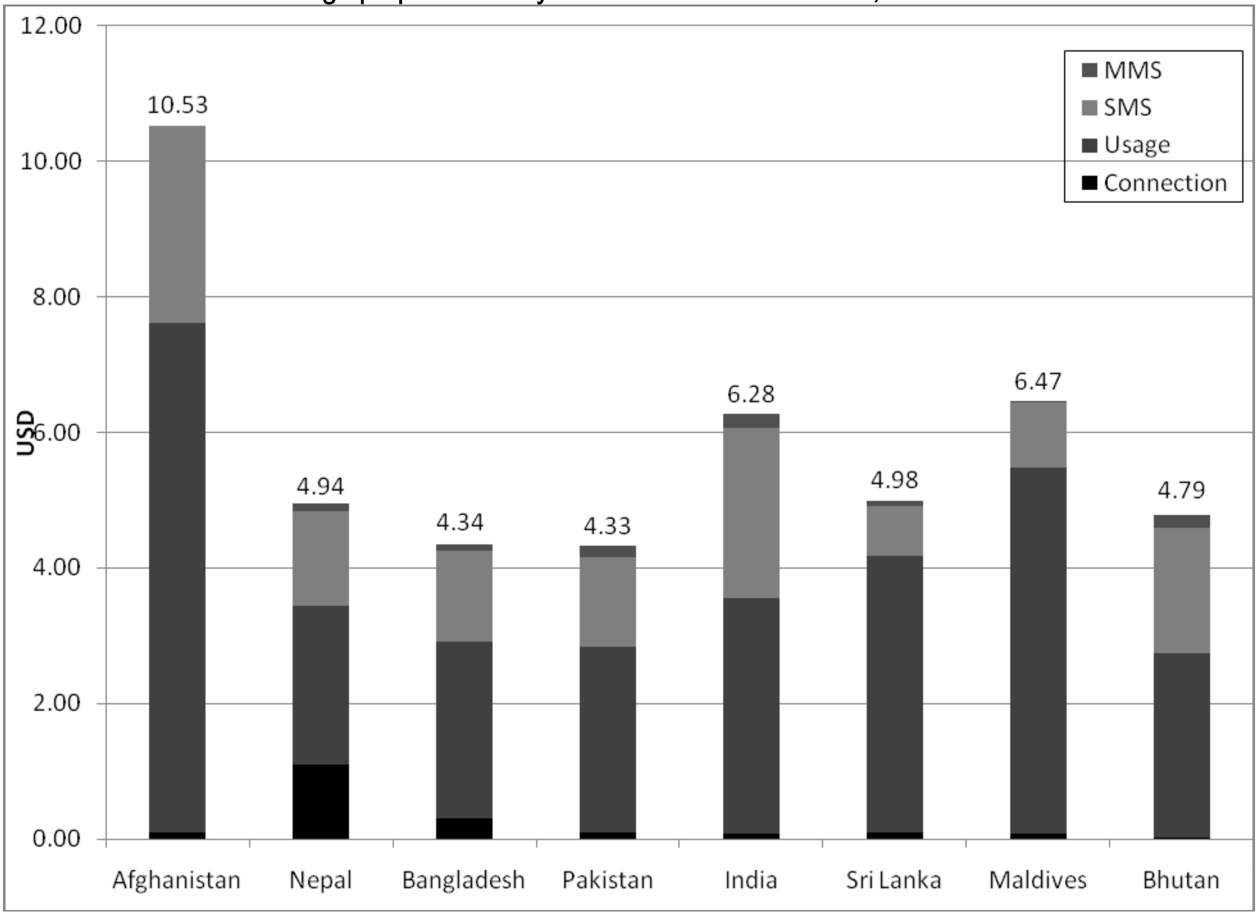
Mobile price baskets (USD PPP)

Average prepaid monthly mobile cost for a Low User, USD PPP



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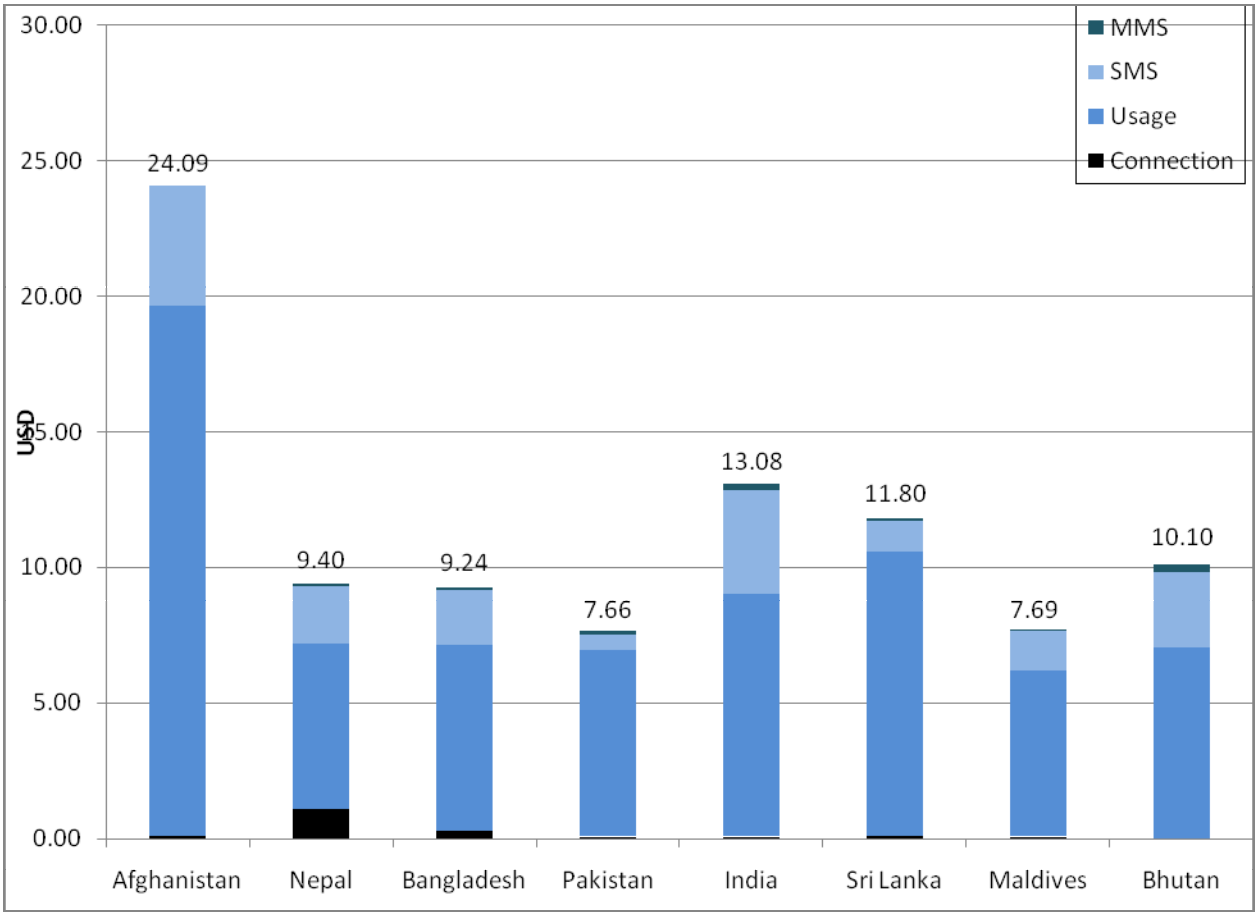
Average prepaid monthly mobile cost for a Medium User, USD PPP



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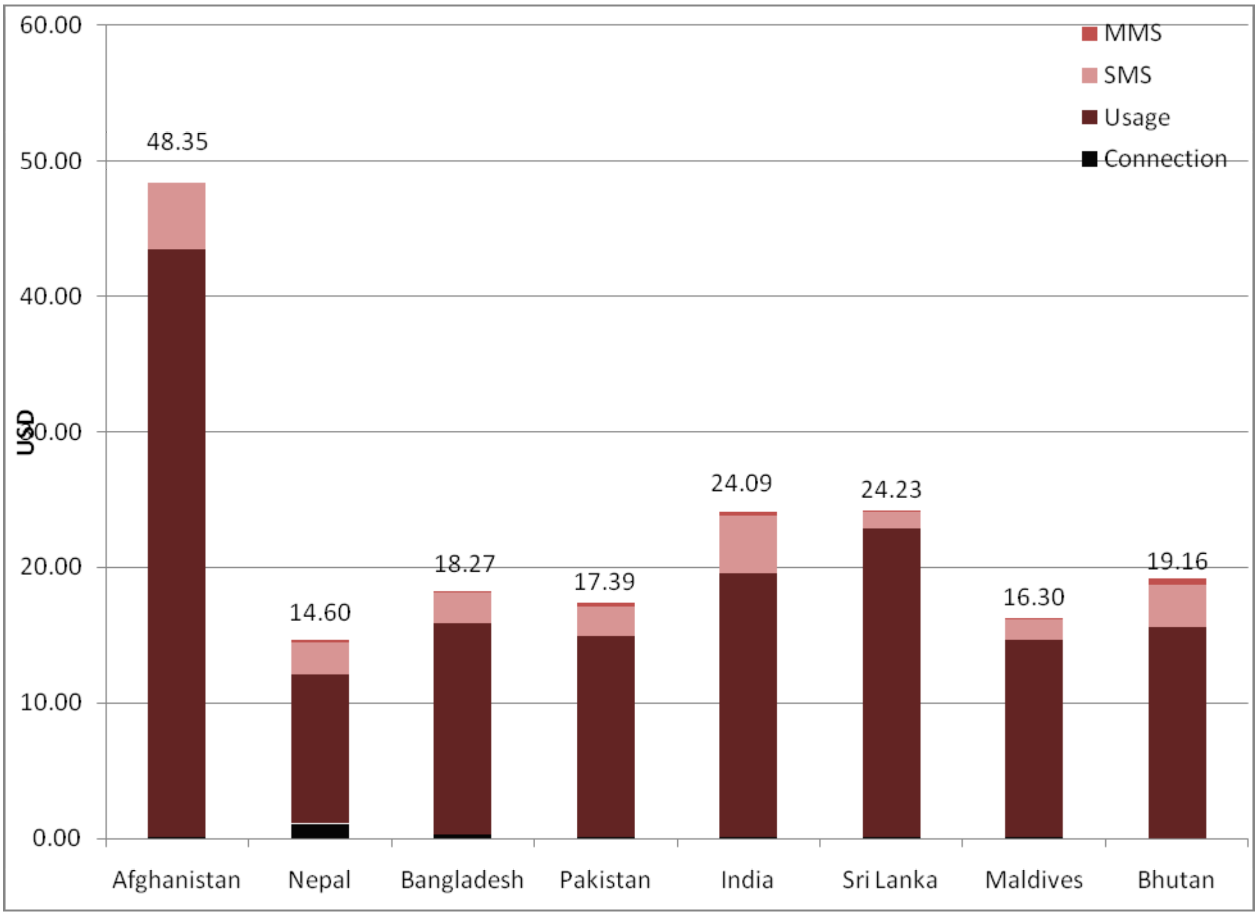
Average prepaid monthly mobile cost for a High User, USD PPP



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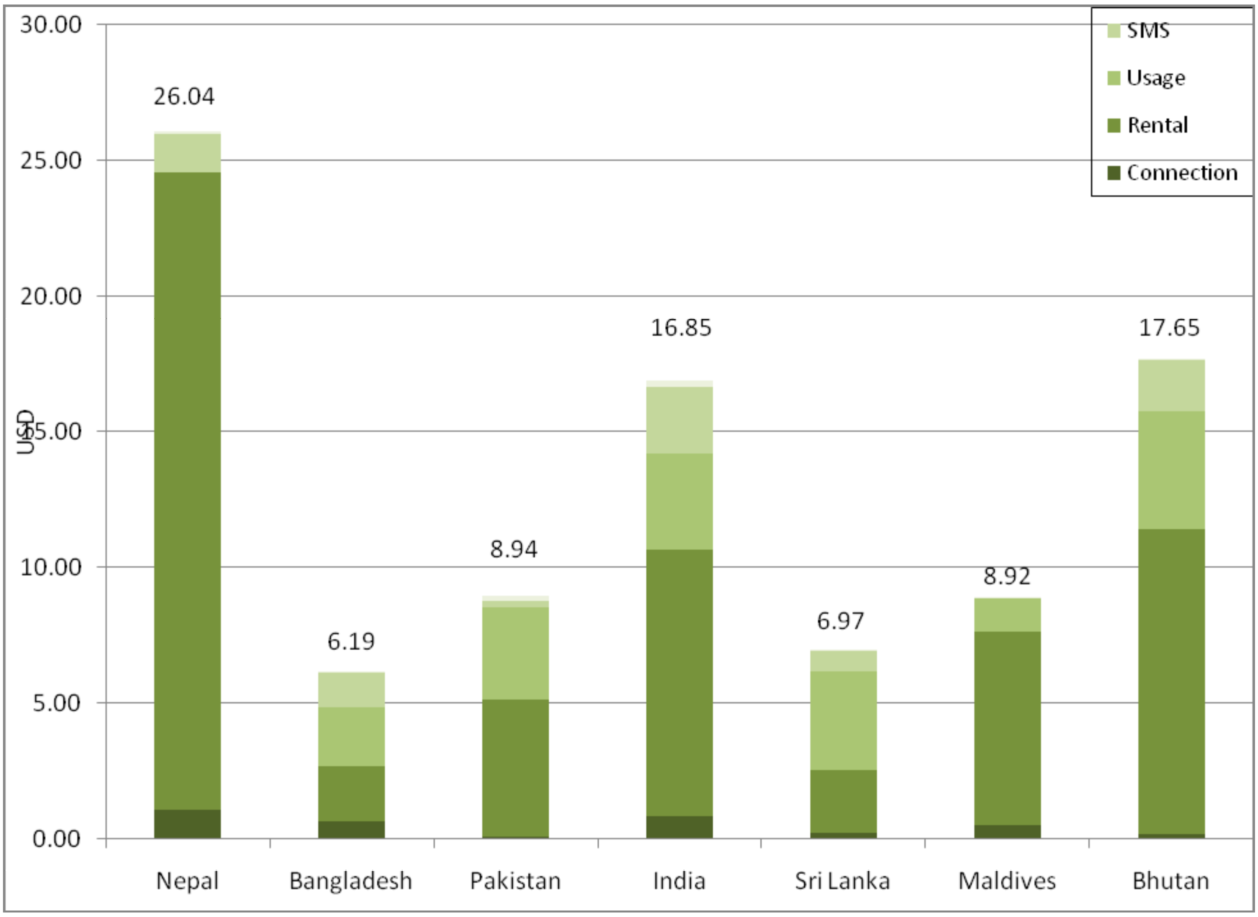
Average postpaid monthly mobile cost for a Low User, USD PPP



Average postpaid monthly mobile cost for a Medium User, USD PPP

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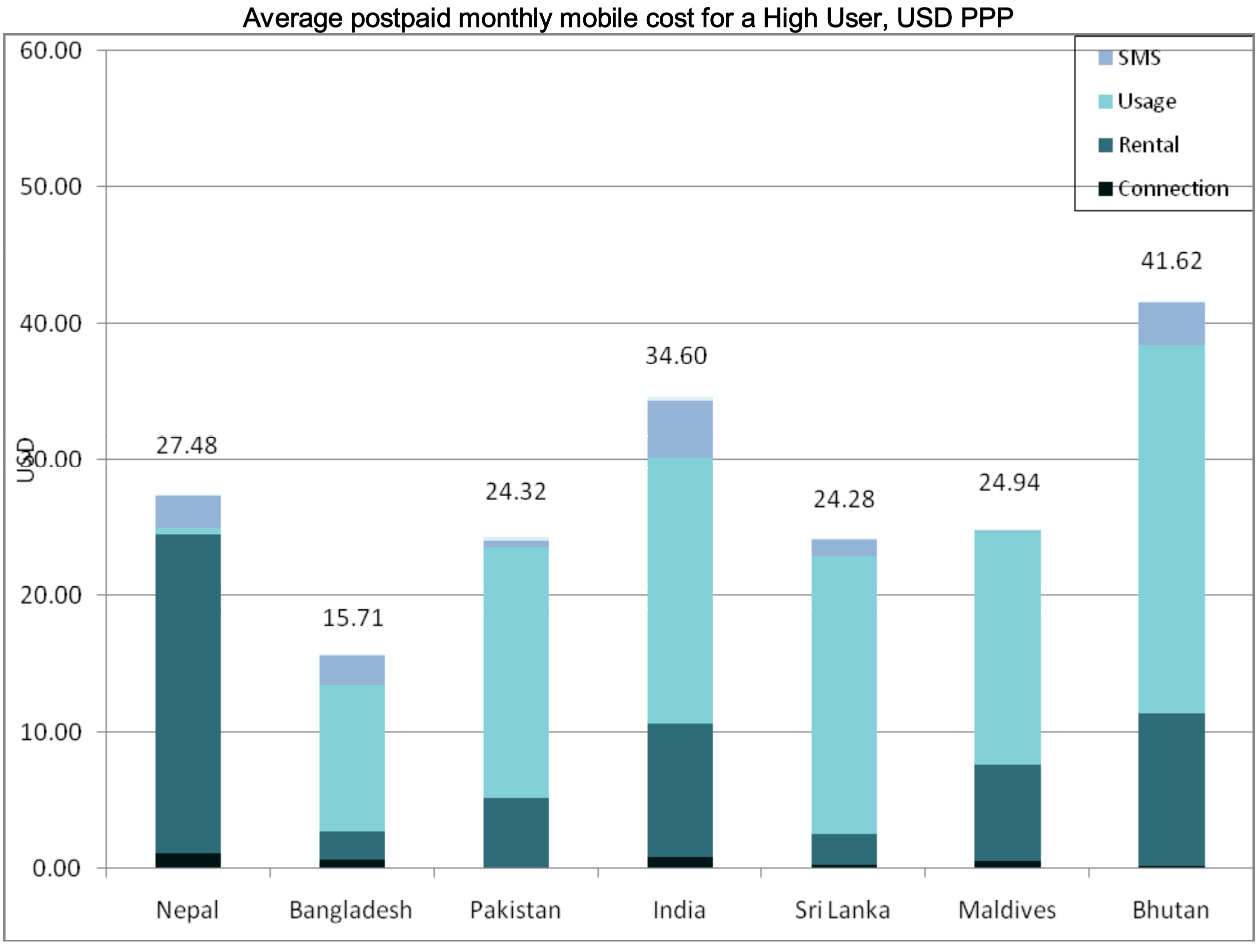

www.lirneasia.net

Notes

1. Tariff data taken from operator websites and/or verbal/written communication with call center agents.
2. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp.
   Voicemail charges and use were excluded from calculation of the basket.
3. Prepaid and postpaid baskets were based on Minutes of Use (MOU) from OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp.
4. OECD call distributions by duration, destination, and time of day were used since relevant data for all eight countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.
5. The cheapest tariff plan (based on initial connection charges for prepaid plans and monthly rental charges for postpaid plans) of the largest operator (based on subscriber numbers) were covered for each country.
6. Postpaid packages for Afghanistan were only available to corporate customers and thus were excluded from the basket.
7. MMS data for Afghanistan was unavailable and hence excluded from the country's basket.
8. Where MMS tariffs were dependent on the size of the message, the average size of an MMS was assumed to equal 30 KB.
9. Where data was not mentioned or available, voicemail retrieval tariffs were assumed to be equal to voice onnet tariffs.
10. Where data was not mentioned or available, voicemail sending tariffs were assumed to be equal to standard outgoing tariffs.
11. Exchanges rates taken on 28 February 2010 from www.oanda.com
12. USD PPP estimates for 2010 were taken from the IMF World Economic Outlook (WEO) Database (October 2009), available at: http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/index.aspx

MOBILE PRICE BASKETS (FEBRUARY 2010)

Background
Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
   a. The price of the handset and handset subsidies are **not** taken into account in the basket.
   b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
   c. Monthly rental charges and any optional charges that may apply to the package.
   d. The usage profile will also include a number of SMS messages per month.
   e. The three user baskets that are taken into consideration are:
      - *Low user basket*
      - *Medium user basket*
      - *High user basket*
   f. Different baskets were calculated for prepaid and postpaid plans.
   g. The baskets compositions used are as follows[1]:

	OECD[2]
Voice, minutes of use per month	
Low User	46
Medium User	119
High User	256
SMS per month	
Low User	33
Medium User	50
High User	55
MMS per month	
Low User	1
Medium User	1
High User	1

[1] Rounded off to the nearest whole number
[2] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).

2. *Call destination (in minutes):*
    a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.
    b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
    c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
    d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
    e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	Low User	Medium User	High User
Local, Fixed line	0.15	0.14	0.13
National, Fixed line	0.07	0.07	0.07
On-net, Mobile	0.48	0.48	0.47
Off-net, Mobile	0.22	0.24	0.26
Voicemail	0.08	0.07	0.07

3. *SMS destination:*
    a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
    b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	Low user	Medium user	High user
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
    a. Peak at weekdays – most expensive time in a 24-hour day
    b. Off-peak at weekdays – cheapest time in a 24-hour day
    c. Weekend – at daytime Saturdays and/or Sundays
    d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	Medium User	High User
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
    a. Local and national fixed line calls
    b. Same network mobile calls (On-net)
    c. Other network mobile calls (Off-net)
    d. Voicemail calls
    e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8
Voicemail	0.8	0.8	0.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*
    a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
    b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
    a. The largest operator (by subscriber numbers) in each country is considered.
    b. The cheapest tariff plan of the largest operator is considered:
        - for prepaid – plans with the lowest connection charges; and
        - for postpaid – plans with the lowest rental are considered.

       These plans are applied across all three baskets (low, medium and high).[3]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in US$ and US$ PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.

<u>Tariff packages</u>

1. Afghanistan – Roshan[4]
    a. Prepaid – SIM Yaraan

2. Nepal – Nepal Telecom
    a. Prepaid – Prepaid
    b. Postpaid – Postpaid

3. Bangladesh – Grameen Phone
    a. Prepaid – Smile
    b. Postpaid – Xplore1

4. Pakistan – Mobilink
    a. Prepaid – Jazz Budget
    b. Postpaid – Indigo Freedom Plan 1

5. India – Bharti Airtel
    a. Prepaid – Regular
    b. Postpaid – Advance Rental Plan

6. Sri Lanka – Dialog GSM
    a. Prepaid – KIT per-second blaster
    b. Postpaid – Lite 103

7. Bhutan – B-Mobile
    a. Prepaid – Prepaid
    b. Postpaid – Super 200 Plan

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[3] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

[4] Postpaid packages are only available to corporate customers and thus were excluded from the basket.

8. Maldives – Dhiraagu
    a. Prepaid – Prepaid
    b. Postpaid – In touch

Mobile tariff comparison

PRE-PAID				AFGHANISTAN	NEPAL		BANGLADESH	PAKISTAN	INDIA		BHUTAN	SRI LANKA	MALDIVES
				SIM Yaraan	Pre-paid package		Smile	Jazz Budget	Regular		Prepaid	KIT Standard	Prepaid
Connection Charges				2.088	15.216		4.282	1.167	1.063		0.311	1.717	2.311
Subscription (rental) fee				N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
Free minutes (in currency)				2	N/A		0	N/A	N/A		0	N/A	N/A
					Local	National			Local	National			
Usage charges	Fixed (local)	Incoming	Peak	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
			Off-peak										
			Weekend										
			Other										
		Outgoing	Peak	0.115	0.027	0.028	0.029	0.016	0.022	0.033	0.026	0.043	0.077
			Off-peak	0.115	0.012	0.013	0.014	N/A	N/A	N/A	0.017	N/A	0.042
			Weekend peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	On-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
			Off-peak										
			Weekend										
			Other										
		Outgoing	Peak	0.115	0.027	0.027	0.021	0.016	0.022	0.033	0.026	0.026	0.077
			Off-peak	0.115	0.010	0.010	0.007	N/A	N/A	N/A	0.017	N/A	0.042
			Weekend peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
			Off-peak										
			Weekend										
			Other										
		Outgoing	Peak	0.115	0.034	0.047	0.029	0.016	0.022	0.033	0.026	0.043	0.116
			Off-peak	0.115	N/A	N/A	0.014	N/A	N/A	N/A	0.017	N/A	0.042
			Weekend peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Voicemail	Registration fee			N/A	N/A		N/A	N/A	N/A		0.434	N/A	N/A
	Deposit	Peak / offpeak		Std outgoing tariffs	Std outgoing tari	Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs	td outgoing tariff		0.022	Std outgoing tariffs	Std outgoing tariffs
	Retrieval	Peak / offpeak		0.052	Standard outgoing onnet tariffs		Standard outgoing onnet tariffs	0.047	0.022	0.033	0.022	0.026	0.000
	Rate			(no per min)	per min	per min	per min	per min	per min		per min	per min	
Free SMSs				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SMS charges		Standard		0.052	N/A		0.014	N/A	0.022	0.033	0.022	N/A	N/A
		On-net		N/A	0.013		N/A	0.012	N/A	N/A	N/A	0.009	0.015
		Off-net		N/A	0.017		N/A	0.012	N/A	N/A	N/A	0.009	0.039
MMS charges		Incoming		N/A	N/A		N/A	N/A	N/A		N/A	0.005	N/A
		Outgoing	Onnet	not available	0.054		0.043	0.070	0.108		0.108	0.022	0.039
			Offnet	not available	0.054		0.043	0.070	0.108		0.152	0.065	0.039
Exchange rate: = USD 1 =				47.9	74.5938		70.0666	86	46		46.083	116.5	12.9807
				AFN	NPR		BDT	PKR	INR		BTN	LKR	MVR
Source				http://www.oanda.com/									

POSTPAID				NEPAL		BANGLADESH	PAKISTAN	INDIA			BHUTAN	SRI LANKA	MALDIVES
				Postpaid		Xplore1	Indigo Freedom Plan 1	Advanced Rental Plan*			Super 200 Plan	Lite 103	In touch
Connection Charges				15.149		9.277	1.167	10.850			2.604	4.292	15.330
Subscription (rental) fee				8.044		0.714	1.459	3.255			4.340	0.858	5.778
Free minutes (in local currency)				5.362		N/A	N/A	N/A			3.255	N/A	2.311
				Local	National			Local	National	CDMA			
Usage charges	Fixed	Incoming	Peak	N/A		N/A	N/A	N/A			N/A	N/A	N/A
			Off-peak										
			Weekend										
		Outgoing	Peak	0.022	0.023	0.019	0.026	0.022			0.043	0.052	0.076
			Off-peak	0.012	0.013	0.019	N/A	N/A	N/A	N/A	0.026	0.017	0.042
			Weekend	0.014	0.015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	On-net	Incoming	Peak	N/A		N/A	N/A	N/A			N/A	N/A	N/A
			Off-peak										
			Weekend										
		Outgoing	Peak	0.021	0.021	0.019	0.015	0.022			0.043	0.026	0.076
			Off-peak	0.010	0.010	0.007	N/A	N/A	N/A	N/A	0.026	0.017	0.042
			Weekend	0.013	0.012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A		N/A	N/A	N/A			N/A	N/A	N/A
			Off-peak										
			Weekend										
		Outgoing	Peak	0.028	0.042	0.019	0.026	0.022			0.061	0.052	0.076
			Off-peak	0.028	0.042	0.019	N/A	N/A	N/A	N/A	0.026	0.017	0.076
			Weekend	0.028	0.042	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Voicemail		Registration fee		N/A		N/A	N/A	N/A			20	N/A	N/A
		Deposit	Peak / offpeak	Std outgoing tariffs		Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs			1	Normal outgoing charges	Std outgoing tariffs
		Retrieval	Peak / offpeak	outgoing onnet tar		Std outgoing onnet tariffs	4	1	1.5	N/A	1	3	0
Free SMS				N/A		100	N/A	N/A			N/A	N/A	50
SMS charges		Basic charge		N/A		1.000	0.002	0.022			N/A	N/A	N/A
		On-net		0.028		N/A	N/A	N/A	N/A	N/A	0.022	0.009	0.015
		Off-net		0.028		N/A	N/A	N/A	N/A	N/A	0.022	0.009	0.039
MMS		Incoming		N/A	0.000	N/A	N/A	N/A	0.000	0.000	N/A	0.005	N/A
		Outgoing	Onnet	0.054		0.043	0.070	0.108			0.108	0.022	0.039
			Offnet	0.054		0.043	0.070	0.108			0.152	0.065	0.039
Exchange rate: USD 1 =				NPR		BDT	PKR	INR			BTN	LKR	MVR
				74.594		70.067	85.669	46.083			46.083	116.500	12.981
Source				http://www.oanda.com/									

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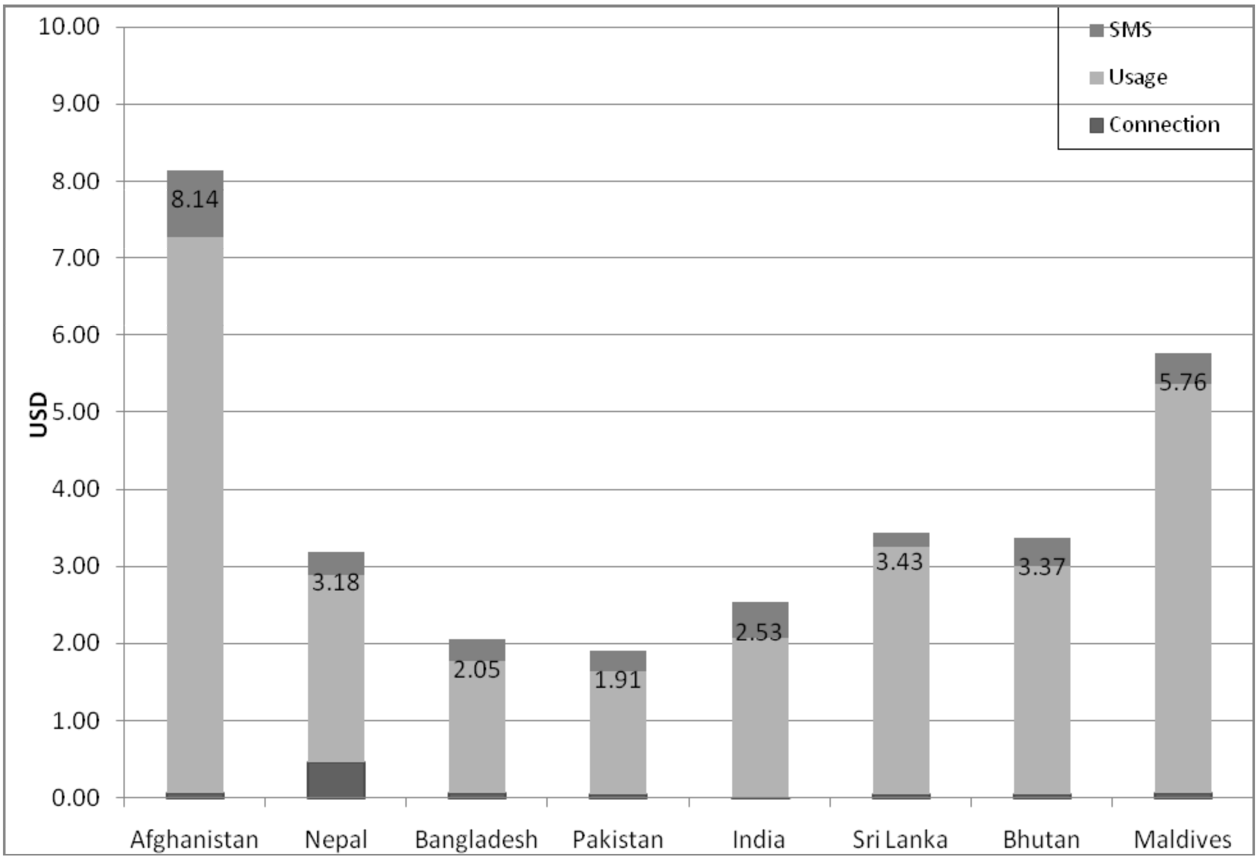
October 2009

Mobile price baskets (USD)

Average monthly prepaid mobile cost for a Low User, USD



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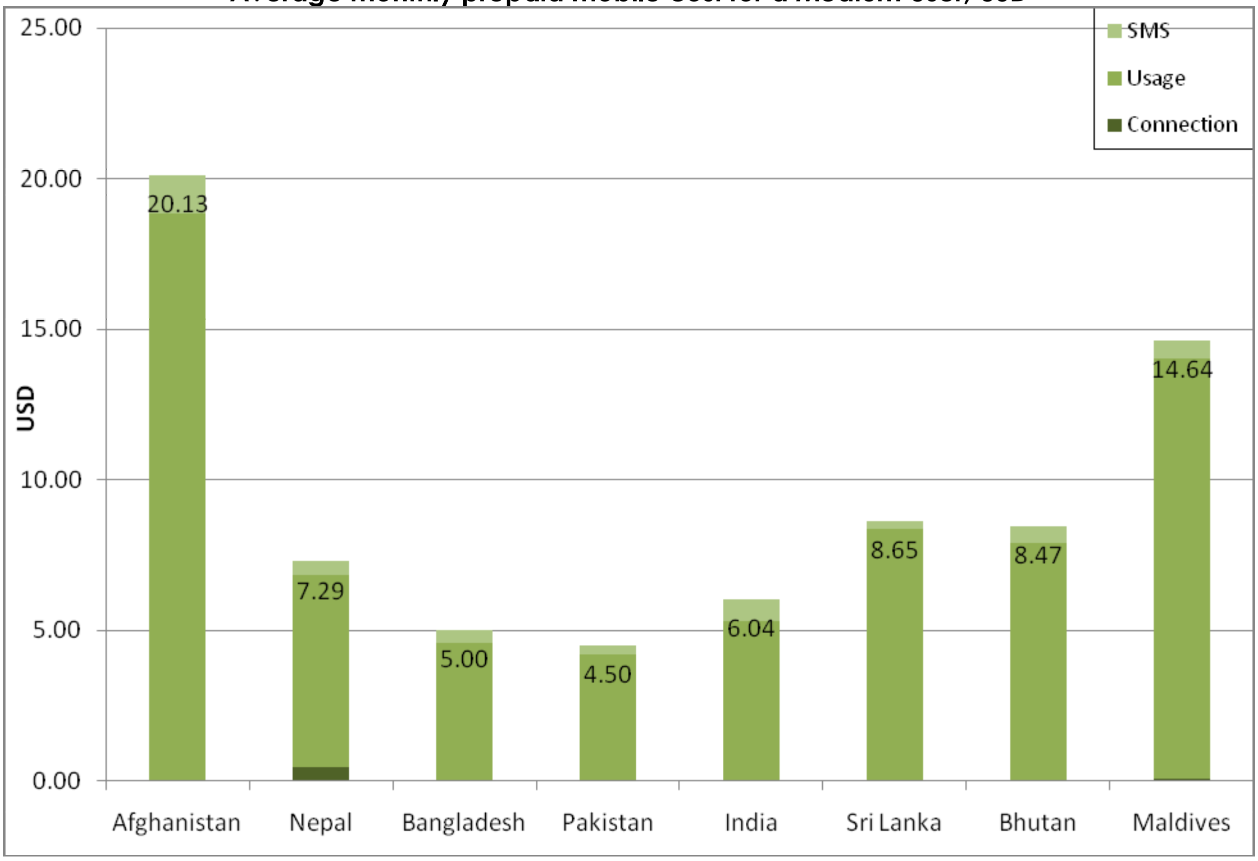
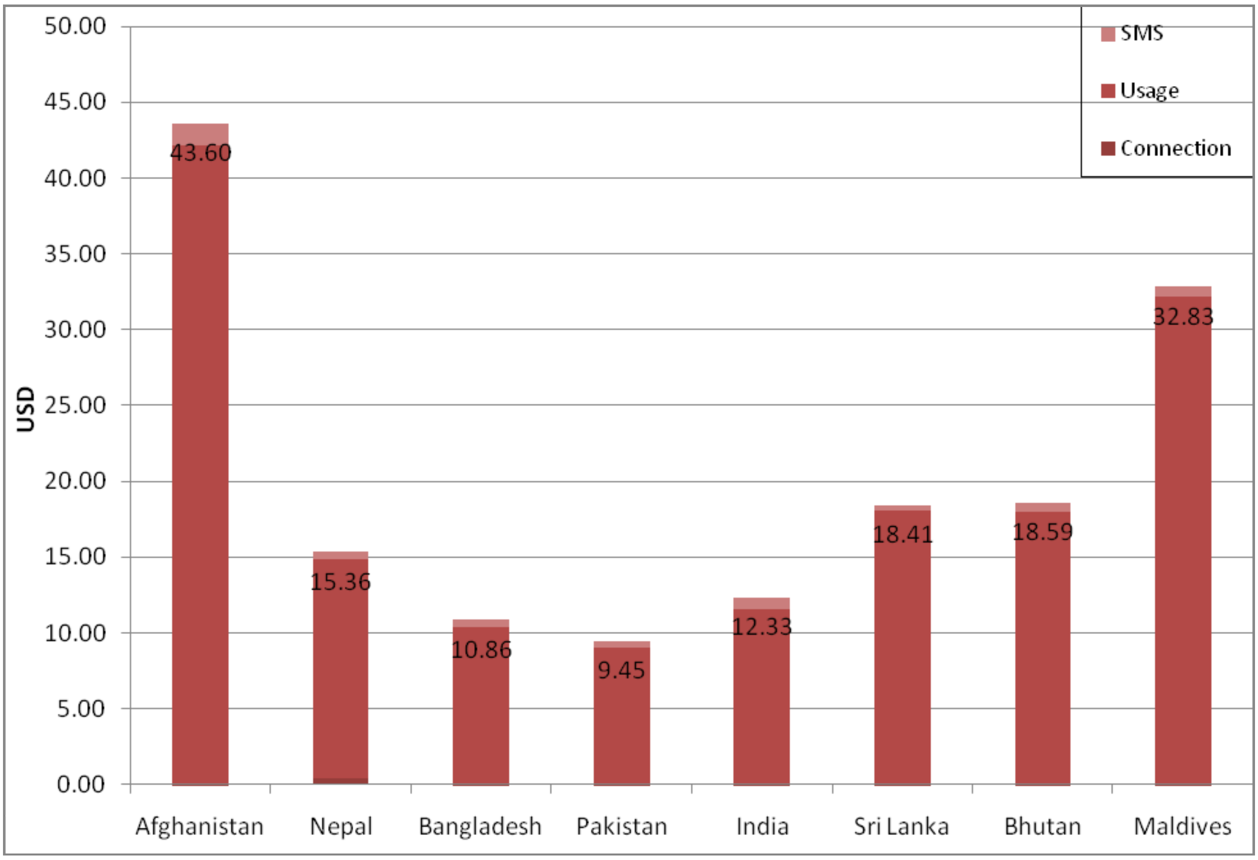
Average monthly prepaid mobile cost for a Medium User, USD



Average monthly prepaid mobile cost for a High User, USD



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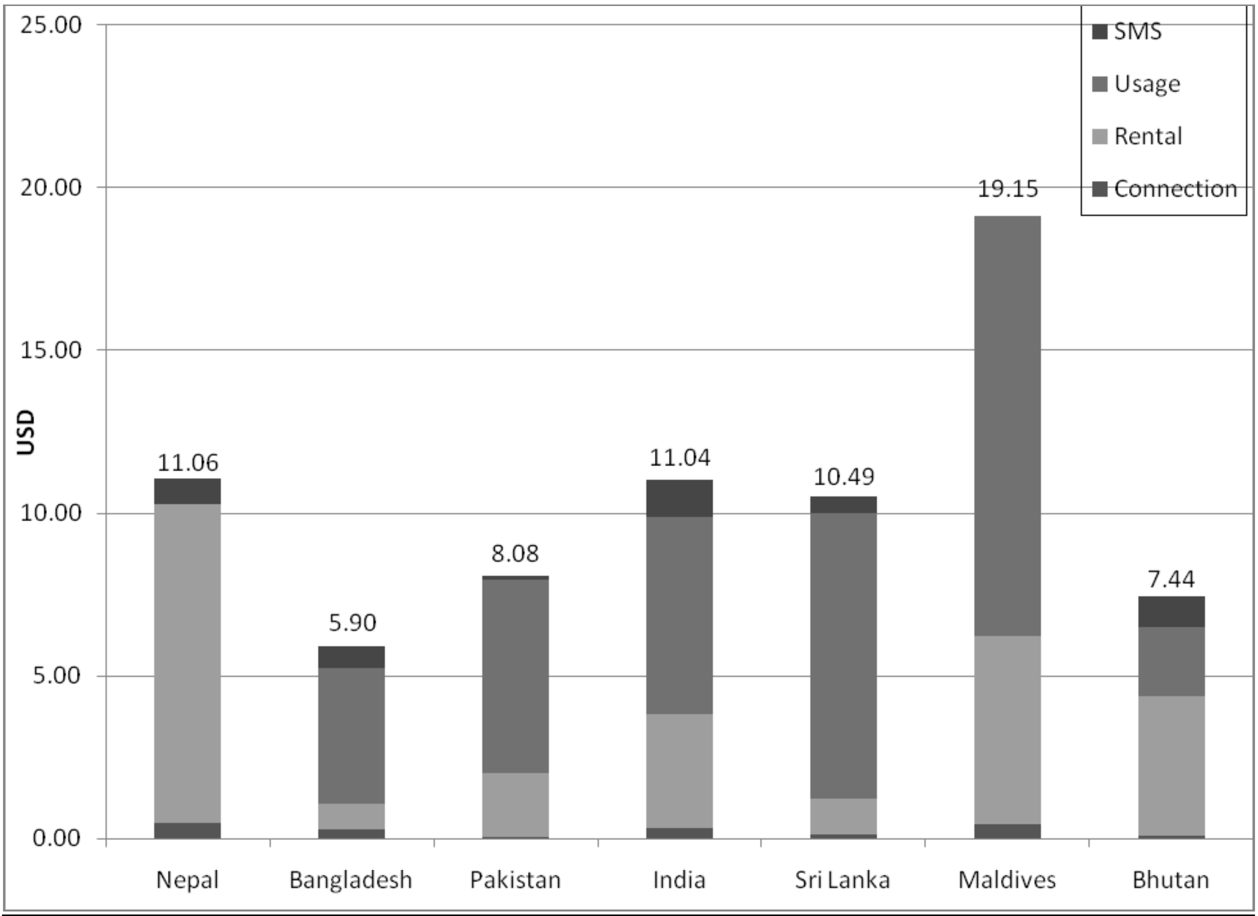
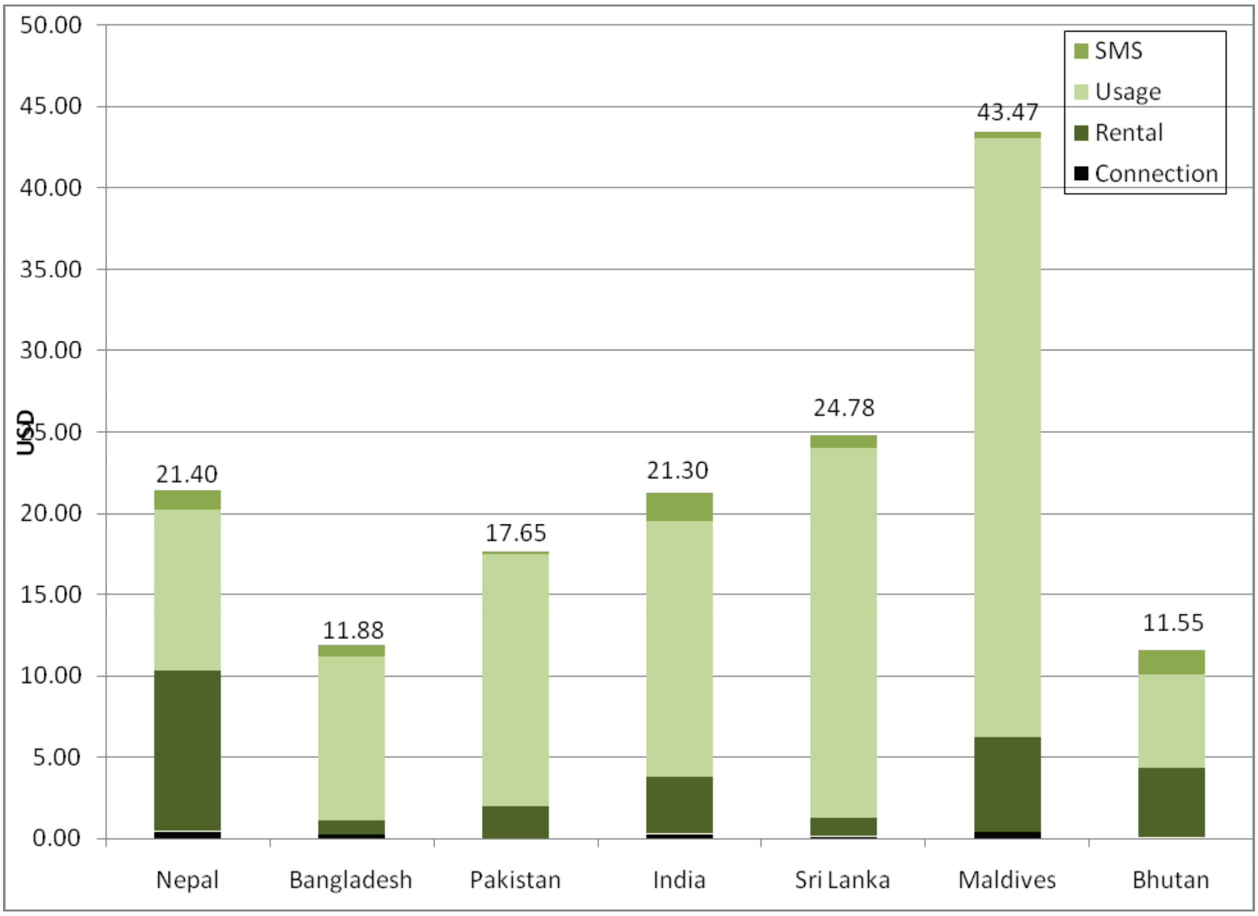
Average monthly postpaid mobile cost for a Low User, USD



Average monthly postpaid mobile cost for a Medium User, USD



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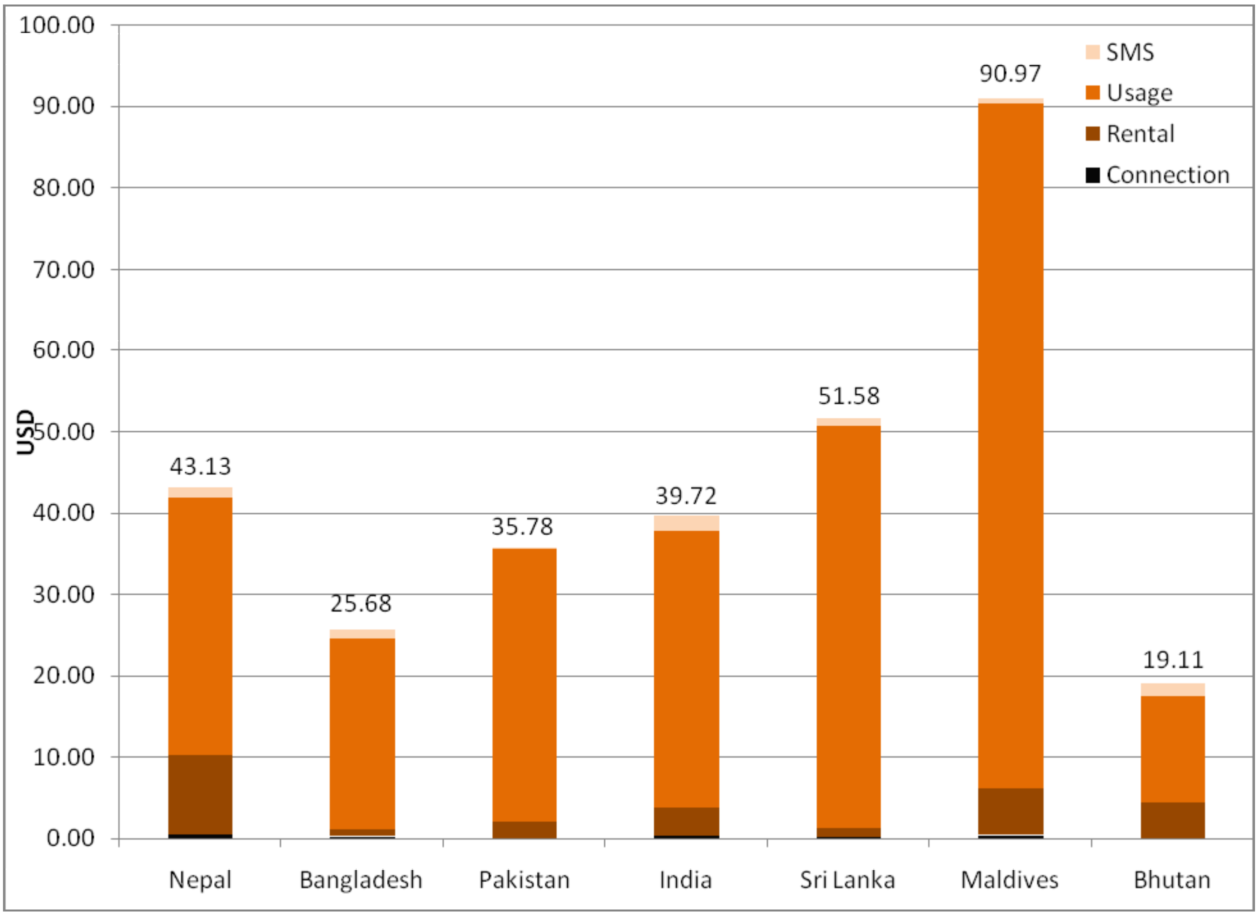
Average monthly postpaid mobile cost for a High User, USD



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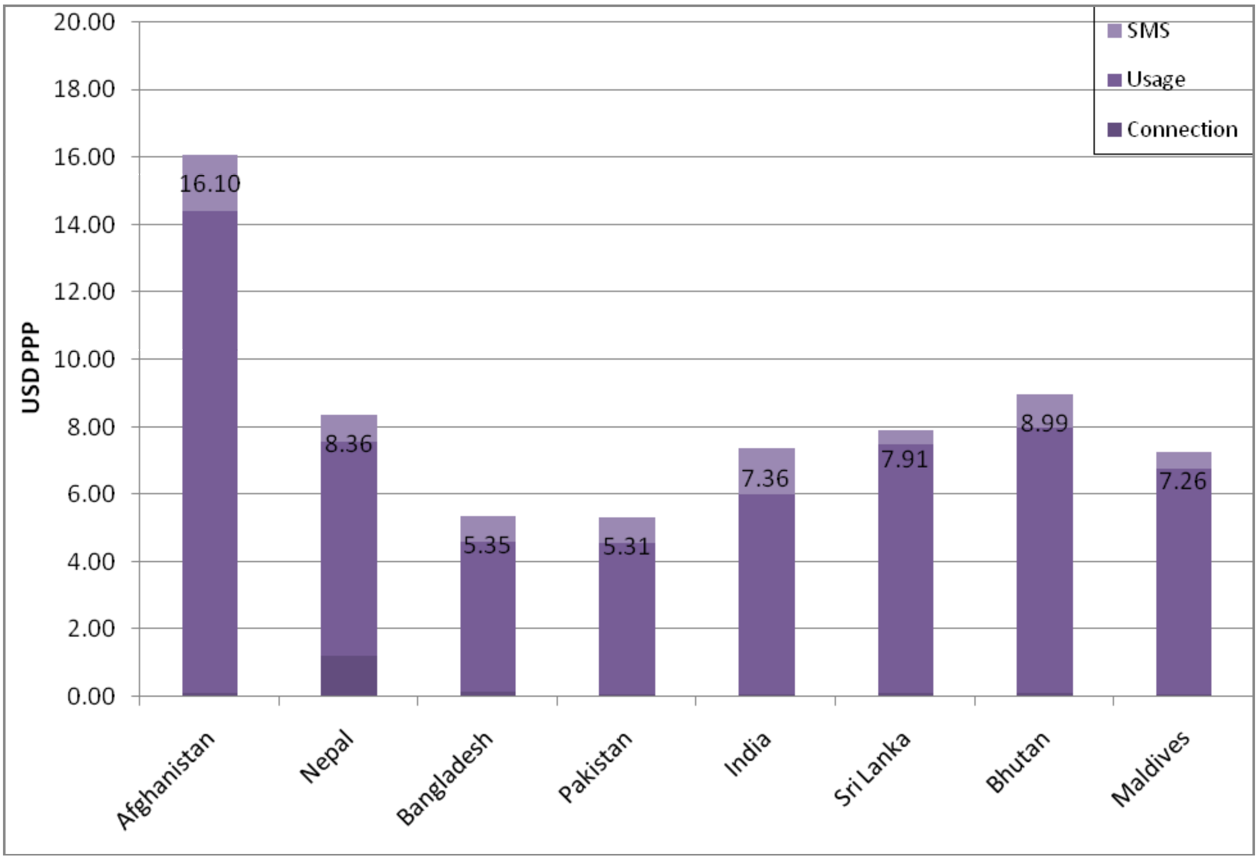
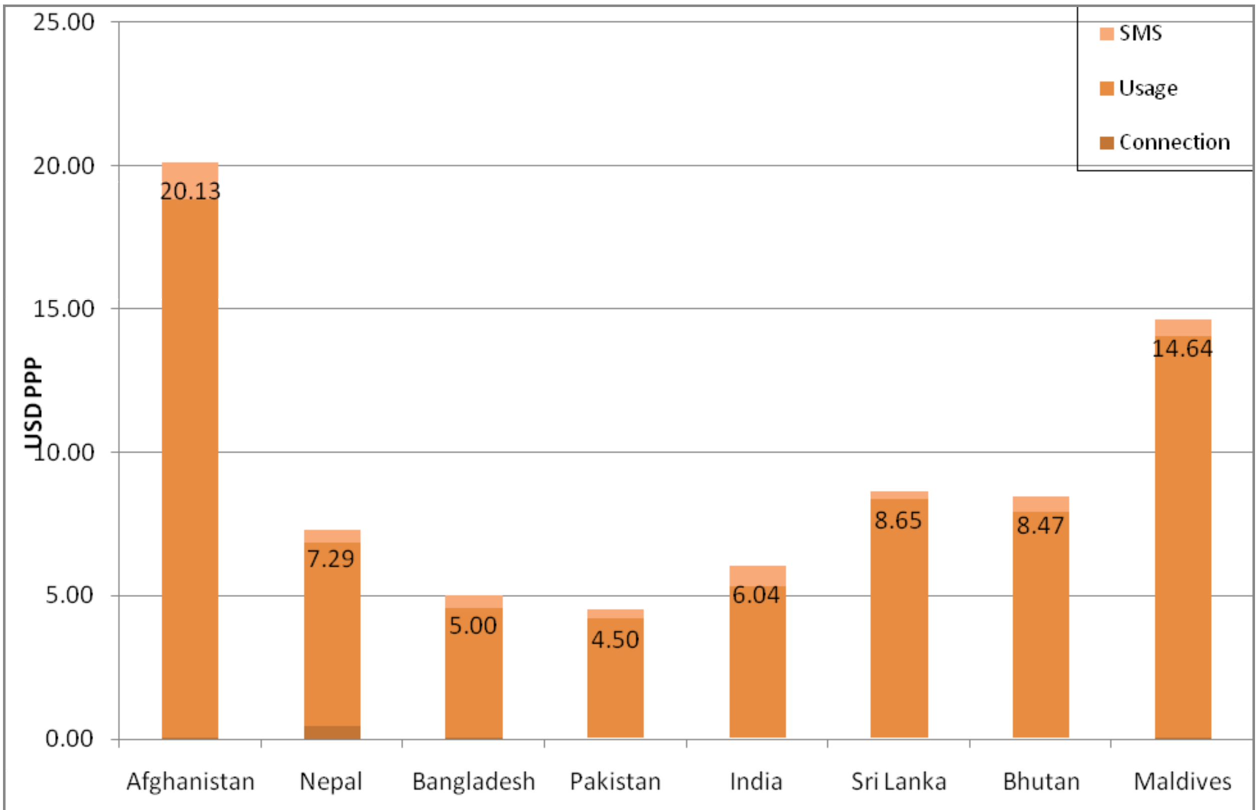
Mobile price baskets (USD PPP)

Average prepaid monthly mobile cost for a Low User, USD PPP



Average prepaid monthly mobile cost for a Medium User, USD PPP



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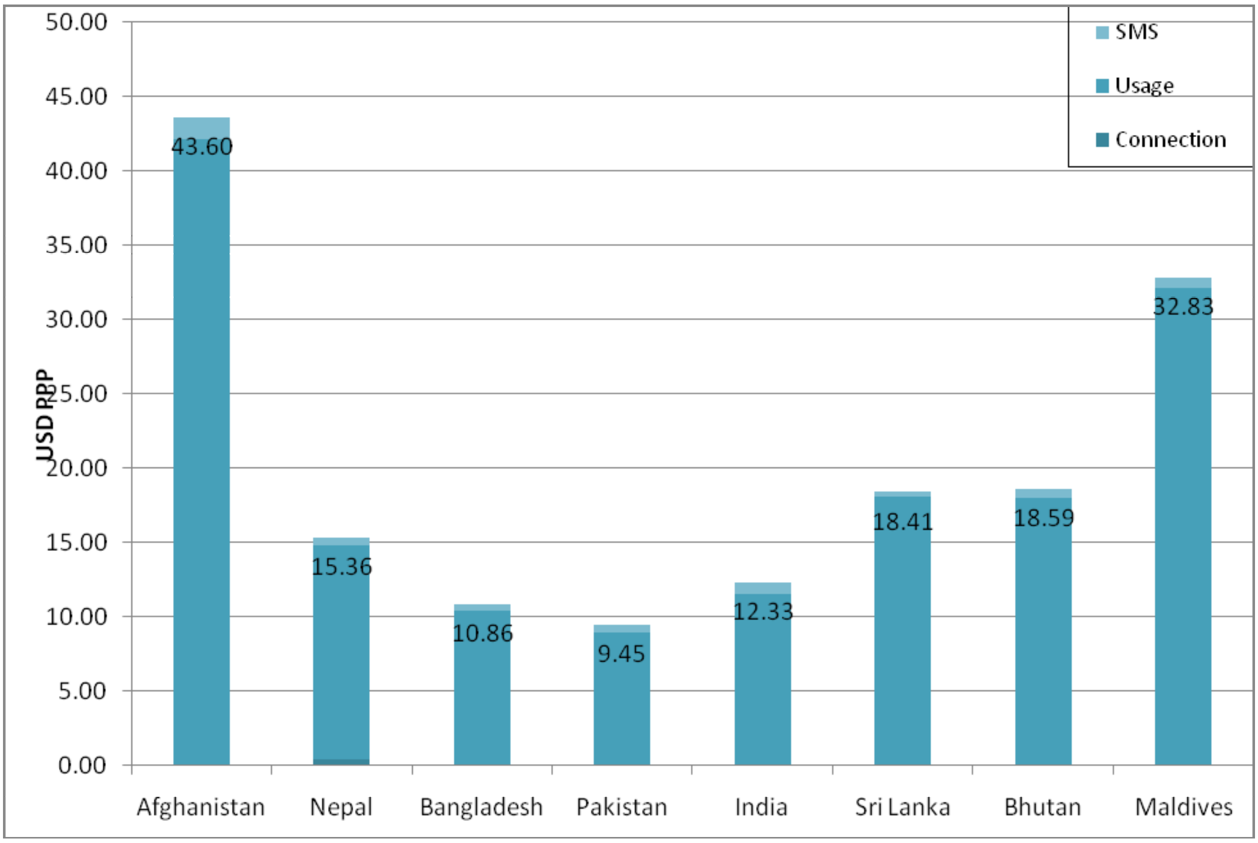
Average prepaid monthly mobile cost for a High User, USD PPP



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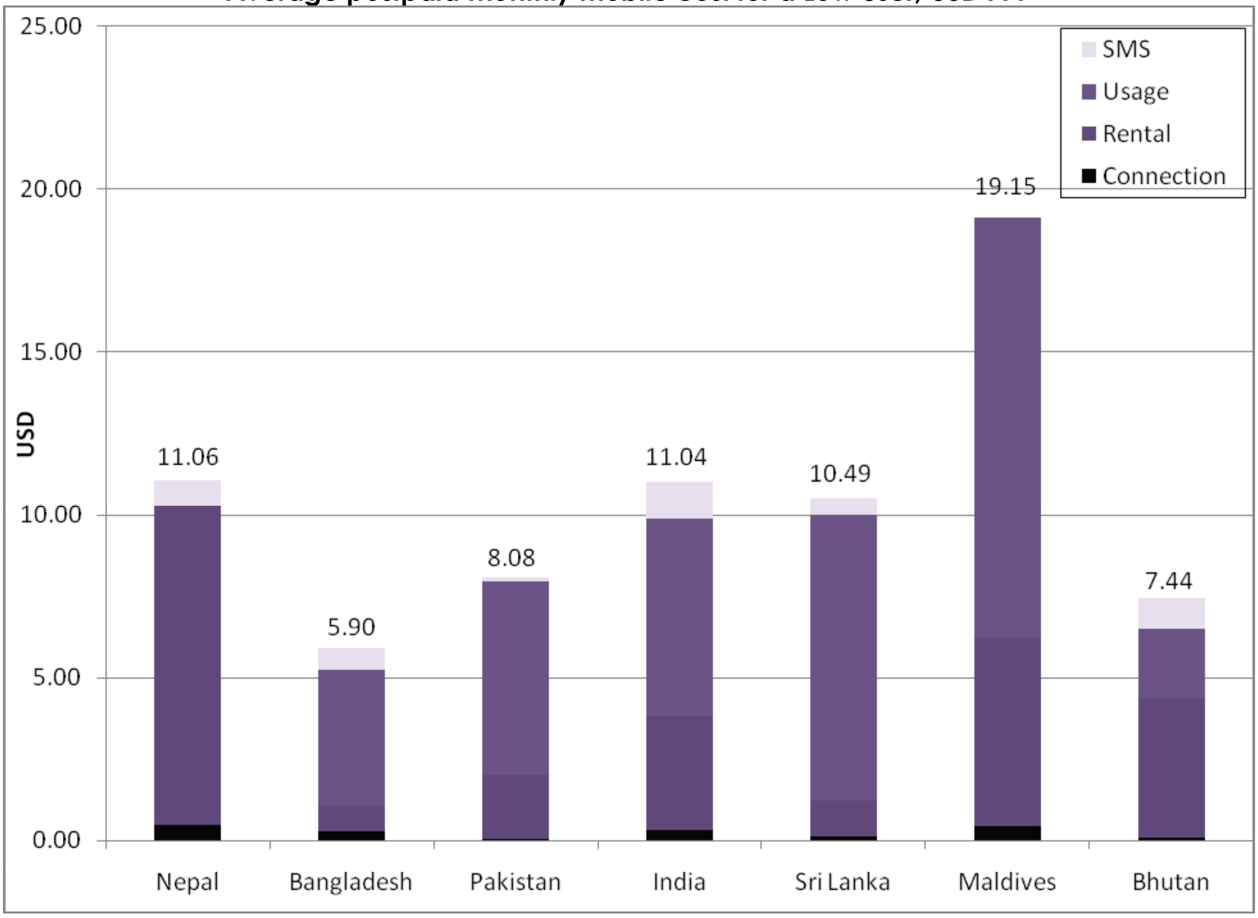
Average postpaid monthly mobile cost for a Low User, USD PPP



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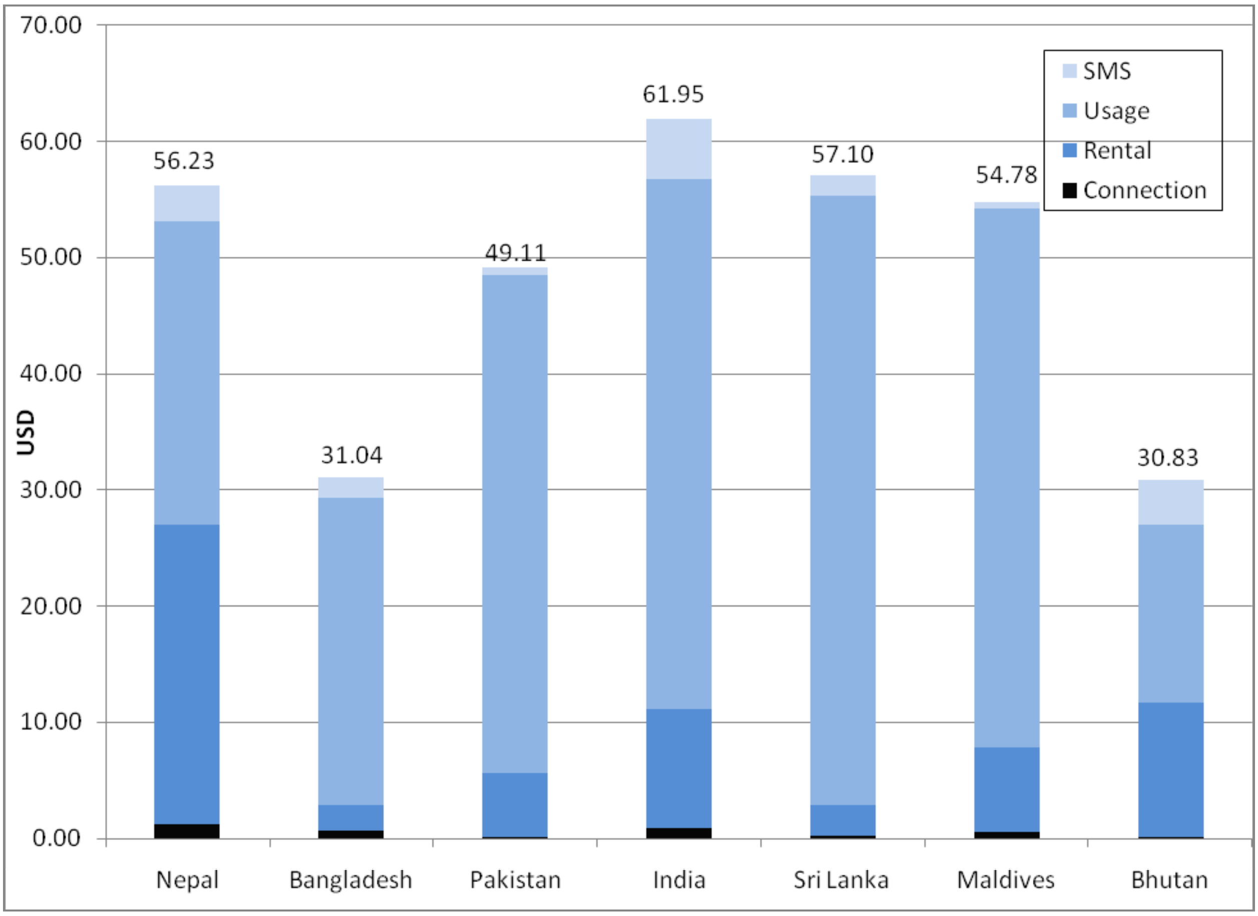
Average postpaid monthly mobile cost for a Medium User, USD PPP



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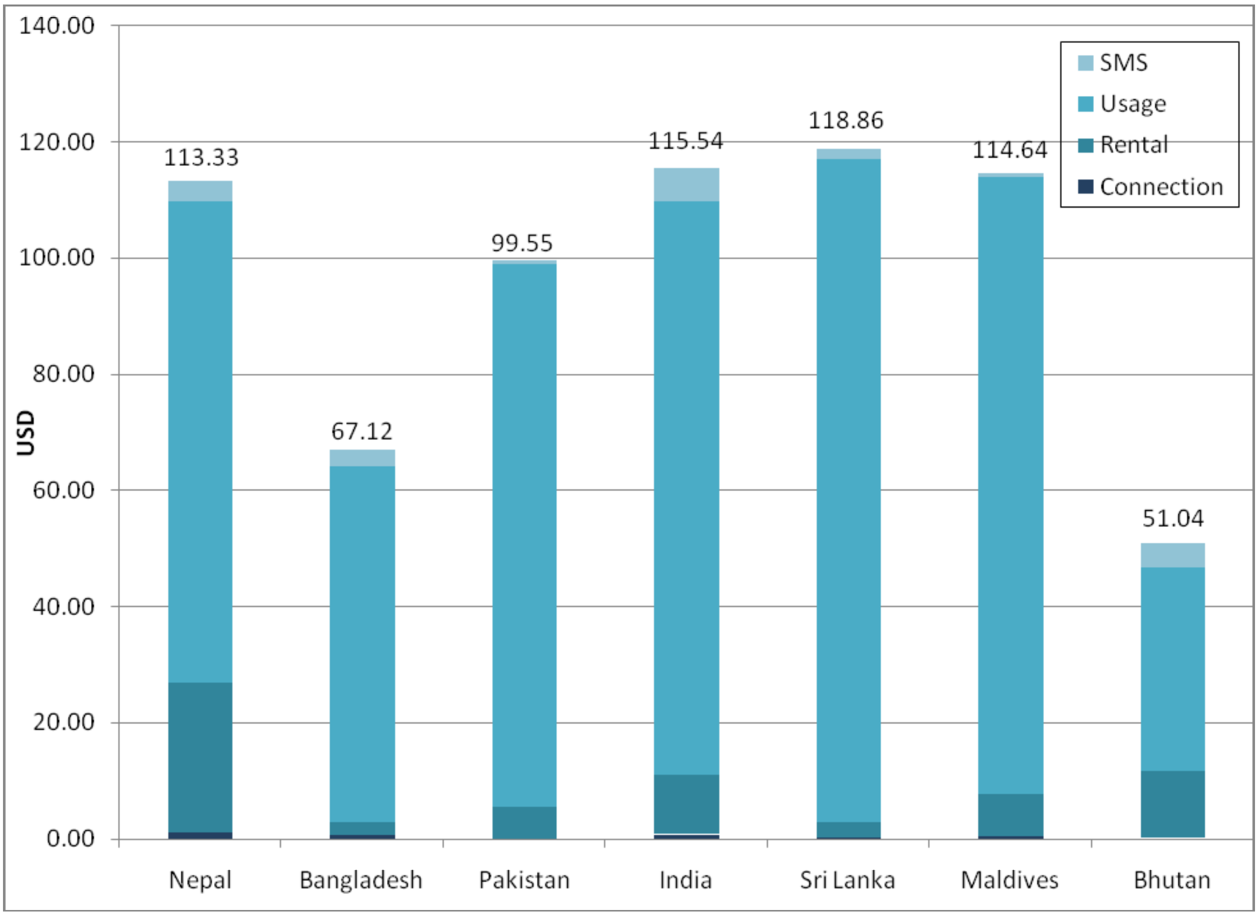
Average postpaid monthly mobile cost for a High User, USD PPP



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Notes

1. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp. MMS and Voicemail charges and use were excluded from calculation of the basket.
2. Prepaid and postpaid baskets were based on Minutes of Use (MOU) from Bangladesh (Grameenphone, June 2009), India (TRAI, June 2009), Pakistan (Mobilink, December 2008) and Sri Lanka (Dialog Telekom, June 2009) and SMS data from India (TRAI, June 2009) and Sri Lanka (Operator data, 2009). Tariff data was based on data for October 2009. Subscriber data was based on data individually reported by the respective operators.
3. A weighted average of MOU and SMS usage based on these four countries and their respective subscriber numbers was used for the calculation of prepaid and postpaid baskets for all eight countries.
4. OECD call distributions by duration, destination, and time of day were used since relevant data for all eight countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.
5. The cheapest tariff plan (based on initial connection charges for prepaid plans and monthly rental charges for postpaid plans) of the largest operator (based on subscriber numbers) were covered for each country.
6. Postpaid packages for Afghanistan were only available to corporate customers and thus were excluded from the basket.
7. Exchanges rates for October 2009 are taken from www.oanda.com
8. USD PPP estimates for 2009 were taken from the IMF World Economic Outlook (WEO) Database (October 2009), available at: http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/index.aspx

MOBILE PRICE BASKETS (OCTOBER 2009)

Background

Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
   a. The price of the handset and handset subsidies are **not** taken into account in the basket.
   b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
   c. Monthly rental charges and any optional charges that may apply to the package.
   d. The usage profile will also include a number of SMS messages per month.
   e. The three user baskets that are taken into consideration are:
      - *Low user basket*
      - *Medium user basket*
      - *High user basket*
   f. Different baskets were calculated for prepaid and postpaid plans.
   g. The baskets compositions[1] used are as follows:

	OECD[2]	Prepaid basket	Postpaid basket
Voice, minutes of use per month			
Low User	46	75	221
Medium User	119	194	571
High User	256	418	1232
SMS per month			
Low User	33	17	44
Medium User	50	26	67
High User	55	29	73

[1] OECD methodology includes MMS data in addition to call and SMS data; however, due to low use and/or even the lack of provision of this service in the South Asian countries considered here, this component has been removed from our basket comparisons.
[2] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).

2. *Call destination (in minutes):*
    a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.
    b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
    c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
    d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
    e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	**Low User**	**Medium User**	**High User**
Local, Fixed line	0.16	0.15	0.14
National, Fixed line	0.08	0.08	0.08
On-net, Mobile	0.52	0.52	0.51
Off-net, Mobile	0.24	0.26	0.28
Voicemail[3]	0.00	0.00	0.00

3. *SMS destination:*
    a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
    b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	**Low user**	**Medium user**	**High user**
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
    a. Peak at weekdays – most expensive time in a 24-hour day
    b. Off-peak at weekdays – cheapest time in a 24-hour day
    c. Weekend – at daytime Saturdays and/or Sundays
    d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	**Medium User**	**High User**
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
    a. Local and national fixed line calls
    b. Same network mobile calls (On-net)

[3] As of February 2006, OECD baskets take voicemail into consideration; however this service/feature is not included in the Asian-based baskets at this time (due to low use and/or even the lack of provision of this service) and the OECD call distributions have been adjusted accordingly.

c. Other network mobile calls (Off-net)
d. Voicemail calls
e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*
   a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
   b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
   a. The largest operator (by subscriber numbers) in each country is considered.
   b. The cheapest tariff plan of the largest operator is considered:
      - for prepaid – plans with the lowest connection charges; and
      - for postpaid – plans with the lowest rental are considered.

      These plans are applied across all three baskets (low, medium and high).[4]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in US$ and US$ PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.

Tariff packages

1. Afghanistan – Roshan[5]
   a. Prepaid – SIM Yaraan

2. Nepal – Nepal Telecom
   a. Prepaid – Prepaid
   b. Postpaid – Postpaid

3. Bangladesh – Grameen Phone

[4] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

[5] Postpaid packages are only available to corporate customers and thus were excluded from the basket.

    a. Prepaid – Smile
    b. Postpaid – Xplore1

4. Pakistan – Mobilink
    a. Prepaid – Jazz Budget
    b. Postpaid – Indigo Freedom Plan 1

5. India – Bharti Airtel
    a. Prepaid – Regular
    b. Postpaid – Advance Rental Plan

6. Sri Lanka – Dialog GSM
    a. Prepaid – KIT per-second blaster
    b. Postpaid – Lite 103

7. Bhutan – B-Mobile
    a. Prepaid – Prepaid
    b. Postpaid – Super 200 Plan

8. Maldives – Dhiraagu
    a. Prepaid – Prepaid
    b. Postpaid – In touch

Mobile tariff comparison

PRE-PAID				AFGHANISTAN	NEPAL		BANGLADESH	PAKISTAN	INDIA		BHUTAN	SRI LANKA	MALDIVES
				SIM Yaraan	Pre-paid package		Smile	Jazz Budget	Regular		Prepaid	KIT Standard	Prepaid
Connection Charges				2.012	14.948		2.136	1.200	1.042		1.614	1.703	2.313
Subscription (rental) fee				N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
Free minutes (in currency)				2	N/A		1	N/A	N/A		1	N/A	N/A
					Local	National			Local	National			
Usage charges	Fixed (local)	Incoming	Peak	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
			Off-peak										
			Weekend										
			Other										
		Outgoing	Peak	0.111	0.028	0.030	0.028	0.016	0.021	0.032	0.043	0.043	0.077
			Off-peak	0.111	N/A	N/A	0.014	N/A	N/A	N/A	0.026	N/A	0.042
			Weekend peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	On-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
			Off-peak										
			Weekend										
			Other										
		Outgoing	Peak	0.111	0.026	0.026	0.021	0.016	0.021	0.032	0.043	0.026	0.077
			Off-peak	0.111	0.010	0.010	0.007	N/A	N/A	N/A	0.026	N/A	0.042
			Weekend peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A
			Off-peak										
			Weekend										
			Other										
		Outgoing	Peak	0.111	0.033	0.046	0.028	0.016	0.021	0.032	0.060	0.043	0.116
			Off-peak	0.111	N/A	N/A	0.014	N/A	N/A	N/A	0.034	N/A	0.042
			Weekend peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Call set -up fee				N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Free SMSs				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SMS charges		Standard		0.050	N/A		0.014	N/A	0.021	0.032	0.022	N/A	N/A
		On-net		N/A	0.013		N/A	0.012	N/A	N/A	N/A	0.009	0.015
		Off-net		N/A	0.016		N/A	0.012	N/A	N/A	N/A	0.009	0.039
Exchange rate: = USD 1 =				49.69	75.932		70.234	83	47		46.473	117.42	12.97033

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	AFN	NPR	BDT	PKR	INR	BTN	LKR	MVR
Source	http://www.oanda.com/							

POSTPAID				NEPAL		BANGLADESH	PAKISTAN	INDIA			BHUTAN	SRI LANKA	MALDIVES
				Postpaid		Xplore1	Indigo Freedom Plan 1	Advanced Rental Plan*			Super 200 Plan	Lite 103	In touch
Connection Charges				14.882		9.255	1.200	10.634			2.152	4.258	15.343
Subscription (rental) fee				7.902		0.712	1.501	3.190			4.304	0.852	5.782
Free minutes (in local currency)				5.268		N/A	N/A	N/A			3.228	N/A	2.313
				Local	National			Local	National	CDMA			
Usage charges	Fixed	Incoming	Peak	N/A		N/A	N/A	N/A			N/A	N/A	N/A
			Off-peak										
			Weekend										
		Outgoing	Peak	0.023	0.025	0.019	0.027	0.021	0.032	N/A	0.043	0.051	0.076
			Off-peak	0.016	0.018	0.019	N/A	N/A	N/A	N/A	0.026	0.017	0.042
			Weekend	0.016	0.018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.066
	On-net	Incoming	Peak	N/A		N/A	N/A	N/A			N/A	N/A	N/A
			Off-peak										
			Weekend										
		Outgoing	Peak	0.021	0.021	0.019	0.015	0.021	0.032	N/A	0.043	0.026	0.076
			Off-peak	0.013	0.013	0.007	N/A	N/A	N/A	N/A	0.026	0.017	0.042
			Weekend	0.013	0.013	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.066
	Off-net	Incoming	Peak	N/A		N/A	N/A	N/A			N/A	N/A	N/A
			Off-peak										
			Weekend										
		Outgoing	Peak	0.028	0.041	0.019	0.027	0.021	0.032	N/A	0.060	0.051	0.076
			Off-peak	0.028	0.041	0.019	N/A	N/A	N/A	N/A	0.034	0.017	0.076
			Weekend	0.028	0.041	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.076
Free SMS				N/A		100	N/A	N/A			N/A	N/A	50
SMS charges		Basic charge		N/A		1.000	0.002	0.021	0.032	0.021	N/A	N/A	N/A
		On-net		0.013		N/A	N/A	N/A	N/A	N/A	0.022	0.009	0.015
		Off-net		0.016		N/A	N/A	N/A	N/A	N/A	0.022	0.009	0.039
Exchange rate: USD 1 =				NPR		BDT	PKR	INR			BTN	LKR	MVR
				75.932		70.234	83.300	47.020			46.473	117.420	12.970
Source				http://www.oanda.com/									

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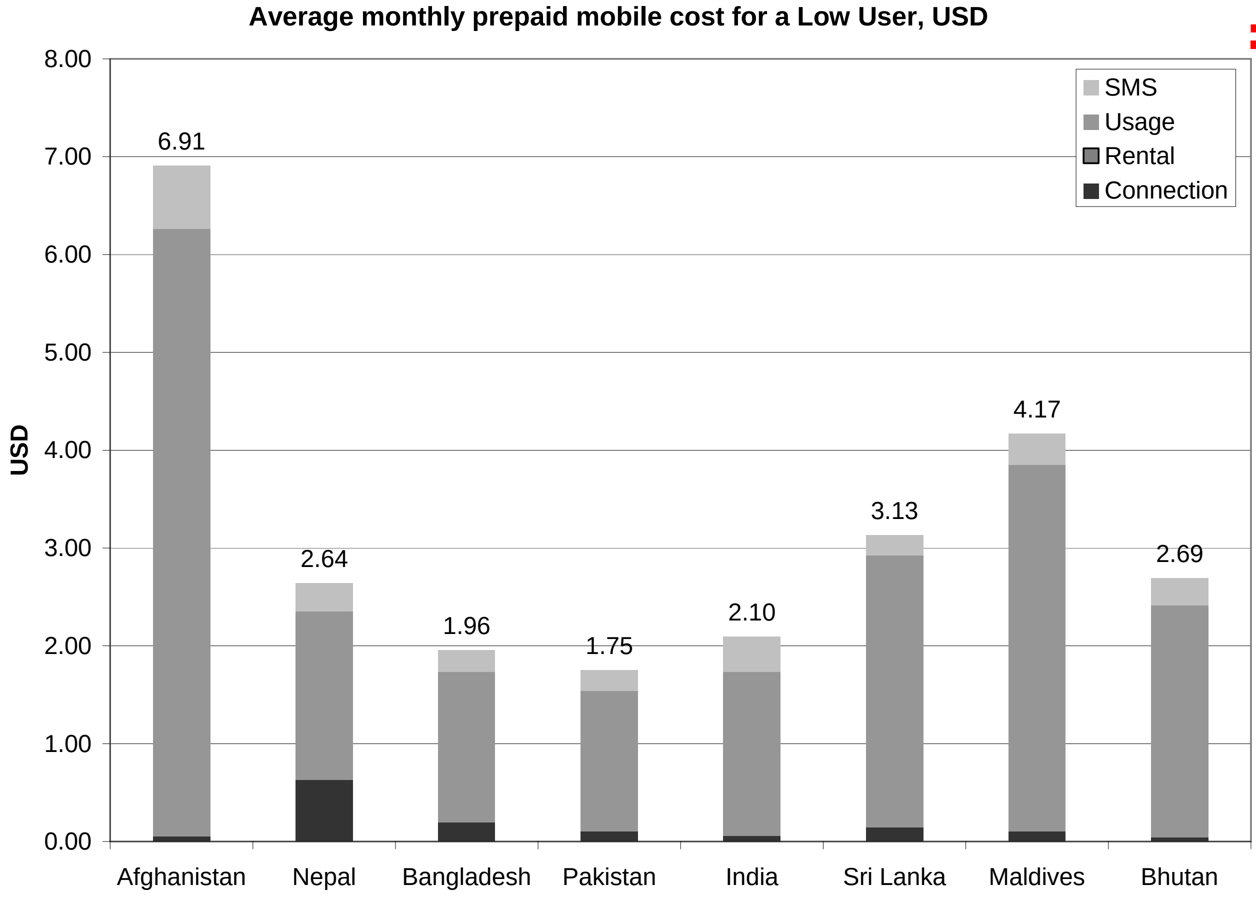
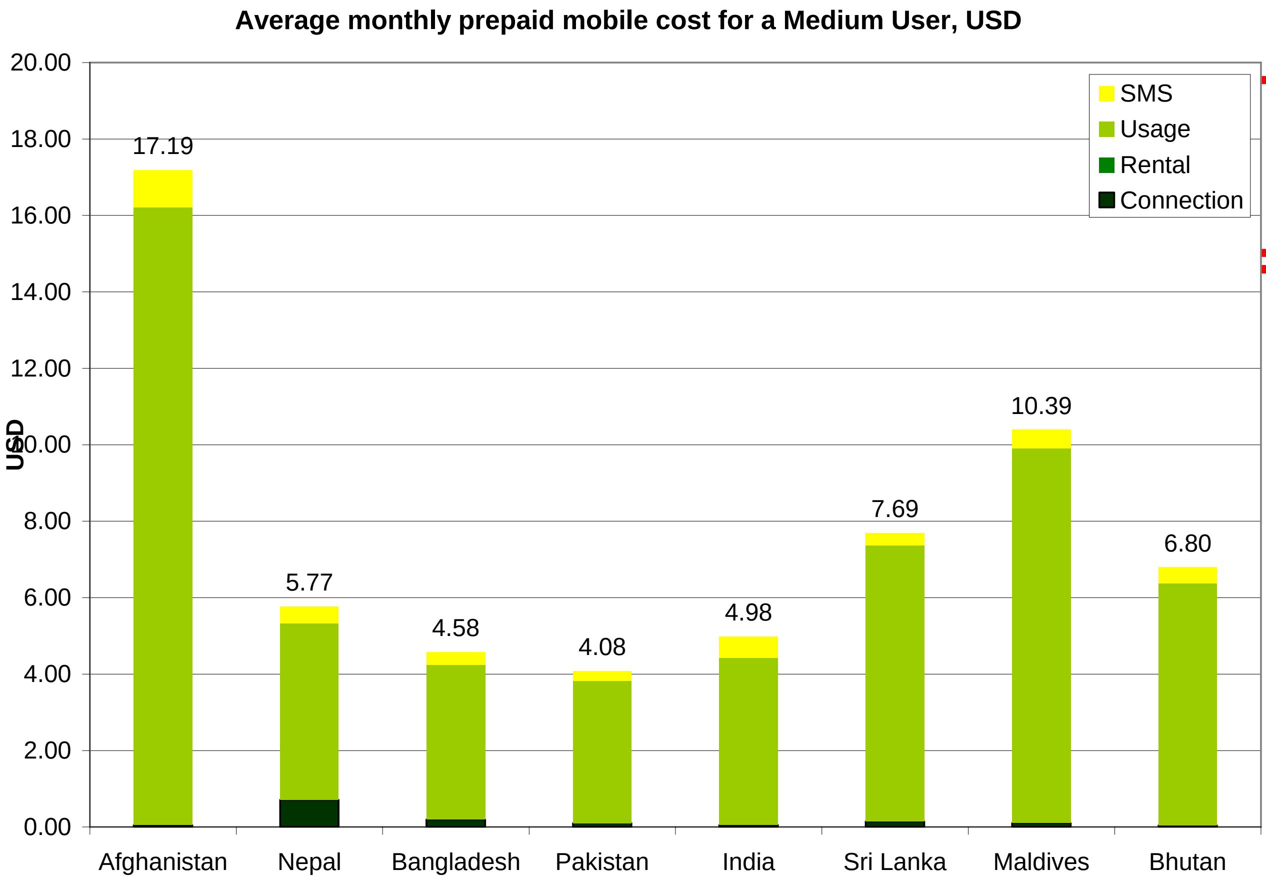
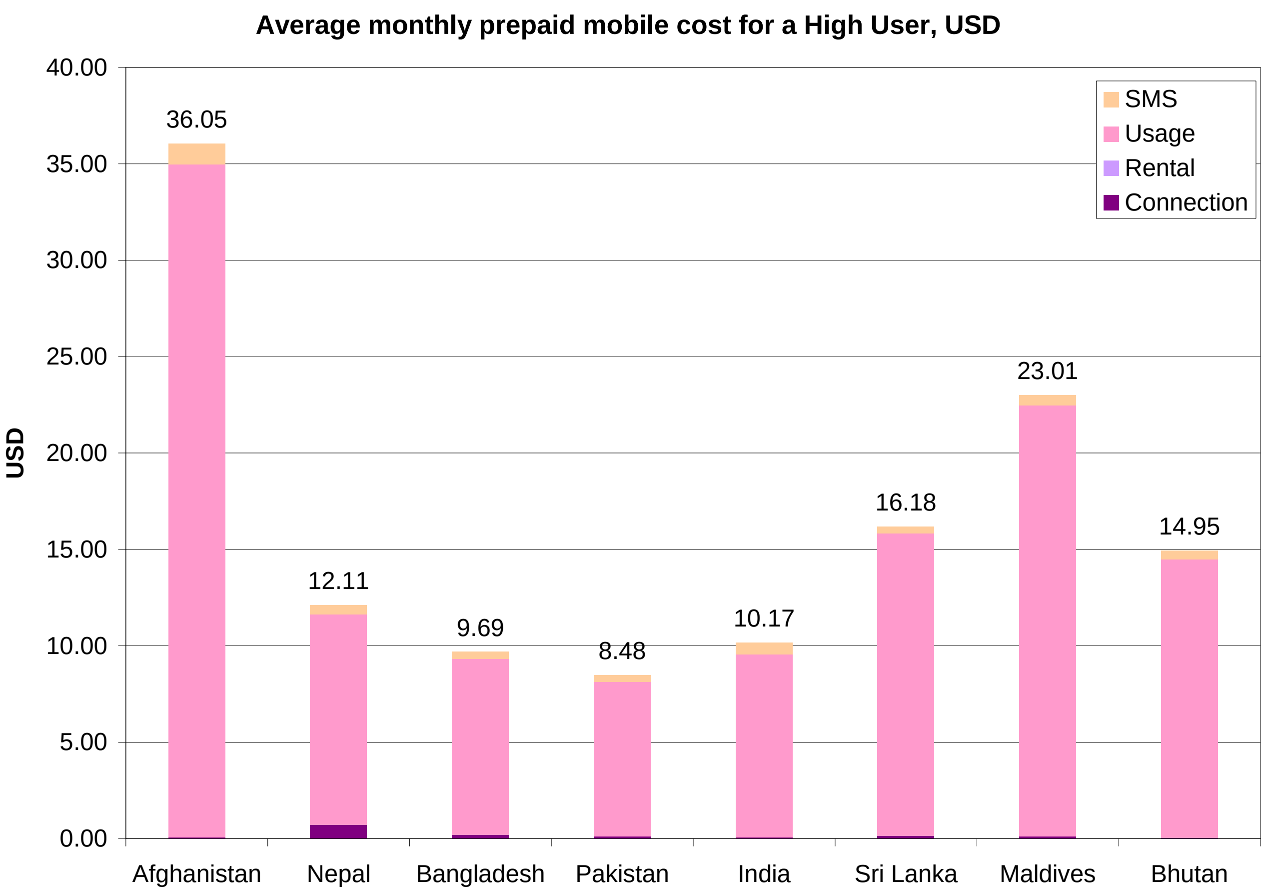
February 2009

Mobile price baskets (USD)







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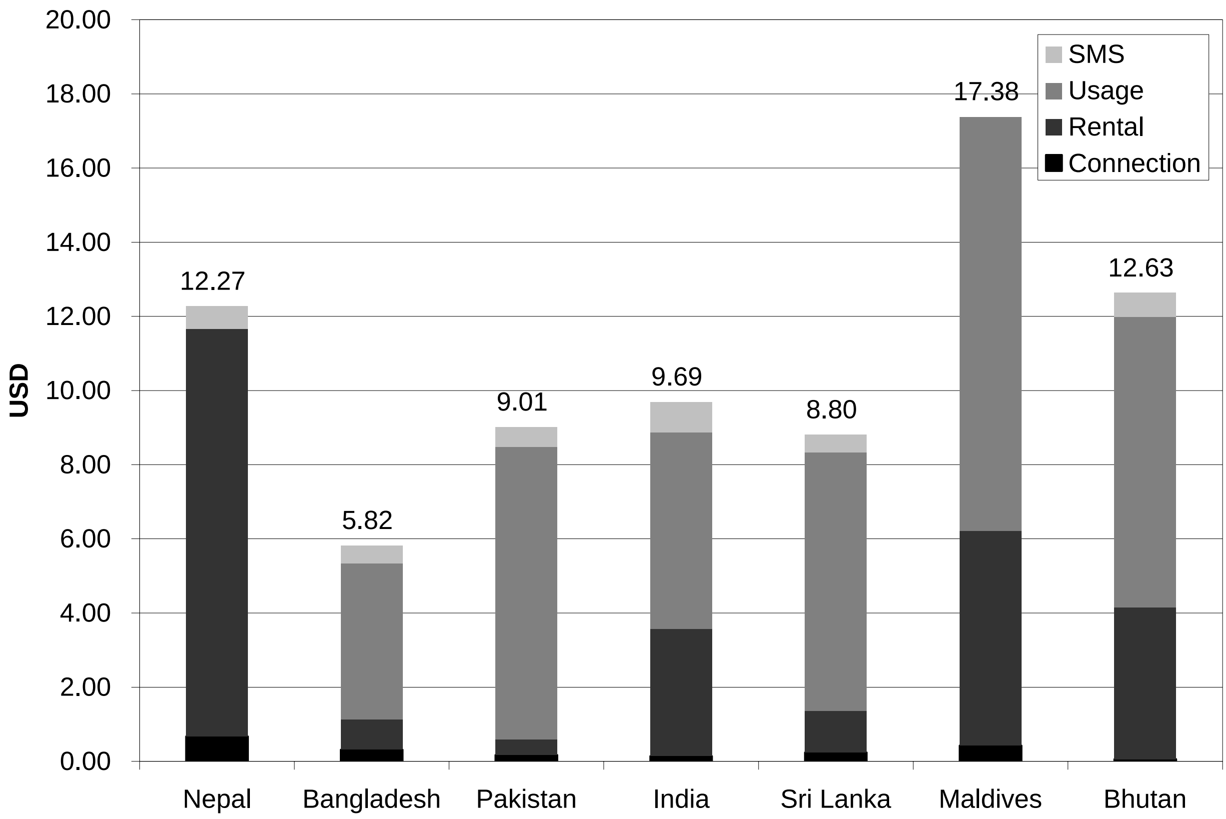
Average monthly postpaid mobile cost for a Low User, USD



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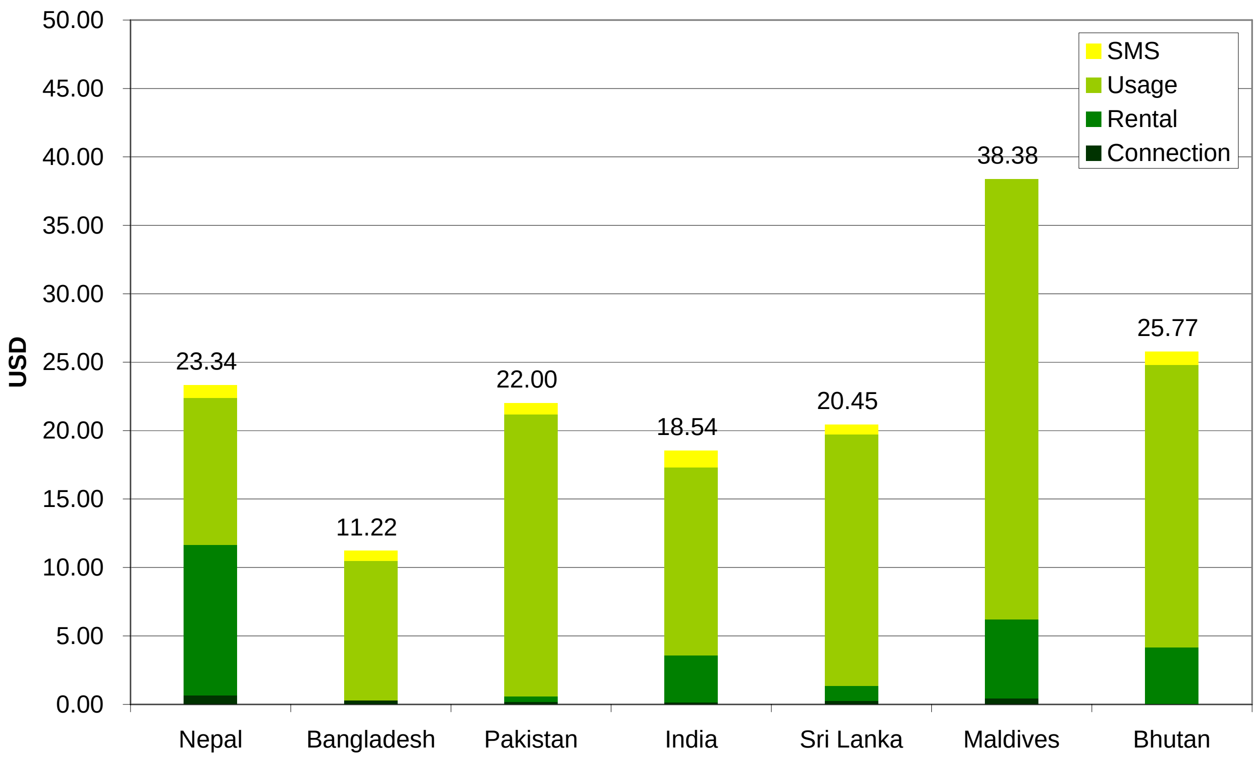
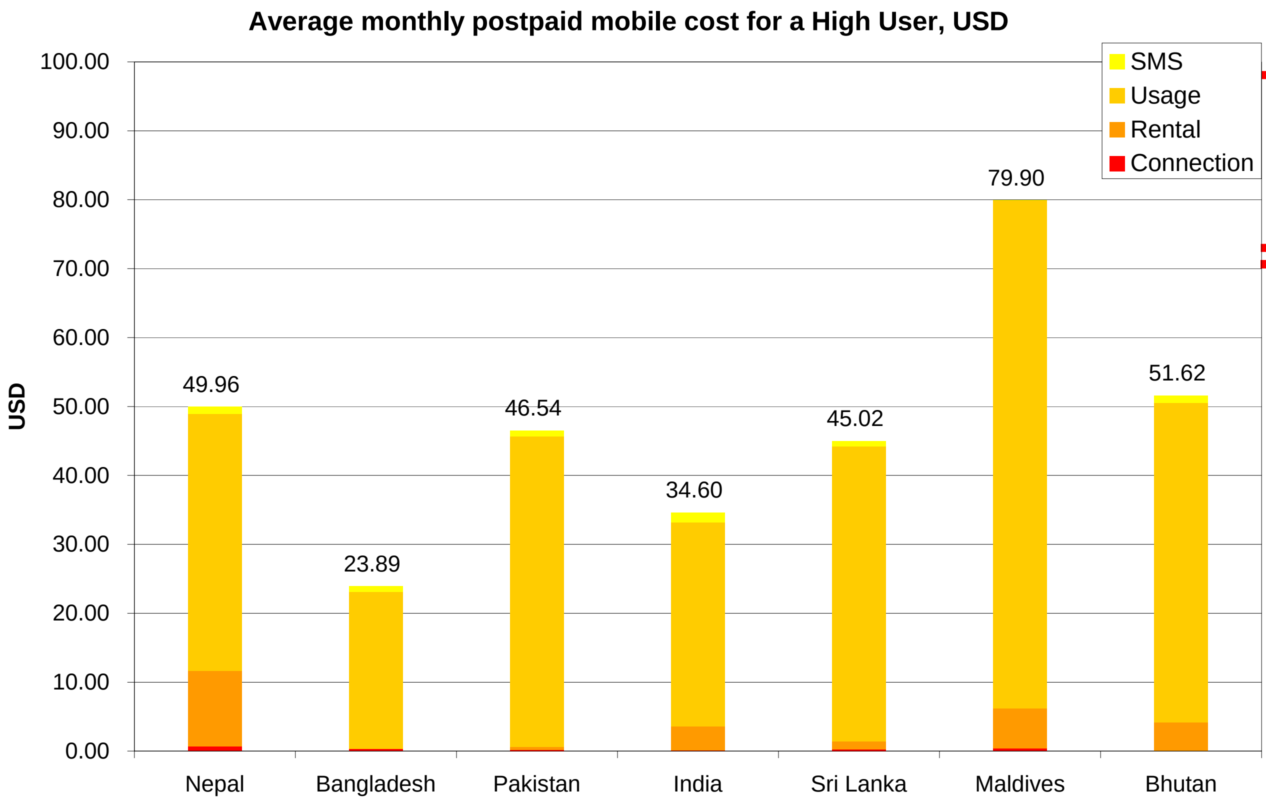
Average monthly postpaid mobile cost for a Medium User, USD





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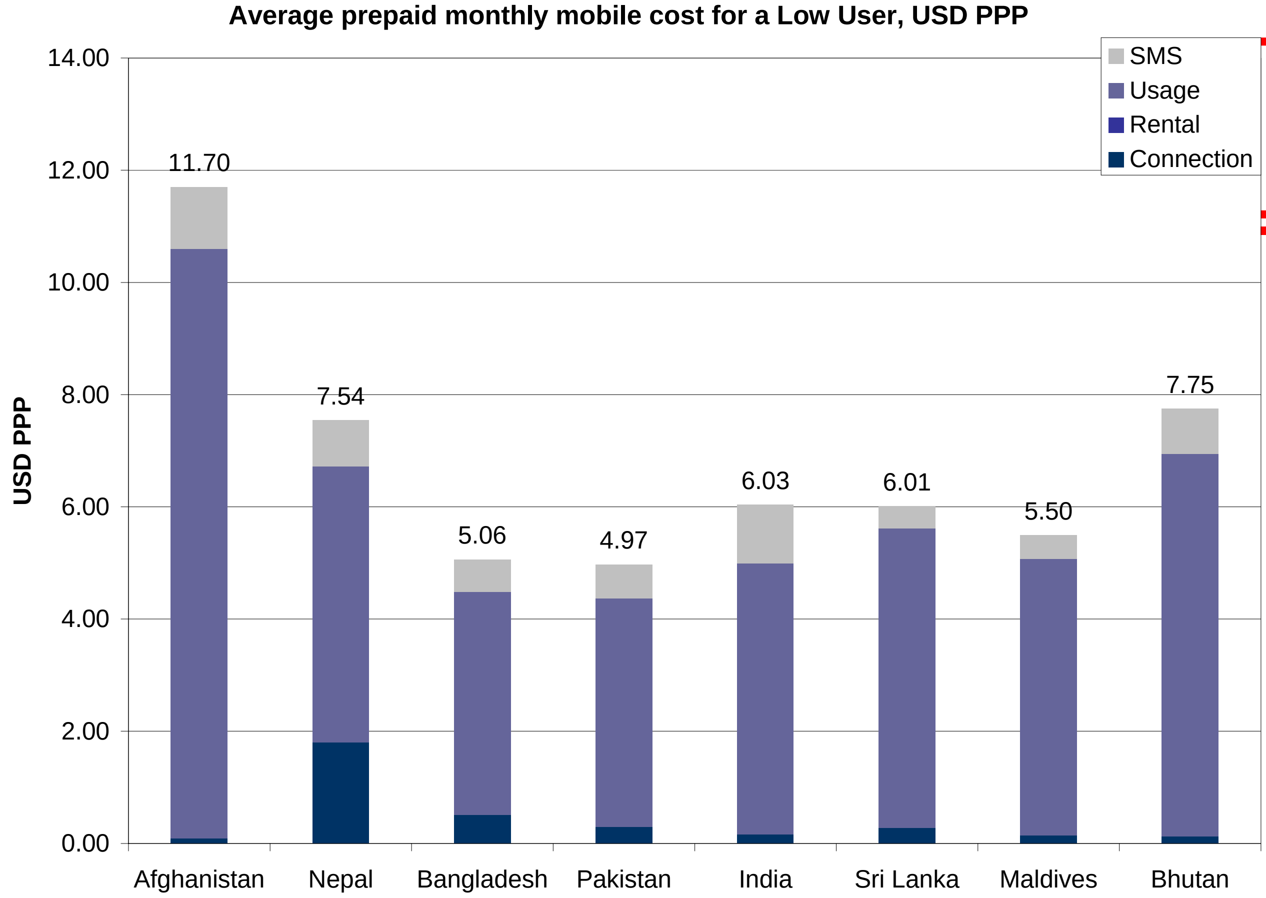
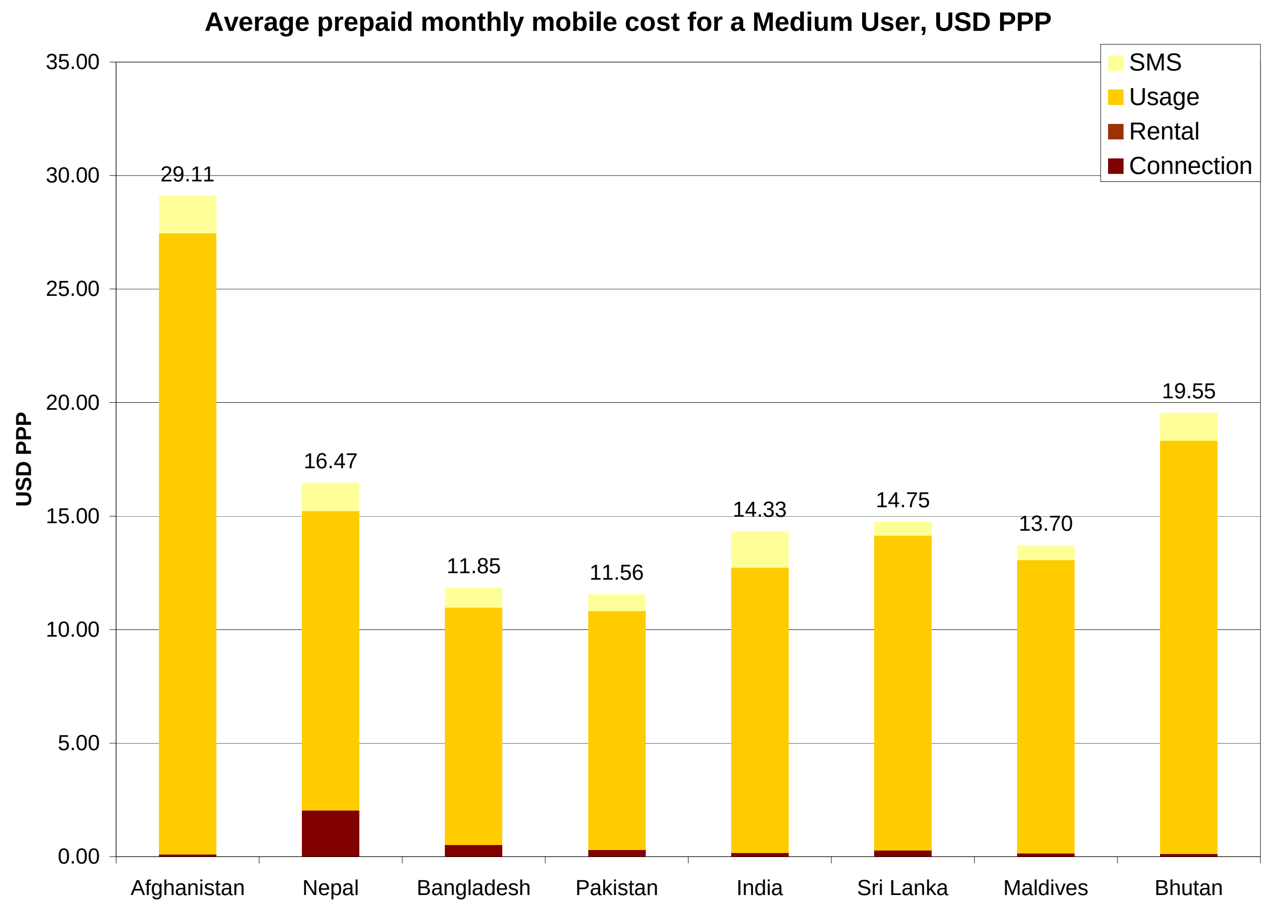
Mobile price baskets (USD PPP)





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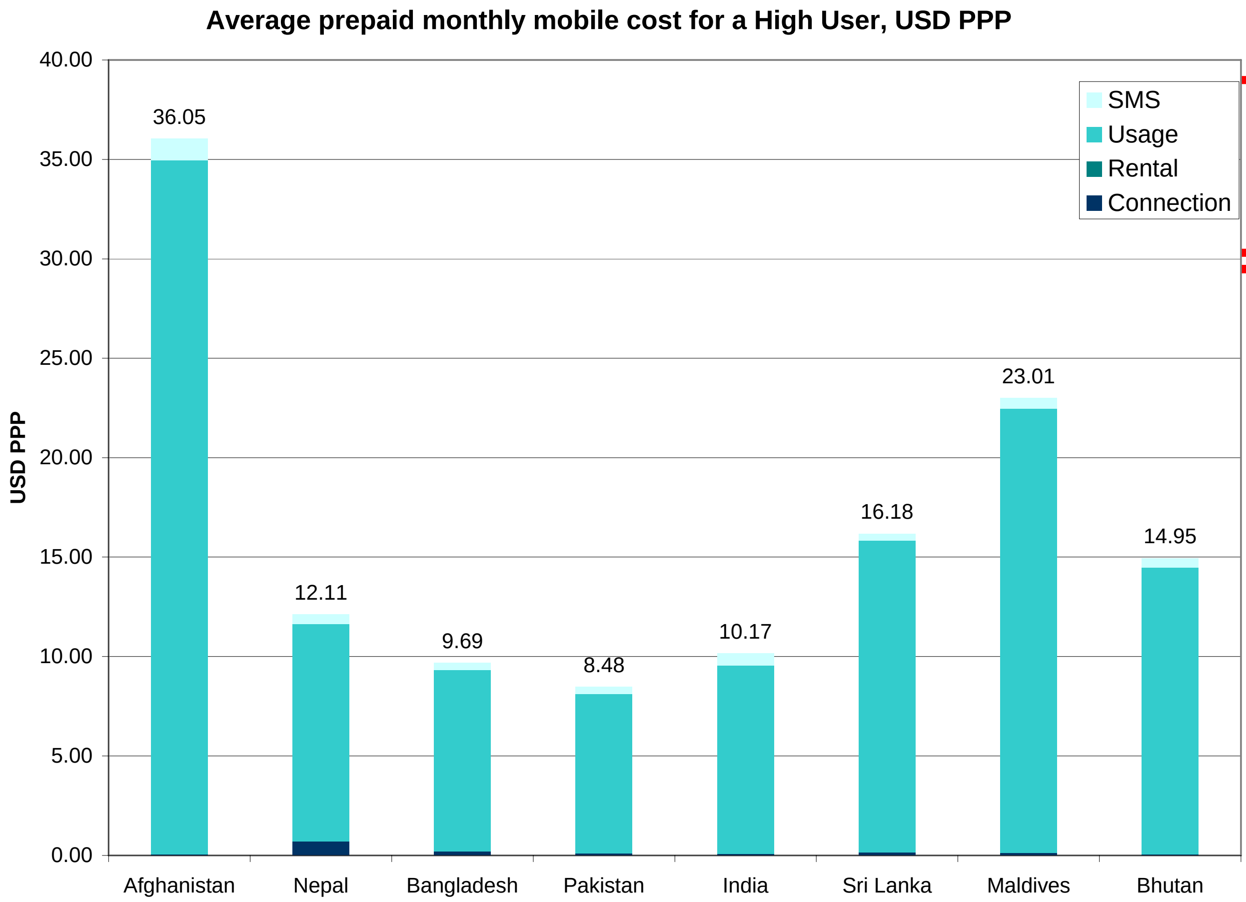

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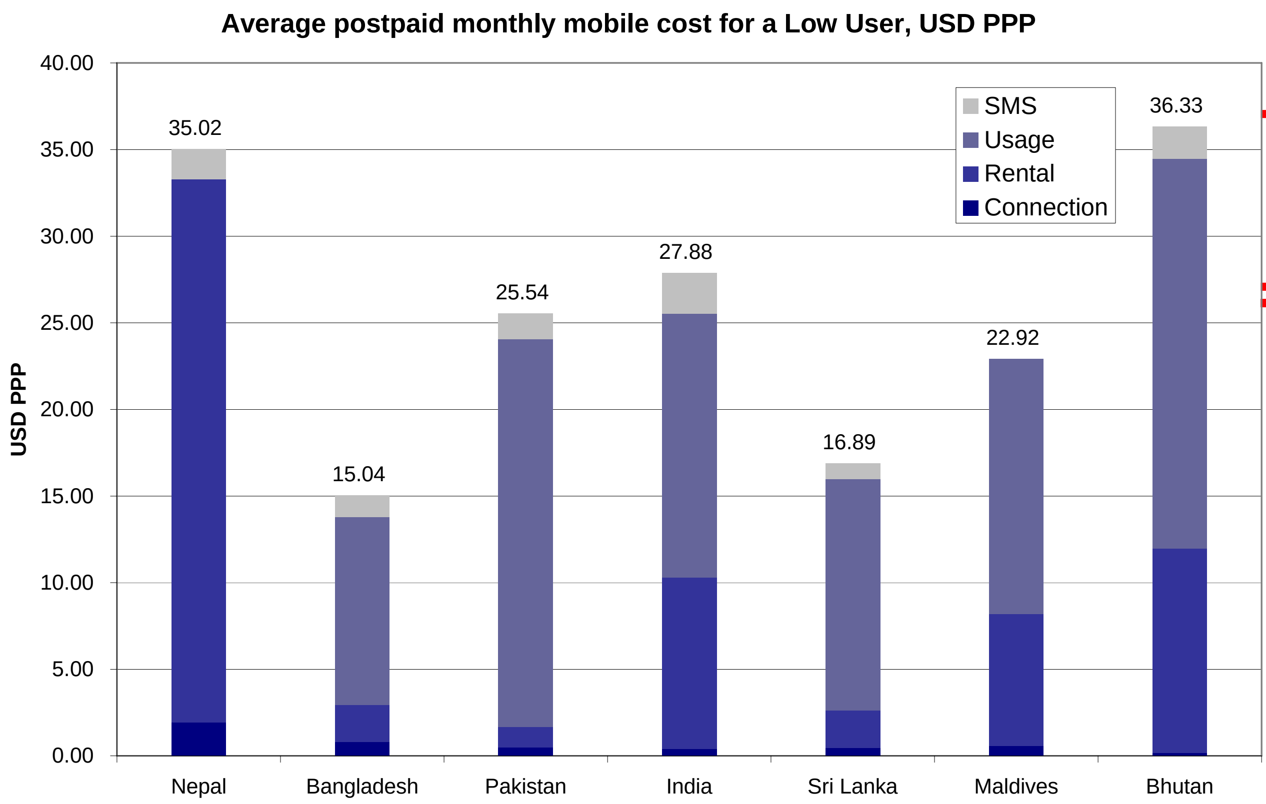

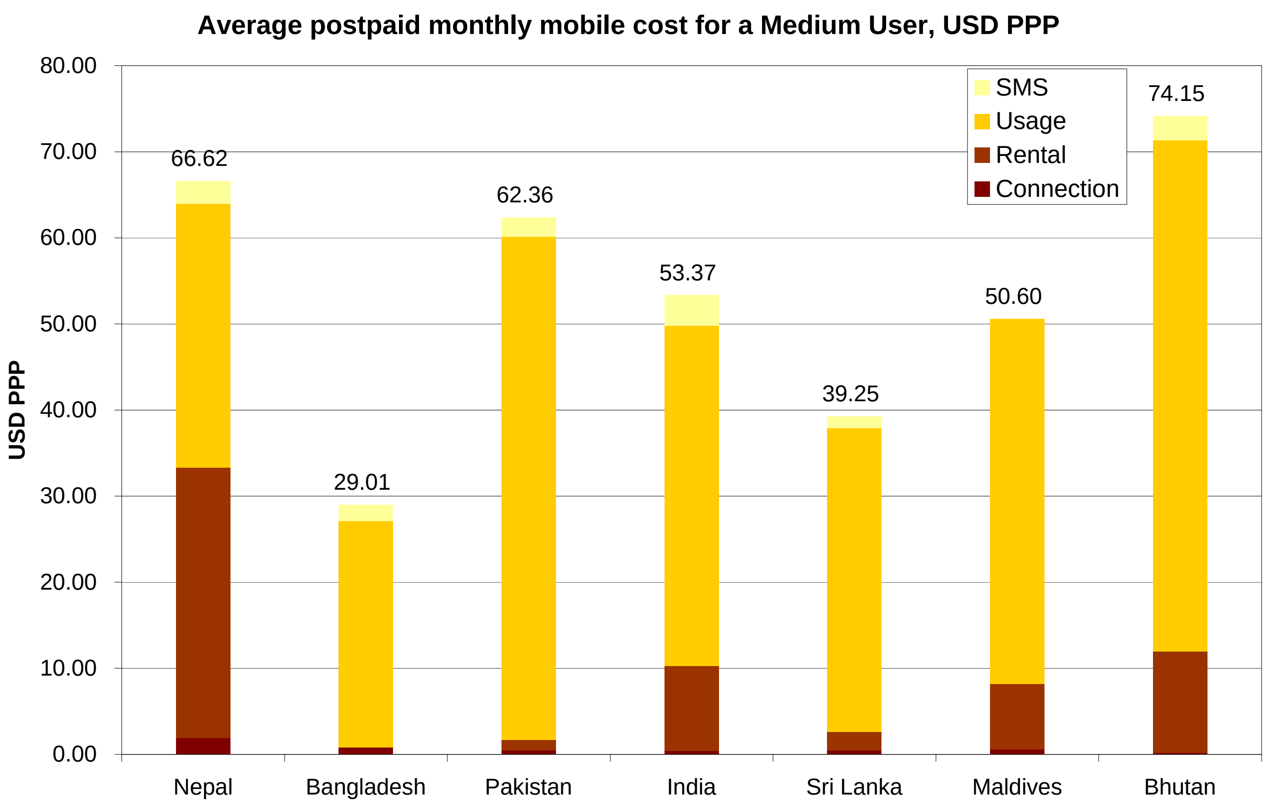

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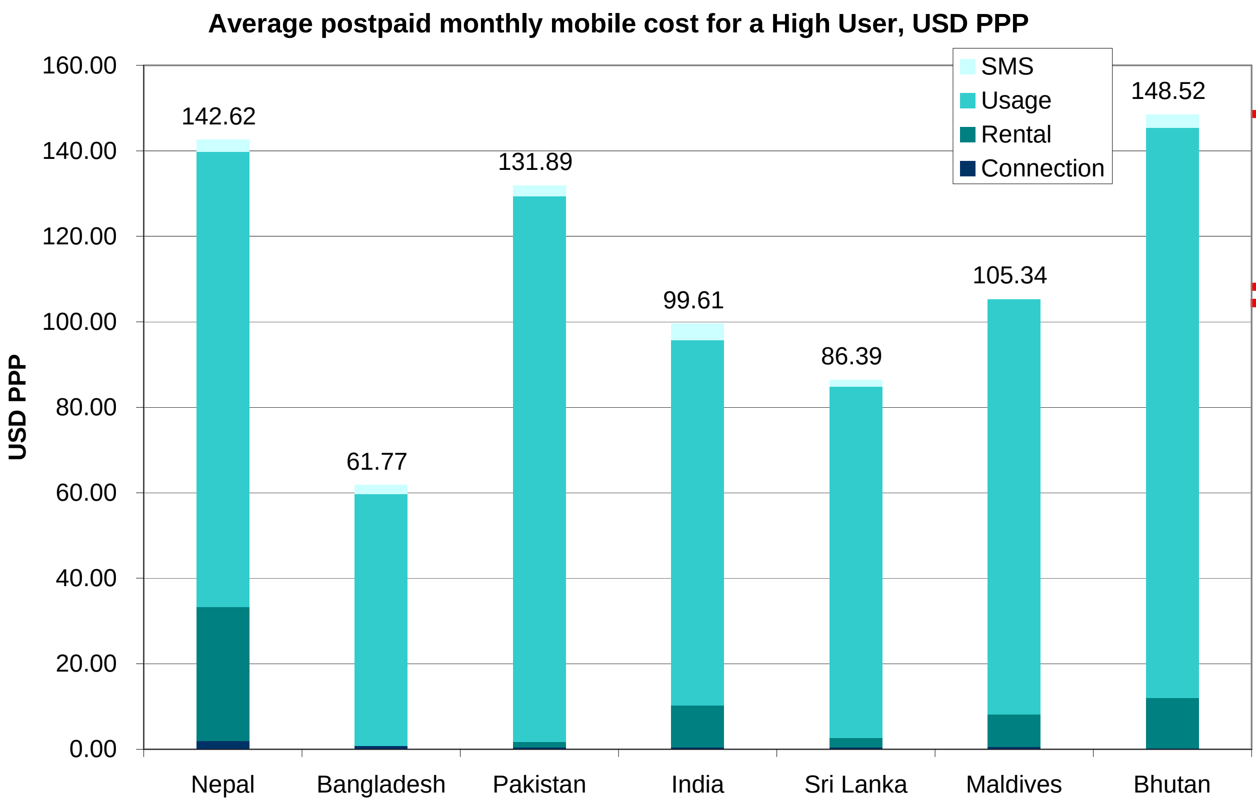

www.lirneasia.net

Notes

1. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp. MMS and Voicemail charges and use were excluded from calculation of the basket.

2. Prepaid and postpaid baskets were based on Minutes of Use (MOU) and SMS data from Afghanistan (ATRA, September 2008), India (TRAI, September 2008), Pakistan (PTA, Annual Report 2007 – 08) and Sri Lanka (Operator data, September 2008). Tariff data was based on data for February 2009. Subscriber data was based on data individually reported by the respective operators.

3. A weighted average of MOU and SMS usage based on these four countries and their respective subscriber numbers was used for the calculation of prepaid and postpaid baskets for all eight countries.

4. OECD call distributions by duration, destination, and time of day were used since relevant data for all eight countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.

5. The cheapest tariff plan (based on initial connection charges for prepaid plans and monthly rental charges for postpaid plans) of the largest operator (based on subscriber numbers) were covered for each country.

6. Postpaid packages for Afghanistan were only available to corporate customers and thus were excluded from the basket.

7. Exchanges rates for February 2009 are taken from www.oanda.com

8. USD PPP estimates for 2009 were taken from the IMF World Economic Outlook (WEO) Database (October 2008), available at: http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

MOBILE PRICE BASKETS (FEBRUARY 2009)

Background

Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
    a. The price of the handset and handset subsidies are **not** taken into account in the basket.
    b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
    c. Monthly rental charges and any optional charges that may apply to the package.
    d. The usage profile will also include a number of SMS messages per month.
    e. The three user baskets that are taken into consideration are:
        - *Low user basket*
        - *Medium user basket*
        - *High user basket*
    f. Different baskets were calculated for prepaid and postpaid plans.
    g. The baskets compositions[1] used are as follows:

	OECD[2]	**Prepaid basket**	**Postpaid basket**
Voice, minutes of use per month			
Low User	46	63	198
Medium User	119	164	511
High User	256	353	1103
SMS per month			
Low User	33	14	32
Medium User	50	21	48
High User	55	23	53

2. *Call destination (in minutes):*
    a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.

[1] OECD methodology includes MMS data in addition to call and SMS data; however, due to low use and/or even the lack of provision of this service in the South Asian countries considered here, this component has been removed from our basket comparisons.

[2] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).

b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	Low User	Medium User	High User
Local, Fixed line	0.16	0.15	0.14
National, Fixed line	0.08	0.08	0.08
On-net, Mobile	0.52	0.52	0.51
Off-net, Mobile	0.24	0.26	0.28
Voicemail[3]	0.00	0.00	0.00

3. *SMS destination:*
   a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
   b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	Low user	Medium user	High user
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
   a. Peak at weekdays – most expensive time in a 24-hour day
   b. Off-peak at weekdays – cheapest time in a 24-hour day
   c. Weekend – at daytime Saturdays and/or Sundays
   d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	Medium User	High User
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
   a. Local and national fixed line calls
   b. Same network mobile calls (On-net)
   c. Other network mobile calls (Off-net)
   d. Voicemail calls
   e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*

[3] As of February 2006, OECD baskets take voicemail into consideration; however this service/feature is not included in the Asian-based baskets at this time (due to low use and/or even the lack of provision of this service) and the OECD call distributions have been adjusted accordingly.

a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
   a. The largest operator (by subscriber numbers) in each country is considered.
   b. The cheapest tariff plan of the largest operator is considered:
      - for prepaid – plans with the lowest connection charges; and
      - for postpaid – plans with the lowest rental are considered.

   These plans are applied across all three baskets (low, medium and high).[4]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in US$ and US$ PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.

Tariff packages

1. Afghanistan – Roshan[5]
   a. Prepaid – SIM Yaraan

2. Nepal – Nepal Telecom
   a. Postpaid – Postpaid
   b. Prepaid – Prepaid

3. Bangladesh – Grameen Phone
   a. Postpaid – Xplore1
   b. Prepaid – Smile

4. Pakistan – Mobilink
   a. Postpaid – Indigo Freedom Plan 1
   b. Prepaid – Jazz Budget

5. India – Bharti Airtel
   a. Postpaid – Advance Rental Plan
   b. Prepaid – Regular

6. Bhutan – B-Mobile
   a. Postpaid – Super 200 Plan
   b. Prepaid – Prepaid

7. Sri Lanka – Dialog GSM
   a. Postpaid – Lite 103
   b. Prepaid – KIT per-second blaster

[4] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.
[5] Postpaid packages are only available to corporate customers and thus were excluded from the basket.

8. Maldives – Dhiraagu
    a. Postpaid – In touch
    b. Prepaid – Prepaid

Mobile tariff comparison

PRE-PAID				AFGHANISTAN	NEPAL		BANGLADESH	PAKISTAN	INDIA		BHUTAN	SRI LANKA	MALDIVES
				SIM Yaraan	Nepal telecom pre-paid		Smile	Jazz Budget	Regular		Prepaid	KIT Standard	Prepaid
Connection Charges				1.904	6.312		7.114	3.762	2.016		1.538	5.256	3.861
Other charges				0.000	14.329		N/A	N/A	N/A		N/A	N/A	N/A
Subscription (rental) fee				N/A	N/A		N/A	N/A	N/A		0.000	N/A	N/A
Free minutes (in currency)				2	N/A		0	N/A	N/A		1	N/A	N/A
					Local	National			Local	National			
Usage charges	Fixed (local)	Incoming	Peak	-0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.026	N/A
			Off-peak	-0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.105	0.029	0.031	0.028	0.017	0.020	0.031	0.041	0.044	0.077
			Off-peak	0.105	0.013	0.016	0.028	N/A	N/A	N/A	0.025	N/A	0.042
			Weekend peak	N/A	0.026	0.016	N/A	N/A	N/A	N/A	N/A	N/A	0.042
			Weekend off-peak	N/A	0.013	0.016	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	On-net	Incoming	Peak	-0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Off-peak	-0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.105	0.025	0.025	0.021	0.017	0.020	0.031	0.041	0.026	0.077
			Off-peak	0.105	0.009	0.009	0.004	N/A	N/A	N/A	0.025	N/A	0.042
			Weekend peak	N/A	0.025	0.025	N/A	N/A	N/A	N/A	N/A	N/A	0.042
			Weekend off-peak	N/A	0.009	0.009	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Off-net	Incoming	Peak	-0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.026	N/A
			Off-peak	-0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.105	0.050	0.063	0.028	0.017	0.020	0.031	0.057	0.044	0.077
			Off-peak	0.105	0.038	0.050	0.028	N/A	N/A	N/A	0.033	N/A	0.042
			Weekend peak	N/A	0.038	0.050	N/A	N/A	N/A	N/A	N/A	N/A	0.042

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	Weekend off-peak	N/A	0.038	0.050	0.000	N/A	0.000	0.000	0.000	N/A	N/A
	Other	N/A	N/A	0.000	N/A	N/A	N/A	N/A	0.000	N/A	N/A
Call set -up fee		N/A	N/A		0.000	0.005	N/A	N/A	N/A	N/A	N/A
Free SMSs		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SMS charges	Standard	0.048	N/A		0.014	N/A	0.020	0.031	0.021	N/A	N/A
	On-net	N/A	0.013		N/A	0.013	N/A	N/A	N/A	0.009	0.015
	Off-net	N/A	0.025		N/A	0.013	N/A	N/A	N/A	0.018	0.039
Exchange rate: = USD 1 =		**52.53**	79.212		70.281	80	49		48.7567	114.154	12.95067
		AFN	NPR		BDT	PKR	INR		BTN	LKR	MVR
Source		http://www.oanda.com/									

POSTPAID				**NEPAL**		**BANGLADESH**	**PAKISTAN**	**INDIA**			**BHUTAN**	**SRI LANKA**	**MALDIVES**
				Postpaid		**Xplore1**	**Indigo Freedom Plan 1**	**Advanced Rental Plan***			**Super 200 Plan**	**Lite 103**	**In touch**
Connection Charges				22.029		11.383	6.270	5.092			2.051	8.760	15.366
Subscription (rental) fee				8.837		0.711	0.313	3.055			4.102	0.876	5.791
Free minutes (in local currency)				6.312		N/A	N/A	N/A			3.077	N/A	2.316
				Local	**National**			**Local**	**National**	**CDMA**			
Usage charges	Fixed	Incoming	Peak	N/A	N/A	N/A	N/A	0.000	0.000	N/A	N/A	0.053	N/A
			Off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.018	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.018	N/A
		Outgoing	Peak	0.023	0.026	0.018	0.032	0.020	0.031	N/A	0.041	0.053	0.076
			Off-peak	0.011	0.013	0.018	N/A	N/A	N/A	N/A	0.031	0.018	0.076
			Weekend peak	0.020	0.006	N/A	0.019	N/A	N/A	N/A	N/A	0.018	0.042
			Weekend off-peak	0.011	0.013	N/A	N/A				N/A	N/A	N/A
	On-net	Incoming	Peak	N/A	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A
			Off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.020	0.020	0.018	0.025	0.020	0.031	N/A	0.041	0.026	0.076
			Off-peak	0.009	0.009	0.018	N/A	N/A	N/A	N/A	0.031	0.018	0.069
			Weekend peak	0.013	0.013	N/A	0.012	N/A	N/A	N/A	N/A	0.018	0.042
			Weekend off-peak	0.009	0.009	N/A	N/A				N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A	N/A	N/A	N/A	0.000	0.000	N/A	N/A	0.053	N/A
			Off-peak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.018	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.018	N/A
		Outgoing	Peak	0.050	0.063	0.018	0.041	0.020	0.031	N/A	0.057	0.053	0.076
			Off-peak	0.038	0.050	0.018	N/A	N/A	N/A	N/A	0.033	0.018	0.076
			Weekend peak	0.038	0.050	N/A	0.028	N/A	N/A	N/A	0.000	0.018	0.042
			Weekend off-peak	0.038	0.050	N/A	N/A				0.000	0.000	0.000
Free SMS				N/A		100	10	N/A			N/A	N/A	50
SMS charges		Basic charge		N/A		1.000	0.013	0.020	0.020	0.031	N/A	N/A	N/A

	On-net	0.013	N/A	N/A	N/A	N/A	N/A	0.021	0.009	0.015
	Off-net	0.025	N/A	N/A	N/A	N/A	N/A	0.103	0.018	0.039
Exchange rate: USD 1 =		NPR	BDT	PKR	INR			BTN	LKR	MVR
		79.212	70.281	79.750	49.096			48.757	114.154	12.951
Source		http://www.oanda.com/								

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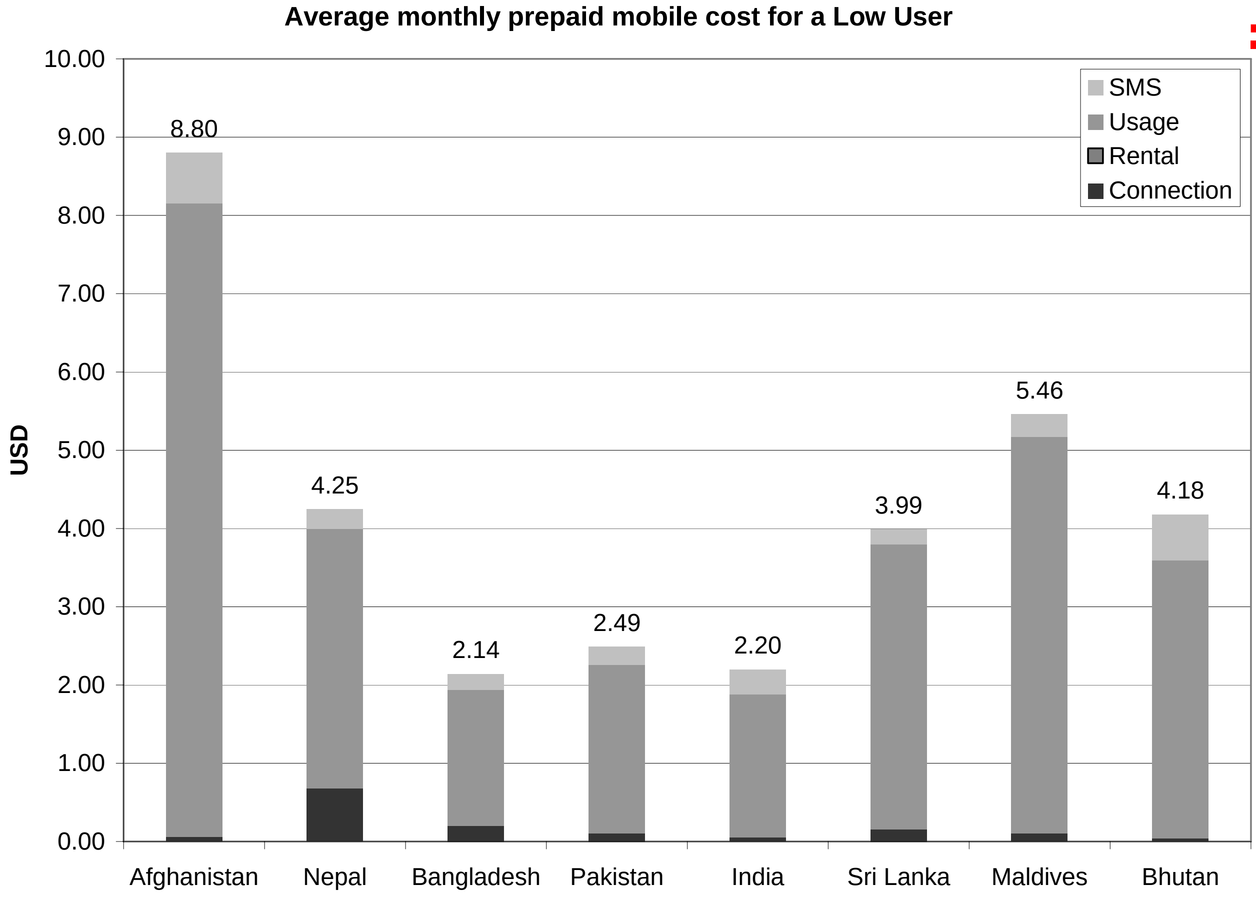
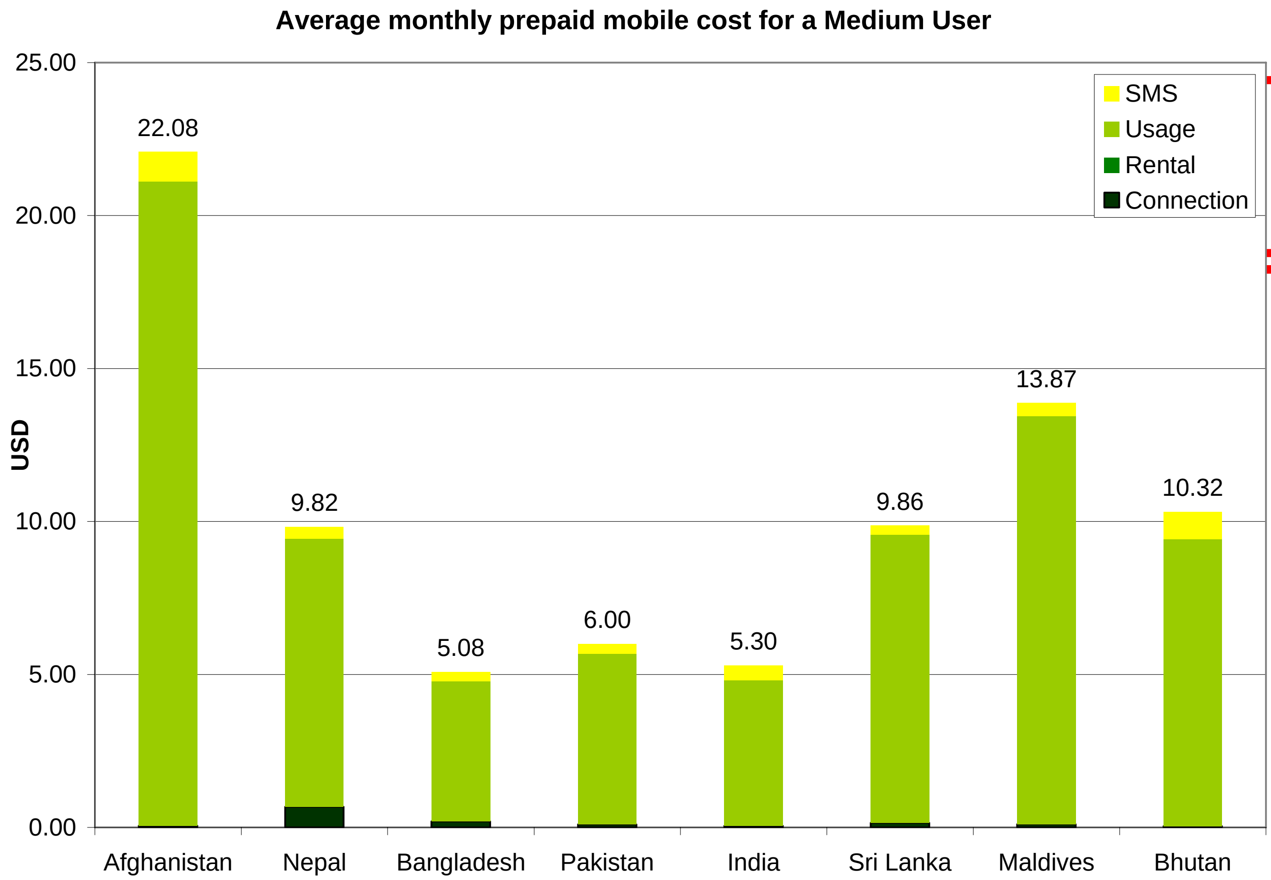
October 2008

Mobile price baskets (USD)





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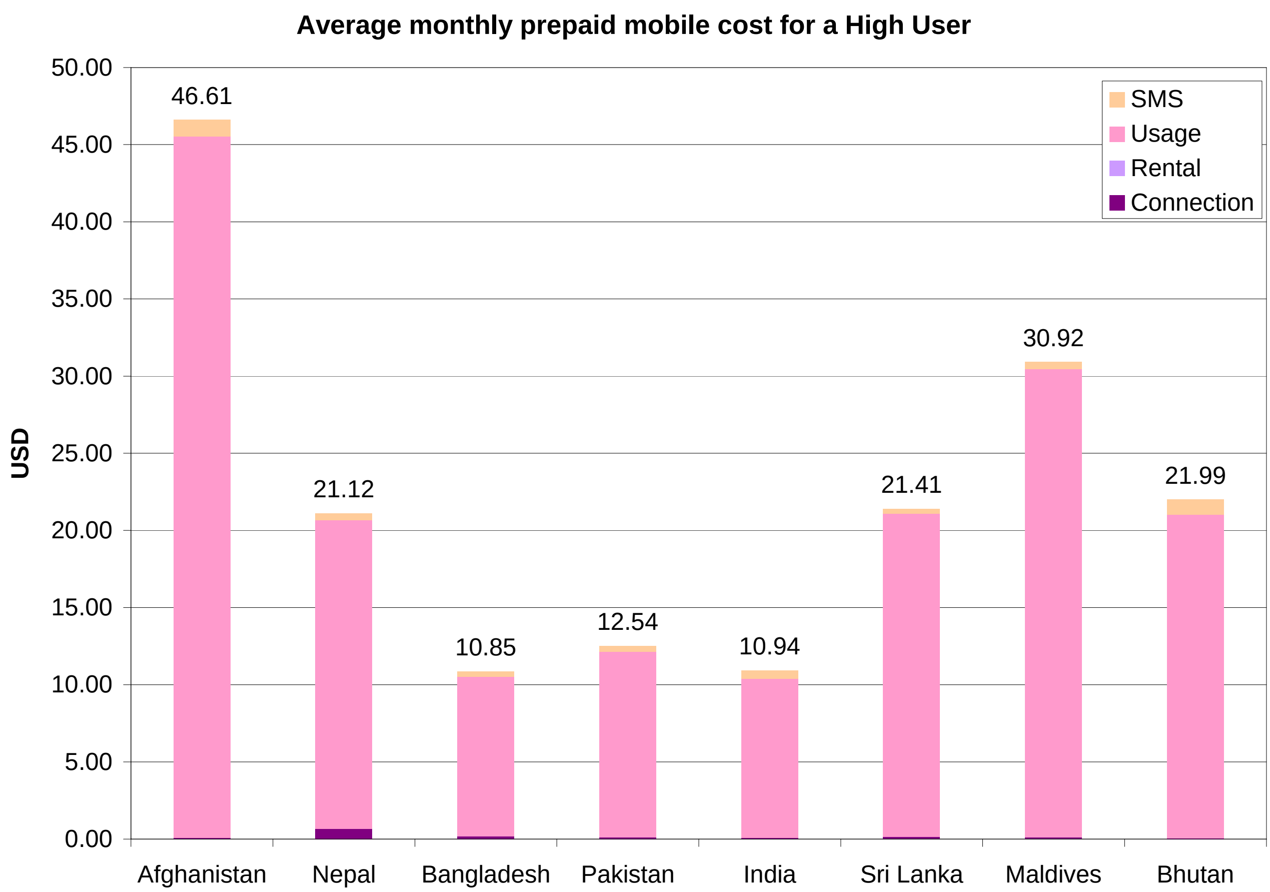
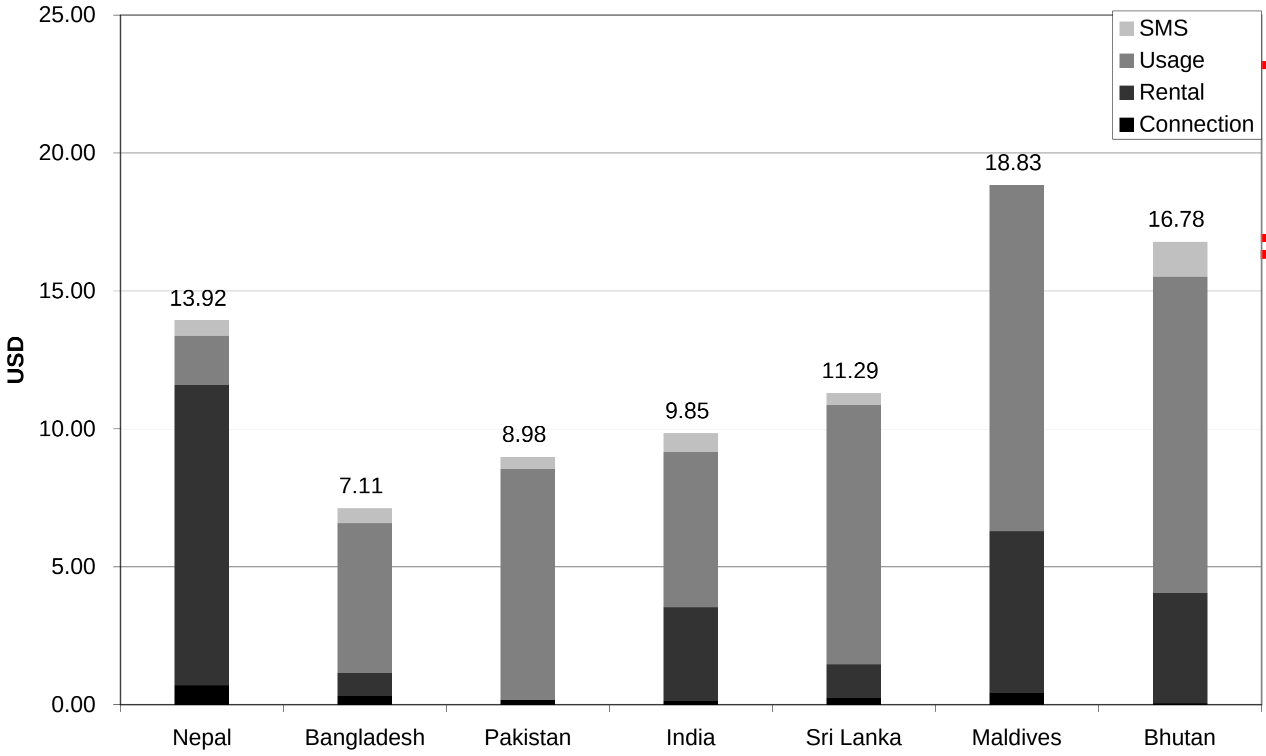


Average monthly postpaid mobile cost for a Low User



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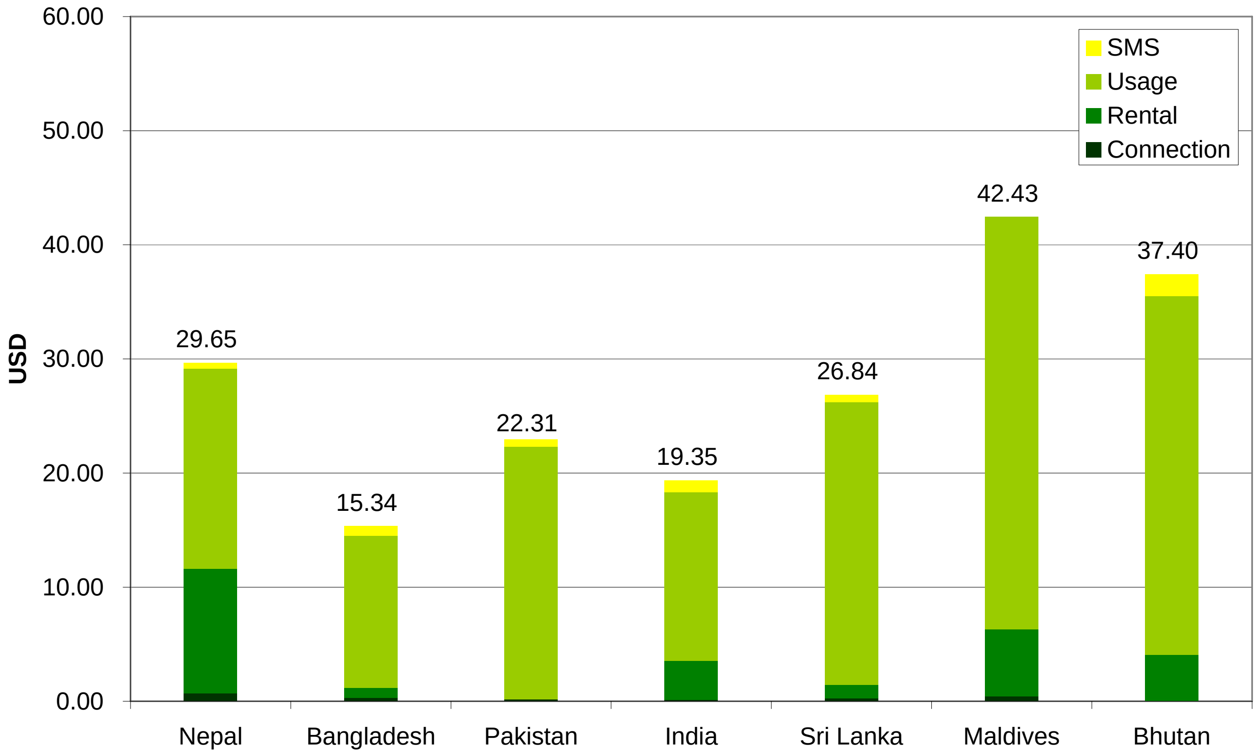
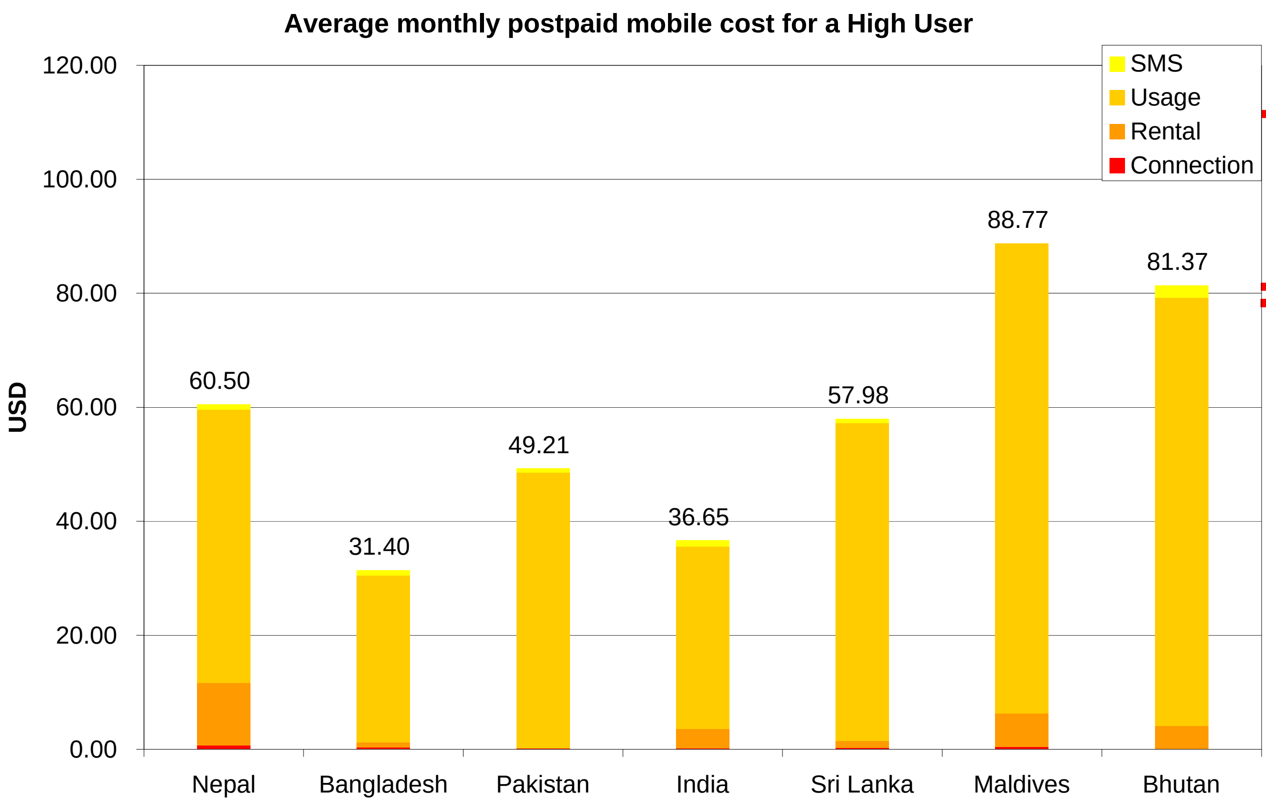
Average monthly postpaid mobile cost for a Medium User





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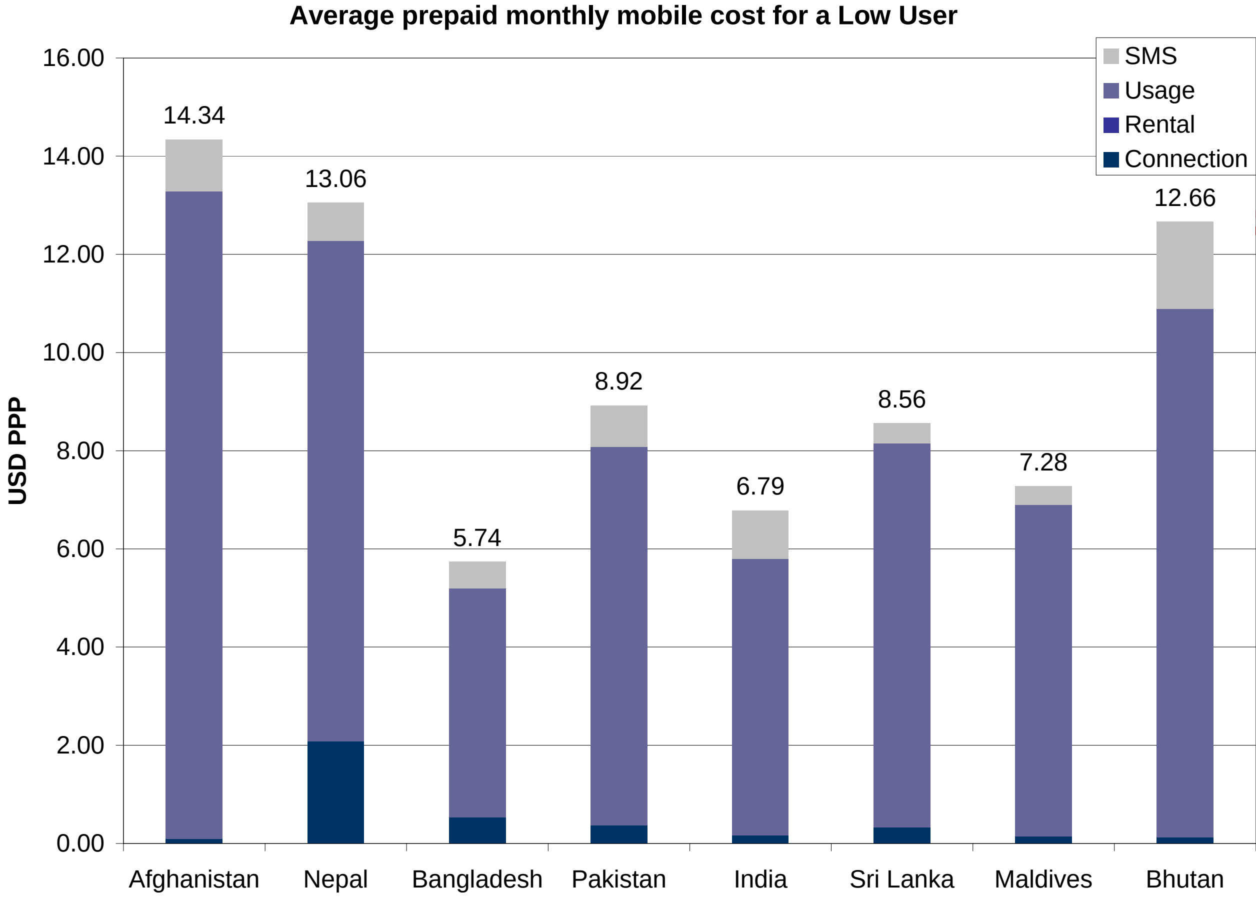
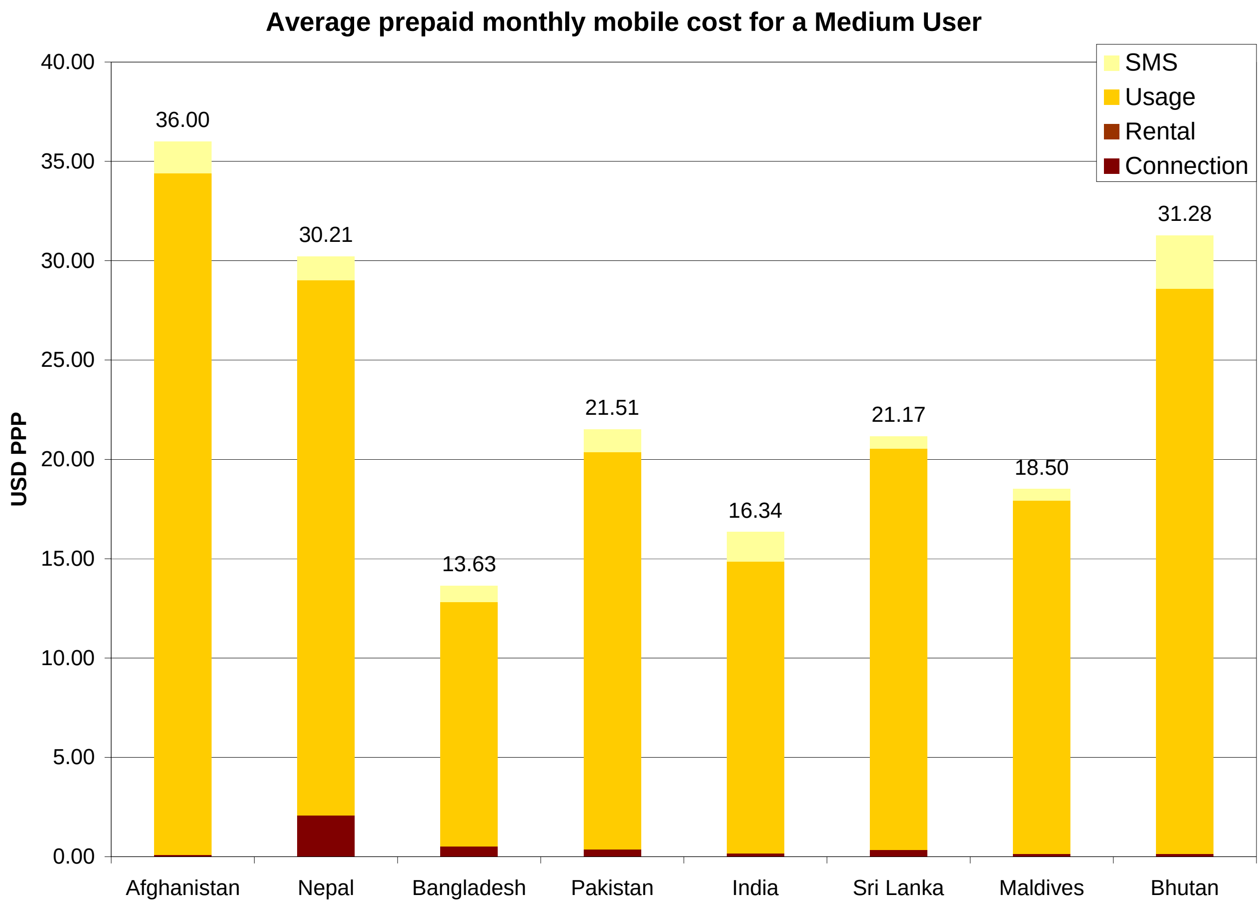
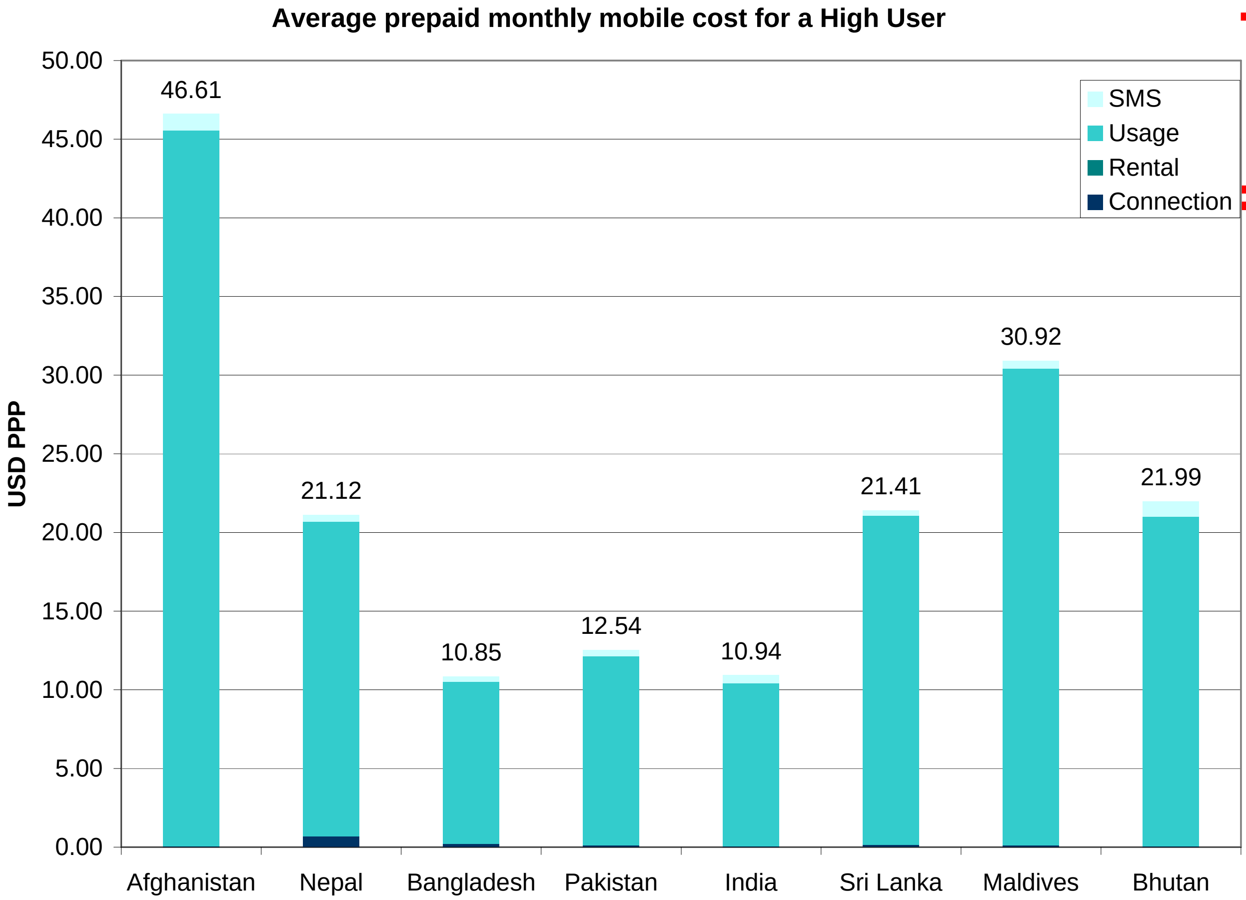
Mobile price baskets (USD PPP)







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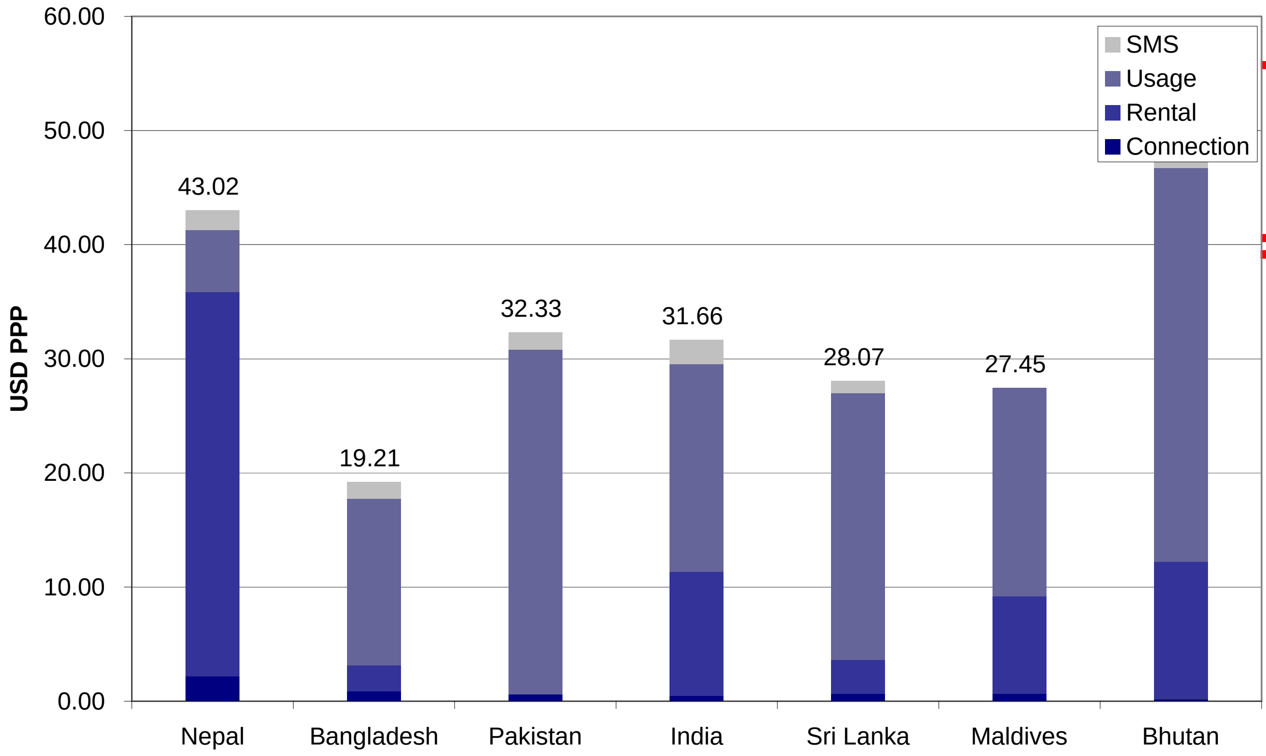
Average postpaid monthly mobile cost for a Low User



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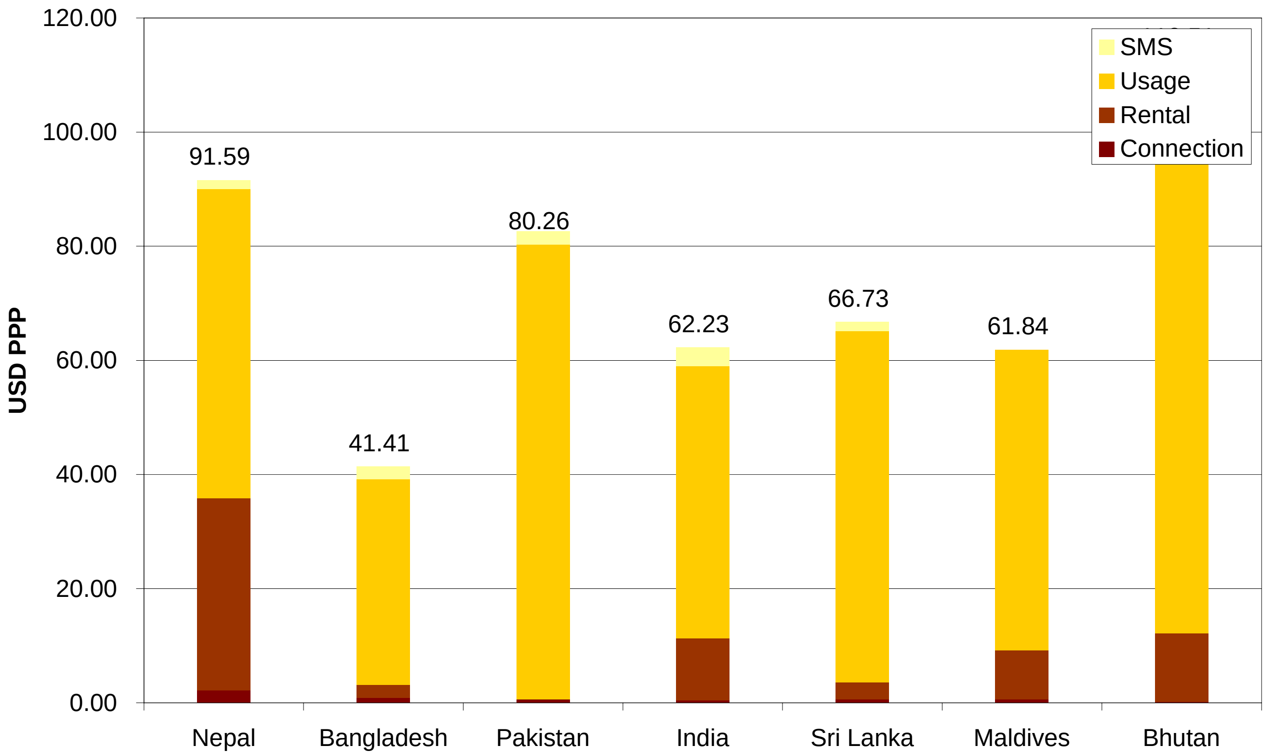
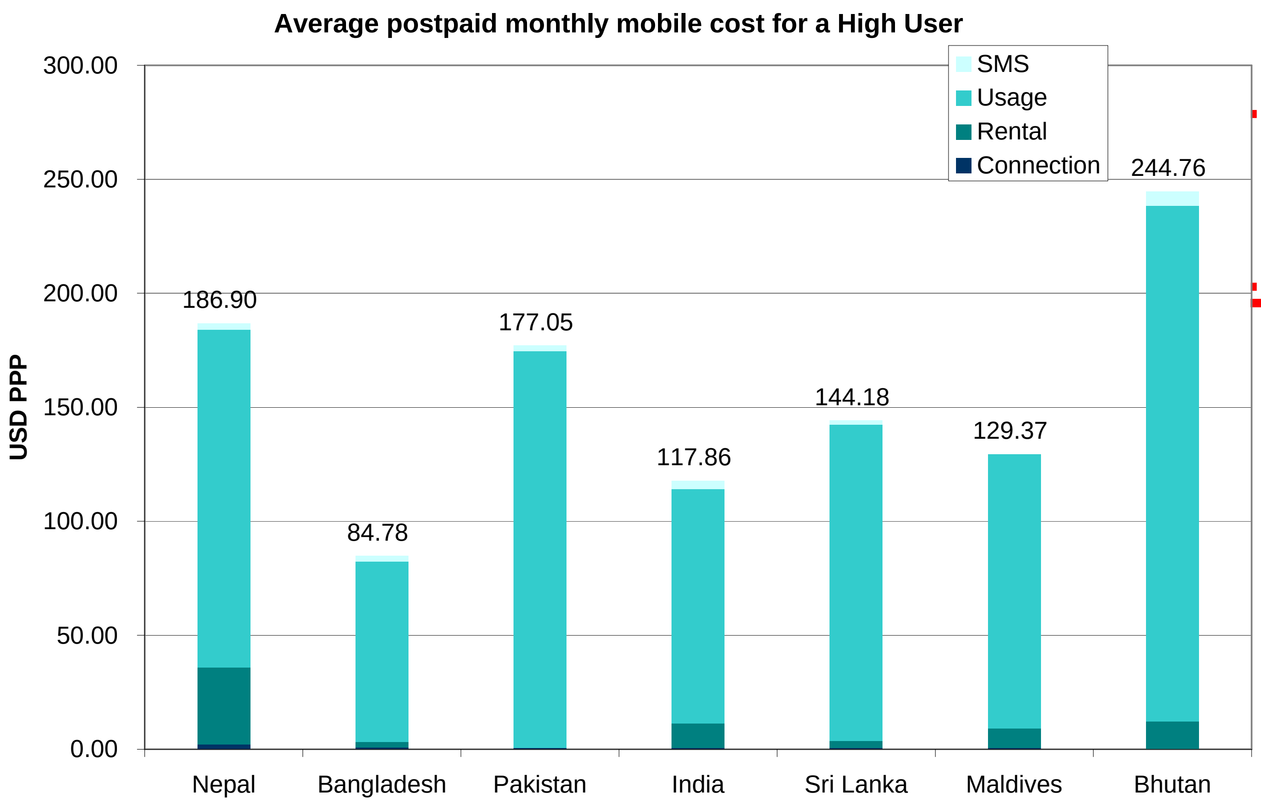
Average postpaid monthly mobile cost for a Medium User





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Notes

1. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp. MMS and Voicemail charges and use were excluded from calculation of the basket.

2. Prepaid and postpaid baskets are a weighted average (weighted by number of subscribers) based on Minutes of Use (MOU) and SMS data from operators in South Asia. Subscriber data was based on data individually reported by the respective operators or from the regulator. Tariff data was based on operator calling plans available on respective websites during September 2008..

3. OECD call distributions by duration, destination, and time of day were used since relevant data for all eight South Asian countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.

4. The cheapest tariff plan (based on initial connection charges for prepaid plans and monthly rental charges for postpaid plans) of the largest operator (based on subscriber numbers) is chosen for each country.

5. Postpaid packages for Afghanistan were only available to corporate customers and thus were excluded from the basket.

6. Exchanges rates for October 2008 are taken from Yahoo! Finance, www.xe.com and Royal Monetary Authority of Bhutan.

7. USD PPP estimates for 2008 taken from the IMF World Economic Outlook (WEO) Database (October 2008), available at: http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx.

MOBILE PRICE BASKETS (OCTOBER 2008)

Background

Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
   a. The price of the handset and handset subsidies are **not** taken into account in the basket.
   b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
   c. Monthly rental charges and any optional charges that may apply to the package.
   d. The usage profile will also include a number of SMS messages per month.
   e. The three user baskets that are taken into consideration are:
      - *Low user basket*
      - *Medium user basket*
      - *High user basket*
   f. Different baskets were calculated for prepaid and postpaid plans.
   g. The baskets compositions[1] used are as follows:

	OECD[2]	**Prepaid basket[3]**	**Postpaid basket[4]**
Voice, minutes of use per month			
Low User	46	70	214
Medium User	119	181	559
High User	256	390	1207
SMS per month			
Low User	33	18	26
Medium User	50	27	40
High User	55	30	44

2. *Call destination (in minutes):*

[1] OECD methodology includes MMS data in addition to call and SMS data; however, due to low use and/or even the lack of provision of this service in the South Asian countries considered here, this component has been removed from our basket comparisons.
[2] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).
[3] The prepaid basket is based on MOU and SMS data reported by operators in multiple countries, weighted by total number of mobile subscribers. Only average/medium user data is available publicly, therefore the OECD low:medium:high user ratios were applied to the prepaid and postpaid baskets.
[4] This basket is based on data as specified above.

a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.
b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	Low User	Medium User	High User
Local, Fixed line	0.16	0.15	0.14
National, Fixed line	0.08	0.08	0.08
On-net, Mobile	0.52	0.52	0.51
Off-net, Mobile	0.24	0.26	0.28
Voicemail[5]	0.00	0.00	0.00

3. *SMS destination:*
   a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
   b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	Low user	Medium user	High user
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
   a. Peak at weekdays – most expensive time during daytime
   b. Off-peak at weekdays – cheapest time before midnight
   c. Weekend – at daytime Sundays
   d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	Medium User	High User
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
   a. Local and national fixed line calls
   b. Same network mobile calls (On-net)
   c. Other network mobile calls (Off-net)
   d. Voicemail calls
   e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

[5] As of February 2006, OECD baskets take voicemail into consideration; however this service/feature is not included in the Asian-based baskets at this time (due to low use and/or even the lack of provision of this service) and the OECD call distributions have been adjusted accordingly.

7. *Inclusive minutes and SMS messages:*
    a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
    b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
    a. The largest operator (by subscriber numbers) in each country is considered.
    b. The cheapest tariff plan of the largest operator is considered:
        - for prepaid – plans with the lowest connection charges; and
        - for postpaid – plans with the lowest rental are considered.

       These plans are applied across all three baskets (low, medium and high).[6]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in USD and USD PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.

Tariff packages

1. Afghanistan – Roshan[7]
    a. Prepaid – SIM Aali

2. Nepal – Nepal Telecom
    a. Postpaid – Postpaid
    b. Prepaid – Prepaid

3. Bangladesh – Grameen Phone
    a. Postpaid – Xplore1
    b. Prepaid – Smile

4. Pakistan – Mobilink
    a. Postpaid – Indigo Freedom Plan 1
    b. Prepaid – Jazz Budget

5. India – Bharti Airtel
    a. Postpaid – Advance Rental Plan
    b. Prepaid – Regular

6. Sri Lanka – Dialog GSM
    a. Postpaid – Lite 103
    b. Prepaid – KIT Standard[8]

7. Maldives – Dhiraagu

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[6] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

[7] Postpaid packages are only available to corporate customers and thus were excluded from the basket.

[8] Dialog GSM's KIT per-second package was not considered at the time of calculation.

    a. Postpaid – In touch
    b. Prepaid – Prepaid

8. Bhutan – B-Mobile
    a. Postpaid – Super 200 Plan
    b. Prepaid – Prepaid

Mobile tariff comparison

PREPAID				AFGHANISTAN	NEPAL		BANGLADESH	PAKISTAN	INDIA		SRI LANKA	MALDIVES	BHUTAN
				SIM Aali	Prepaid		Smile	Jazz Budget	Regular		KIT Standard	Prepaid	Prepaid
Connection Charges				2.123	24.424		7.140	4.062	1.989		5.550	3.906	1.502
Subscription (rental) fee				0	0		0	0	0		0	0	0
Free minutes (in USD)				2.123	0		0.291	0	0		First minute incoming free	0	1.001
					Local	National			Local	National			
Usage charges	Fixed	Incoming	Peak	0	0	0	0	0	0	0	0.071	0	0
			Off-peak	0	0	0	0	N/A	N/A	N/A	0.024	0	0
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	0	0
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	N/A	N/A
		Outgoing	Peak	0.117	0.050	0.065	0.034	0.032	0.023	0.034	0.071	0.078	0.054
			Off-peak	0.117	0.031	0.047	0.034	N/A	N/A	N/A	0.083	0.063	0.051
			Weekend	N/A	0.031	0.047	N/A	N/A	N/A	N/A	0.059	0.063	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.035	0.043	0.036
	On-net	Incoming	Peak	0	0	0	0	0	0	0	0.071	0	0
			Off-peak	0	0	0	0	N/A	N/A	N/A	0.024	0	0
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	0	0
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	N/A	N/A
		Outgoing	Peak	0.117	0.050	0.050	0.025	0.029	0.023	0.034	0.047	0.078	0.054
			Off-peak	0.117	0.031	0.031	0.004	N/A	N/A	N/A	0.083	0.063	0.051
			Weekend	N/A	0.031	0.031	N/A	N/A	N/A	N/A	0.047	0.063	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.035	0.043	0.036
	Off-net	Incoming	Peak	0	0	0	0	0	0	0	0.071	0	0
			Off-peak	0	0	0	0	N/A	N/A	N/A	0.024	0	0
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	0	0
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	N/A	N/A
		Outgoing	Peak	0.117	0.073	0.089	0.034	0.032	0.023	0.034	0.071	0.117	0.065
			Off-peak	0.117	0.054	0.070	0.034	N/A	N/A	N/A	0.083	0.117	0.065
			Weekend	N/A	0.054	0.070	N/A	N/A	N/A	N/A	0.059	0.117	N/A
			Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.035	0.043	0.065
Free SMSs													
SMS charges		Standard		0.053	N/A	N/A	0.017	N/A	0.023	0.034	N/A	N/A	N/A
		On-net		N/A	0.016	0.016		0.016	N/A	N/A	0.012	0.016	0.020
		Off-net		N/A	0.031	0.031		0.025	N/A	N/A	0.024	0.039	0.100
Exchange rate: USD 1 =				AFG 47.10	NPR 79.9		BDT 68.63	PKR 81.25	INR 49.78		LKR 108.1	MVR 12.8	BTN 49.95
Source				www.xe.com	Yahoo! Finance		Yahoo! Finance	Yahoo! Finance	Yahoo! Finance	Yahoo! Finance	Yahoo! Finance	Yahoo! Finance	http://www.rma.org.bt

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POSTPAID				NEPAL		BANGLADESH	PAKISTAN	INDIA			SRI LANKA	MALDIVES	BHUTAN	
				Postpaid		**Xplore1**	**Indigo Freedom Plan 1**	**Advanced Rental Plan***			**Lite 103**	**In touch**	**Super 200 Plan**	
Connection Charges				25.124		11.658	6.154	5.023			9.251	15.547	2.002	
Subscription (rental) fee				10.890		0.838	0	3.386			1.182	5.859	4.004	
Free minutes (in USD)				6.258		N/A	N/A	N/A			First 3 minutes incoming free	2.344	3.003	
				Local	**National**			**Local**	**National**	**CDMA**			**Local**	**National**
Usage charges	Fixed	Incoming	Peak	0	0	0	0	0	0	N/A	0.071	0	0	0
			Off-peak	N/A	N/A	0	N/A	N/A	N/A	N/A	0.024	0	0	0
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	0	0	0
		Outgoing	Peak	0.037	4.226	0.039	0.041	0.023	0.034	N/A	0.071	0.077	0.045	0.090
			Off-peak	0.016	2.486	0.034	N/A	N/A	N/A	N/A	0.024	0.077	0.030	0.060
			Weekend	0.016	2.486	N/A	0.025	N/A	N/A	N/A	0.059	0.043		
	On-net	Incoming	Peak	0	0	0	0	0	0	N/A	0.000	0	0	0
			Off-peak	N/A	N/A	0	N/A	N/A	N/A	N/A	0.000	0	0	0
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.000	0	0	0
		Outgoing	Peak	0.037	2.983	0.022	0.033	0.023	0.034	N/A	0.035	0.077	0.045	0.090
			Off-peak	0.016	1.243	0.022	N/A	N/A	N/A	N/A	0.024	0.070	0.030	0.060
			Weekend	0.016	1.243	N/A	0.016	N/A	N/A	N/A	0.035	0.043		
	Off-net	Incoming	Peak	0	0	0	0	0	0	N/A	0.071	0	0	0
			Off-peak	N/A	N/A	0	N/A	N/A	N/A	N/A	0.024	0	0	0
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024	0	0	0
		Outgoing	Peak	0.061	4.226	0.022	0.053	0.023	0.034	N/A	0.071	0.077	0.105	0.105
			Off-peak	0.039	2.486	0.022	N/A	N/A	N/A	N/A	0.024	0.077	0.105	0.105
			Weekend	0.039	2.486	N/A	0.037	N/A	N/A	N/A	0.059	0.043	0.105	0.105
Free SMS				N/A		100.000	10.000	N/A			N/A	50	N/A	
SMS charges		Basic charge		N/A		N/A	0.016	0.023	0.023	0.034	N/A	N/A	N/A	
		On-net		0.013		0.017	N/A	N/A	N/A	N/A	0.012	0.016	0.020	
		Off-net		0.025		0.034	N/A	N/A	N/A	N/A	0.024	0.039	0.100	
Exchange rate: USD 1 =				NPR 79.9		BDT 68.63	PKR 81.25	INR 49.78			LKR 108.1	MVR 12.8	BTN 49.95	
Source				Yahoo! Finance		Yahoo! Finance	Yahoo! Finance	Yahoo! Finance			Yahoo! Finance	Yahoo! Finance	http://www.rma.org.bt	

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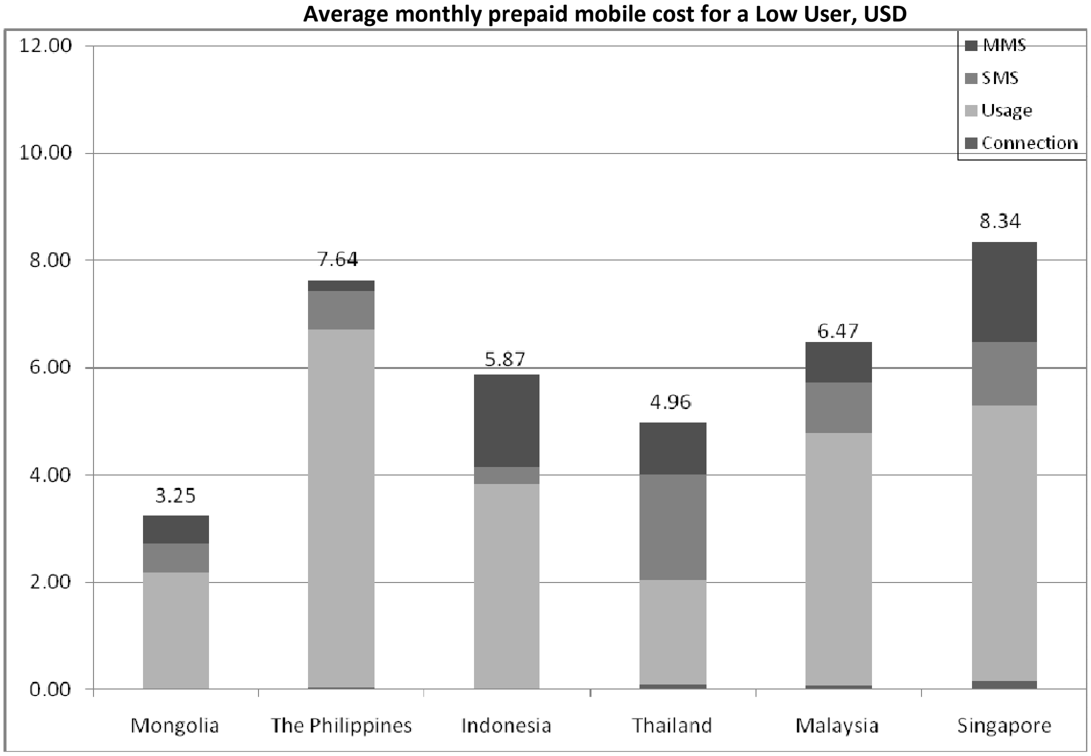
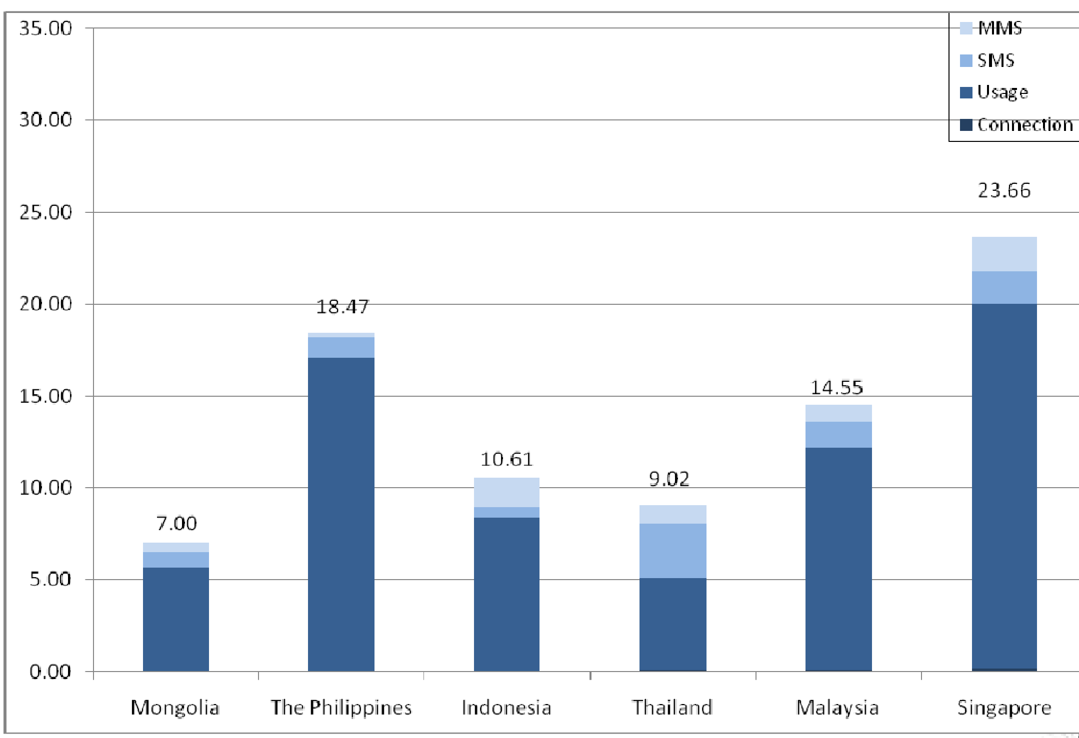
February 2010

Mobile price baskets (USD)

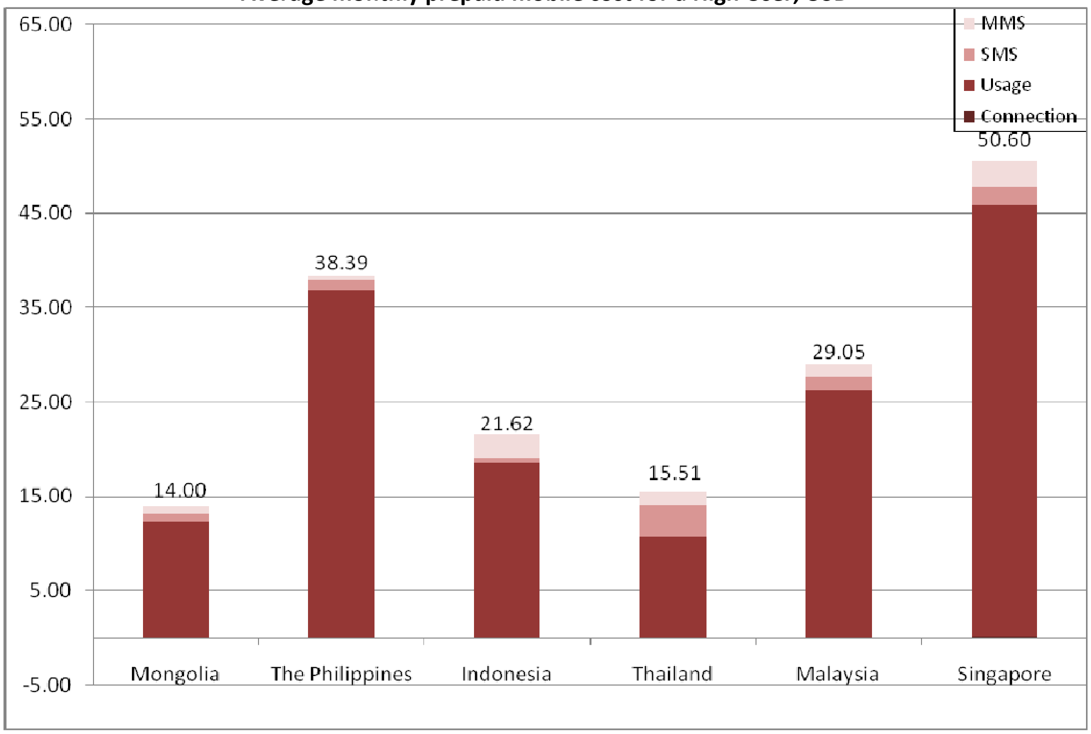
Average monthly prepaid mobile cost for a Low User, USD



Average monthly prepaid mobile cost for a Medium User, USD



Average monthly prepaid mobile cost for a High User, USD



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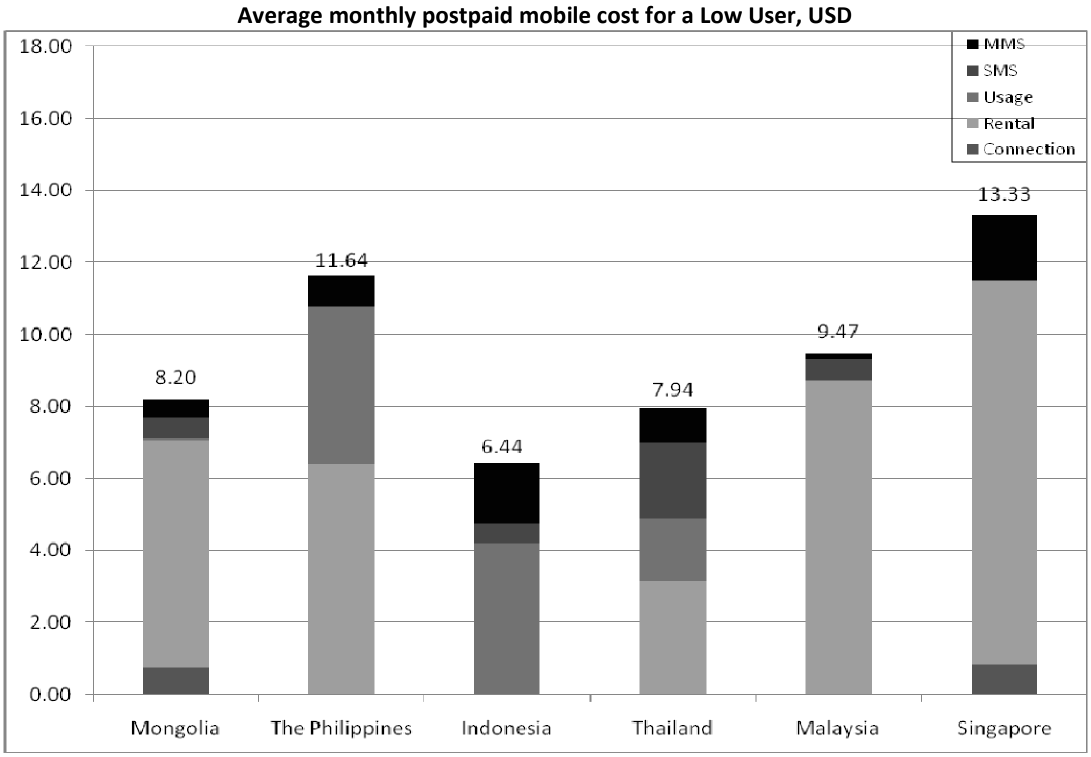
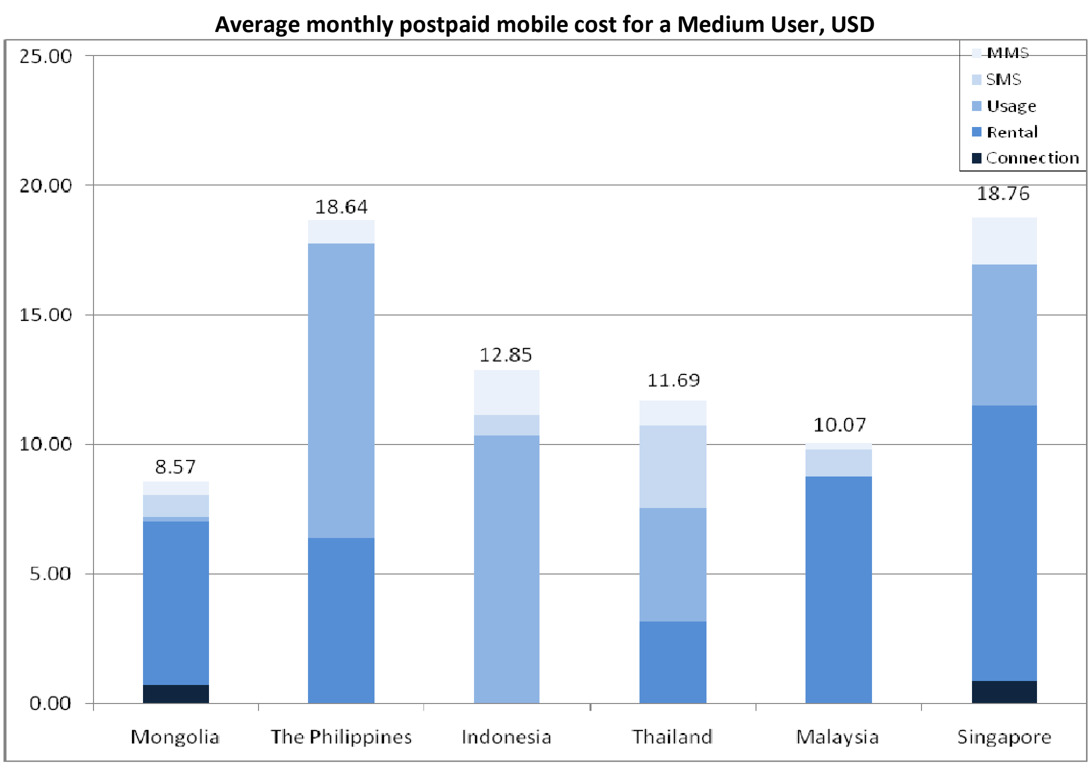
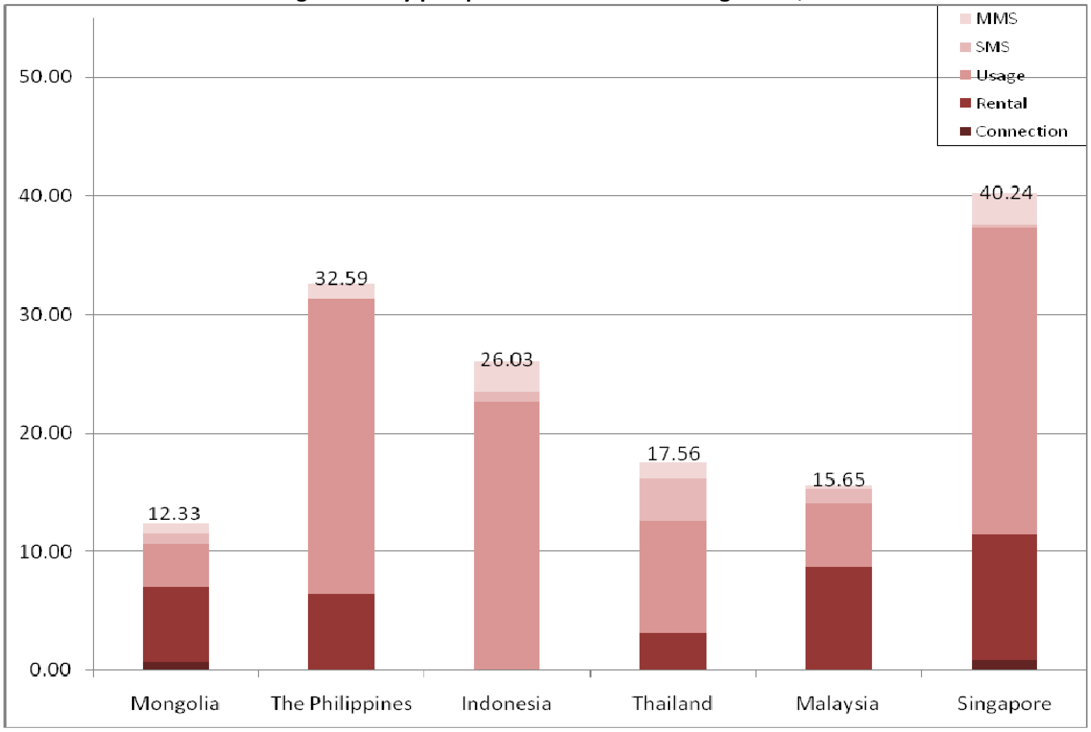




Average monthly postpaid mobile cost for a High User, USD



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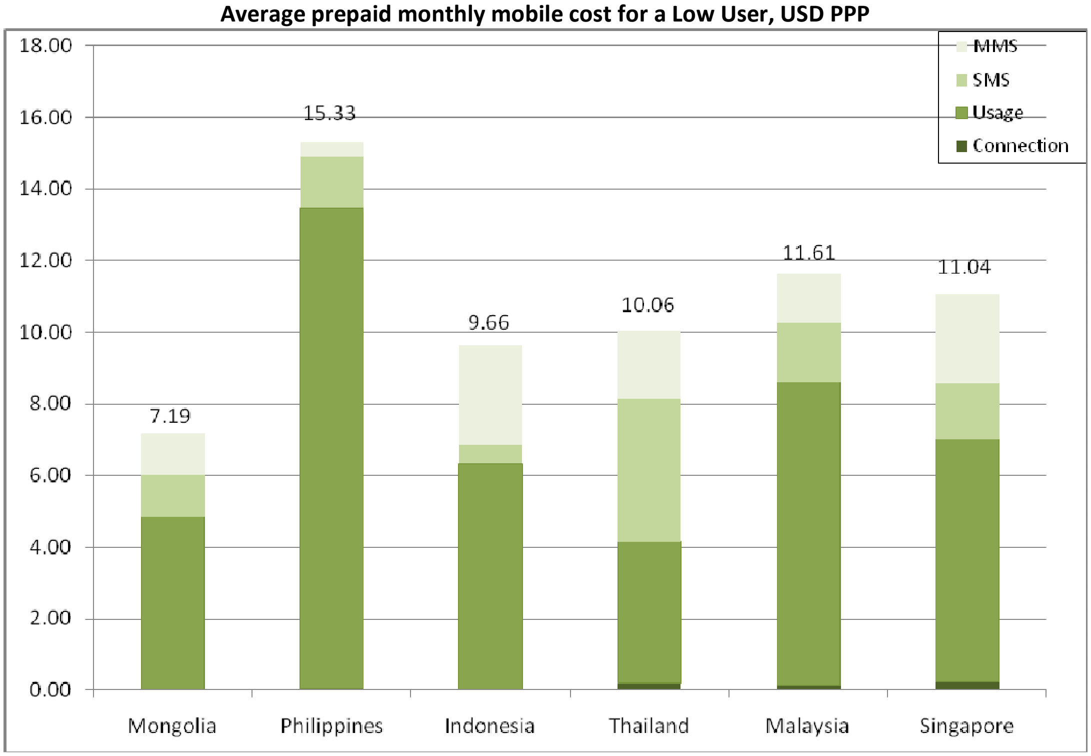
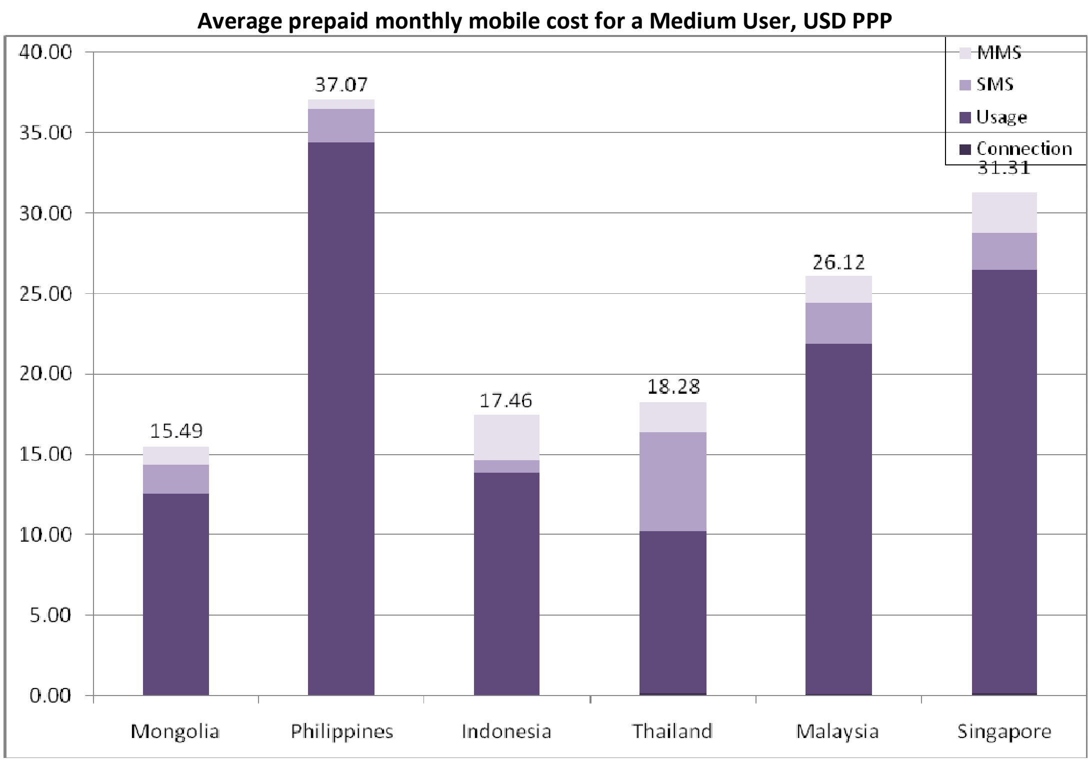
Mobile price baskets (USD PPP)





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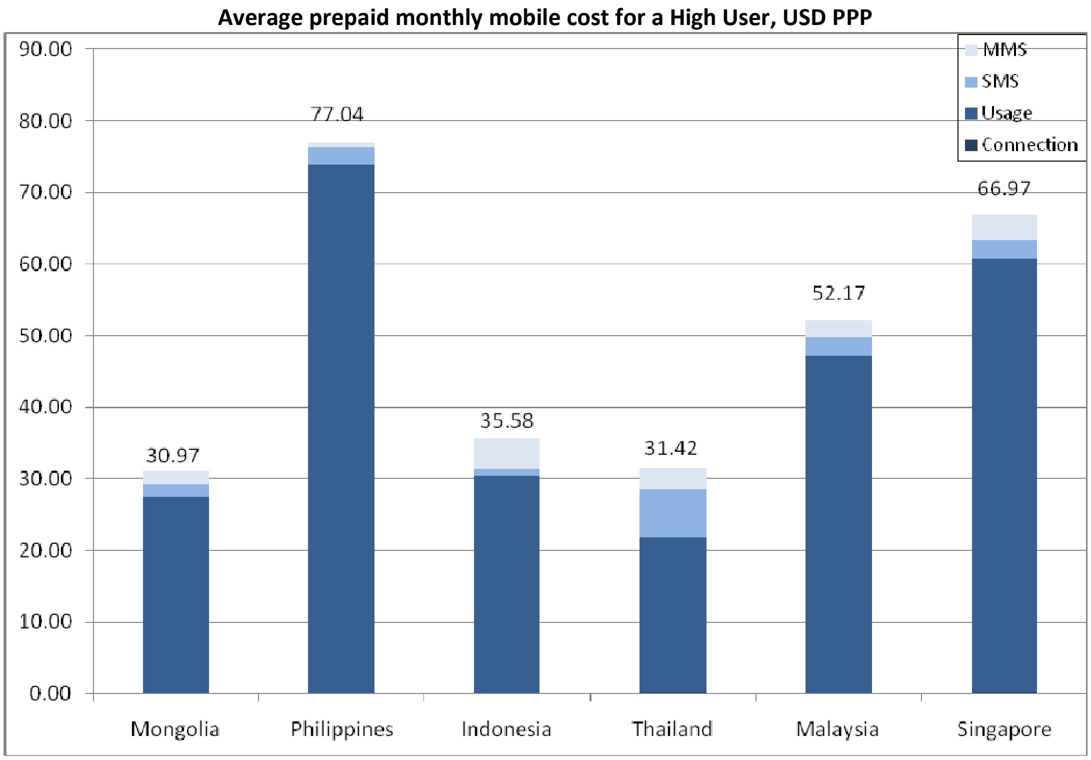

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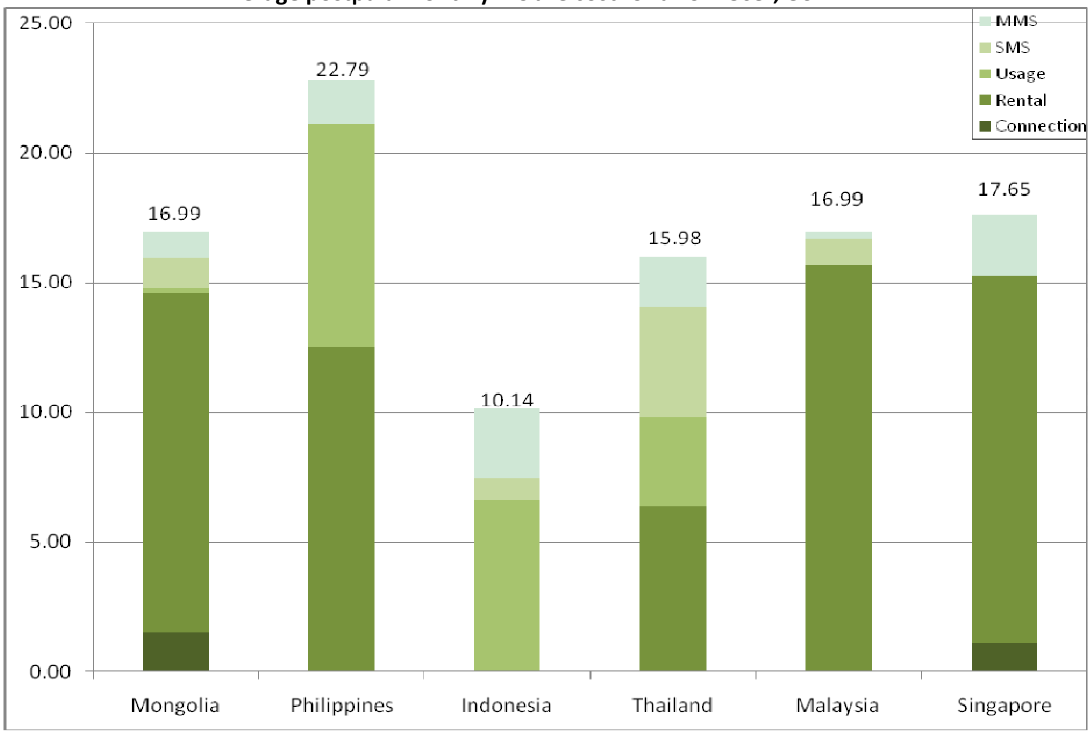
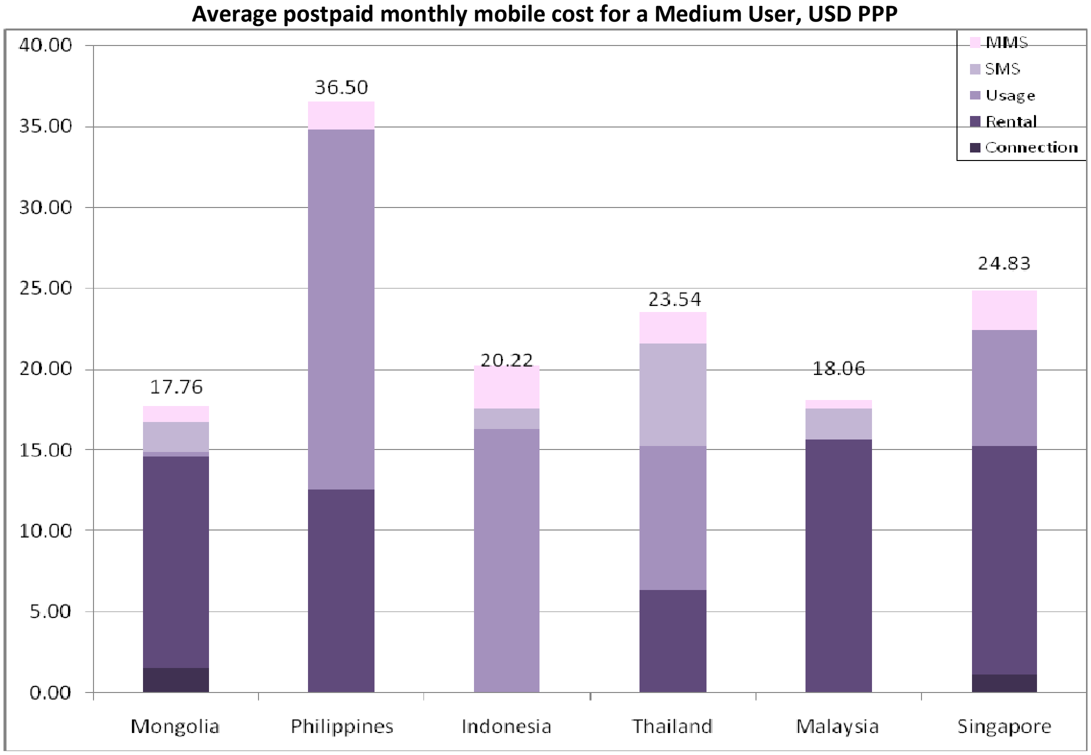
Average postpaid monthly mobile cost for a Low User, USD PPP



Average postpaid monthly mobile cost for a Medium User, USD PPP



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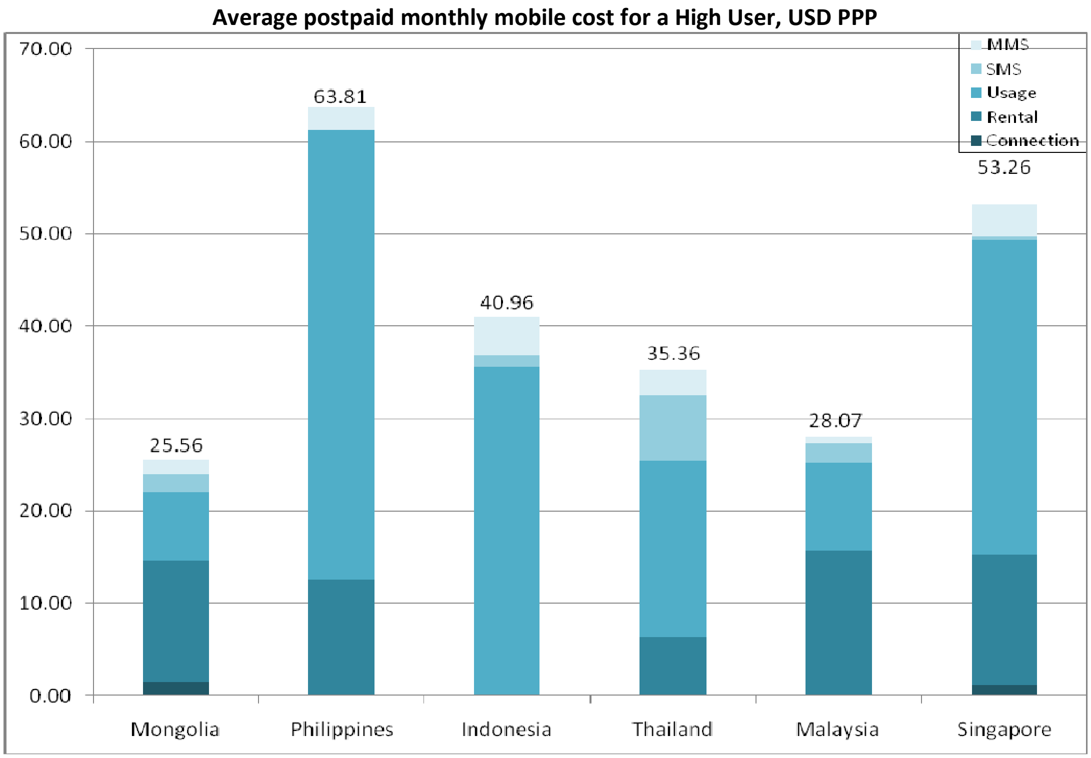

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Notes

1. Tariff data taken from operator websites and/or verbal/written communication with call center agents.
2. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp.
3. Prepaid and postpaid baskets were based on Minutes of Use (MOU) from OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp
4. OECD call distributions by duration, destination, and time of day were used since relevant data for all eight countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.
5. The cheapest tariff plan (based on initial connection charges for prepaid plans and monthly rental charges for postpaid plans) of the largest operator (based on subscriber numbers) were covered for each country.
6. Where MMS tariffs were dependent on the size of the message, the average size of an MMS was assumed to equal 30 KB.
7. Where data was not mentioned or available, voicemail retrieval tariffs were assumed to be equal to voice onnet tariffs.
8. Exchanges rates taken on 28 February 2010 from www.oanda.com
9. USD PPP estimates for 2010 were taken from the IMF World Economic Outlook (WEO) Database (October 2009), available at: http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/index.aspx

MOBILE PRICE BASKETS (FEBRUARY 2010)

Background

Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
   a. The price of the handset and handset subsidies are **not** taken into account in the basket.
   b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
   c. Monthly rental charges and any optional charges that may apply to the package.
   d. The usage profile will also include a number of SMS messages per month.
   e. The three user baskets that are taken into consideration are:
      - *Low user basket*
      - *Medium user basket*
      - *High user basket*
   f. Different baskets were calculated for prepaid and postpaid plans.
   g. The baskets compositions[1] used are as follows:

	OECD[2]
Voice, minutes of use per month	
Low User	46
Medium User	119
High User	256
SMS per month	
Low User	33
Medium User	50
High User	55
MMS per month[3]	
Low User	1
Medium User	1
High User	1

[2] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).
[3] Rounded off to the nearest whole number

2. *Call destination (in minutes):*
    a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.
    b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
    c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
    d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
    e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	Low User	Medium User	High User
Local, Fixed line	0.16	0.15	0.14
National, Fixed line	0.08	0.08	0.08
On-net, Mobile	0.52	0.52	0.51
Off-net, Mobile	0.24	0.26	0.28
Voicemail	0.08	0.07	0.07

3. *SMS destination:*
    a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
    b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	Low user	Medium user	High user
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
    a. Peak at weekdays – most expensive time in a 24-hour day
    b. Off-peak at weekdays – cheapest time in a 24-hour day
    c. Weekend – at daytime Saturdays and/or Sundays
    d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	Medium User	High User
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
    a. Local and national fixed line calls
    b. Same network mobile calls (On-net)
    c. Other network mobile calls (Off-net)
    d. Voicemail calls
    e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8
Voicemail	0.8	0.8	0.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*
    a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
    b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
    a. The largest operator (by subscriber numbers) in each country is considered.
    b. The cheapest tariff plan of the largest operator is considered:
        - for prepaid – plans with the lowest connection charges; and
        - for postpaid – plans with the lowest rental are considered.

        These plans are applied across all three baskets (low, medium and high).[4]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in US$ and US$ PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.
    b. Incoming call charges have been considered in the construction of the baskets, on the assumption that outgoing minutes = incoming minutes.

<u>Tariff packages</u>

1. Mongolia - Mobicom
    a. Prepaid – Be
    b. Postpaid – Zone160

2. Philippines – SMART Communications
    a. Prepaid – Smart Buddy
    b. Postpaid – Smart Gold Lite 300

3. Indonesia - Telkomsel
    a. Prepaid – Kartu As
    b. Postpaid – Kartu Helo

4. Thailand – Advanced Info Service (AIS) Plc.
    a. Prepaid – SIM One-2-call 99
    b. Postpaid – GSM Net SIM 99

5. Malaysia – Maxis Communications

[4] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

a. Prepaid – New Hotlink Plan
b. Postpaid – Value First

6. Singapore – SingTel
    a. Prepaid – Hi Card
    b. Postpaid – *i*One Super Value

Mobile tariff comparison

PREPAID				MONGOLIA	THE PHILIPPINES	INDONESIA	THAILAND	MALAYSIA	SINGAPORE
				Be	Smart Buddy	Kartu As	SIM One-2-Call 99	New Hotlink Plan	Hi card
Connection Charges				6.294	0.854	N/A	2.953	2.567	5.686
Subscription (rental) fee				N/A	N/A	N/A	N/A	N/A	0
Free minutes (in local currency)					N/A	N/A	N/A	0.000	N/A
Usage charges	Fixed	Incoming	Peak	N/A	N/A	N/A	N/A	N/A	0.114
			Off-peak						0.057
			Weekend						0.057
		Outgoing	Peak	0.049	0.160	0.083	0.030	0.114	0.114
			Off-peak	N/A	N/A	N/A	0.030	N/A	0.057
			Weekend	N/A	N/A	N/A	N/A	N/A	0.057
	On-net	Incoming	Peak	N/A	N/A	N/A	N/A	N/A	0.114
			Off-peak						0.057
			Weekend						0.057
		Outgoing	Peak	0.049	0.139	0.083	0.035	0.096	0.114
			Off-peak	N/A	N/A	N/A	0.035	N/A	0.057
			Weekend	N/A	N/A	N/A	N/A	N/A	0.057
	Off-net	Incoming	Peak	N/A	N/A	N/A	N/A	N/A	0.114
			Off-peak						0.057
			Weekend						0.057
		Outgoing	Peak	0.070	0.160	0.083	0.030	0.114	0.114
			Off-peak	N/A	N/A	N/A	0.030	N/A	0.057
			Weekend	N/A	N/A	N/A	N/A	N/A	0.057
Voicemail		Deposit	Peak/offpeak	0.049	Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs (incoming charges also apply)
		Retrieval	Peak/offpeak	0.014	0.139	Std outgoing onnet tariffs	Std outgoing onnet tariffs	0.058	0.071
Free SMSs				N/A	N/A	100.000	N/A	N/A	N/A
SMS charges		Basic charge		N/A	0.021	0.011	0.060	N/A	0.036
		On-net		0.010	N/A	N/A	N/A	0.020	N/A
		Off-net		0.028	N/A	N/A	N/A	0.044	N/A
MMS charges		Incoming		N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Onnet	0.066	42.722	0.000	0.030	0.096	2.843
			Offnet	0.066	42.722	0.000	0.060	0.096	2.843
Exchange rate: USD 1 =				1430.000	46.814	9354.540	33.529	3.428	1.407
				MNT	PHP	IDR	THB	MYR	SGD
Source					http://www.oanda.com/				

POST-PAID				MONGOLIA	PHILIPPINES	INDONESIA		THAILAND (AIS)	MALAYSIA	SINGAPORE
				Zone160	Smart Gold Lite 300	Kartu Helo		GSM Net SIM 99	Value First	iOne Super Value
						Local	National			
Connection Charges				26.573	N/A		0.000	0.000	N/A	30.421
Subscription (rental) fee				6.294	6.408		0.000	2.953	0.003	10.662
Free minutes (in minutes)				N/A	N/A		N/A	N/A	N/A	80
Free minutes (in value)				0.000					0.003	
Usage charges	Fixed	Incoming	Peak	N/A	N/A		N/A	N/A	N/A	0.000
			Off-peak							
			Weekend							
			Other							
		Outgoing	Peak	0.052	0.163	0.070	0.096	0.037	0.058	0.152
			Off-peak		N/A		N/A	N/A	N/A	0.107
			Weekend		N/A		N/A	N/A	N/A	N/A
	On-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A	0.000
			Off-peak							
			Weekend							
			Other							
		Outgoing	Peak	0.031	0.043	0.070	0.091	0.037	0.053	0.152
			Off-peak		N/A		N/A	N/A	N/A	0.107
			Weekend		N/A		N/A	N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A	0.000
			Off-peak							
			Weekend							
			Other							
		Outgoing	Peak	0.052	0.163	0.070	0.128	0.037	0.058	0.152
			Off-peak		N/A		N/A	N/A	N/A	0.107
			Weekend		N/A		N/A	N/A	N/A	N/A
Voicemail		Deposit	Peak/offpeak	0.031	Std outgoing tariffs		Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs	Std outgoing tariffs (incoming charges also apply)
		Retrieval	Peak/offpeak	0.013	0.139		Std outgoing onnet tariffs	Std outgoing onnet tariffs	0.058	0.071
		Rate		per min	per min		per min	per min	per call	per sms
Free SMSs				N/A	75.000		N/A	N/A	500.000	50.000
SMS charges		Basic charge		N/A	0.022		N/A	0.060	N/A	0.038
		On-net		0.013	N/A		0.013	N/A	0.029	N/A
		Off-net		0.025	N/A		0.016	N/A	0.029	N/A
MMS charges		Incoming		N/A	N/A		N/A	N/A	N/A	N/A
		Outgoing	Onnet	90.000	5.000		2000.000	4.000	0.250	0.321
			Offnet	90.000	5.000		2000.000	4.000	0.500	0.321
Exchange rate: USD 1 =				1,430.00	46.814		9354.540	33.529	3.428	1.407
				MNT	PHP		IDR	THB	MYR	SGD
Source				http://www.oanda.com/						

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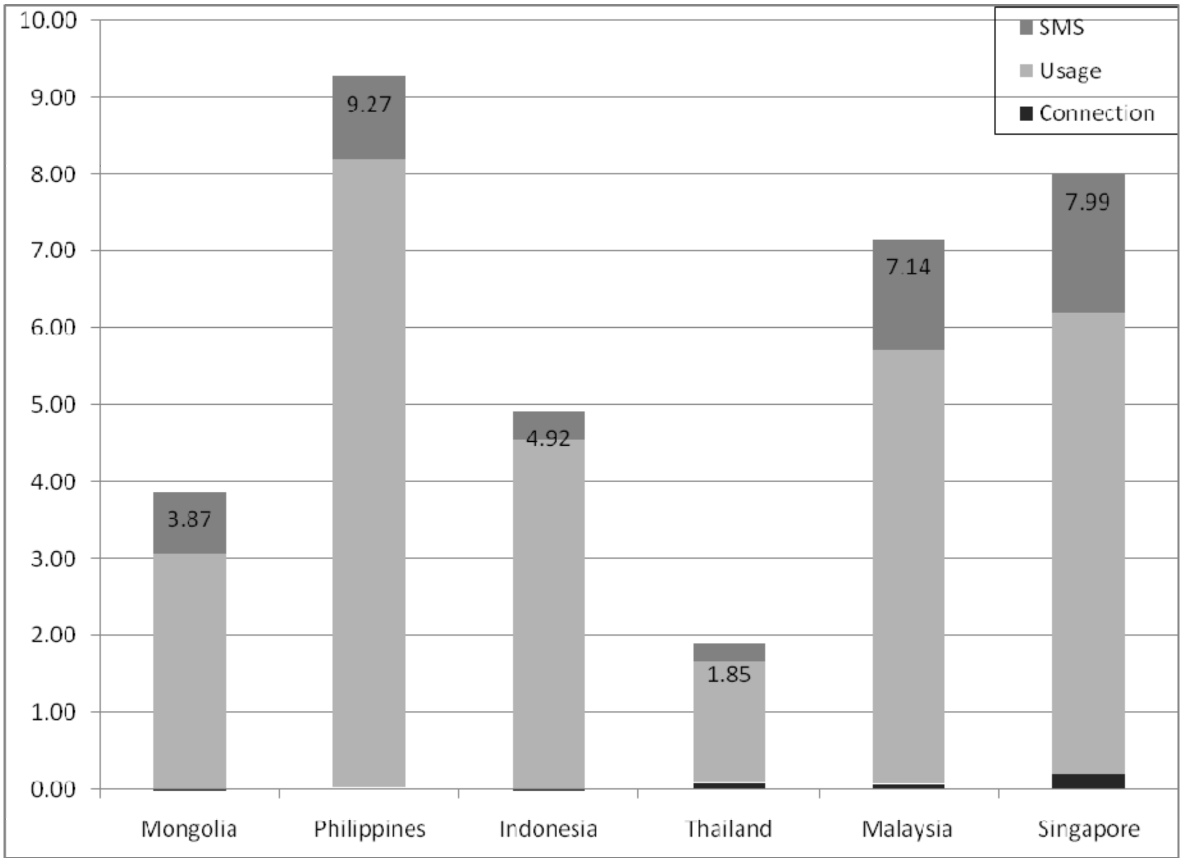
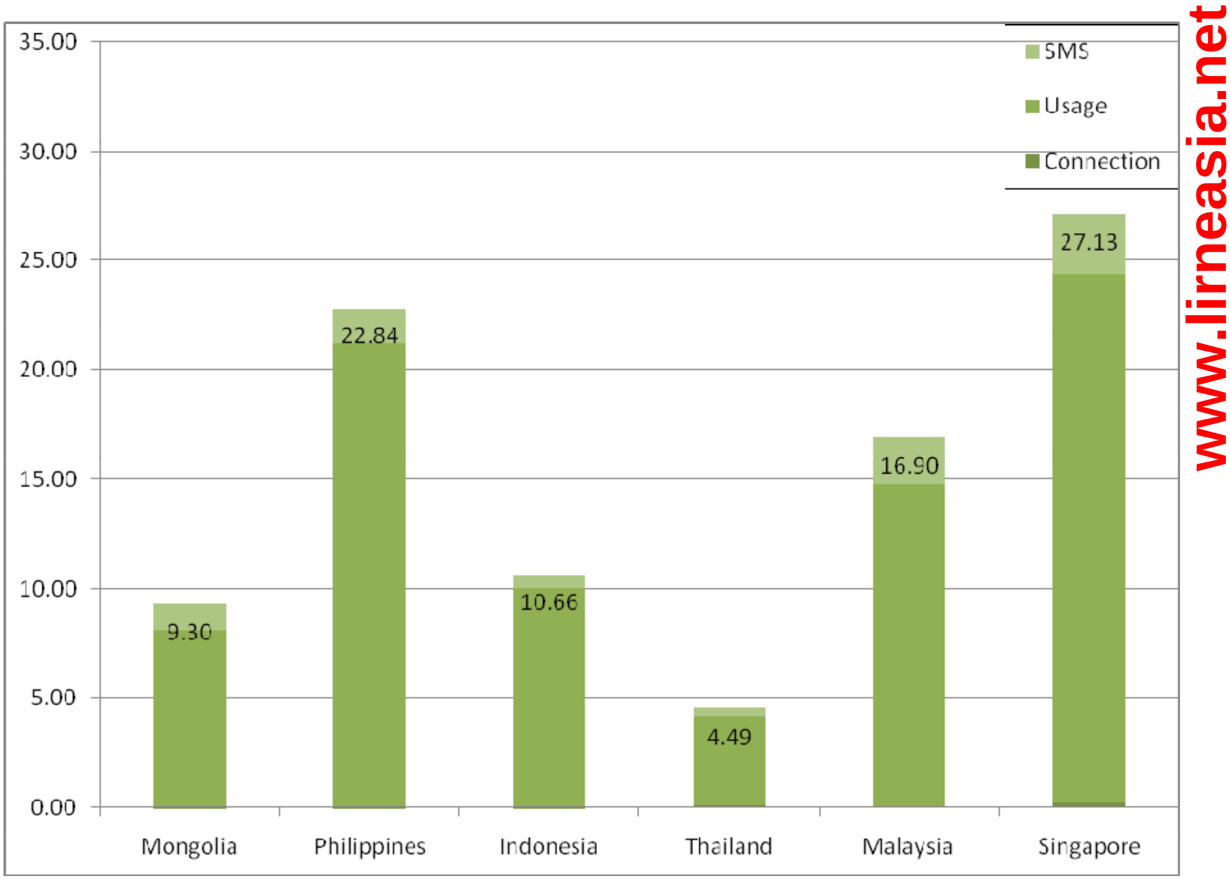
October 2009

Mobile price baskets (USD)

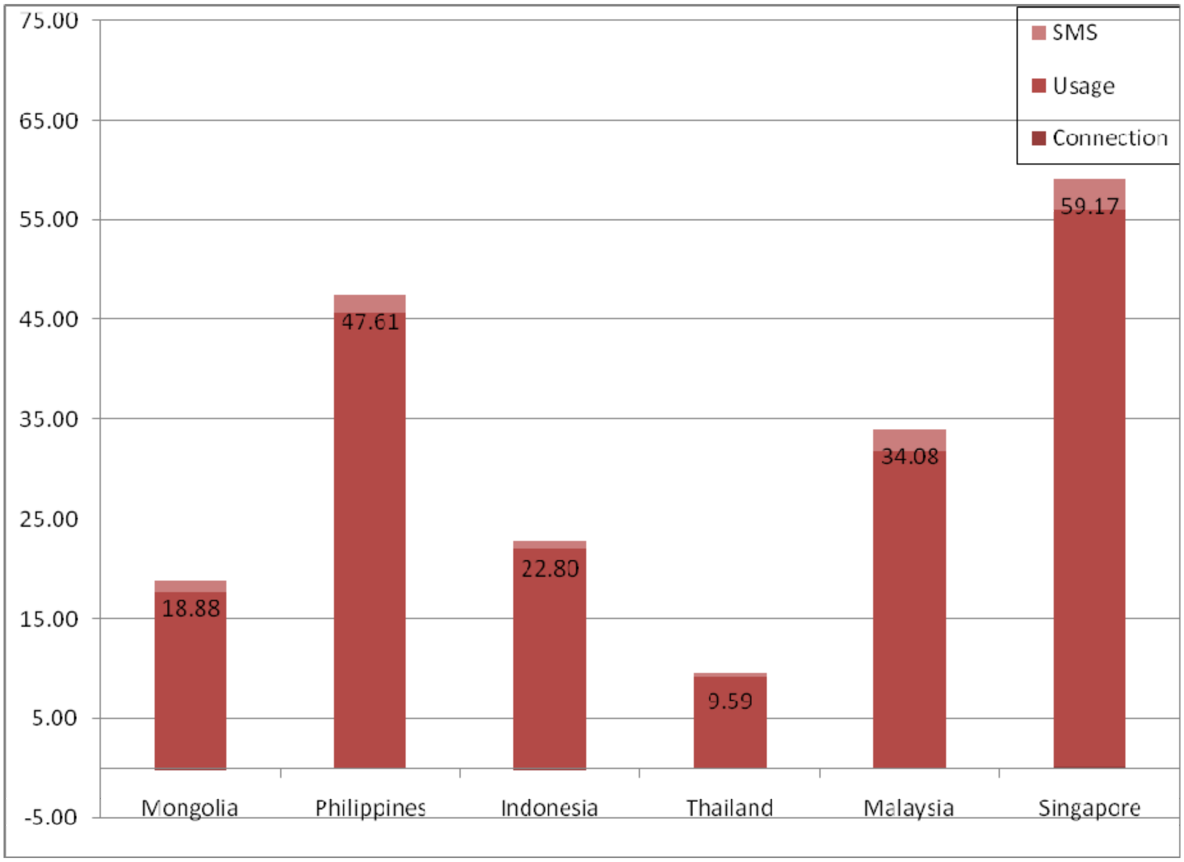
Average monthly prepaid mobile cost for a Low User, USD



Average monthly prepaid mobile cost for a Medium User, USD



Average monthly prepaid mobile cost for a High User, USD



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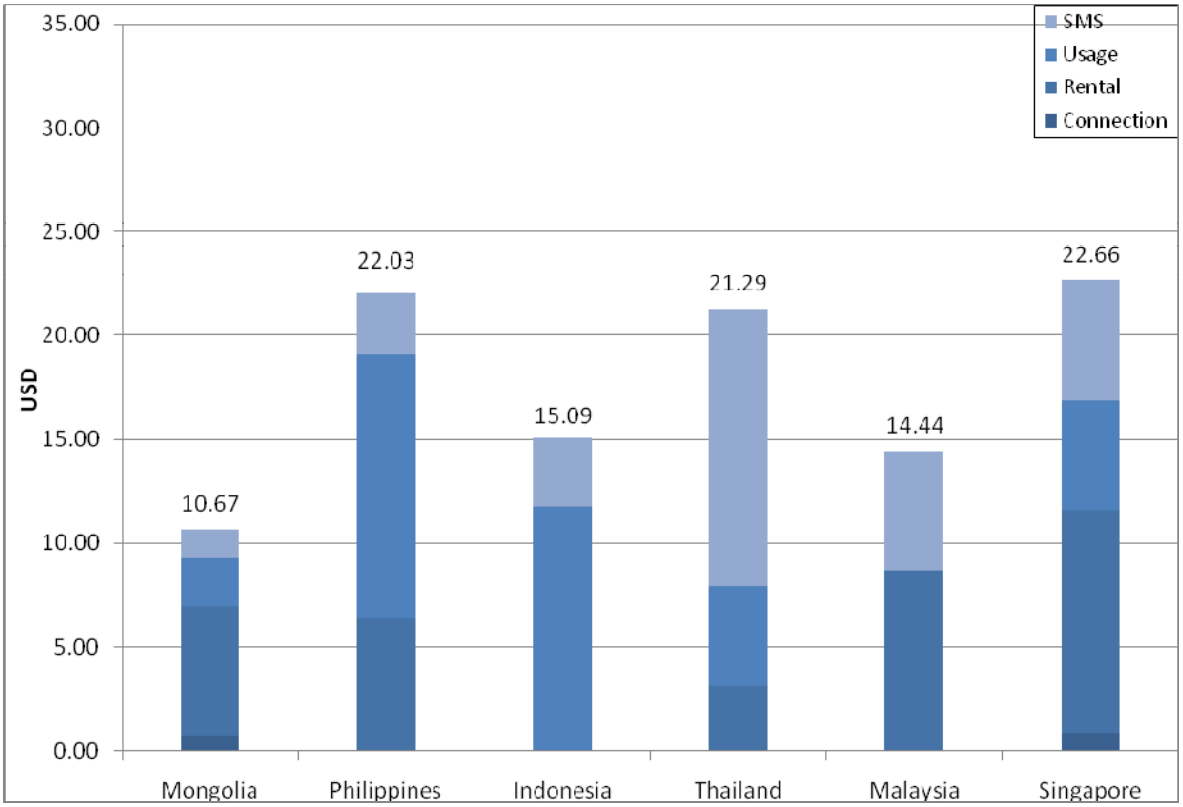
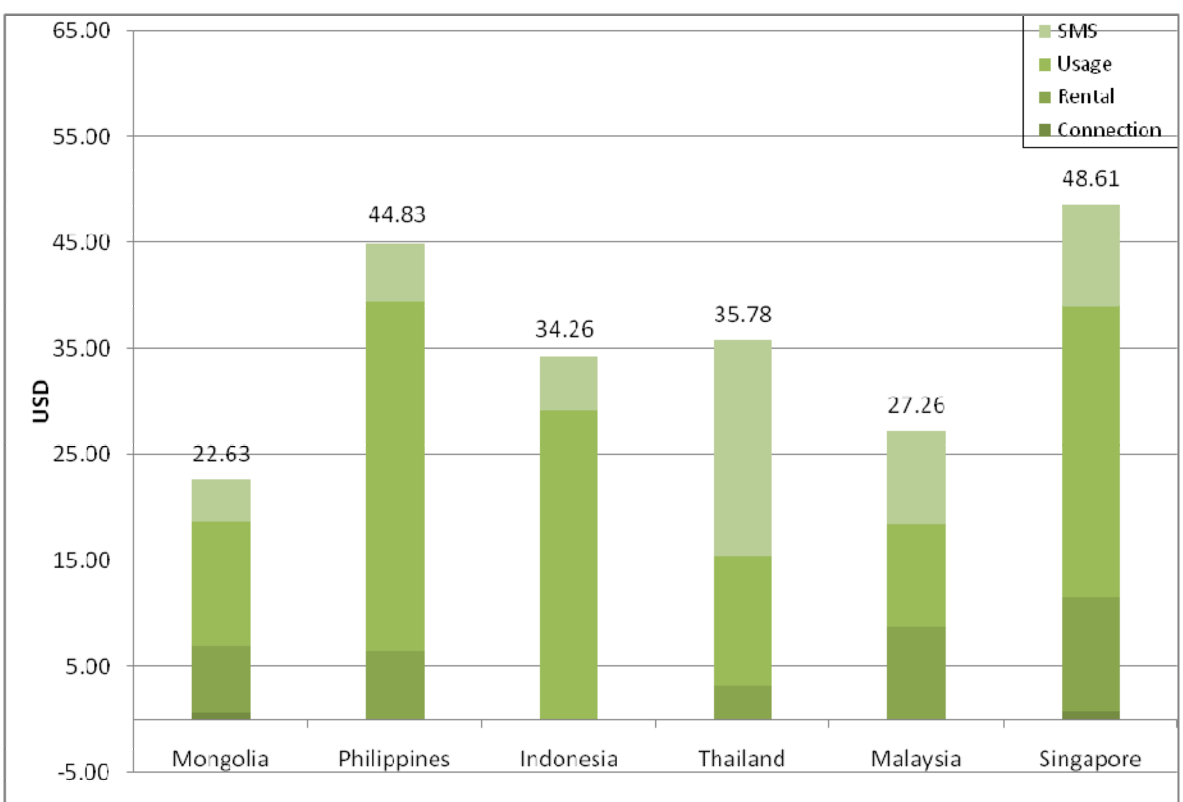
Average monthly postpaid mobile cost for a Low User, USD



Average monthly postpaid mobile cost for a Medium User, USD



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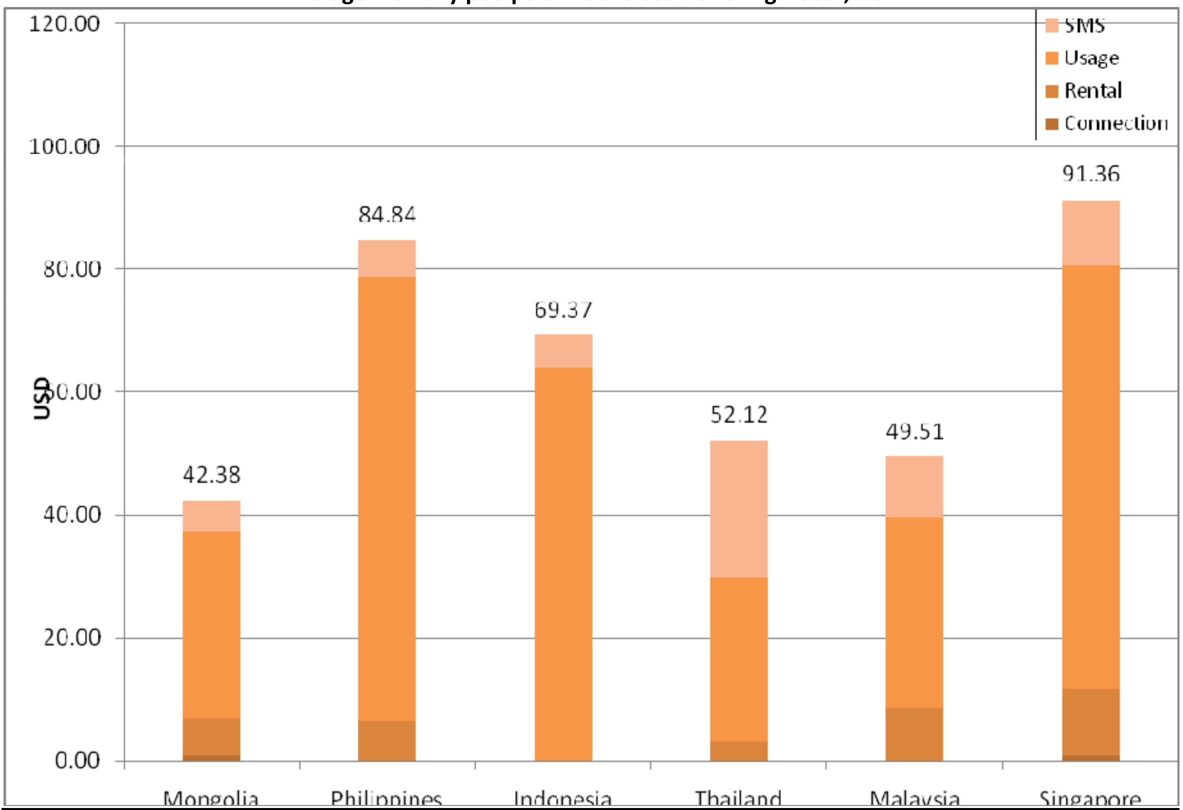
Average monthly postpaid mobile cost for a High User, USD



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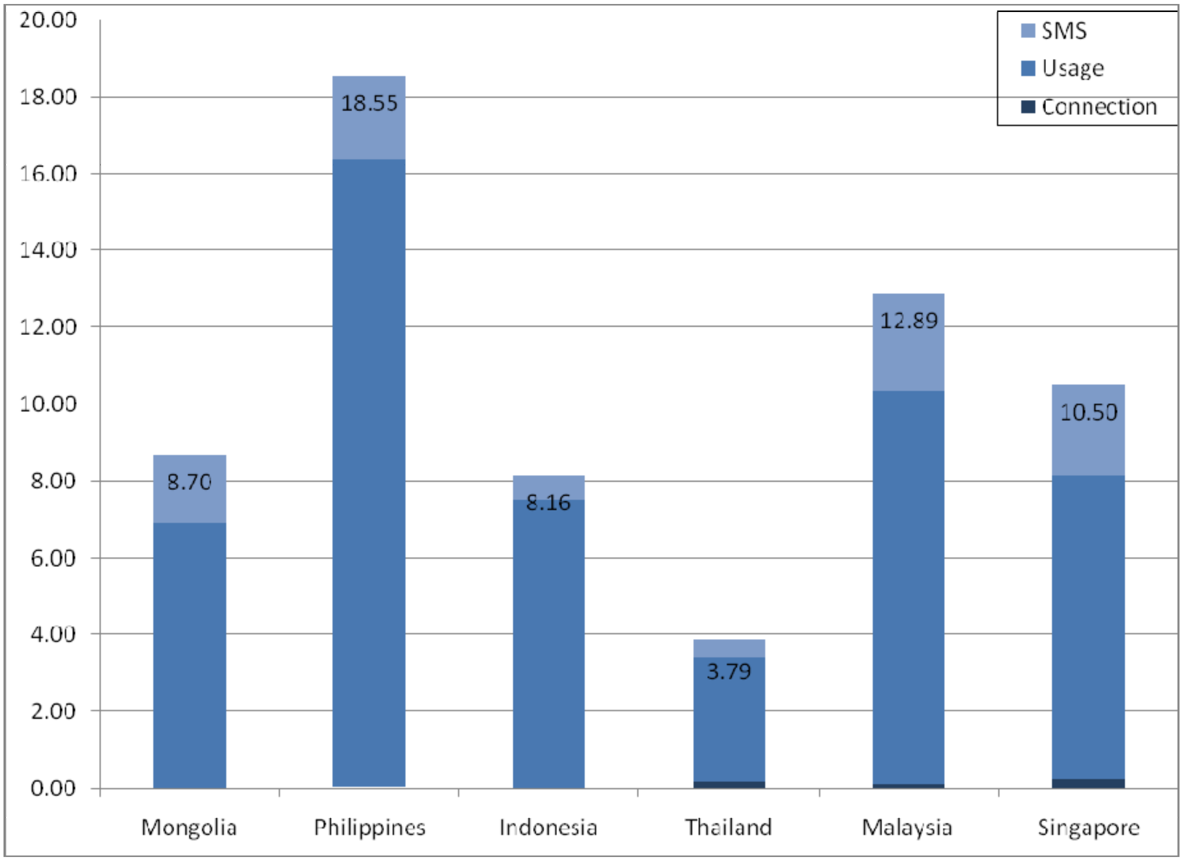
Mobile price baskets (USD PPP)

Average prepaid monthly mobile cost for a Low User, USD PPP



Average prepaid monthly mobile cost for a Medium User, USD PPP

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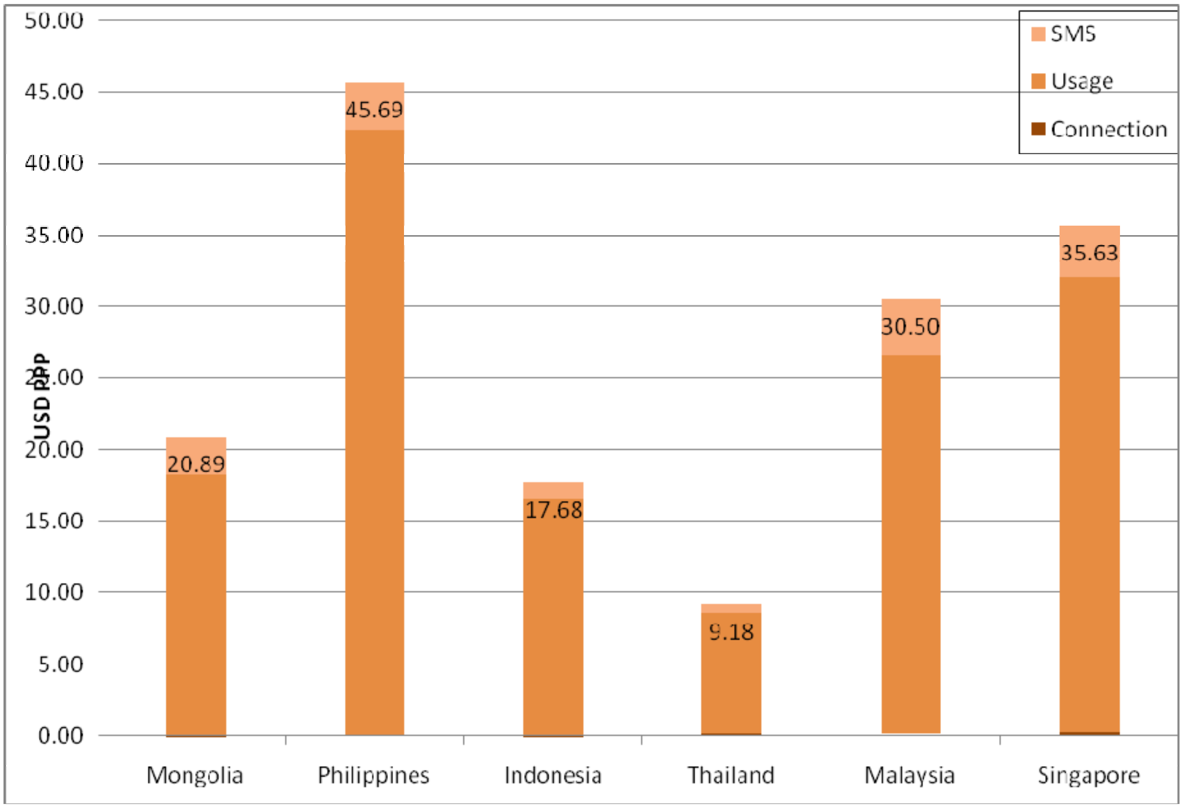

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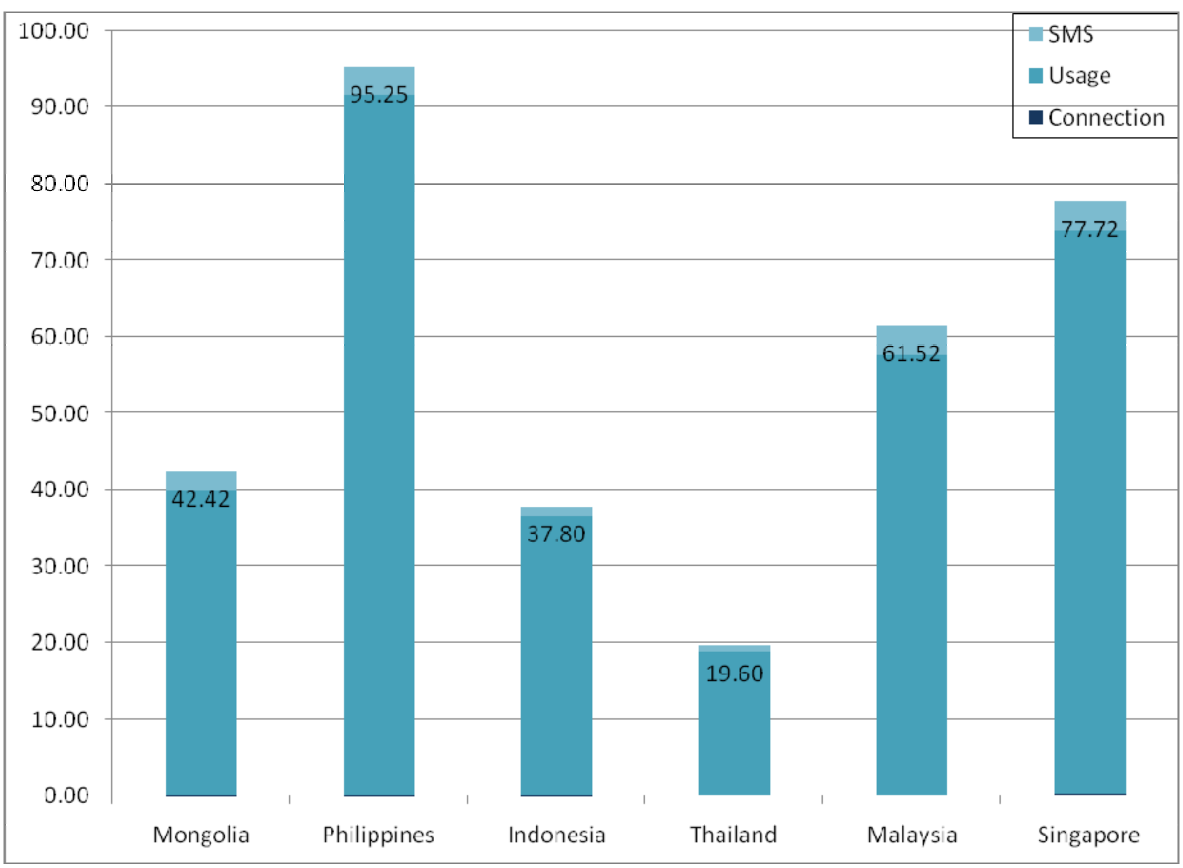
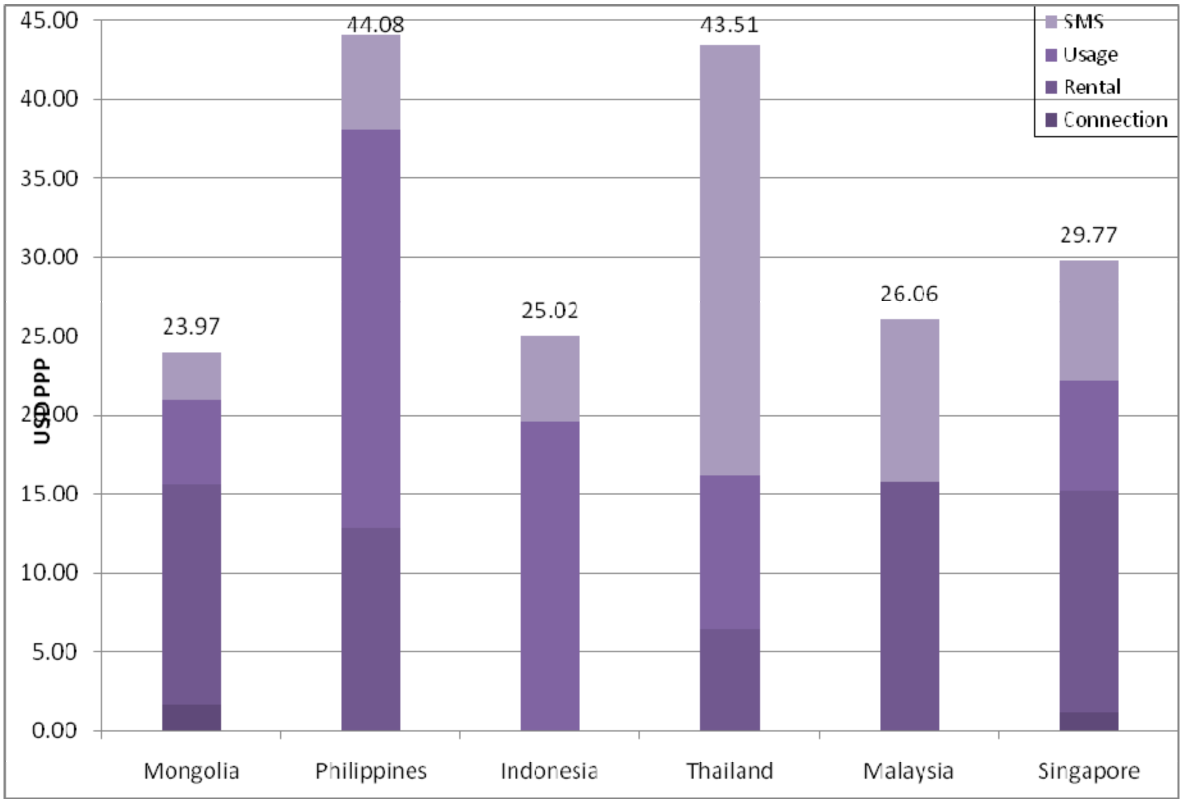
Average prepaid monthly mobile cost for a High User, USD PPP



Average postpaid monthly mobile cost for a Low User, USD PPP



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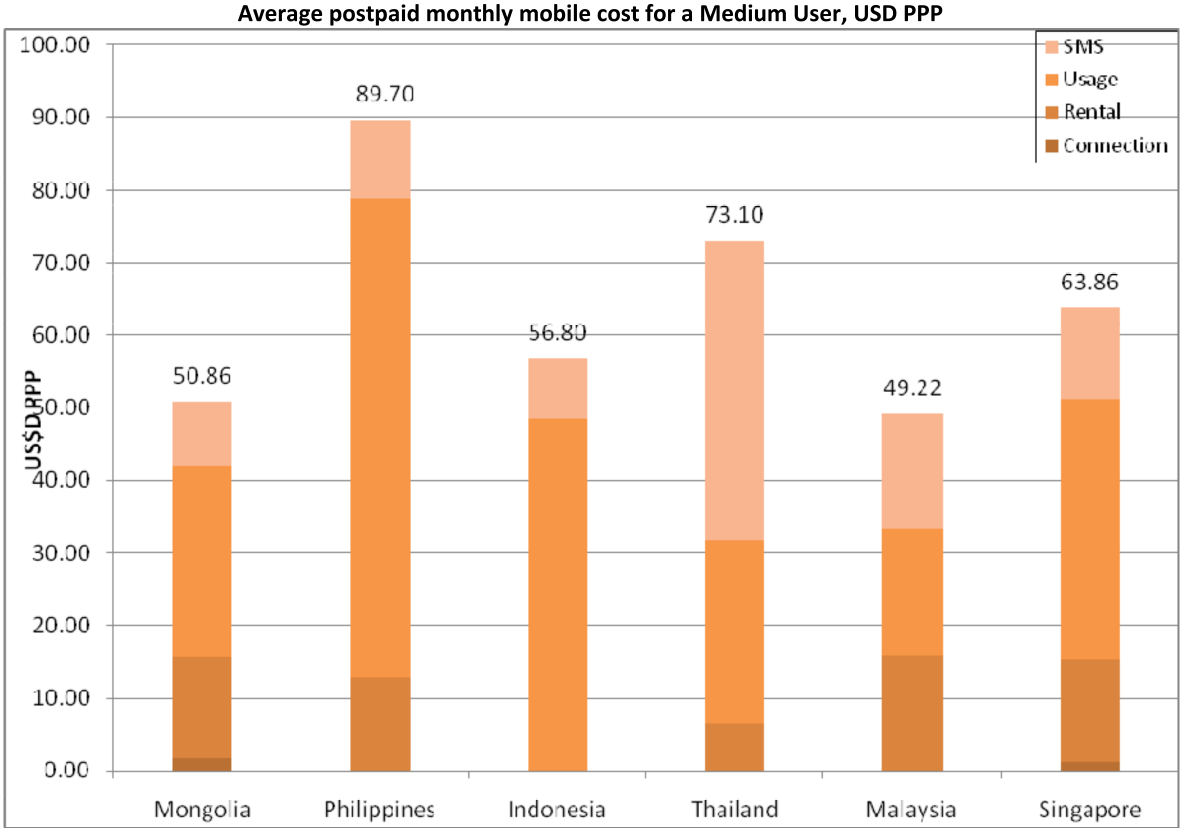
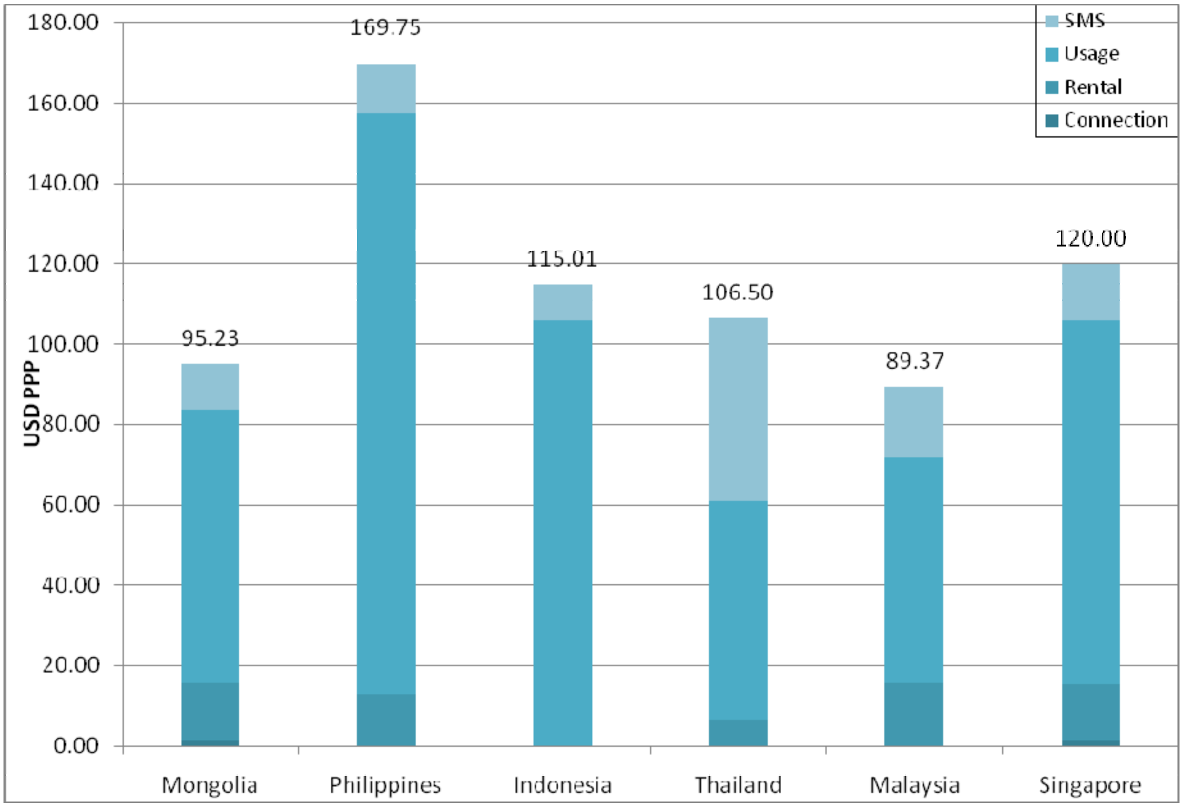
Average postpaid monthly mobile cost for a Medium User, USD PPP



Average postpaid monthly mobile cost for a High User, USD PPP



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Notes

1. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp. MMS and Voicemail charges and use were excluded from calculation of the basket.

2. Prepaid and postpaid baskets were based on Minutes of Use [MOU] data from Indonesia (Telkomsel, June 2009) Malaysia (Celcom, June 2009), Philippines (SMART, June 2009) , Thailand (AIS, June 2009 and Singapore (SingTel, June 2009) and SMS data from Indonesia (Telkomsel, June 2009) and the Philippines (SMART[1] June 2009) Tariff data was based on data for October 2009. Subscriber data was based on data individually reported by the respective operators.

3. A weighted average of MOU and SMS usage based on these four countries and their respective subscriber numbers was used for the calculation of prepaid and postpaid baskets for all five countries.

4. OECD call distributions by duration, destination, and time of day were used since relevant data for all five countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.

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[1] Bucket-priced SMS data was excluded from the basket

MOBILE PRICE BASKETS (OCTOBER 2009)

Background

Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
   a. The price of the handset and handset subsidies are **not** taken into account in the basket.
   b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
   c. Monthly rental charges and any optional charges that may apply to the package.
   d. The usage profile will also include a number of SMS messages per month.
   e. The three user baskets that are taken into consideration are:
      - *Low user basket*
      - *Medium user basket*
      - *High user basket*
   f. Different baskets were calculated for prepaid and postpaid plans.
   g. The baskets compositions[2] used are as follows:

	OECD[3]	**Prepaid basket**	**Postpaid basket**
Voice, minutes of use per month			
Low User	46	55	129
Medium User	119	142	334
High User	256	306	721
SMS per month			
Low User	33	50	211
Medium User	50	76	320
High User	55	84	352

2. *Call destination (in minutes):*

[2] OECD methodology includes MMS data in addition to call and SMS data; however, this component has been removed from our basket comparisons.

[3] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).

a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.
b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	Low User	Medium User	High User
Local, Fixed line	0.16	0.15	0.14
National, Fixed line	0.08	0.08	0.08
On-net, Mobile	0.52	0.52	0.51
Off-net, Mobile	0.24	0.26	0.28
Voicemail[4]	0.00	0.00	0.00

3. *SMS destination:*
   a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
   b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	Low user	Medium user	High user
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
   a. Peak at weekdays – most expensive time in a 24-hour day
   b. Off-peak at weekdays – cheapest time in a 24-hour day
   c. Weekend – at daytime Saturdays and/or Sundays
   d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	Medium User	High User
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
   a. Local and national fixed line calls
   b. Same network mobile calls (On-net)
   c. Other network mobile calls (Off-net)
   d. Voicemail calls
   e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8

[4] As of February 2006, OECD baskets take voicemail into consideration; however this service/feature is not included in the Asian-based baskets at this time (due to low use and/or even the lack of provision of this service) and the OECD call distributions have been adjusted accordingly.

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*
    a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
    b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
    a. The largest operator (by subscriber numbers) in each country is considered.
    b. The cheapest tariff plan of the largest operator is considered:
        - for prepaid – plans with the lowest connection charges; and
        - for postpaid – plans with the lowest rental are considered.

        These plans are applied across all three baskets (low, medium and high).[5]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in US$ and US$ PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.
    b. Incoming call charges have been considered in the construction of the baskets, on the assumption that outgoing minutes = incoming minutes.

Tariff packages

1. Mongolia - Mobicom
    a. Prepaid – Be
    b. Postpaid – Zone160

2. Philippines – SMART Communications
    a. Prepaid – Smart Buddy
    b. Postpaid – Smart Gold Lite 300

3. Indonesia - Telkomsel
    a. Prepaid – Kartu As
    b. Postpaid – Kartu Helo

4. Thailand – Advanced Info Service (AIS) Plc.
    a. Prepaid – SIM One-2-call 99
    b. Postpaid – GSM Net SIM 99

5. Malaysia – Maxis Communications

[5] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

a. Prepaid – New Hotlink Plan
b. Postpaid – Value First

6. Singapore – SingTel
   a. Prepaid – Hi Card
   b. Postpaid – *i*One Super Value

Mobile tariff comparison

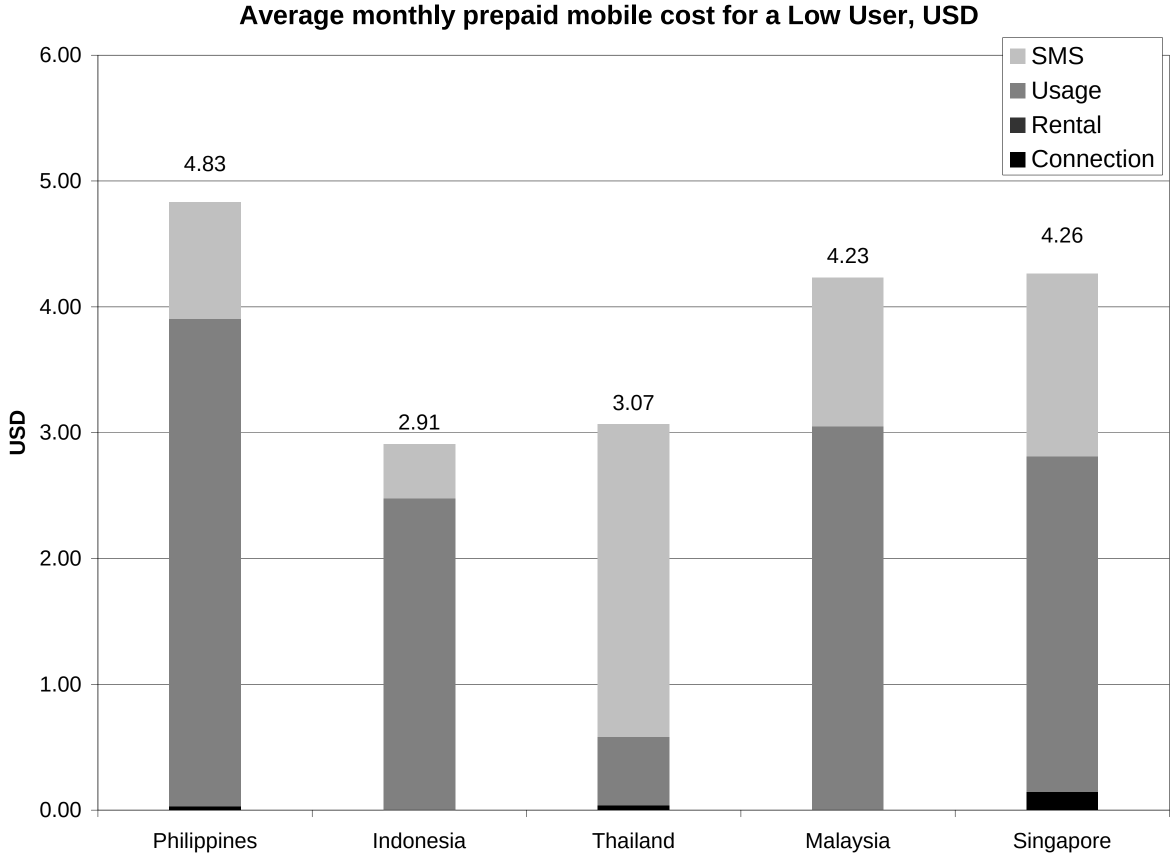
				MONGOLIA	PHILIPPINES	INDONESIA	THAILAND	MALAYSIA	SINGAPORE
				Be	Smart Buddy	Kartu As	SIM One-2-Call 99	New Hotlink Plan	Hi card
Connection Charges				6.198	0.857	N/A	2.928	2.554	7.162
Subscription (rental) fee				N/A	N/A	N/A	N/A	N/A	0
Free minutes (in local currency)					N/A	N/A	N/A	1.161	N/A
Usage charges	Fixed	Incoming	Peak						0.115
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.057
			Weekend						0.057
		Outgoing	Peak	0.069	0.161	0.083	0.030	0.113	0.115
			Off-peak	N/A	N/A	N/A	0.030	N/A	0.057
			Weekend	N/A	N/A	N/A	N/A	N/A	0.057
	On-net	Incoming	Peak						0.115
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.057
			Weekend						0.057
		Outgoing	Peak	0.048	0.139	0.083	0.030	0.096	0.115
			Off-peak	N/A	N/A	N/A	0.004	N/A	0.057
			Weekend	N/A	N/A	N/A	N/A	N/A	0.057
	Off-net	Incoming	Peak						0.115
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.057
			Weekend						0.057
		Outgoing	Peak	0.069	0.161	0.083	0.030	0.113	0.115
			Off-peak	N/A	N/A	N/A	0.030	N/A	0.057
			Weekend	N/A	N/A	N/A	N/A	N/A	0.057
Free SMSs				N/A	N/A	500	N/A	N/A	N/A
SMS charges		Basic charge		N/A	0.021	0.011	0.005	N/A	0.036
		On-net		0.010	N/A	N/A	N/A	0.020	N/A
		Off-net		0.028	N/A	N/A	N/A	0.044	N/A
Exchange rate: USD 1 =				1451.980	46.672	9425.070	33.810	3.446	1.396
				MNT	PHP	IDR	THB	MYR	SGD
Source					http://www.oanda.com/				

POST-PAID	MONGOLIA	PHILIPPINES	INDONESIA		THAILAND (AIS)	MALAYSIA	SINGAPORE
	Zone160	**Smart Gold Lite 300**	**Kartu Helo**		**GSM Net SIM 99**	**Value First**	**iOne Super Value**
			Local	**National**			
Connection Charges	26.171	N/A	0.000		0.000	N/A	30.652

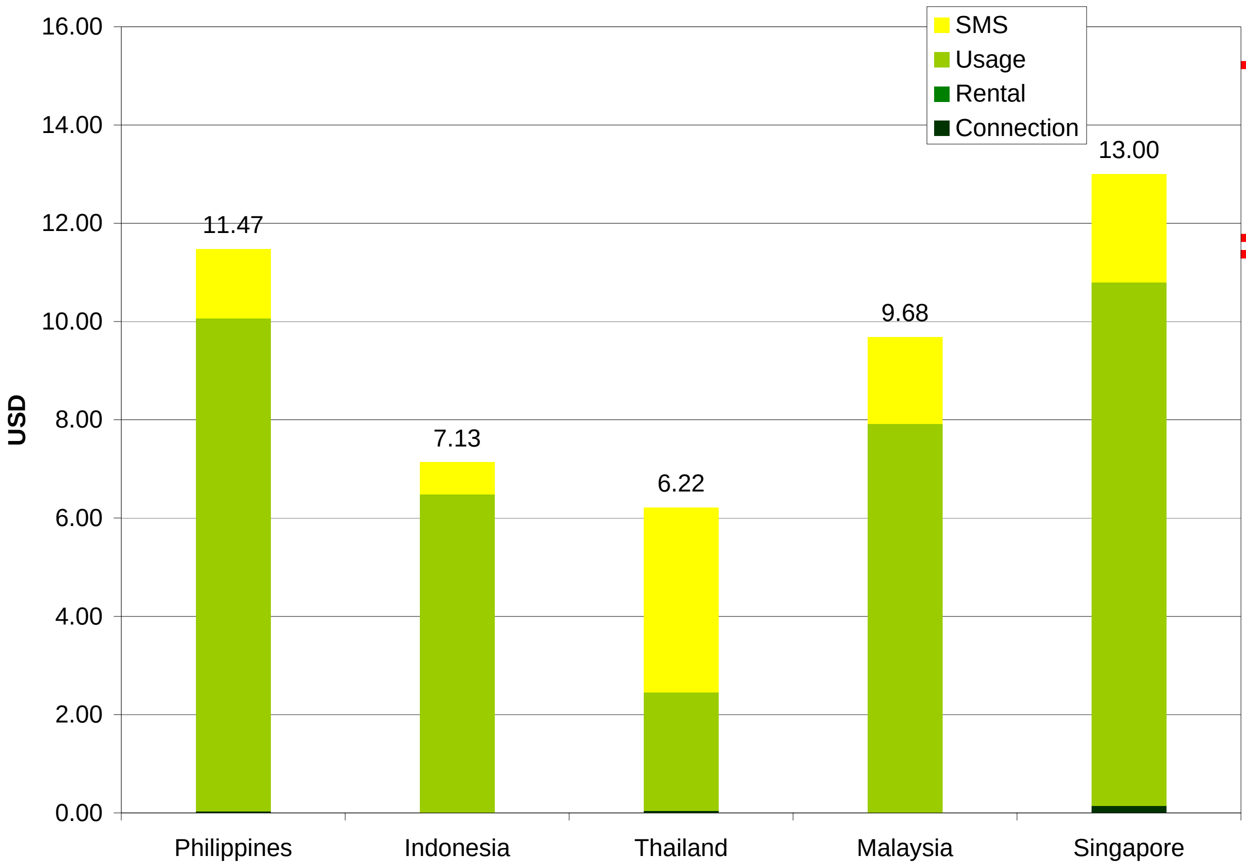
Subscription (rental) fee				6.198	6.428	0.000		2.928	0.003	10.742
Free minutes (in minutes)				N/A	N/A	N/A		N/A	N/A	80
Free minutes (in value)				6.198					0.003	
Usage charges	Fixed	Incoming	Peak	N/A	N/A	N/A		N/A	N/A	0.000
			Off-peak							
			Weekend							
			Other							
		Outgoing	Peak	0.062	0.164	0.069	0.095	0.037	0.058	0.107
			Off-peak		N/A	N/A		N/A	N/A	N/A
			Weekend		N/A	N/A		N/A	N/A	N/A
	On-net	Incoming	Peak	N/A	N/A	N/A		N/A	N/A	0.000
			Off-peak							
			Weekend							
			Other							
		Outgoing	Peak	0.038	0.043	0.069	0.090	0.037	0.052	0.107
			Off-peak		N/A	N/A		N/A	N/A	N/A
			Weekend		N/A	N/A		N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A	N/A	N/A		N/A	N/A	0.000
			Off-peak							
			Weekend							
			Other							
		Outgoing	Peak	0.062	0.164	0.069	0.127	0.037	0.058	0.107
			Off-peak		N/A	N/A		N/A	N/A	N/A
			Weekend		N/A	N/A		N/A	N/A	N/A
Free SMSs				N/A	75	N/A		N/A	500	50
SMS charges		Basic charge		N/A	0.022	N/A		0.059	N/A	0.036
		On-net		0.013	N/A	0.013		N/A	0.029	N/A
		Off-net		0.025	N/A	0.016		N/A	0.029	N/A
Exchange rate: USD 1 =				1,451.98	46.672	9425.070		33.810	3.446	1.396
				MNT	PHP	IDR		THB	MYR	SGD
Source				http://www.oanda.com/						

February 2009

Mobile price baskets (USD)



Average monthly prepaid mobile cost for a Medium User, USD



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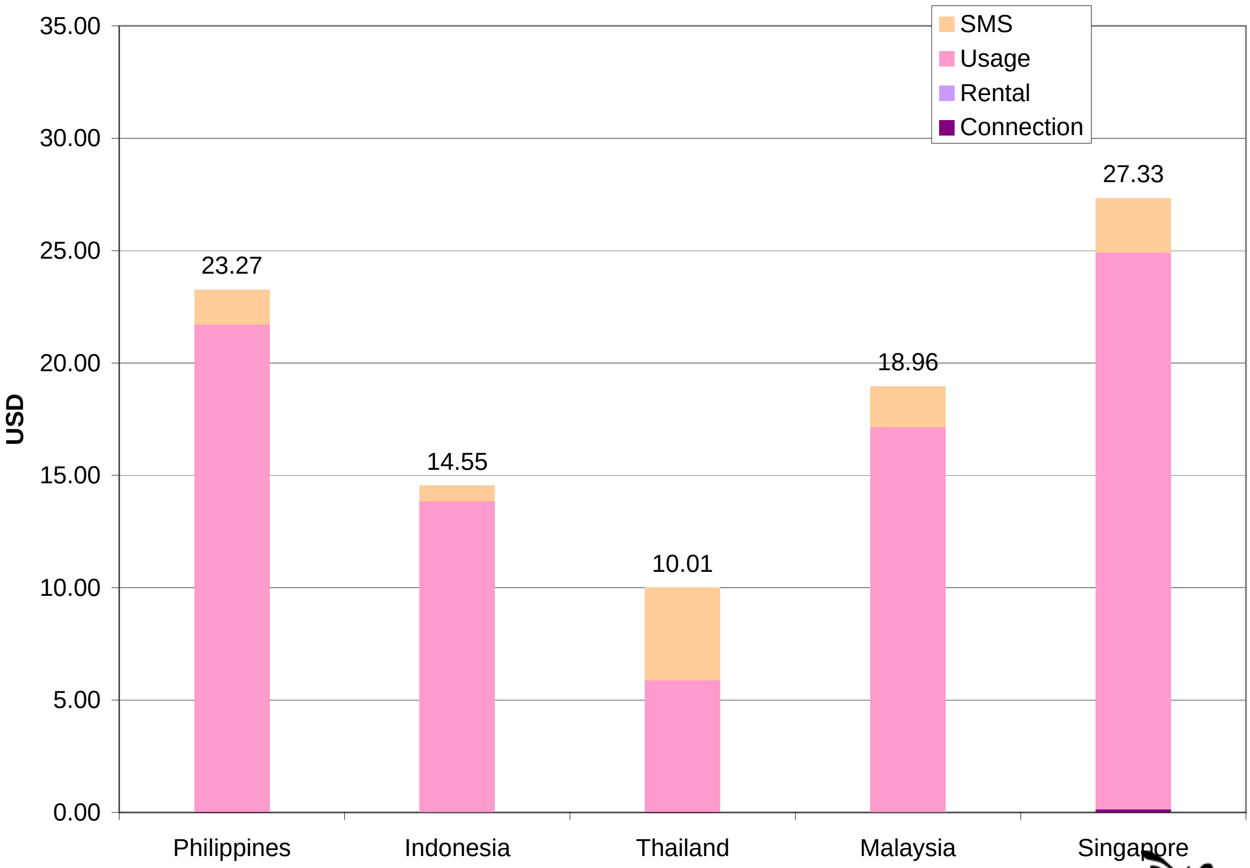
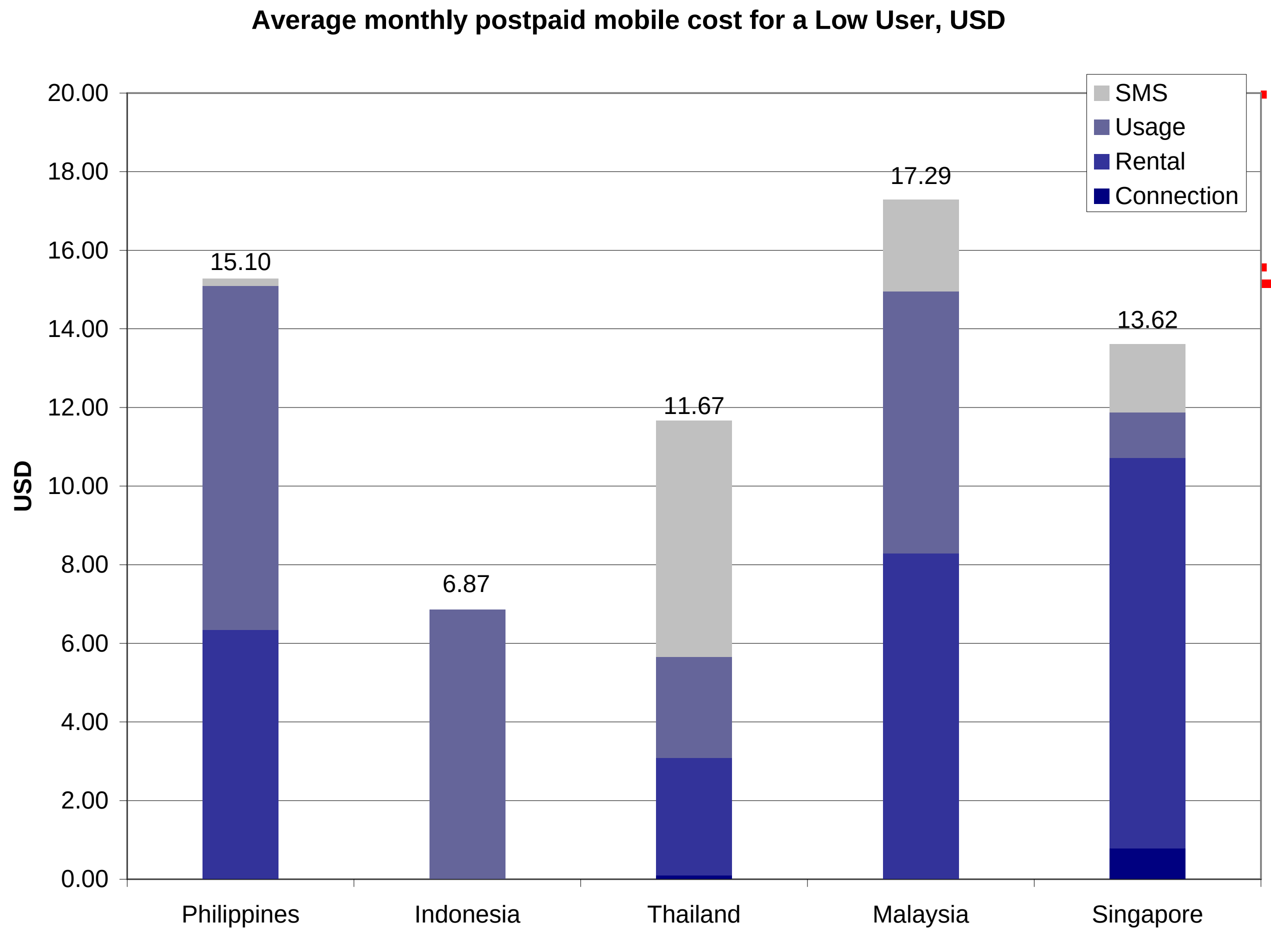
Average monthly prepaid mobile cost for a High User, USD





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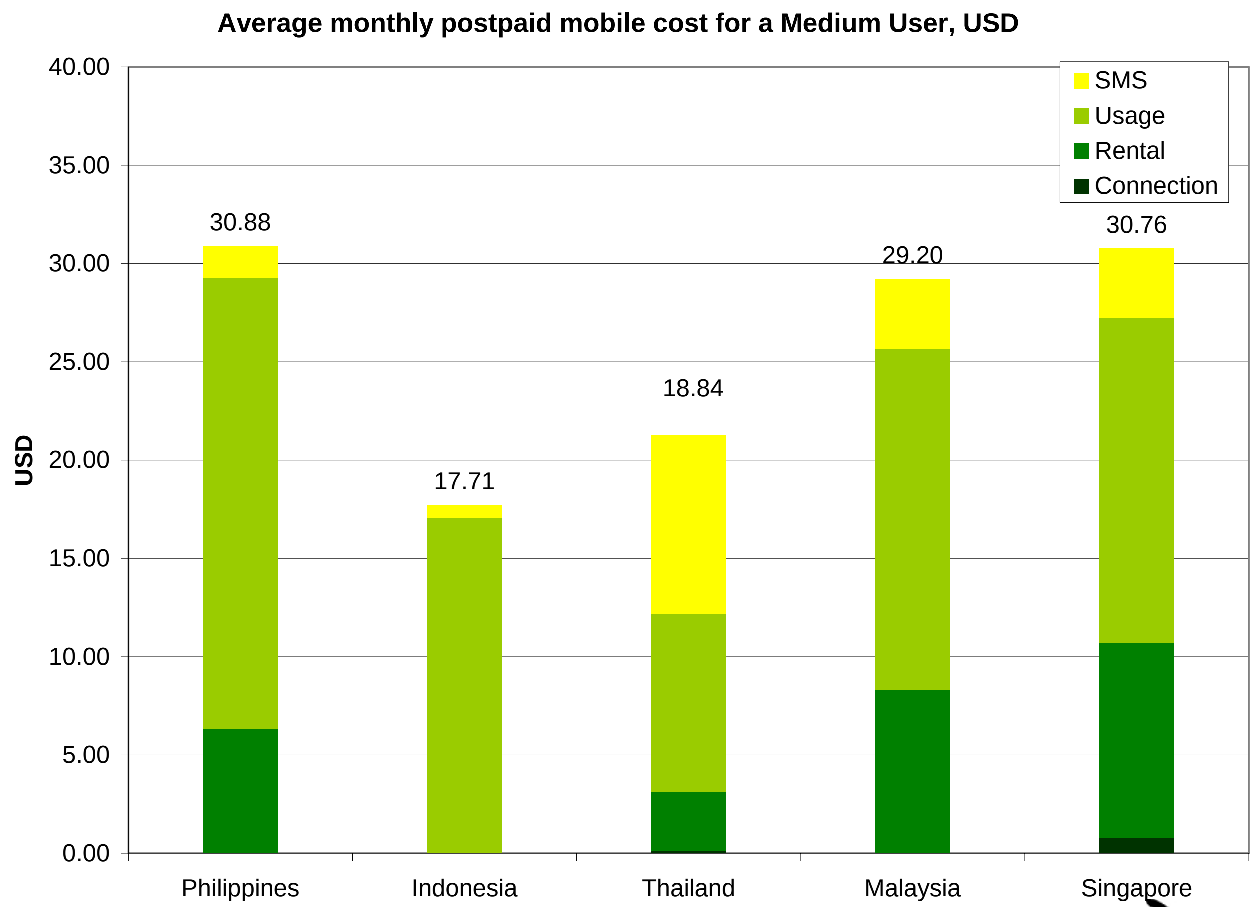

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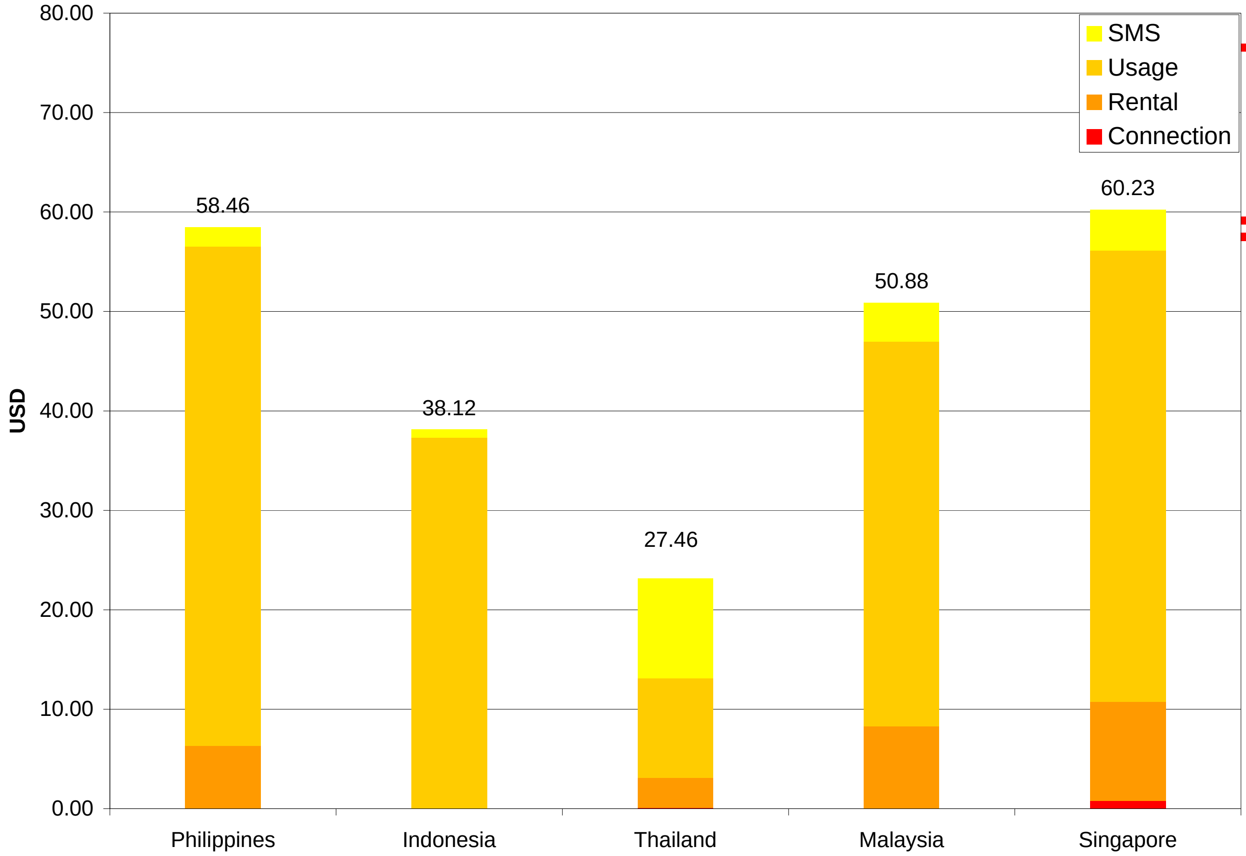

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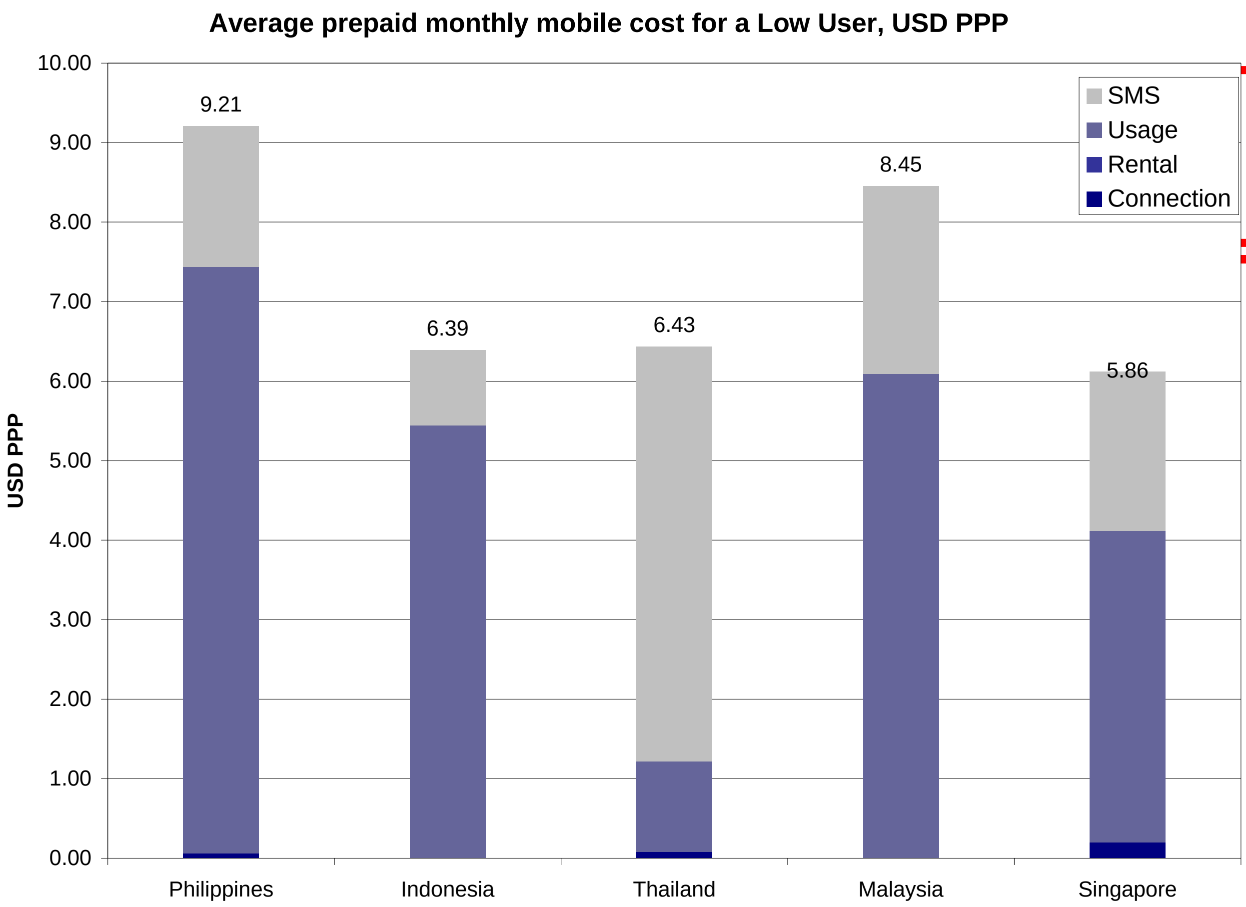
Mobile price baskets (USD PPP)



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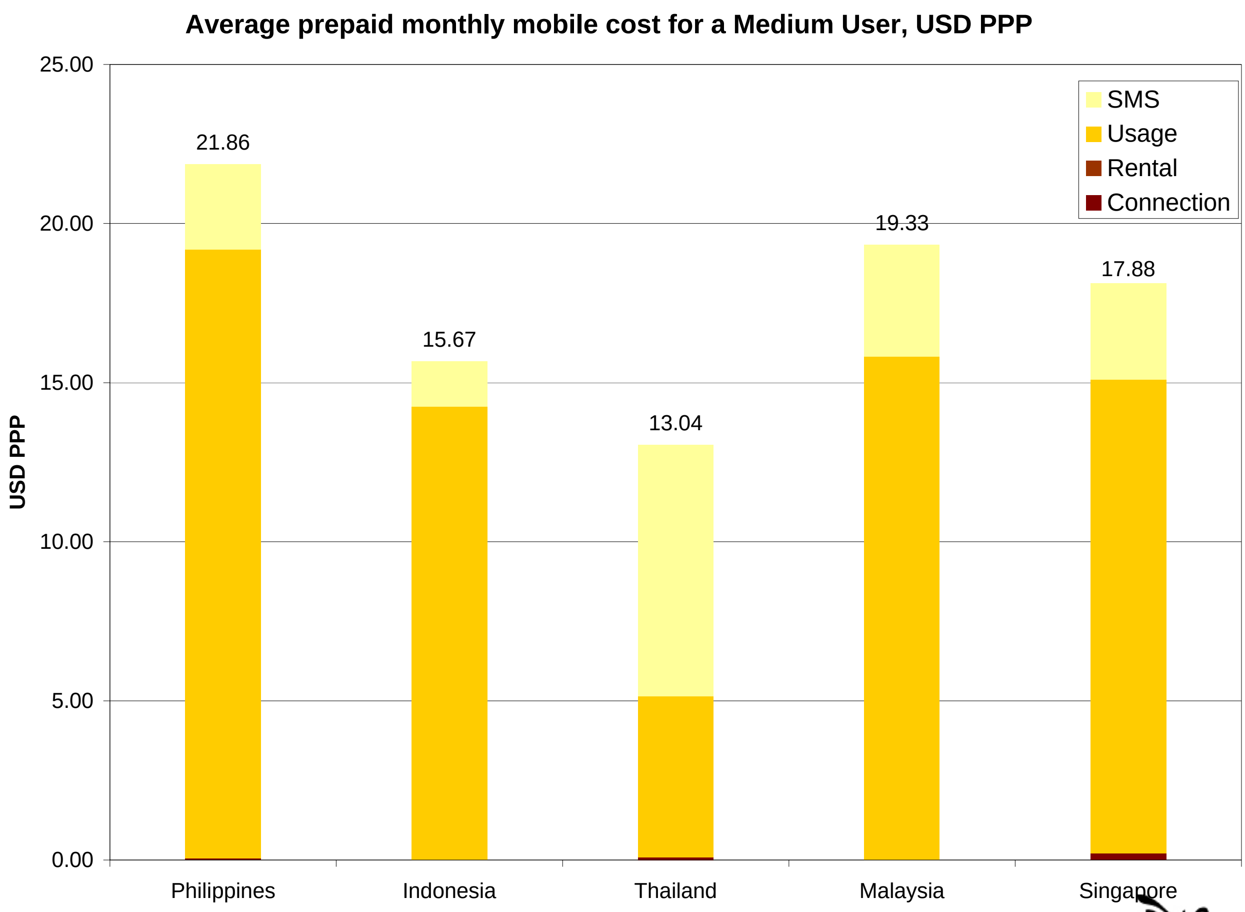

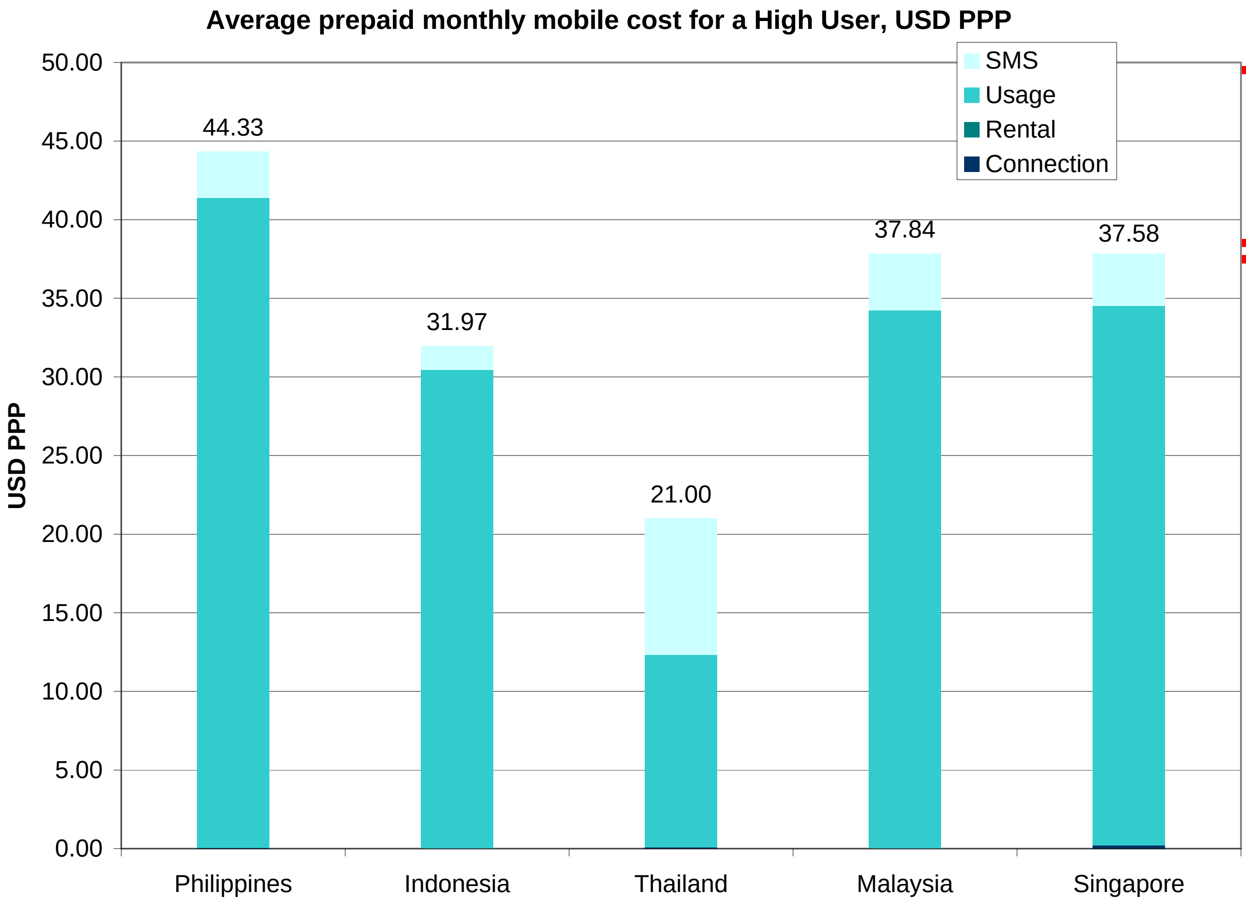

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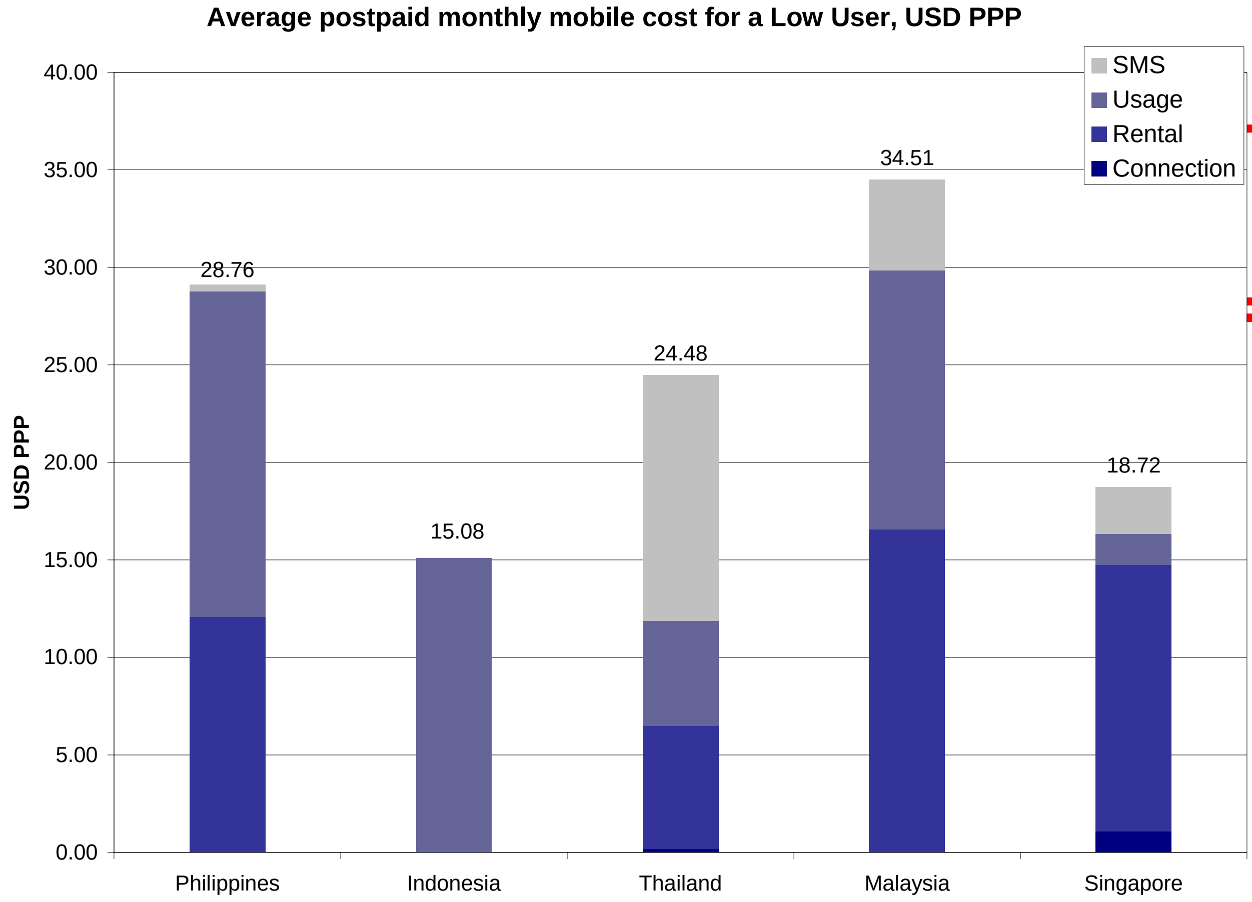

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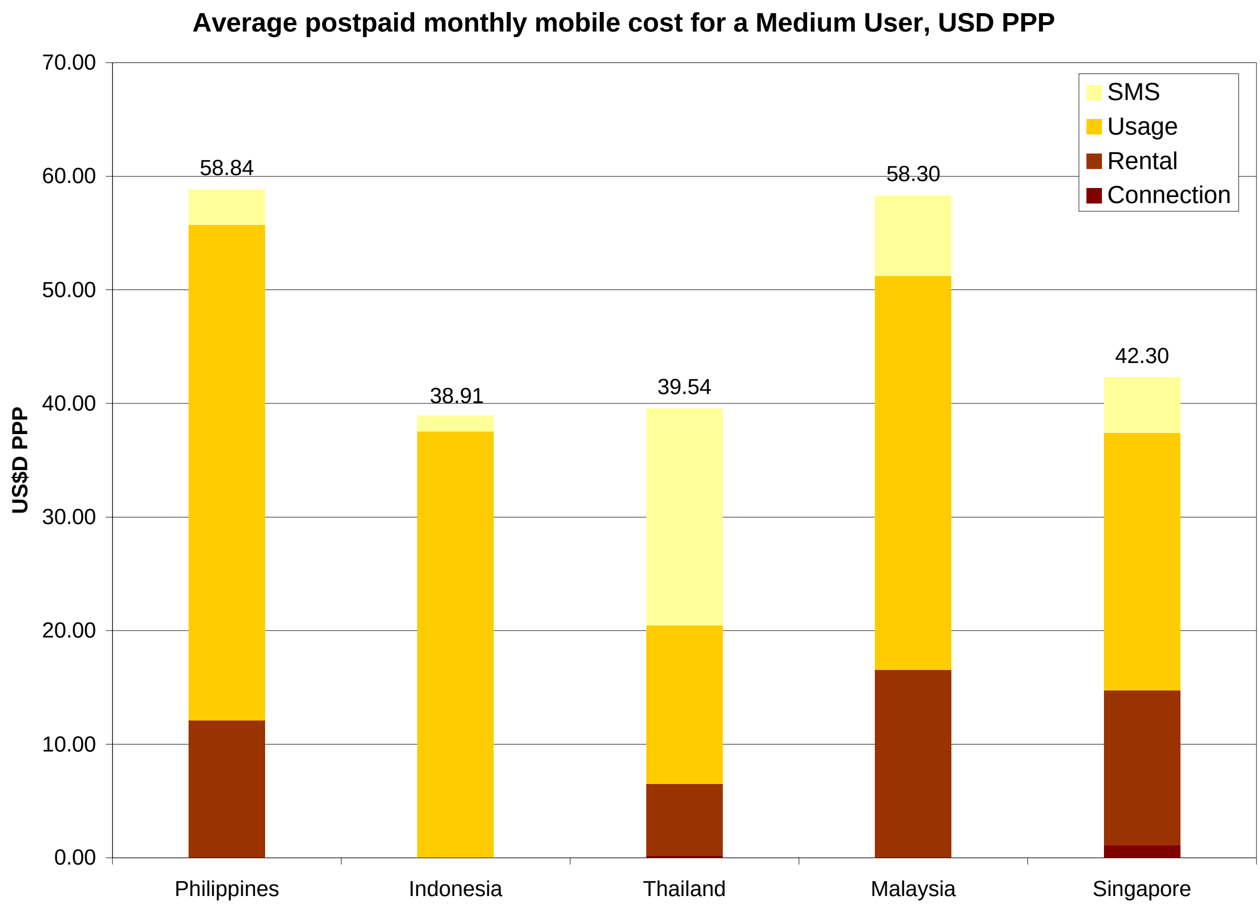

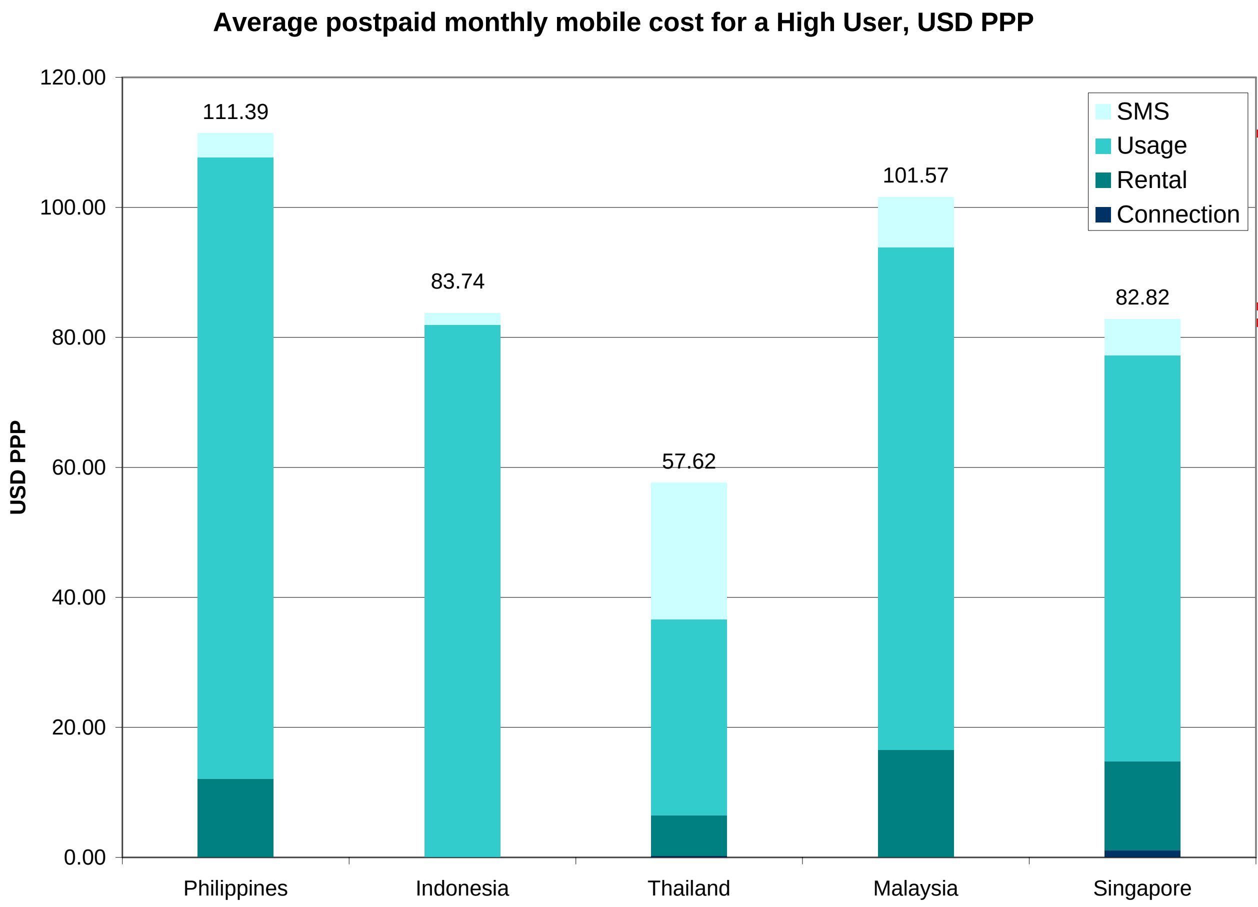

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MOBILE PRICE BASKETS (FEBRUARY 2009)

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2. *Call destination (in minutes):*
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Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*

[4] As of February 2006, OECD baskets take voicemail into consideration; however this service/feature is not included in the Asian-based baskets at this time (due to low use and/or even the lack of provision of this service) and the OECD call distributions have been adjusted accordingly.

a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
    a. The largest operator (by subscriber numbers) in each country is considered.
    b. The cheapest tariff plan of the largest operator is considered:
        - for prepaid – plans with the lowest connection charges; and
        - for postpaid – plans with the lowest rental are considered.

       These plans are applied across all three baskets (low, medium and high).[5]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in US$ and US$ PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.
    b. Incoming call charges have been considered in the construction of the baskets, on the assumption that outgoing minutes = incoming minutes.

<u>Tariff packages</u>

1. Philippines – SMART Communications
    a. Postpaid – Smart Gold Lite 300
    b. Prepaid – Smart Buddy

2. Indonesia - Telkomsel
    a. Postpaid – Helo Hybrid
    b. Prepaid – SimPATI Promotion

3. Thailand – Advanced Info Service (AIS) Plc.
    a. Postpaid – GSM Net SIM 99
    b. Prepaid – Non-commercial SIM

4. Malaysia – Maxis Communications
    a. Postpaid – Standard Plan
    b. Prepaid – Hotlink Plan

5. Singapore – SingTel
    a. Postpaid – *i*One Super Value
    b. Prepaid – Hi Card

[5] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

Mobile tariff comparison

PRE-PAID				PHILIPPINES	INDONESIA			THAILAND	MALAYSIA	SINGAPORE
				Smart Buddy	SimPATI Promotion			Non-commercial SIM	New Hotlink Plan	Hi card
				Local	Local	National	Applicability	Local	Local	Local
Connection Charges				1.163	N/A			1.387	2.764	5.298
Subscription (rental) fee				N/A	N/A			N/A	N/A	11.921
Free minutes (in local currency)				N/A	N/A			N/A	4.147	N/A
Usage charges	Fixed	Incoming	Peak	N/A	N/A			N/A	N/A	0.106
			Off-peak	N/A	N/A			N/A	N/A	0.053
			Weekend	N/A	N/A			N/A	N/A	0.053
		Outgoing	Peak	0.159	0.076	0.101	N/A	0.057	0.135	0.106
			Off-peak	0.159	N/A	N/A	N/A	0.014	0.135	0.053
			Weekend	0.159	N/A	N/A	N/A	N/A	0.135	0.053
	On-net	Incoming	Peak	N/A	N/A	N/A	N/A	N/A	N/A	0.106
			Off-peak	N/A	N/A	N/A	N/A	N/A	N/A	0.053
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	0.053
		Outgoing	Peak	0.137	N/A	N/A	N/A	0.057	0.100	0.106
			Off-peak	0.137	N/A	N/A	N/A	0.014	0.100	0.053
			Weekend	0.137	N/A	N/A	N/A	N/A	0.100	0.053
			Time-frame 1[6]	N/A	0.076		First 10 secs	N/A	N/A	N/A
				N/A	0.003		> 10 secs	N/A	N/A	N/A
			Time-frame 2[7]	N/A	0.076		First 130 secs	N/A	N/A	N/A
				N/A	0.003		> 130 secs	N/A	N/A	N/A
	Off-net	Incoming	Peak	N/A	N/A		N/A	N/A	N/A	0.106
			Off-peak	N/A	N/A		N/A	N/A	N/A	0.053
			Weekend	N/A	N/A		N/A	N/A	N/A	0.053
		Outgoing	Peak	0.159	0.126		N/A	0.057	0.135	0.106
			Off-peak	0.159	N/A		N/A	0.014	0.135	0.053
			Weekend	0.159	N/A		N/A	N/A	0.135	0.053
Free SMSs				50.000	N/A		N/A	N/A	N/A	N/A
SMS charges		Basic charge		0.021	N/A			0.057	N/A	0.033
		On-net		N/A	0.008		N/A	N/A	0.019	N/A
		Off-net		N/A	0.013		N/A	N/A	0.041	N/A
				PHP	IDR			THB	MYR	SGD

[6] Time period: 1800 – 2359 (peak)
[7] Time period: 0000 – 0559 (off-peak)

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Exchange rate: USD 1 =	47.308	11919.000	35.339	3.617	1.510
Source	http://www.oanda.com/				

POST-PAID				PHILIPPINES	INDONESIA		THAILAND (AIS)	MALAYSIA		SINGAPORE
				Smart Gold Lite 300	Helo Hybrid		GSM Net SIM 99	Standard Plan		*i*One Super Value
					Local	National		Local	National	
Connection Charges				N/A	N/A		3.113	N/A		28.345
Subscription (rental) fee				6.341	N/A		2.801	8.293		9.934
Free minutes (in minutes)				N/A	N/A		N/A	N/A		80
Usage charges	Fixed	Incoming	Peak	N/A	N/A		N/A	N/A		N/A
			Off-peak	N/A	N/A		N/A	N/A		N/A
			Weekend	N/A	N/A		N/A	N/A		N/A
			Other	N/A	N/A		N/A	N/A		N/A
		Outgoing	Peak	0.161	0.055	0.101	0.028	0.083	0.083	0.106
			Off-peak	N/A	N/A		N/A	0.041	0.083	N/A
			Weekend	N/A	N/A		N/A	N/A		N/A
	On-net	Incoming	Peak	N/A	N/A		N/A	N/A		N/A
			Off-peak	N/A	N/A		N/A	N/A		N/A
			Weekend	N/A	N/A		N/A	N/A		N/A
			Other	N/A	N/A		N/A	N/A		N/A
		Outgoing	Peak	0.042	0.055	0.071	0.028	0.083	0.083	0.106
			Off-peak	N/A	N/A		N/A	0.041	0.083	N/A
			Weekend	N/A	N/A		N/A	N/A		N/A
	Off-net	Incoming	Peak	N/A	N/A		N/A	N/A		N/A
			Off-peak	N/A	N/A		N/A	N/A		N/A
			Weekend	N/A	N/A		N/A	N/A		N/A
			Other	N/A	N/A		N/A	N/A		N/A
		Outgoing	Peak	0.161	0.063	0.101	0.028	0.083	0.083	0.106
			Off-peak	N/A	N/A		N/A	0.041	0.083	N/A
			Weekend	N/A	N/A		N/A	N/A		N/A
Free SMSs				75	100		N/A	N/A		50
SMS charges		Basic charge		0.022	N/A		0.057	N/A		
		On-net		N/A	0.010		N/A	0.014		0.035
		Off-net		N/A	0.013		N/A	0.041		N/A
Exchange rate: USD 1 =				PHP	IDR		THB	MYR		SGD
				47.308	11919.000		35.339	3.617		1.510
Source				http://www.oanda.com/						

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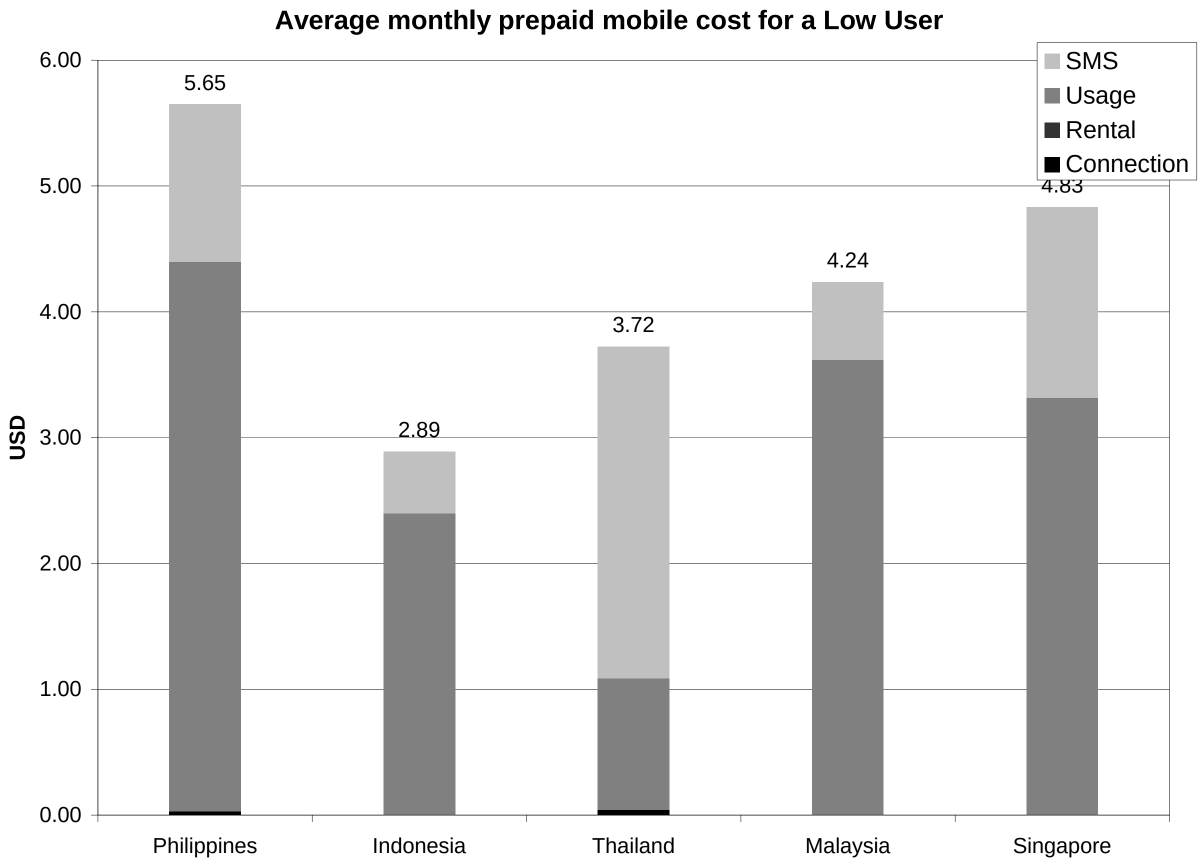
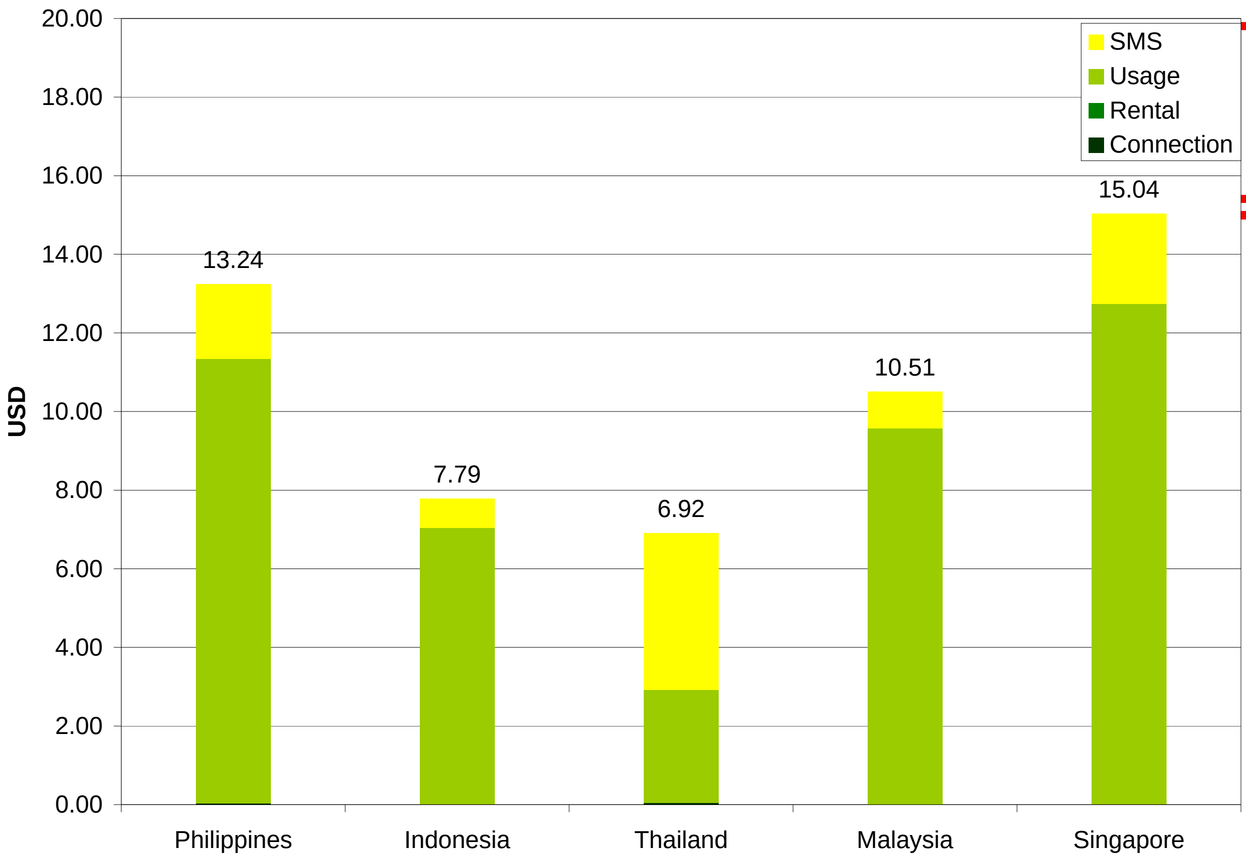
October 2008

Mobile price baskets (USD)

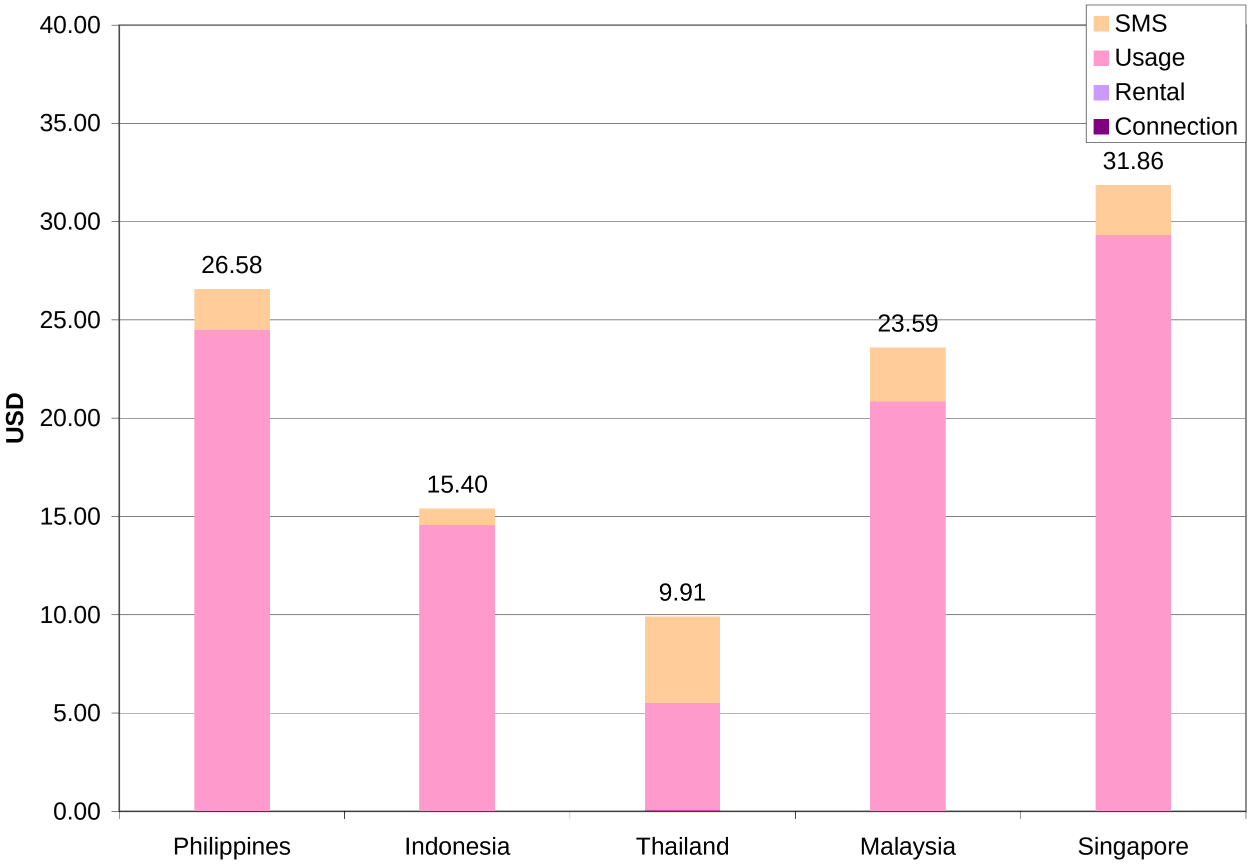


Average monthly prepaid mobile cost for a Medium User



www.lirneasia.net

Average monthly prepaid mobile cost for a High User



Average monthly postpaid mobile cost for a Low User

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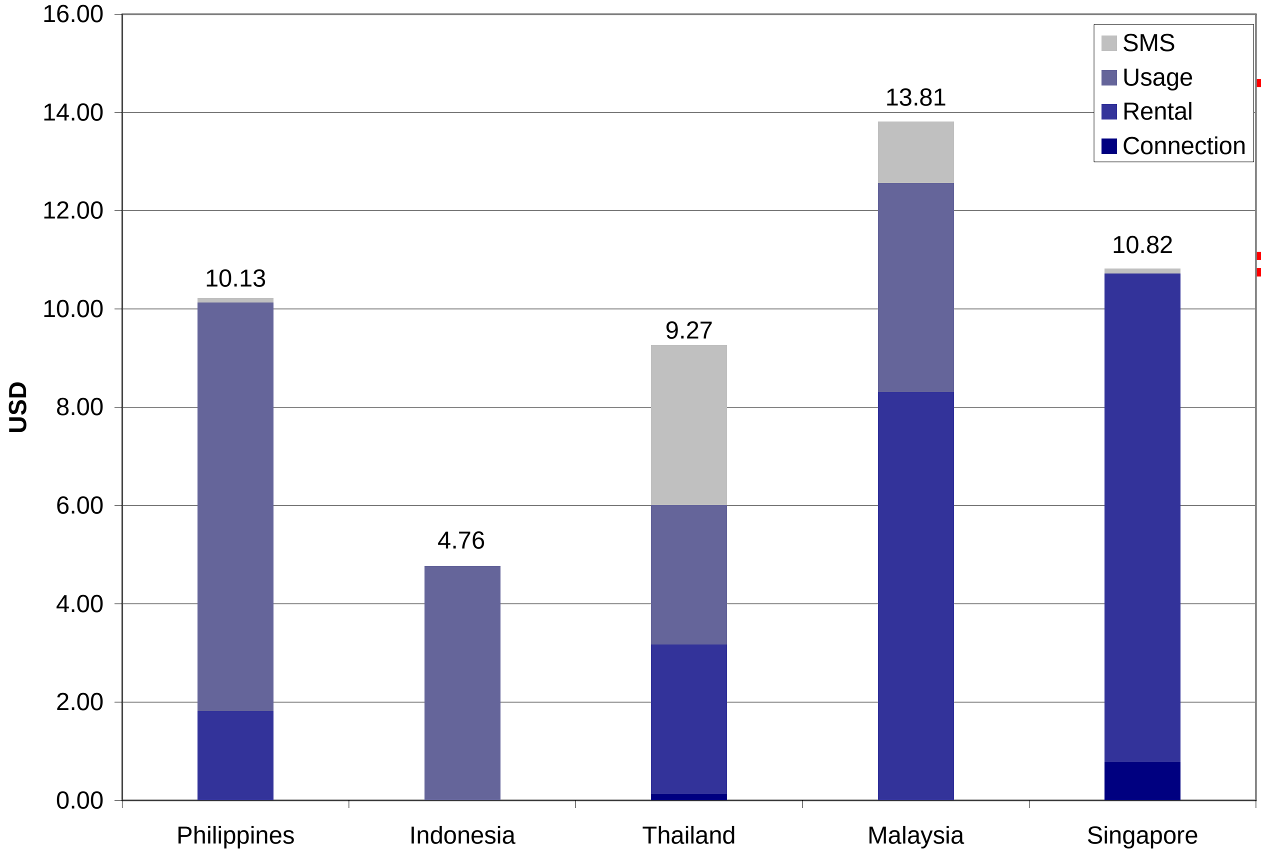
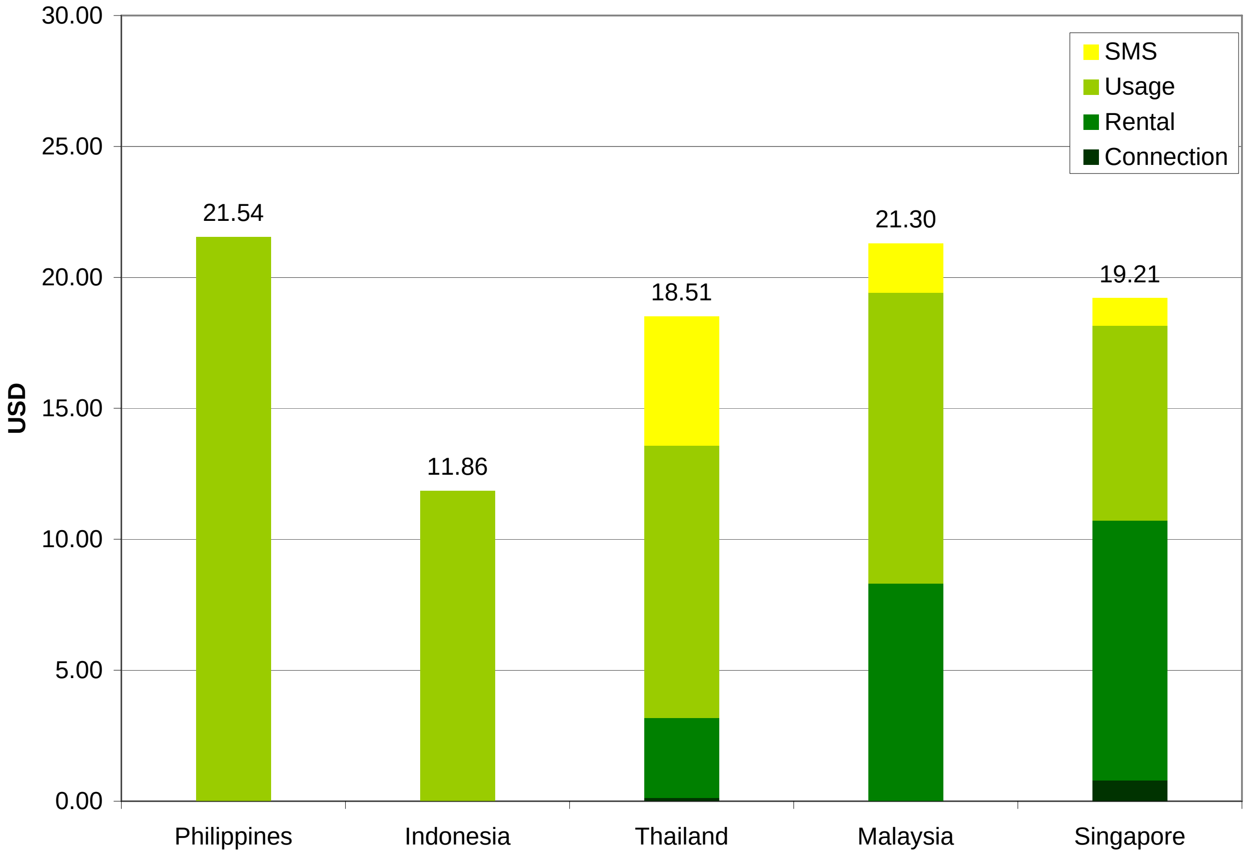
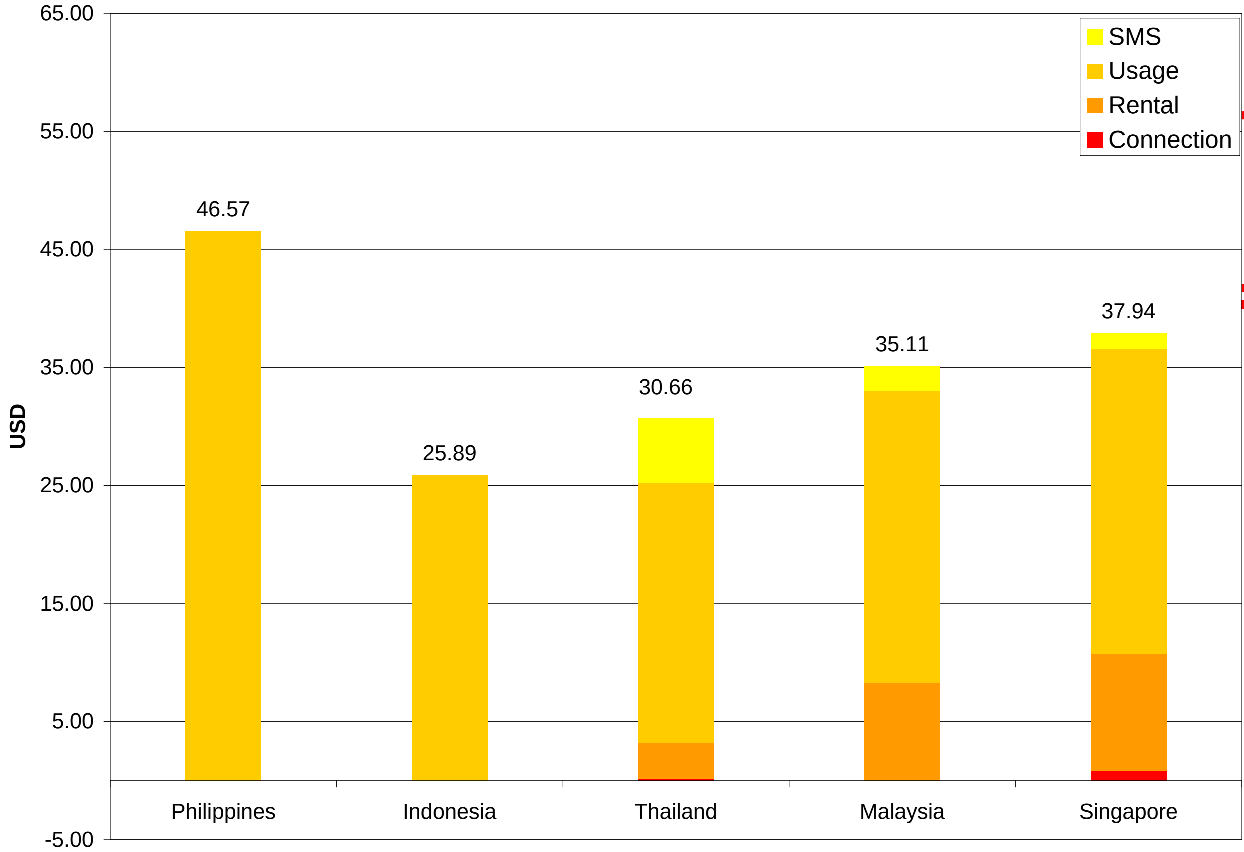


Average monthly postpaid mobile cost for a Medium User



Average monthly postpaid mobile cost for a High User



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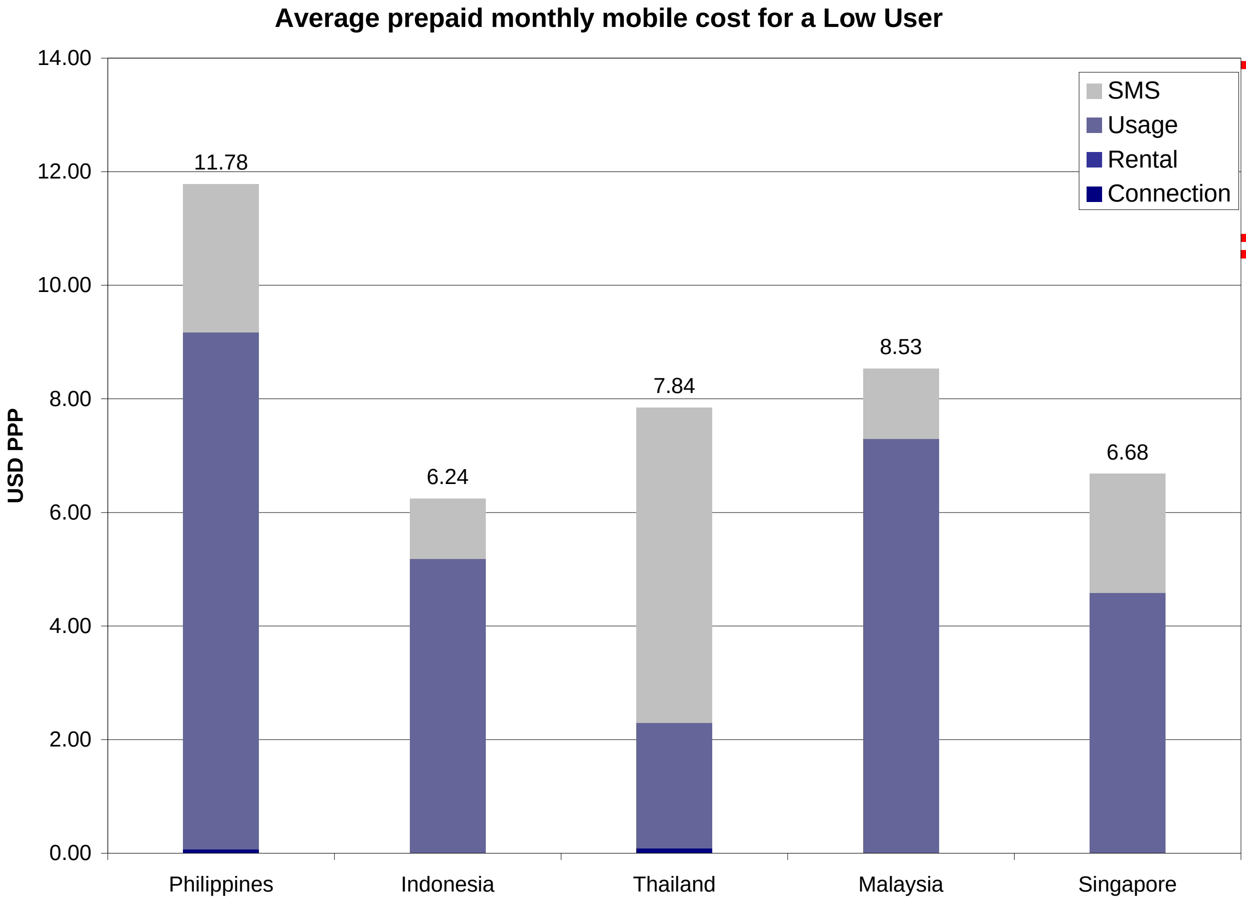
Mobile price baskets (USD PPP)



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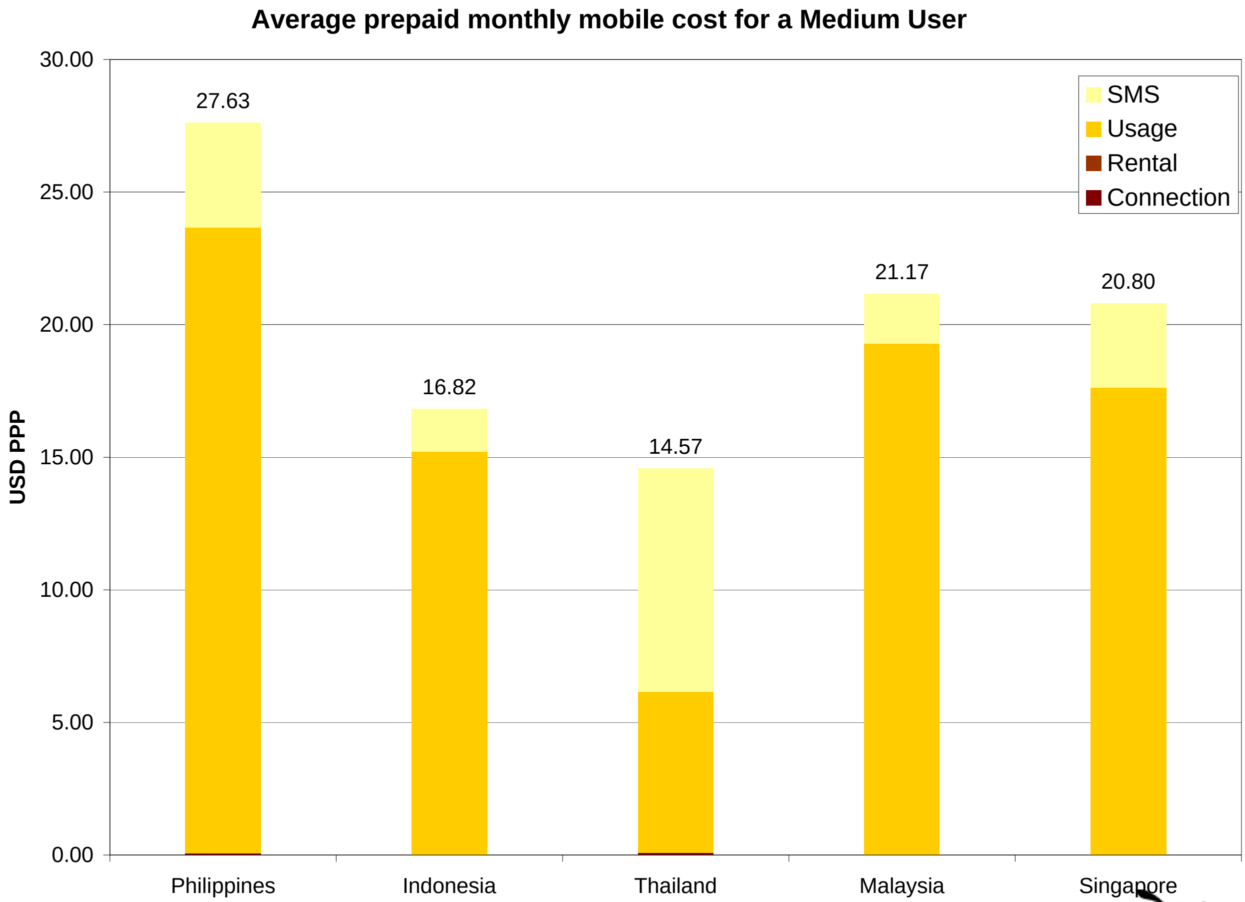

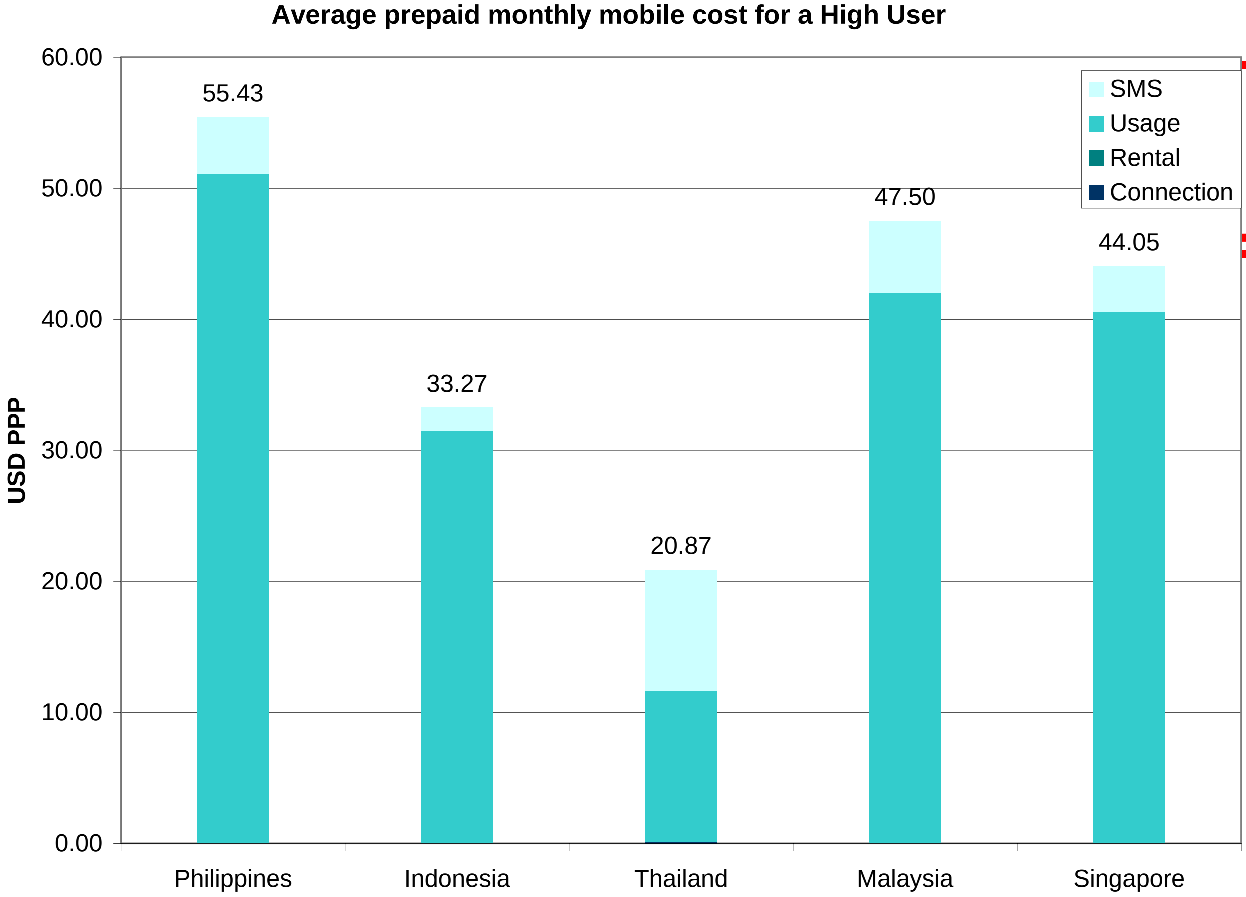

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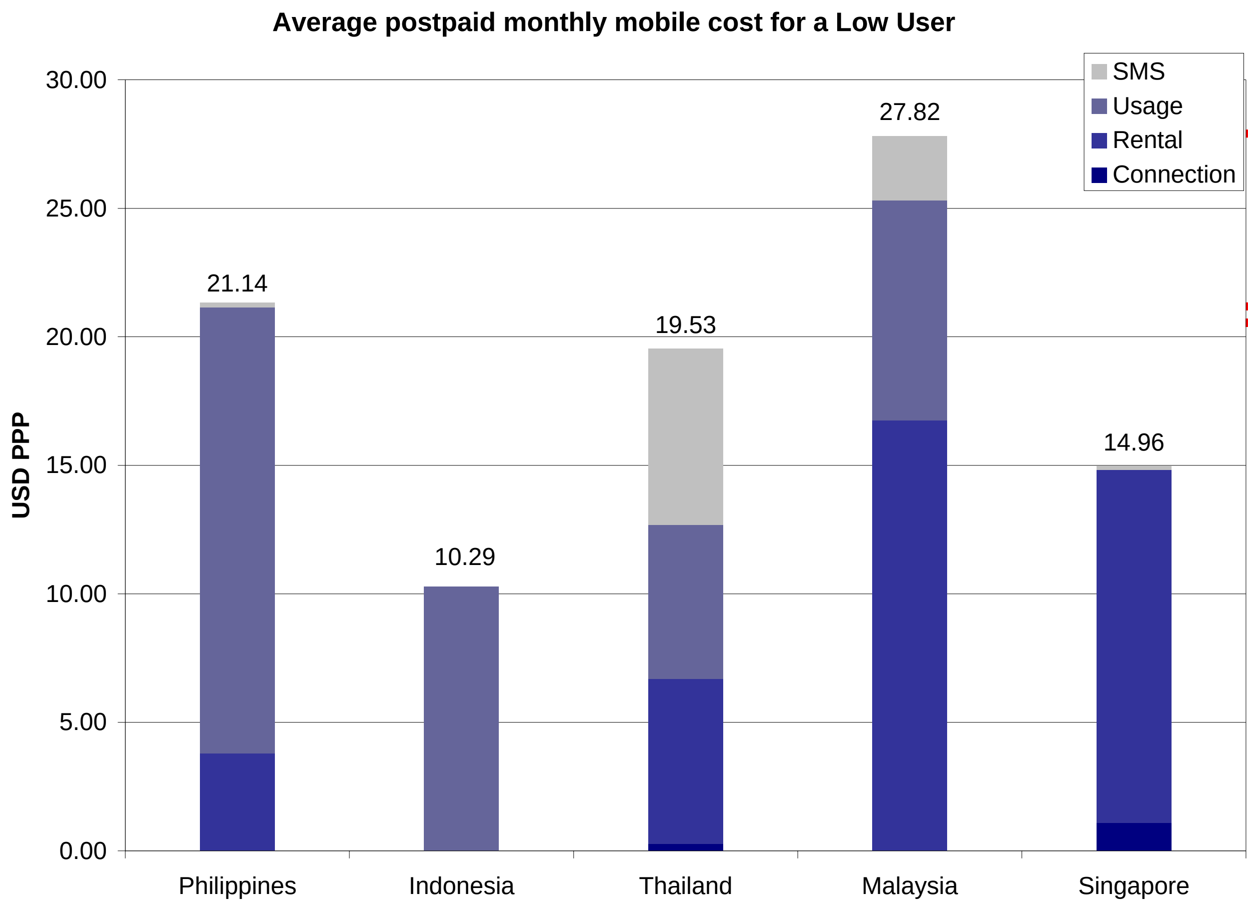

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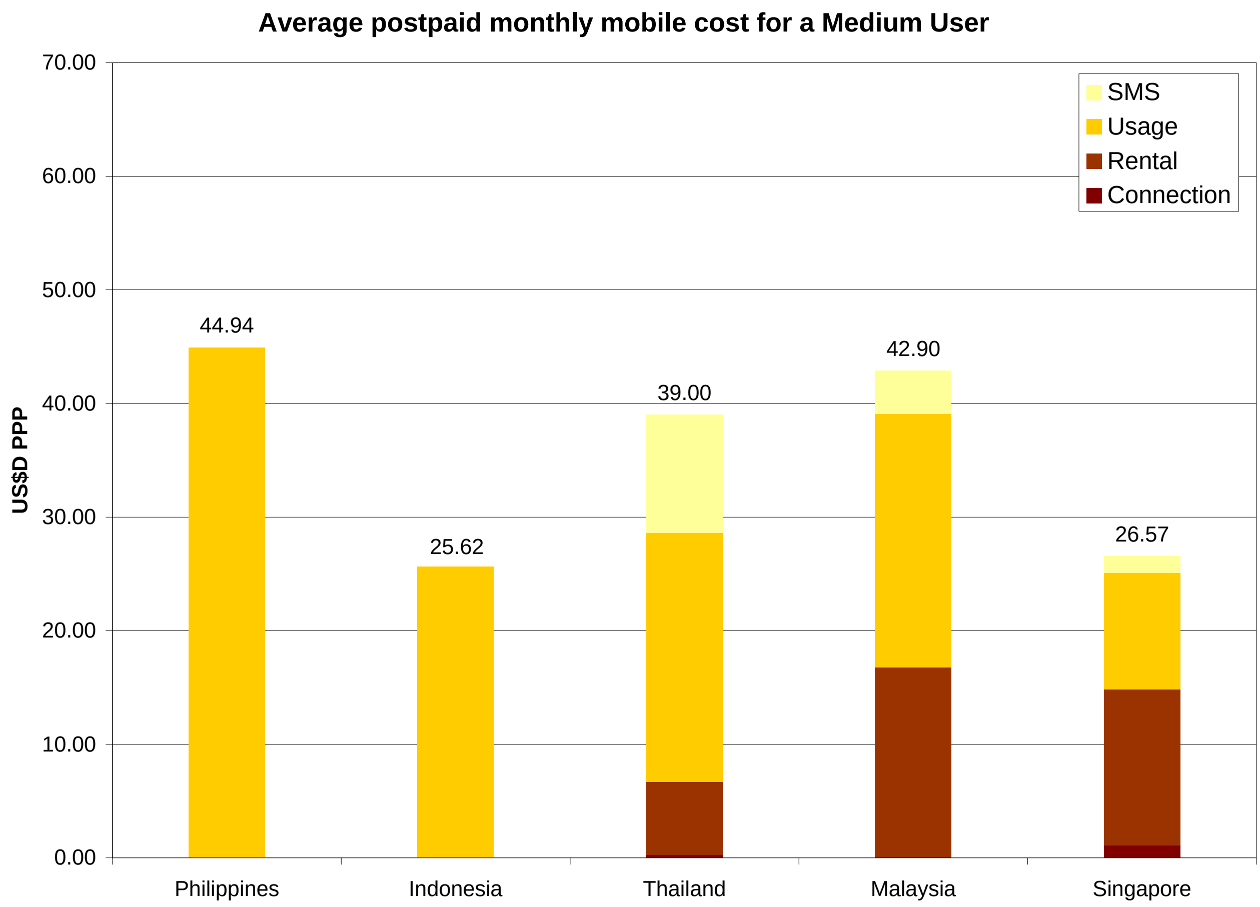

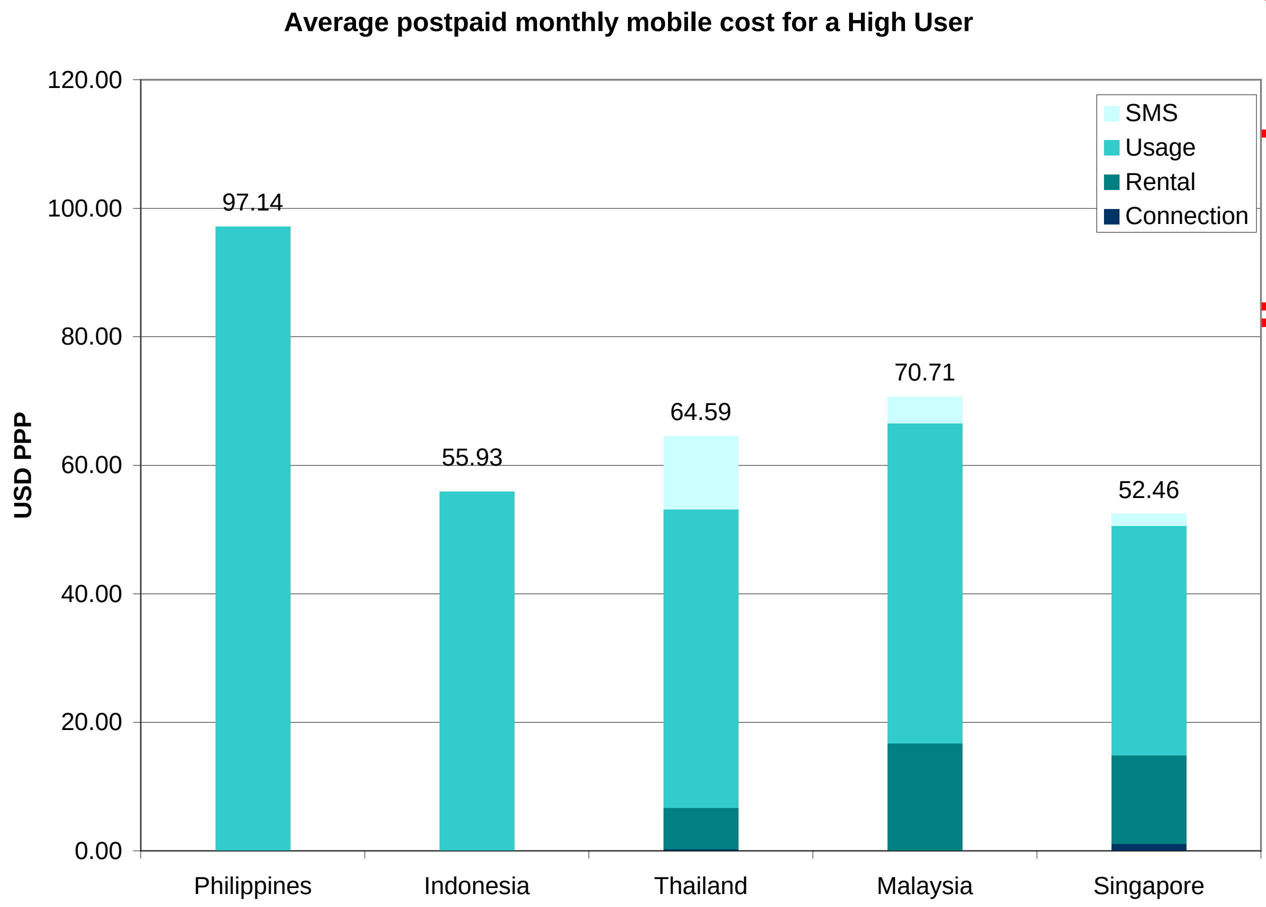

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Notes

1. The calculation of a price basket is based on OECD methodology. Details of methodology available at: http://www.teligen.com/t_basket.asp. MMS and Voicemail charges and use were excluded from calculation of the basket.

2. Prepaid and postpaid baskets were based on Minutes of Use [MOU] data from Indonesia (Telkomsel, June 2008) Malaysia (Maxis, March 2007), Philippines (SMART, June 2008) and Thailand (AIS, June 2008) and SMS data from Philippines (SMART[1] June 2008). An average basket (weighted by subscribers) is calculated using MOUs. Subscriber data was based on data individually reported by the respective operators or the regulator. Tariff data was based on data for September 2008.

3. OECD call distributions by duration, destination, and time of day were used since relevant data for all eight countries was not available publicly. Where this data was available, the distributions were not presented in the form required for calculating the baskets.

4. The cheapest tariff plan (based on initial connection charges for prepaid plans and monthly rental charges for postpaid plans) of the largest operator (based on subscriber numbers) were covered for each country.

5. Exchanges rates for October 2008 are taken from Yahoo! Finance

6. USD PPP estimates for 2008 taken from the IMF World Economic Outlook (WEO) Database (October 2008), available at: http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx.

[1] Bucket-priced SMS data was excluded from the basket

MOBILE PRICE BASKETS (OCTOBER 2008)

Background

Three kinds of price indicators:

- *T-Baskets, OECD* (http://www.teligen.com/t_basket.asp)
  OECD-based and OECD-authorized; takes pricing information from the Teligen Master Tariff Database.
  A technique to create comparable user baskets based on actual user profiles.
  Takes into consideration most popular plans of the largest operator (based on subscribers) in each country; connection charges and monthly subscription; call, SMS and MMS use; taxes; and free minutes/SMS, etc.

- *The Core ICT Indicators document, Partnership on Measuring ICT for Development* (http://www.itu.int/ITU-D/ict/partnership/)
  Compares the cost of 100 minutes of use per month (50 minutes of local peak time calling and 50 minutes of local off-peak calling), and is intended to represent an average use basket which is applicable to individual consumers.

- *ITU basket of call charges*
  Considers separate indicators for connection charges, rental, SMS and the price of a 3-minute local call.

Why OECD T-Baskets?

- Provides a comprehensive tariff indicator as opposed to other methodologies.
- Has been in use since 1995 with periodic recalibrations and improvements.

Adapted methodology (based on OECD methodology)

1. *Basket composition:*
   a. The price of the handset and handset subsidies are **not** taken into account in the basket.
   b. 1/3 of the registration or installation charges (i.e. depreciated over 3 years) where applicable.
   c. Monthly rental charges and any optional charges that may apply to the package.
   d. The usage profile will also include a number of SMS messages per month.
   e. The three user baskets that are taken into consideration are:
      - *Low user basket*
      - *Medium user basket*
      - *High user basket*
   f. Different baskets were calculated for prepaid and postpaid plans.
   g. The baskets compositions[2] used are as follows:

	OECD[3]	Prepaid basket[4]	Postpaid basket[5]

[2] OECD methodology includes MMS data in addition to call and SMS data; however, this component has been removed from our basket comparisons.

[3] OECD methodology provides call volumes per year. Since data from the countries considered here are available in the form of minutes of use per month or year and not in call volumes, we convert OECD call volumes into minutes of use per year or month, by making use of the average duration of call data (as discussed in point 5).

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Voice, minutes of use per month			
Low User	46	31	58
Medium User	119	80	150
High User	256	173	323
SMS per month			
Low User	33	23	53
Medium User	50	34	80
High User	55	38	88

2. *Call destination (in minutes):*
   a. Local area fixed line: this is used to accommodate the tariffs that have separate charges for the local area. When such charges are not available, this proportion of minutes is included in the 'National fixed line' category.
   b. National fixed line: this covers all fixed line minutes outside the local area, except in cases as noted above.
   c. Same network mobile (On-net): this includes all minutes to mobiles in the same mobile network as the caller. In the case of differences between on-net local and national tariffs, the total on-net minutes are weighted by 65% to 35% respectively and total charges are calculated based on this split.
   d. Other network mobile (Off-net): this includes minutes to all other mobile networks in the caller's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.
   e. Distribution of minutes across different destinations are given as a percentage of the total number of minutes used/month. This distribution was used across all baskets:

Call made to	**Low User**	**Medium User**	**High User**
Local, Fixed line	0.16	0.15	0.14
National, Fixed line	0.08	0.08	0.08
On-net, Mobile	0.52	0.52	0.51
Off-net, Mobile	0.24	0.26	0.28
Voicemail[6]	0.00	0.00	0.00

3. *SMS destination:*

---

[4] Prepaid and postpaid baskets were based on Minutes of Use [MOU] data from Indonesia (Telkomsel, June 2008) Malaysia (Maxis, March 2007), Philippines (SMART, June 2008) and Thailand (AIS, June 2008); SMS data was based on data from Philippines (SMART[4], June 2008). The data was weighted by total mobile subscriber data for the four countries, and was used to calculate the baskets for all five countries. Only average/medium user data is available publicly, therefore the OECD low:medium:high user ratios were applied to the prepaid and postpaid baskets.

[5] This basket is based on data as specified above.

[6] As of February 2006, OECD baskets take voicemail into consideration; however this service/feature is not included in the Asian-based baskets at this time (due to low use and/or even the lack of provision of this service) and the OECD call distributions have been adjusted accordingly.

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a. On-net: this includes all SMSs to mobiles in the same mobile network as the sender. In the case of differences between on-net local and national tariffs, the total on-net SMSs are weighted by 65% to 35% respectively and total charges are calculated based on this split.
b. Off-net: this includes SMSs to all other mobile networks in the sender's country. When the charges are different depending on destination network, the market shares based on subscriber numbers are used for weighting the charges. Up to three other networks will be considered in each country.

SMS	Low user	Medium user	High user
On-net	0.65	0.65	0.65
Off-net	0.35	0.35	0.35

4. *Peak/off-peak differentials:* Instead of splitting time and day into distinct times and days the following approach will be used:
   a. Peak at weekdays – most expensive time during daytime
   b. Off-peak at weekdays – cheapest time before midnight
   c. Weekend – at daytime Sundays
   d. Distribution of minutes over time of day is given as a percentage of the number of minutes:

	Low User	Medium User	High User
Peak	0.48	0.50	0.60
Off peak	0.25	0.24	0.19
Weekend	0.27	0.26	0.21

5. *Call duration:* There will be four separate call durations:
   a. Local and national fixed line calls
   b. Same network mobile calls (On-net)
   c. Other network mobile calls (Off-net)
   d. Voicemail calls
   e. Call durations for each basket:

By duration	Low User	Medium User	High User
Local and national, Fixed line	1.5	1.8	1.7
On-net, Mobile	1.6	1.9	1.9
Off-net, Mobile	1.4	1.7	1.8

6. *Treatment of taxes:* Tariffs include value added tax (VAT), goods and services tax (GST) and/or any other communication levies.

7. *Inclusive minutes and SMS messages:*
   a. Any inclusive minutes will be deducted from the basket before starting the calculation of usage cost. The inclusive minutes are assumed to be used up with the same calling pattern is described in the basket i.e. the same/peak off-peak ratio and the same distribution across destinations. Where the inclusive minutes are clearly limited to specific destinations or times of day this will be taken into account. No transfer of unused minutes is taken into account.
   b. Any inclusive SMS message will be deducted from the basket before starting the calculation of SMS cost, up to the number of messages in the basket.

8. *Selection of package and operator:*
   a. The largest operator (by subscriber numbers) in each country is considered.
   b. The cheapest tariff plan of the largest operator is considered:

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- for prepaid – plans with the lowest connection charges; and
- for postpaid – plans with the lowest rental are considered.

These plans are applied across all three baskets (low, medium and high).[7]

9. *Timeframe:* Basket results are calculated for a period of one month.

10. *Currency calculations:* Tariffs are made available in USD and USD PPP.

11. *Other assumptions:*
    a. For most countries considered here, data on call and SMS distributions by destination, time of day and duration were not publicly available. Where available, these distributions were not presented in the form required for calculating the baskets, and available only for average users (i.e. applicable to medium user baskets). As such the latest OECD weights have been utilized (detailed above in points 2, 3, 4, and 5) to calculate the price baskets for all eight countries. While the OECD weights may not reflect Asian usage patterns accurately, they were loosely verified using LIRNE*asia*'s Teleuse@BOP findings and were deemed applicable for use.
    b. Incoming call charges have been considered in the construction of the baskets, on the assumption that outgoing minutes = incoming minutes.

Tariff packages

1. Philippines – SMART Communications
    a. Postpaid – Consumable Plan 500
    b. Prepaid – Smart Buddy

2. Indonesia - Telkomsel
    a. Postpaid – Helo Hybrid
    b. Prepaid – SimPATI Promotion

3. Thailand – Advanced Info Service (AIS) Plc.
    a. Postpaid – GSM Net SIM 99
    b. Prepaid – Commercial SIM

4. Malaysia – Maxis Communications
    a. Postpaid – Standard Plan
    b. Prepaid – Hotlink Plan

5. Singapore – SingTel
    a. Postpaid – *i*One Super Value
    b. Prepaid – Hi Card

[7] Although it would seem more suitable to apply a plan targeted at low users (assuming plans with low rental + high usage charges are targeted at this group of users) for low user baskets, and a plan targeted at medium and higher users (assuming high rental + low usage charges are targeted at these groups of users) for medium and high user baskets, the difficulties in deciding which plans to consider based on the assumptions mentioned, and the lack of information on who uses which plans (i.e. are we certain that low, medium and high users of mobile opt for the plans targeted at them?) render this almost impossible. Also, the use of varying tariff plans across different user baskets makes the comparison of results from one country to another somewhat arbitrary.

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Mobile tariff comparison

POSTPAID				PHILIPPINES	INDONESIA		THAILAND		MALAYSIA		SINGAPORE
				Consumable Plan 500	**Helo Hybrid**		**GSM Net SIM 99**		**Standard Plan**		***iOne* Super Value**
Connection Charges				0	0		4.288		0		28.348
Subscription (rental) fee				0	0		2.849		8.313		9.935
Minimum usage				10.134	2.283		N/A		N/A		N/A
Free minutes (USD)				N/A	N/A		N/A		N/A		N/A
Free minutes (in minutes)				N/A	N/A		N/A		N/A		80
					Local	**National**	**1st min**	**2nd min**	**Local**	**National**	
Usage charges	Fixed	Incoming	Peak	0	0	0	0	0	0	0	0
			Off-peak	N/A	N/A	N/A	N/A	N/A	0	0	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.155	0.059	0.110	0.086	0.014	0.083	0.083	0.106
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.042	0.083	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	On-net	Incoming	Peak	0	0	0	0	0	0	0	0
			Off-peak	N/A	N/A	N/A	N/A	N/A	0	0	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.134	0.059	0.078	0.086	0.014	0.083	0.083	0.106
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.042	0.083	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Off-net	Incoming	Peak	0	0	0	0	0	0	0	0
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.000	0.000	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Outgoing	Peak	0.155	0.068	0.110	0.086	0.014	0.083	0.083	0.106
			Off-peak	N/A	N/A	N/A	N/A	N/A	0.042	0.083	N/A
			Weekend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Free SMSs				150	100		N/A	N/A	N/A		50
SMS charges	Basic charge			N/A	N/A		N/A	N/A	N/A		N/A
	On-net			0.021	0.011		0.058		0.014		0.035
	Off-net			0.021	0.014		0.058		0.042		0.035
Exchange rate: USD 1 =				PHP 49.34	IDR 10950		THB 34.75		MYR 3.609		SGD 1.5098
Source				Yahoo! Finance	Yahoo! Finance		Yahoo! Finance		Yahoo! Finance		Yahoo! Finance

PREPAID	PHILIPPINES	INDONESIA	THAILAND	MALAYSIA	SINGAPORE
	Smart Buddy	**SimPATI promotion**	**Commerical SIM**	**Hotlink Plan**	**Hi card**
Connection Charges	1.115	0	1.410	2.771	5.299

Subscription (rental) fee				0	0			0	0	0
Free minutes (in USD)				N/A	N/A			N/A	4.156	N/A
Usage charges	Fixed	Incoming	Peak	0	**Local**	**National**	**Applicability**	0	0	0.106
			Off-peak	N/A				0	N/A	0.053
			Weekend	N/A				N/A	N/A	0.053
		Outgoing	Peak	0.152	0.082	0.192	First min	0.014	0.136	0.106
					0.003	0.003	Second - fourth mins			
			Off-peak	0.152	N/A	N/A		0.058	0.136	0.053
			Weekend	0.152	N/A	N/A		N/A	0.136	0.053
	On-net	Incoming	Peak	0	0	0		0	0	0.106
			Off-peak	N/A	0	0		0	N/A	0.053
			Weekend	N/A	N/A	N/A		N/A	N/A	0.053
		Outgoing	Peak	0.132	-	-		0.014	0.108	0.106
			Off-peak	0.132	-	-		0.058	0.108	0.053
			Weekend	0.132	-	-		N/A	0.108	0.053
			Timeframe 1[8]	-	0.003	0.003	-	-	-	-
			Timeframe 2[9]	-	0.082	0.082	First 20 secs	-	-	-
					0.003	0.003	> 20 secs			
			Timeframe 3[10]	-	0.082	0.082	First min	-	-	-
					0.003	0.003	> 1 min	-	-	-
			Timeframe 4[11]	-	0.082	0.082	First 1.5 mins	-	-	-
					0.003	0.003	> 1.5 mins			
	Off-net	Incoming	Peak	0	0	0		0	0	0.106
			Off-peak	N/A	N/A	N/A		0	N/A	0.053
			Weekend	N/A	N/A	N/A		N/A	N/A	0.053
		Outgoing	Peak	0.152	0.137	0.137	First min	0.014	0.136	0.106
					0.003	0.003	Second - fourth mins			
			Off-peak	0.152	N/A	N/A		0.058	0.136	0.053
			Weekend	0.152	N/A	N/A		N/A	0.136	0.053
Free SMSs				50.000	N/A			N/A	N/A	N/A
SMS charges		Basic charge		N/A	N/A			0.058	N/A	0.033
		On-net		0.020	0.009			N/A	0.019	N/A
		Off-net		0.041	0.014			N/A	0.042	N/A
Exchange rate: USD 1 =				PHP 49.34	IDR 10950			THB 34.75	MYR 3.609	SGD 1.5098
Source				Yahoo! Finance	Yahoo! Finance			Yahoo! Finance	Yahoo! Finance	Yahoo! Finance

8 0000 - 0559
9 0600 - 1159
10 1200 - 1759
11 1800 - 2359

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BROADBAND BENCHMARKS

Emerging Asia

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Feb 2010

Figure 1 - Annual cost, 256kbps Broadband business connection (unlimited download)

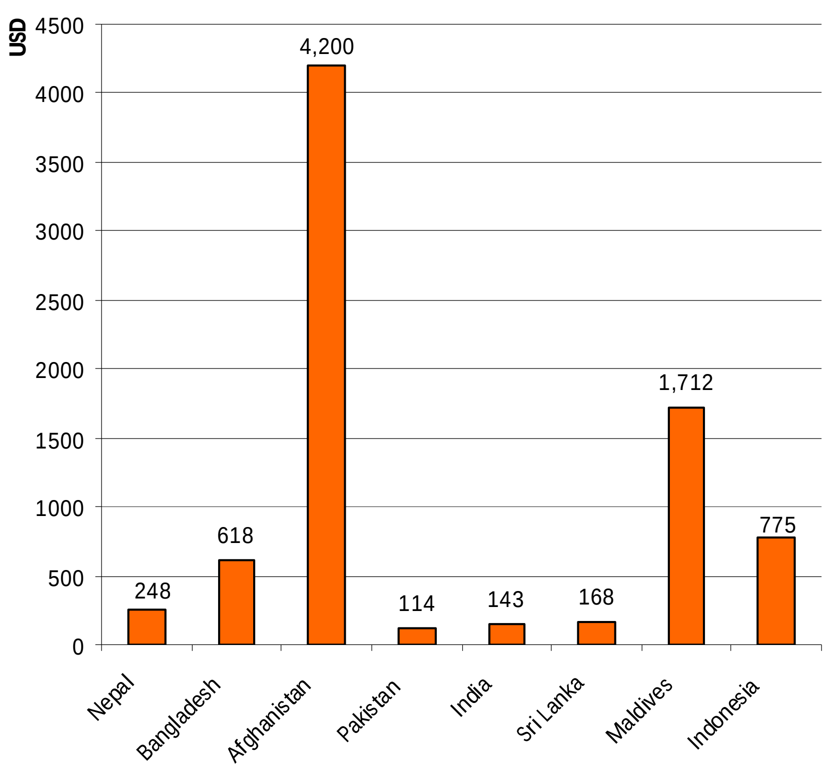
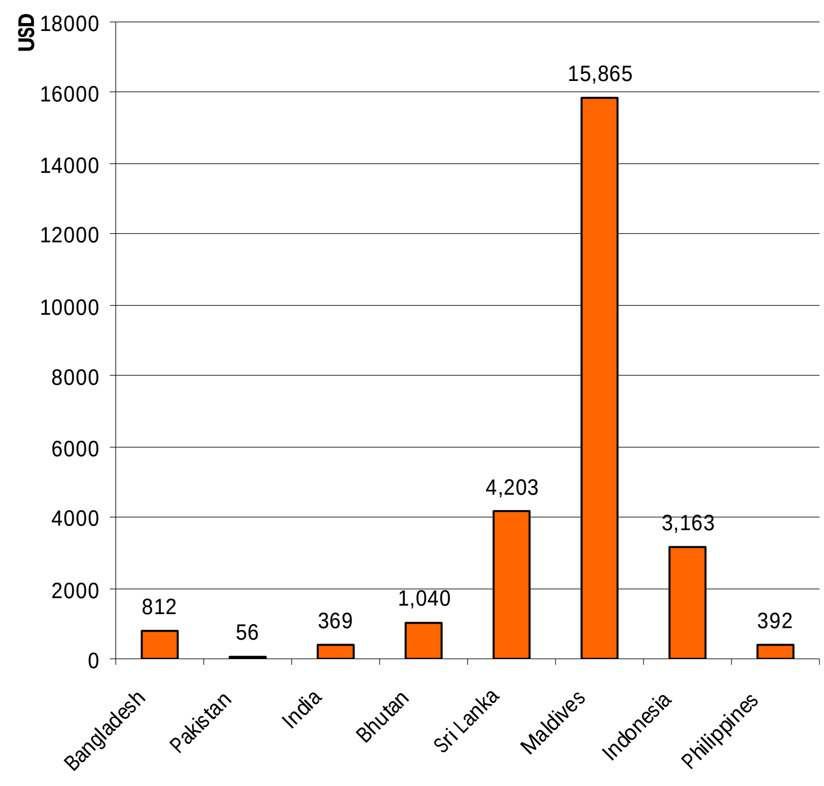


Figure 1- Annual cost, 2Mbps, 2km DPLC (tail cost)



ROADBAND ENCHMARKS

Emerging Asia

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Table 1- Broadband Prices in Emerging Asia in USD[1]

	Whole sale packages		Fixed broadband retail packages						Mobile broadband retail packages	
Country[2]	**Annual cost, 2Mbps, 2km DPLC (tail cost)**	**Annual cost, 2Mbps, 100km DPLC[3]**	**Annual cost, 2Mbps Broadband business connection (unlimited download)**	**Annual cost, 256kbps Broadband business connection (unlimited download)**	**Annual cost, 256kbps Broadband residential connection (unlimited download)**	**Price per GB, for 2Mbps, 5-10 GB data limit (Business)**	**Price per GB, for 256kbps, 5-10 GB data limit (Business)**	**Price per GB, for 256kbps, 1- 4 GB data limit (Residential)**	**Price per GB, 1Mbps speed, 1GB data limit mobile internet**	**Value of 1 USD[4] in local currency as at February 23, 2010**
South Asia										
Nepal	[5]	[6]	1,535[7]	248[8]	248[9]					73
Bangladesh	812[10]	3,619[11]		618[12]	265[13]	4[14]				68
Afghanistan	[15]	[16]	11,700[17]	4,200[18]	4,200[19]					47
Pakistan	56[20]	2,776[21]	285[22]	114[23]	114[24]		3[25]			84
India	369[26]	3,823[27]	953[28]	143[29]	143[30]	3[31]		6[32]	9[33]	46
Bhutan	1,040[34]	7,799[35]				4[36]	4[37]	4[38]	6[39]	46
Sri Lanka	4,203[40]	9,498[41]	525[42]	168[43]	168[44]			4[45]	3[46]	114
Maldives	15,865[47]	41,422[48]	3,794[49]	1,712[50]	284[51]	23[52]	10[53]	10[54]		13
South East Asia										
Indonesia	3,163[55]	8909[56]		775[57]		21[58]		9[59]	17[60]	9,294
Philippines	392[61]		782[62]		207[63]					46

If no data is shown, it indicates unavailability of information at time of research, or that a package closely fitting the category could not be found.

Feb 2010

[1] Prices originally quoted in local currency have been converted into USD using exchange rates shown in final column.
[2] Countries are separated by region (South Asia vs South East Asia) and then listed in ascending order of gross domestic product per capita, current prices projected for 2010 from the IMF World Economic Outlook (WEO) Database (October 2009), available at: http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx
[3] Unless otherwise specified by the operator 100 km price is calculated using the price for 96 km link and 2 tail links (of 2km each)
[4] Exchange rates taken from http://www.oanda.com on 23 February 2010
[5] Available package is for a lower speed of 64kbps. USD 550 for 2km link. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
[6] Available package is for a lower speed of 64kbps. USD 2036 for 100 km link. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
[7] *NT ADSL* 2 Mpbs package http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[8] *NT ADSL* 256 kpbs package http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[9] *NT ADSL* 256 kpbs package http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[10] Minimum Charge is 4,600 BDT/month for any distance below 20km. http://www.btrc.gov.bd/tariffs/btcl_domestic_transmission_charges.pdf
[11] Price Shown = (first 50km*230 BDT per kilometer) + (balance 50km * 180 BDT per kilometer) from http://www.btrc.gov.bd/tariffs/btcl_domestic_transmission_charges.pdf
[12] *Zip SOHO* Speed not Specified. http://www.siriusbroadband.com/rate.php
[13] *Zip Xpress* Speed not Specified. http://www.siriusbroadband.com/rate.php
[14] Banglalion, *Lion Mega* 25 GB data limit http://www.banglalionwimax.com/plan.php
[15] Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan USD 450
[16] Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan USD 22,500
[17] TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 downlink 2048kbps uplink 256 kbps
[18] TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 downlink 256kbps uplink 128 kbps
[19] TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 downlink 256kbps uplink 128 kbps
[20] Each kilometer between 0 -200km is PKR 2333. Hence price quoted is 2*2333PKR. http://www.ntc.net.pk/tariffleasing.asp?menu_id=03
[21] Each kilometer between 0 -200km is PKR 2333. Hence price quoted is 100*2333PKR http://www.ntc.net.pk/tariffleasing.asp?menu_id=03
[22] Pakistan Telecom Company Limited, *DSL-2Mbps Unlimited* package. http://www.ptcl.com.pk/contentp.php?NID=190#Bbunlimited
[23] National telecommunication Corporation, *Internet DSL NTC 256K package.* No distinction made between business and residential packages http://www.ntc.net.pk/tariffInternet.asp?menu_id=03
[24] National telecommunication Corporation, *Internet DSL NTC 256K package.* No distinction made between business and residential packages http://www.ntc.net.pk/tariffInternet.asp?menu_id=03
[25] DSL volume packages *Connect 12*, 12 GB limit http://www.dsl.net.pk/VolumePackages.php
[26] BSNL 2Mbps 5km distance http://bsnl.co.in/service/leased_tariff.htm#high
[27] BSNL 2Mbps 100km distance http://bsnl.co.in/service/leased_tariff.htm#high
[28] MTNL Triband Trib *Unlimited 2Mbps* (Annual DSL Subscription Option) http://mumbai.mtnl.net.in/triband/htm/tariff.htm

[29] MTNL TriBand Trib *Unlimited 256 Kbps* (Annual DSL Subscription Option) http://mumbai.mtnl.net.in/triband/htm/tariff.htm No distinction made between business and residential packages
[30] MTNL TriBand Trib *Unlimited 256 Kbps* (Annual DSL Subscription Option) http://mumbai.mtnl.net.in/triband/htm/tariff.htm No distinction made between business and residential packages
[31] MTNL Triband TriB *1199* 10GB data limit http://mtnldelhi.in/broadband/triband_tariff.htm
[32] BSNL *Home 299*, 1GB data download 256 Kbps up to 2Mbps http://www.bsnl.co.in/service/dataone_tariff.htm
[33] BSNL 3G data plan 399 (Postpaid/Prepaid) 1 GB per month http://www.bsnl.in/service/3G/3G_files/3g.htm
[34] Bhutan Telecom point to point Leased line service <10km. http://www.druknet.bt/btelecom/Point-to-Point-Leased-Line-Service.html
[35] Bhutan Telecom point to point Leased line service 100km. http://www.druknet.bt/btelecom/Point-to-Point-Leased-Line-Service.html
[36] Bhutan telecom, post-paid broadband, *Enterprise*, 15GB Limit http://www.druknet.bt/btelecom/Broadband.html
[37] Bhutan Telecom post-paid Broadband, *Home* 5GB Limit http://www.druknet.bt/btelecom/Broadband.html
[38] Bhutan Telecom post-paid Broadband, *Personal* 2.5GB Limit http://www.druknet.bt/btelecom/Broadband.html
[39] Bhutan Telecom post-paid Internet Packages, *Easy* 2.5GB Limit http://www.druknet.bt/btelecom/GPRSEDGE3G.html
[40] Price quoted by Sri Lanka Telecom
[41] Price quoted by Sri Lanka Telecom
[42] Dialog *OfficeNet* http://www.dialog.lk/business/broadband/officenet/
[43] Sri Lanka telecom, *Home Package* http://www.sltnet.lk/tariff.html (Only available package for the quoted speed)
[44] Sri Lanka telecom, *Home Package* http://www.sltnet.lk/tariff.html
[45] Sri Lanka Telecom, *Entrée Package* 1GB http://www.sltnet.lk/tariff.html
[46] Mobitel *Zoom 490* 1.5 GB data limit http://www.mobitel.lk/broadband/postpaid_internet.html
[47] Due to the unavailability of updated data October 2008 data has been quoted http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
[48] Due to the unavailability of updated data October 2008 data has been quoted http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
[49] Raajje online *Biz broadband 2M* http://www.rol.net.mv/small-medium-biz/Biz-Broadband-2M.html
[50] Dhiraguu *Biz unlimited* http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_unlimited.php
[51] Raajje *Online ROL Value Pack* http://www.rol.net.mv/home-user/ROL-Value-Pack-256k.html
[52] Dhiraagu *Biz Premier4M* 4Mbps/512Kbps speed, 10GB data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_premier.php
[53] Dhiraagu *Biz Starter Package*, 512/128kbps Speed 5GB data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_starter.php
[54] Dhiraagu *home starter* 512/256 speed, 1GB data limit http://www.dhiraagu.com.mv/internet/starter.php
[55] No. 32/DJPT.1/KOMINFO/4/2008 distance 5km

[56] No. 32/DJPT.1/KOMINFO/4/2008 distance 100km

[57] ABLTech *SOHO package* http://abltech.com/price.html

[58] Indosat M2 *Broadband 3.5G - BIZZ* speed up to 3.6Mbps 5GB data limit http://www.indosatm2.com/index.php/business-solution/internet-services/im2-broadband-35g-bizz

[59] *PRIME (Postpaid 3.5G) Eco* Unlimited 384kbps up to 2GB data limit. 64kbps for further unlimited data. http://www.indosatm2.com/index.php/consumer-solution/internetservices/postpaid/im2-broadband-35g

[60] Indosat *3.5G Regular Quote Package Extra Light* 1.2 GB data limit http://www.indosat.com/Indosat_3.5G_Broadband

[61] Due to the unavailability of updated data October 2008 data has been quoted http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf

[62] PLDT(Philippine Long Distance Telephone Company) *Explorer* http://www.pldtdsl.com/smes.asp

[63] Globe broadband *P795* http://site.globe.com.ph/web/broadband/plans/basic-internet?sid=S4ZN3MuxpRYAAFJJLI0AAACSe

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Broadband Quality of Service Experience (QoSE) Indicators[i]

Price is not the only dimension that interests broadband users and regulators. Quality of Service Experience (QoSE) is integrally connected to price: an increase in quality is an invisible decrease in price and vice versa.

Broadband quality can be evaluated through speed tests. Test sites provide a variety of information about the speed of a link. Careful design and implementation of tests can shed light on the exact segment where inadequate capacity constrains speed. Carefully implemented tests can also be the basis for Service Level Agreements (SLAs) between operators and users and for regulatory action.

In the present tests, the methodology has been developed in collaboration with a team headed by Professor Timothy Gonsalves of IIT Madras. The following dimensions of quality have been measured for two packages of two operates in Bangladesh (Dhaka) four packages of two operates in India (Bangalore and New Delhi) and three packages of two networks in Sri Lanka (Colombo). Also this report contains a comparison with two packages of two operators in Canada (Ottawa) and two packages of two networks in United States (Buffalo and Denver).

Fixed Broadband Packages and colour keys

Package/Test Location/Country	Advertised Download speed
Sirius (256 kbps) Dhaka, Bangladesh	256 kbps
SKYbd (256 kbps) Dhaka, Bangladesh	256 kbps
BSNL (256 kbps) Bangalore, India	256 kbps
BSNL (1 Mbps) Bangalore, India	1 Mbps
Airtel (256 kbps) Delhi, India	256 kbps
Airtel (1 Mbps) Delhi, India	1 Mbps
Dialog (2 Mbps) Colombo, Sri Lanka	2 Mbps
SLT (2 Mbps) Colombo, Sri Lanka	2 Mbps
SLT (512 kbps) Colombo, Sri Lanka	512 kbps
Bell (6 Mbps) Ottawa, Canada	6 Mbps
Rogers (10 Mbps) Ottawa, Canada	10 Mbps
Verizon (3 Mbps) Buffalo, United States	3 Mbps
Comcast (6 Mbps) Denver, United States	6 Mbps

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This research was done as part of the Indicators, Continued research at LIRNE*asia* (www.lirneasia.net) and was funded through a grant from the International Development Research Center (Canada) and the Department for International Development (UK)

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IDRC CRDI International Development Research Centre Centre de recherches pour le développement international

DFID Department for International Development

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Throughput (kbps)	Referred to as the "actual amount of useful data sent on a transmission"[ii]. **Defined by the ITU as "an amount of user information transferred in a period of time" (ITU-T X.641 (97), 6.3.3.16)**, more commonly referred to as download or upload speeds. A key advertised metric in broadband services is the download speed. It defines how much information a user can receive from a local or international server. Upload speed defines the speed at which the user can send information to local or international servers. It plays a significant role in responsiveness and real-time applications like VoIP (Voice over Internet Protocol). Throughput, or download and upload speeds, varies depending on the location of the server that holds the content. If the location is local, such as an ISP server, the throughput may be higher than it would be if the location is international. Therefore the testing has included throughput for both local (ISP) and international (yahoo.com) servers.
Latency (ms)	Referred to as "delays when voice packets transverse the network"[iii]. It is measured in milliseconds by using the Round Trip Time (RTT). This is significant in systems that require two-way interactive communication, such as voice telephony, or ACK/NAK [acknowledge/not acknowledge] data systems where the round-trip time directly affects the throughput rate, such as the Transmission Control Protocol (TCP). **The ITU definition states that "Latency means transmission delay for FEC (Forwarding Equivalence Class) encoding, decoding, interleaving and de-interleaving" (ITU-T G.972 (04), 3025).**
Jitter (ms)	Referred to as "uneven latency and packet loss"[iv]. It is the variation of end-to-end delay from one packet to the next within the same packet stream/connection/flow. Jitter is more relevant for real-time traffic like VoIP. Ideally the figure should be low. E.g. Radio quality voice requires less than 1 ms Jitter, toll-quality voice requires less than 20 ms jitter and normal VoIP requires jitter to be less than 30 ms. Beyond 30 ms, the performance of VoIP will degrade.[v] **Also defined by ITU as "Short-term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time" (ITU-T G.701 (93), 2024).**
Packet Loss (%)	Referred to as the number of packets (as a percentage) that does not reach the destination. Degradation can result in noticeable performance loss with streaming technologies, VoIP and video conferencing. **ITU states that "in general, IP-based networks do not guarantee delivery of packets. Packets will be dropped under peak loads and during periods of congestion. NOTE – in case of multimedia services, when a late packet finally arrives, it will be considered lost" (ITU-T H.360 (04), 5.3.2.2).**

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Results of QoSE testing[vi] (Bangalore, Chennai, New Delhi, Colombo, Dhaka, Buffalo, Denver and Ottawa)

Fixed Broadband – Throughput (kbps)[vii]

Figure 1 - Download from ISP - kbps per dollar[viii]

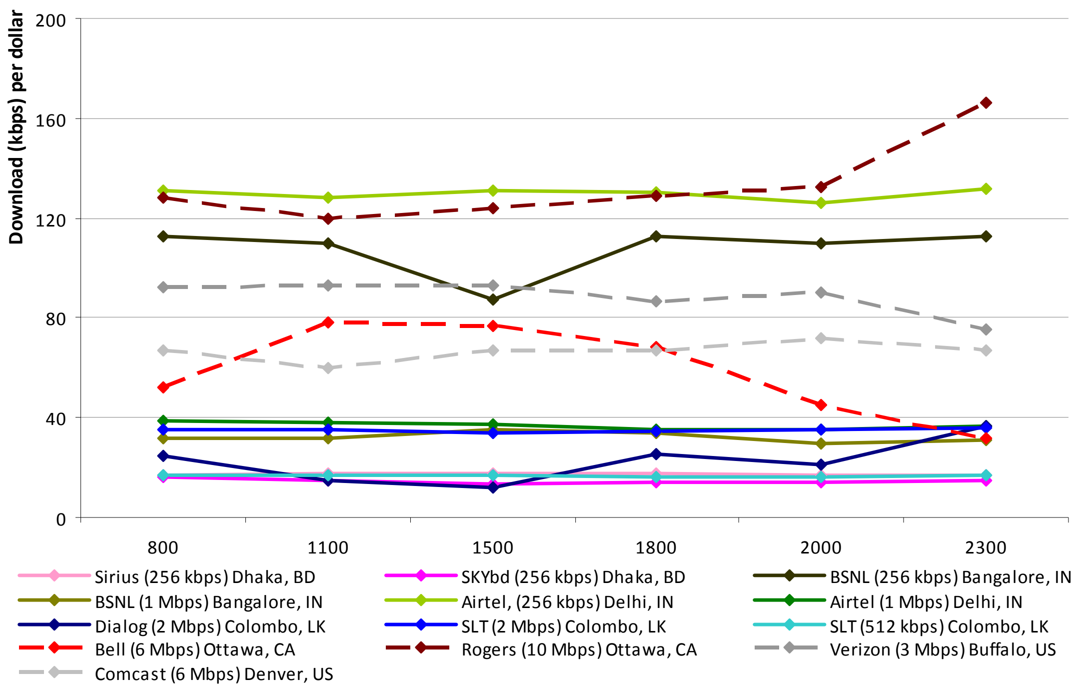

Figure 2 - Download from ISP - Fixed Broadband (Delivery vs. Stated)

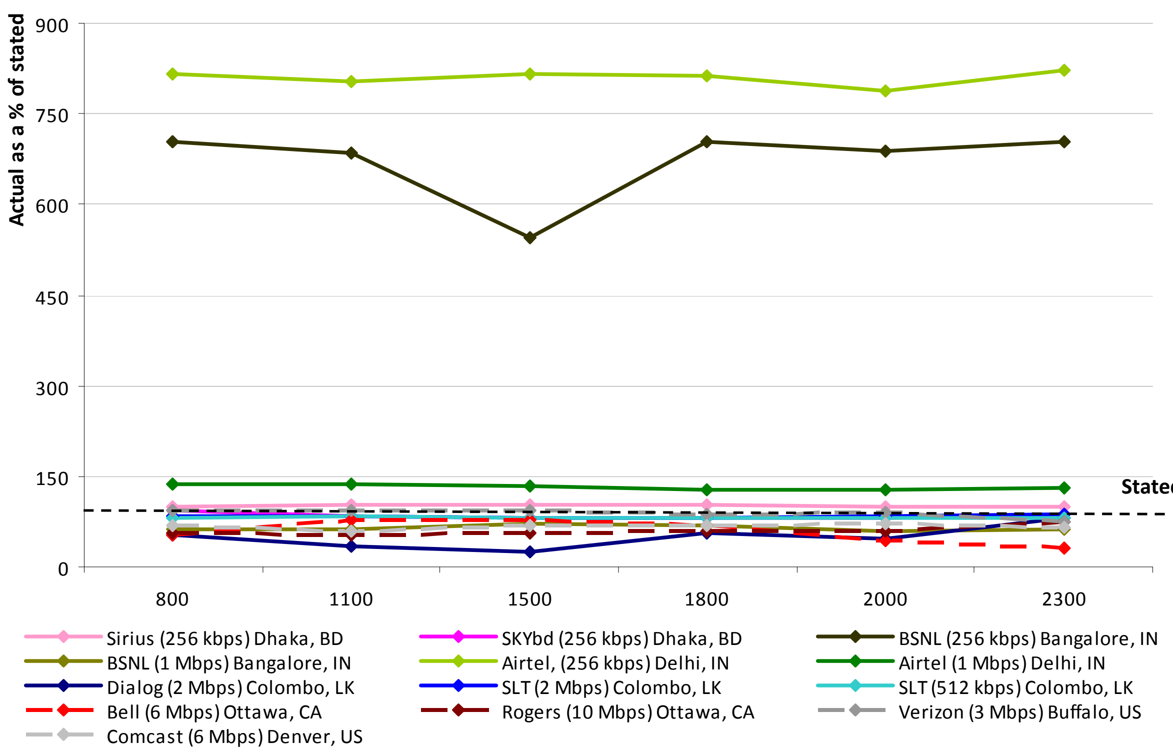

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Figure 3 - Download from International - kbps per dollar

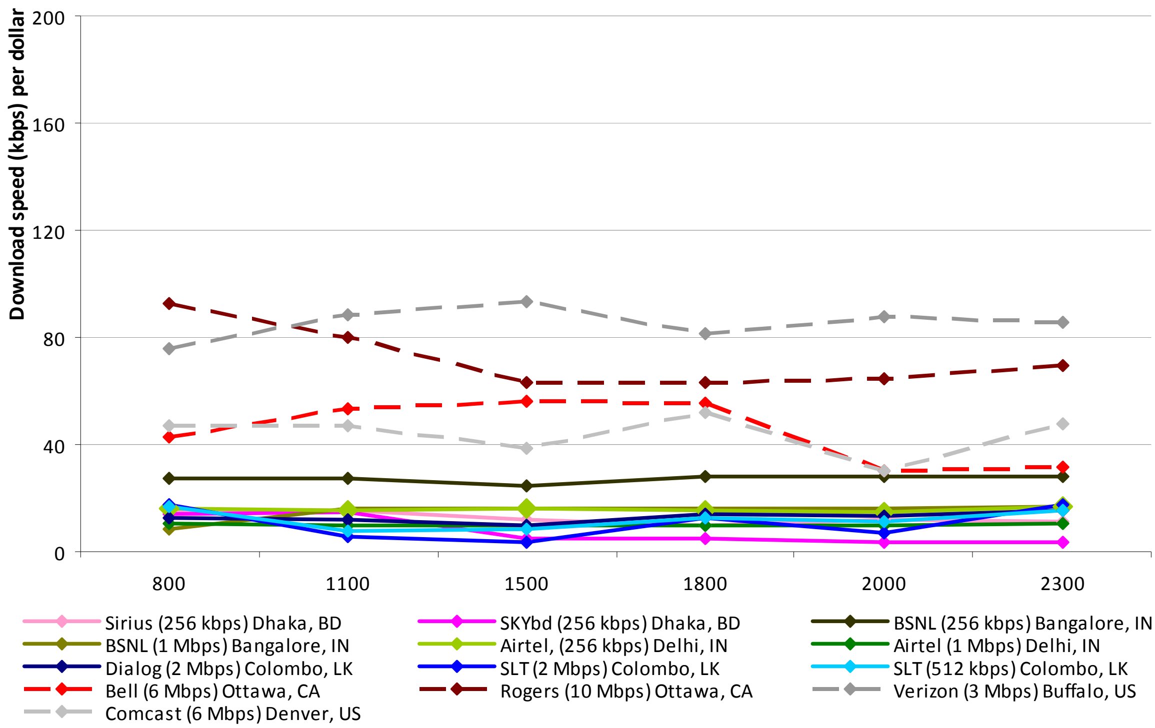
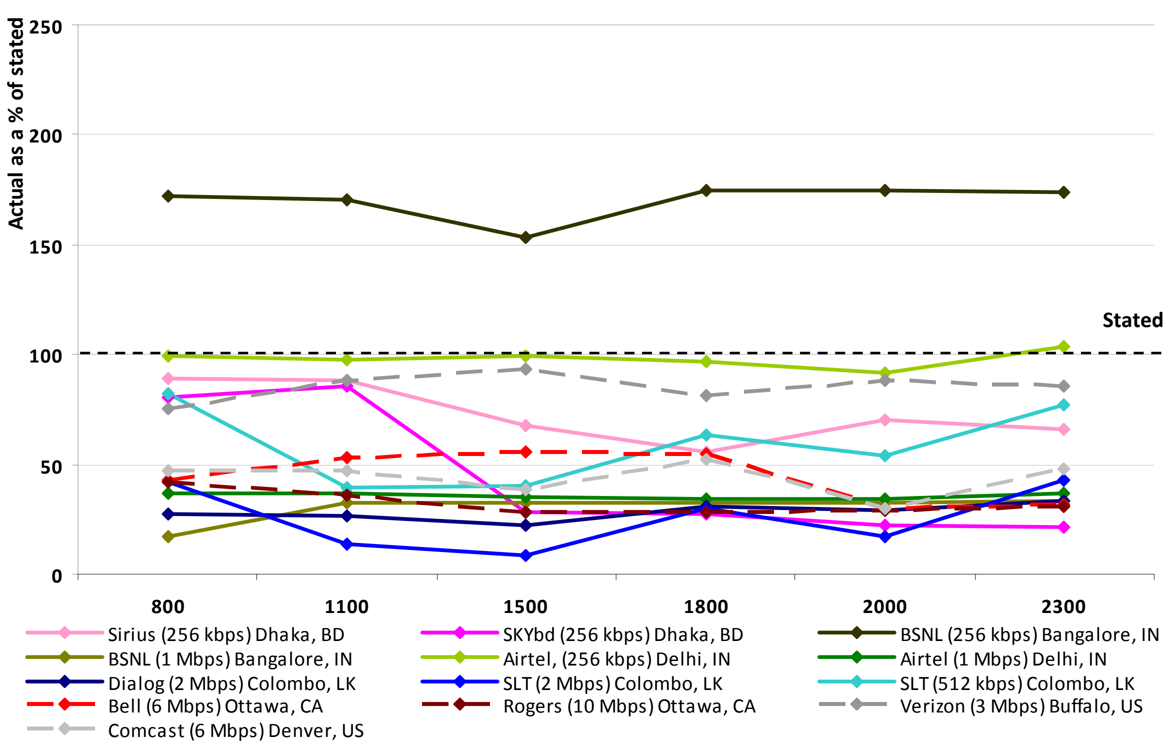


Figure 4 - Download from International – Fixed Broadband (Delivery vs. Stated)



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Fixed Broadband - Jitter[ix] and Packet Loss[x]
Figure 5 - Jitter when pinged to International

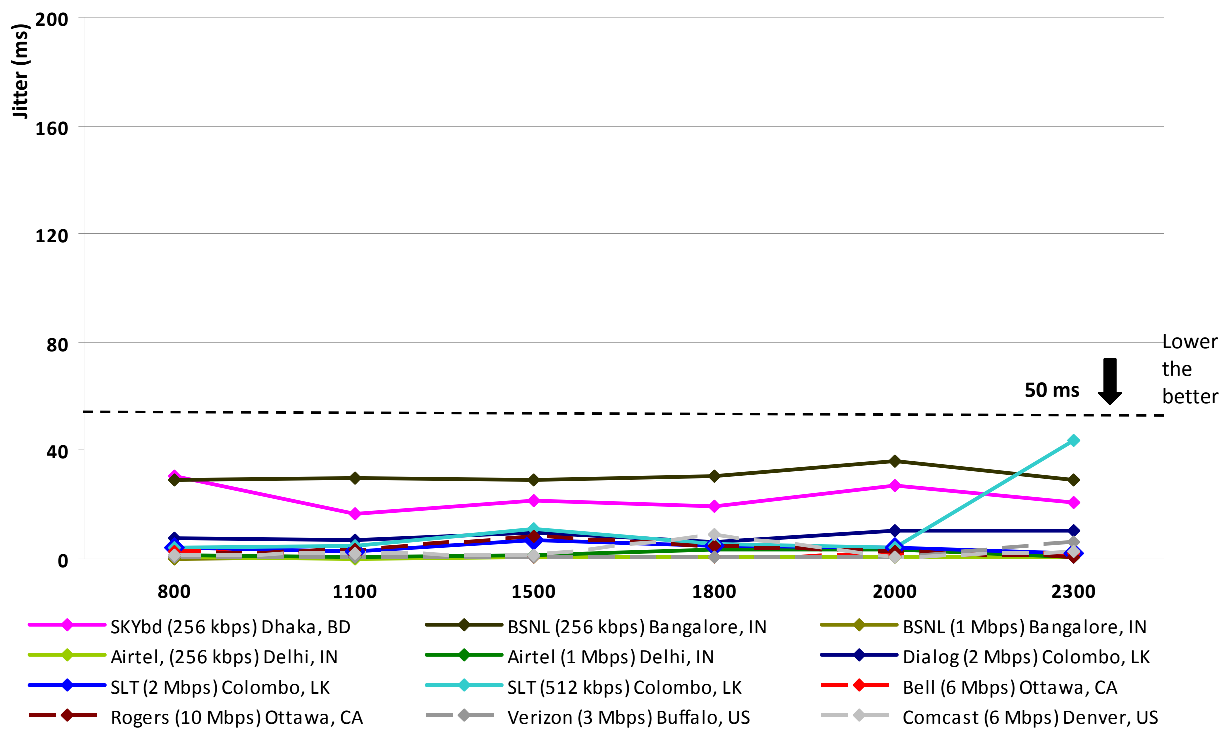
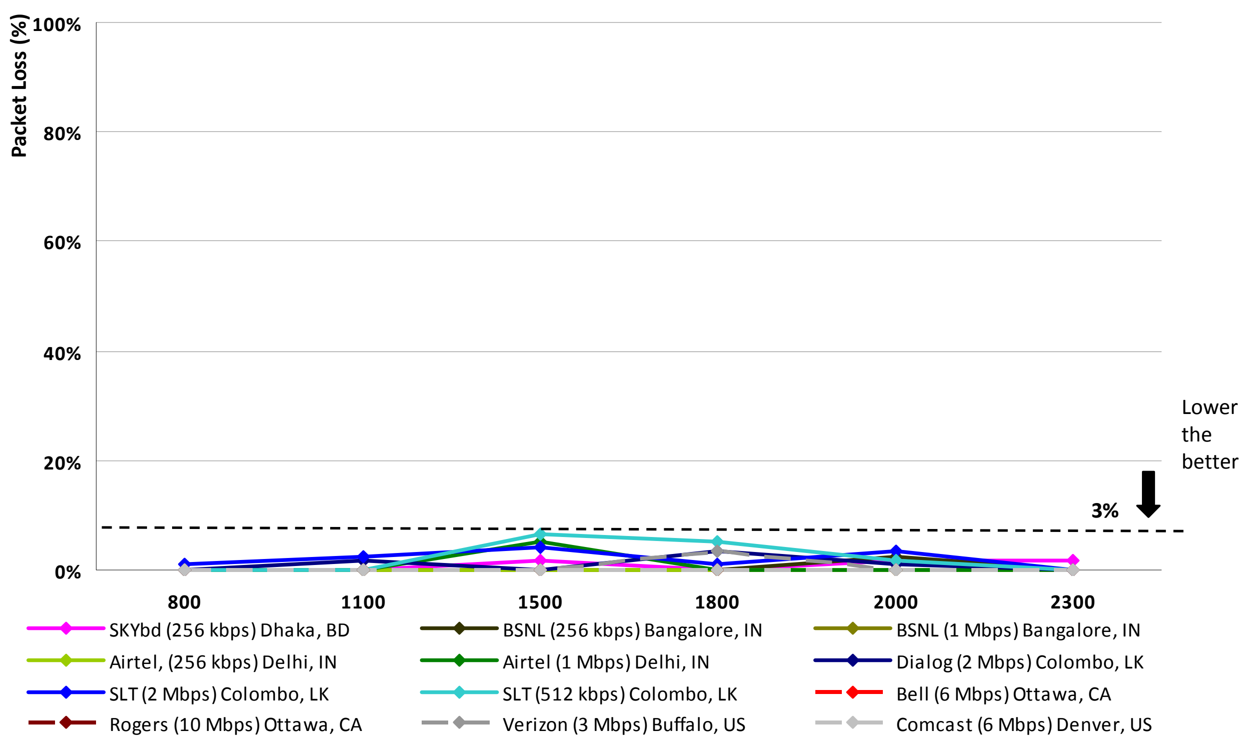


Figure 6 - Packet loss when pinged to International



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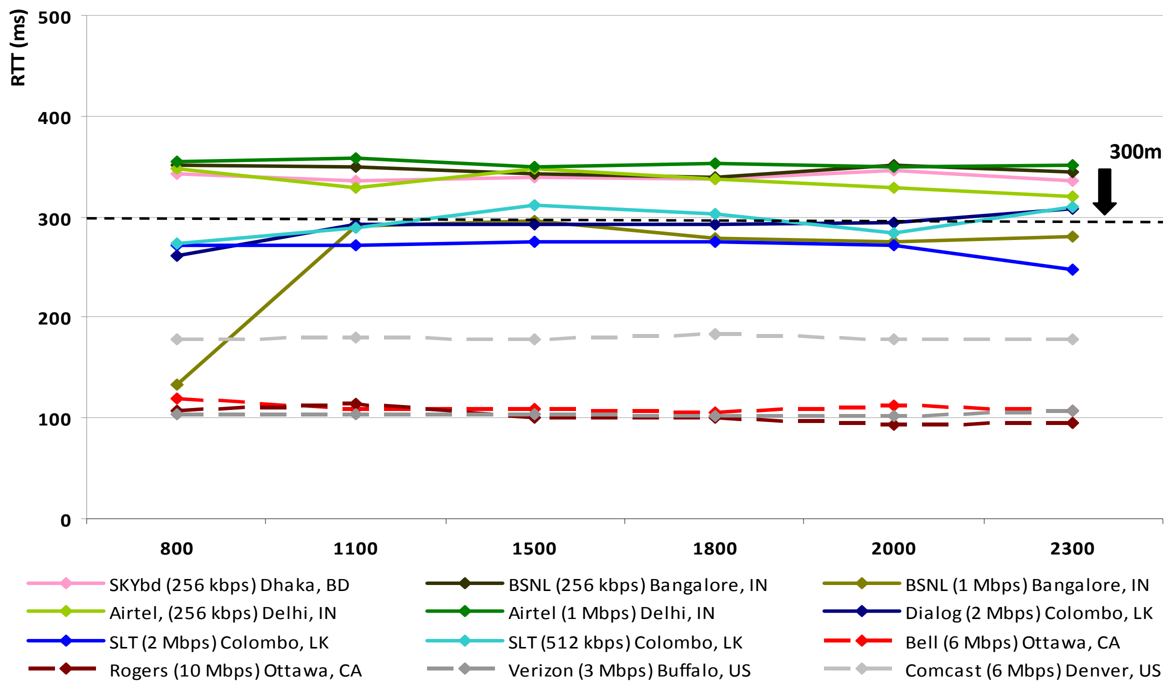
Fixed Broadband - Latency[xi]

Figure 7 - RTT when pinged to International



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Mobile Broadband Packages and colour keys

Package/Test Location/Country	Advertised Download speed	Data Limit
Dialog (1 Mbps) Colombo, Sri Lanka - I	1 Mbps	1 GB
Dialog (1 Mbps) Colombo, Sri Lanka - II	1 Mbps	Unlimited
Mobitel (1 Mbps) Colombo, Sri Lanka	1 Mbps	2 GB
Mobitel (3.6 Mbps) Colombo, Sri Lanka	3.6 Mbps	7 GB

NB:

1. This comparison has ignored whether the package offers limited or unlimited download option. For example Dialog (1 Mbps) Colombo LK which seems to offer the best performance has a limit of 1 GB per month.

2. Speeds were taken using personal computers not mobile handsets. The speeds may vary when mobile handsets are used.

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Mobile Broadband (Simulated testing) – Throughput (kbps)

Figure 8 - Download from ISP - kbps per dollar

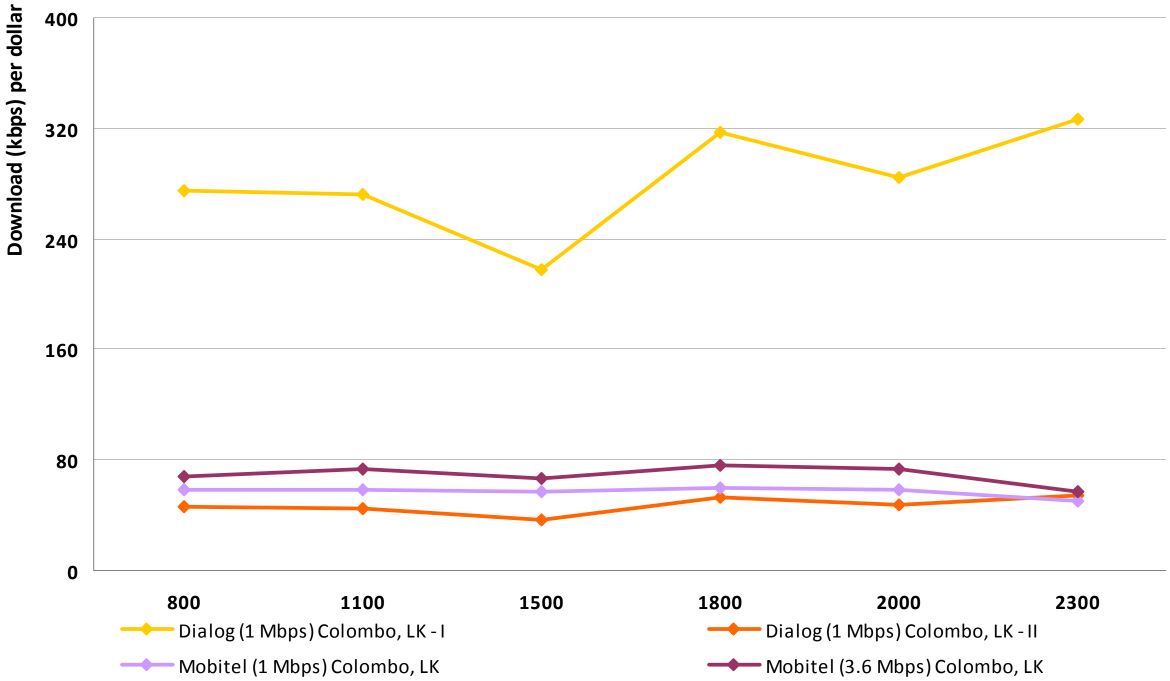

Figure 9 - Download from ISP - Mobile Broadband (Delivery vs. Stated)

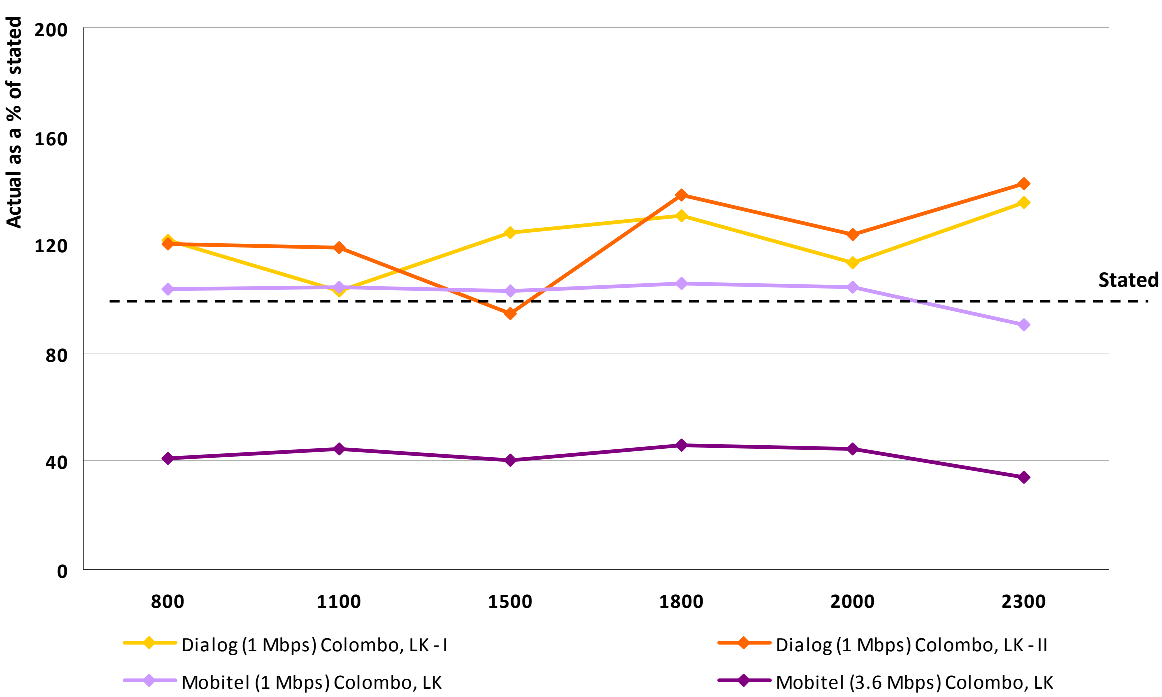

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Figure 10 - Download from International - kbps per dollar

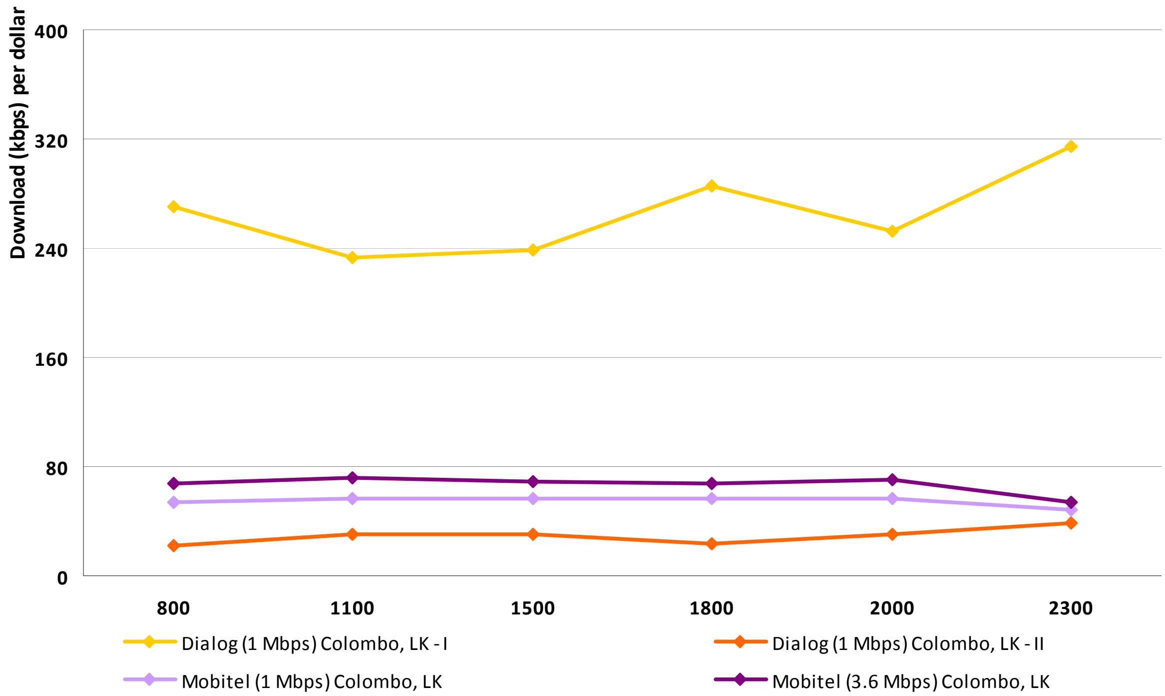
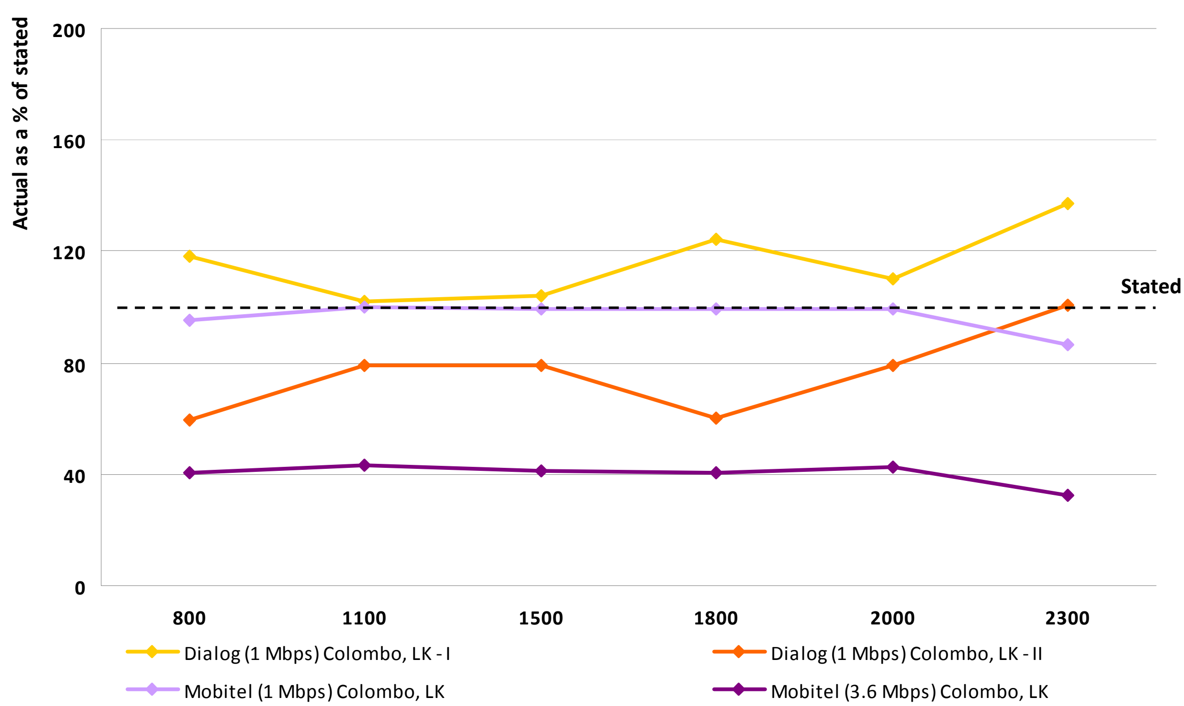


Figure 11 - Download from International - Mobile Broadband (Delivery vs. Stated)



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Mobile Broadband (Simulated testing) - Jitter[xii] and Packet Loss[xiii]

Figure 12 - Jitter when pinged to International

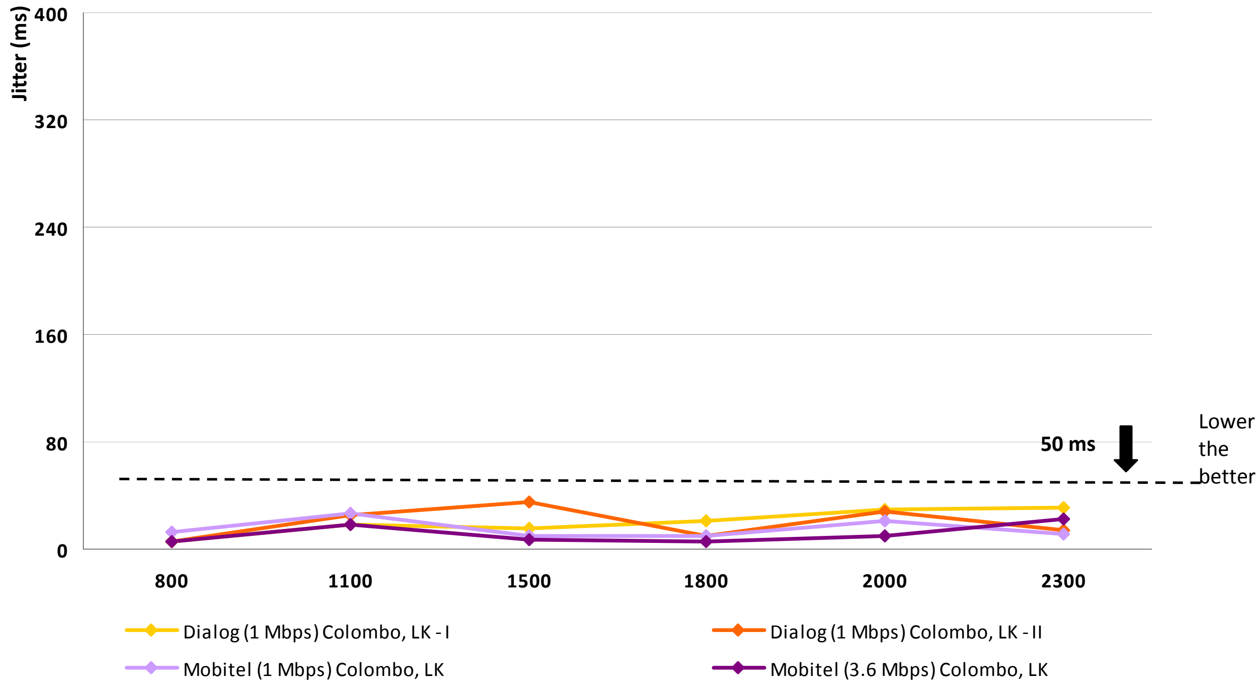
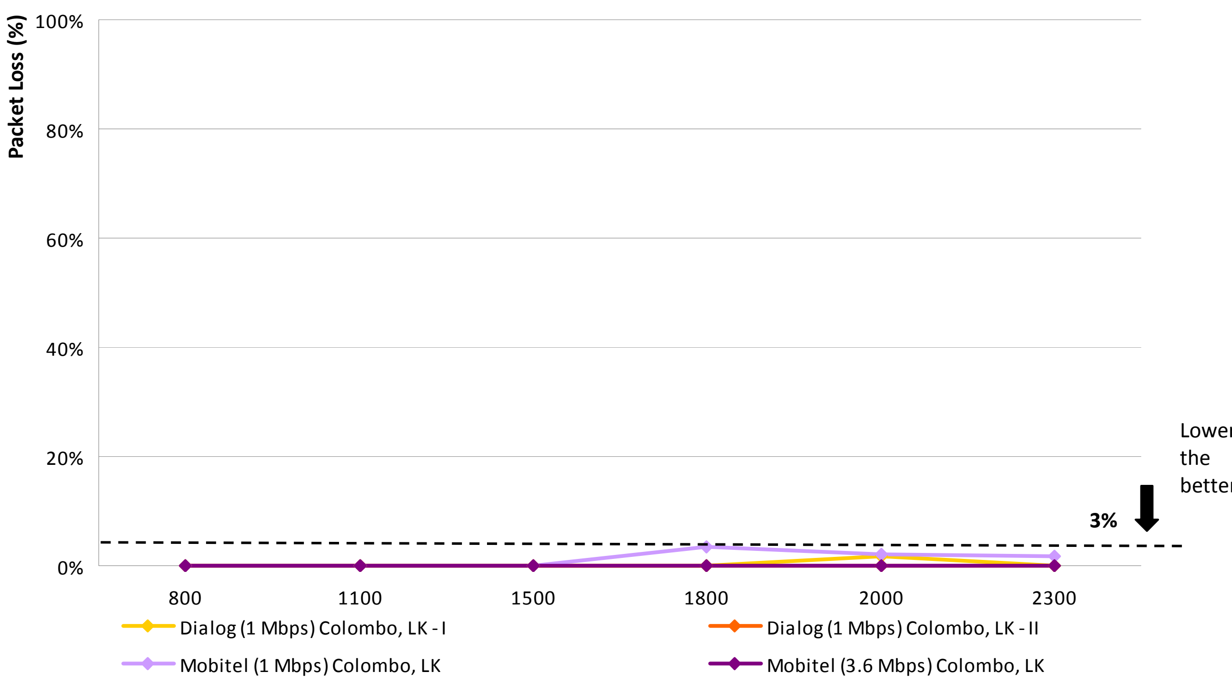


Figure 13 - Packet loss when pinged to International



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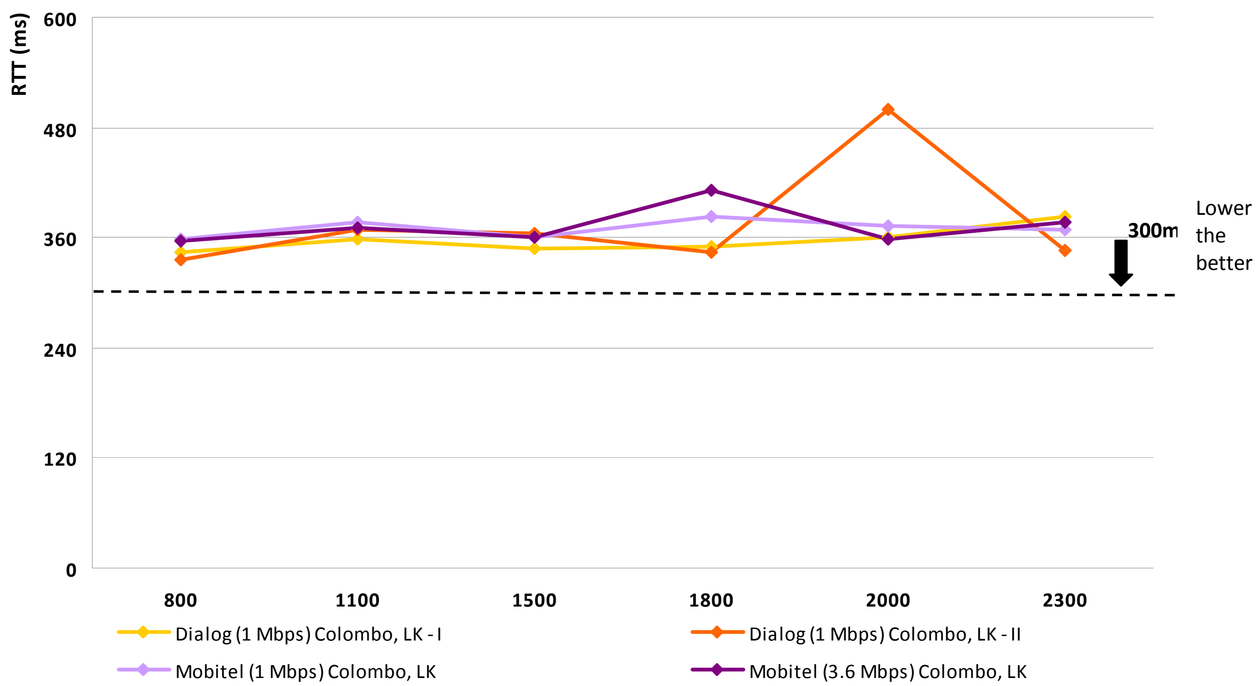
Mobile Broadband (Simulated testing) - Latency[xiv]
Figure 14 - RTT when pinged to International



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i http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/
ii Dodd, A. (2005), "The Essential Guide to Telecommunication" Fourth Edition, Pearson Education, p. 14
iii Dodd, A. (2005), "The Essential Guide to Telecommunication" Fourth Edition, Pearson Education, p. 60
iv Dodd, A. (2005), "The Essential Guide to Telecommunication" Fourth Edition, Pearson Education, p. 60
v Connection Magazine, http://www.connectionsmagazine.com/articles/5/049.html, CISCO Press Article
vi The connections were tested on:

SLT 1Mbps (Colombo) tested on	: 08 Sep and 09 Sep 2009
SLT 2Mbps (Colombo) tested on	: 08 Sep, 09 Sep, 24 Sep and 25 Sep 2009
Dialog 2 Mbps (Colombo) tested on	: 08 Sep, 09 Sep, 24 Sep and 25 Sep 2009
BSNL 256 kbps (Bangalore) tested on	: 08 Sep and 09 Sep 2009
BSNL 1 Mbps (Bangalore) tested on	: 09 Sep and 10 Sep 2009
Airtel 256 kbps (Delhi), tested on	: 08 Sep and 09 Sep 2009
Airtel 1 Mbps (Delhi), tested on	: 09 Sep and 12 Sep 2009
Sirius 256 kbps (Dhaka) tested on	: 15 Sep and 18 Sep 2009
SKYbd 256 kbps (Dhaka) tested on	: 16Sep and 18 Sep 2009
Rogers 10 Mbps (Ottawa) tested on	: 07 Oct, 08 Oct, 09 Oct and 10 Oct
Bell 6 Mbprs (Ottawa) tested on	: 22 Sep to 25 Sep 2009
Comcast 6 Mbps (Denver) tested on	: 09 Aug and 10 Aug 2009
Verizon 3 Mbps (Buffalo) tested on	: 20 Jul and 21 Jul 09
Dialog 1 Mbps Limited (1GB) (Colombo), Sri Lanka – I	: 09 Sep and 10 Sep 2009
Dialog 1 Mbps Unlimited (Colombo), Sri Lanka – II	: 10 Sep and 11 Sep 2009
Mobitel 1 Mbps Limited (2GB) (Colombo), Sri Lanka	: 08 Sep and 09 Sep 2009
Mobitel 3.6 Mbps Limited (7GB) (Colombo), Sri Lanka	: 10 Sep and 11 Sep 2009

vii The speedsat which the subscriber can receive traffic from the ISP server and a commonly used International Server. (e.g. yahoo.com). It plays a significant role in responsiveness and real-time applications like VoIP.
viii Tariff of the packages are converted in to United State Dollars for comparison.
ix Jitter is the variation of end-to-end delay from one packet to the next within the same packet stream/ connection/ flow. Jitter experienced in packets, more relevant in Real-time traffic like VoIP. Ideally it should be zero.
x Number of packets (in %) that does not reach the destination. This can result in highly noticeable performance issues with Streaming Technologies, VoIP and video conferencing.
xi Time taken for traffic to reach a particular destination.
xii Jitter is the variation of end-to-end delay from one packet to the next within the same packet stream/ connection/ flow. Jitter experienced in packets, more relevant in Real-time traffic like VoIP. Ideally it should be zero.
xiii Number of packets (in %) that does not reach the destination. This can result in highly noticeable performance issues with Streaming Technologies, VoIP and video conferencing.
xiv Time taken for traffic to reach a particular destination.

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Figure 1 - Annual cost, 2Mbps, 2km DPLC (tail cost)

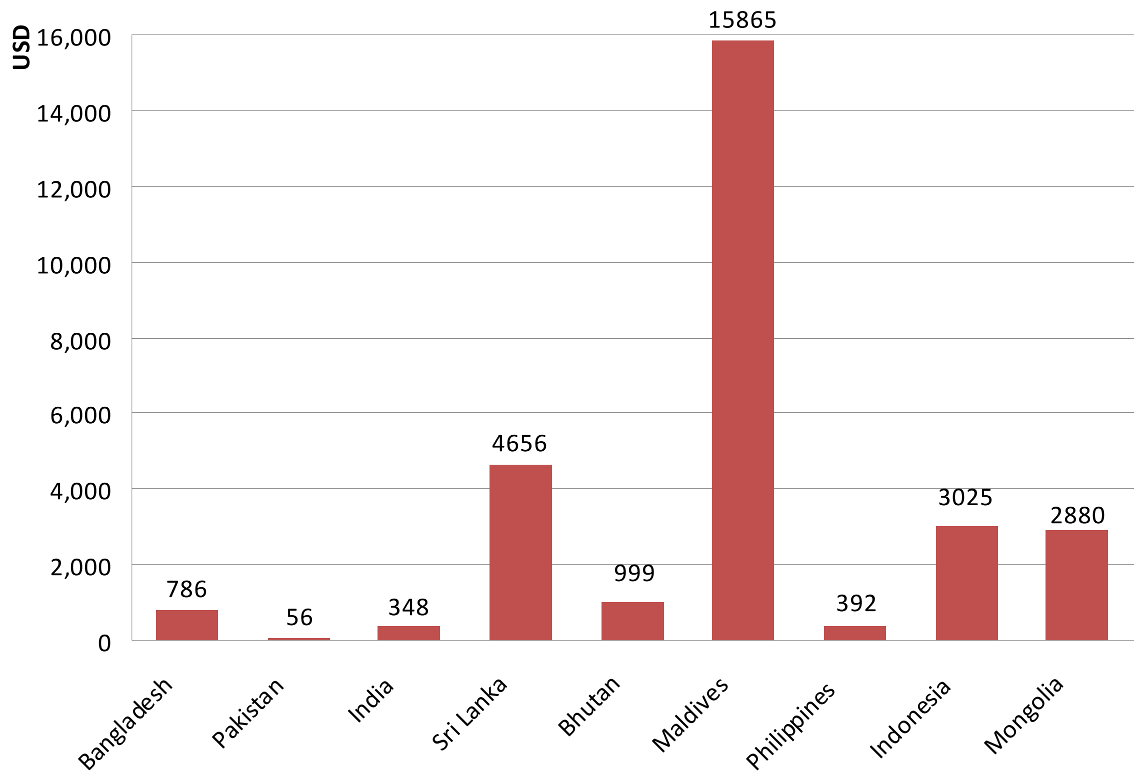

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Figure 2 - Annual cost, 2Mbps Broadband business connection (unlimited download)

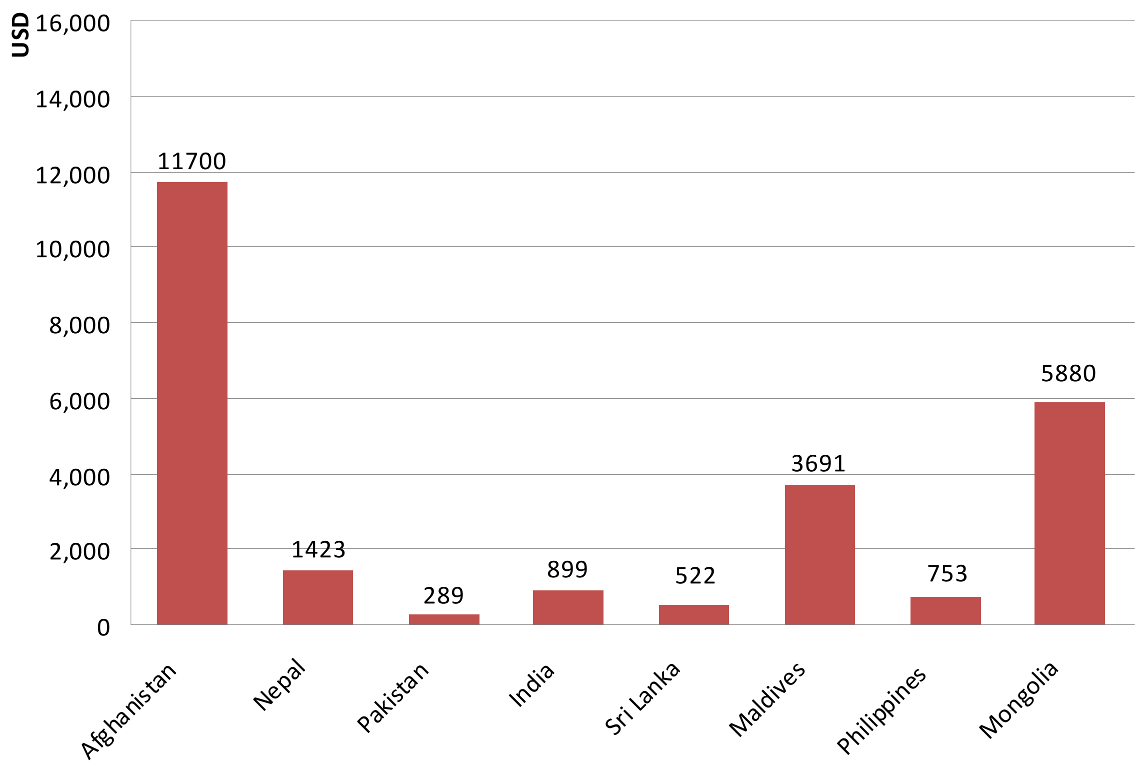

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Figure 3 - Annual cost, 256kbps Broadband residential connection (unlimited download)

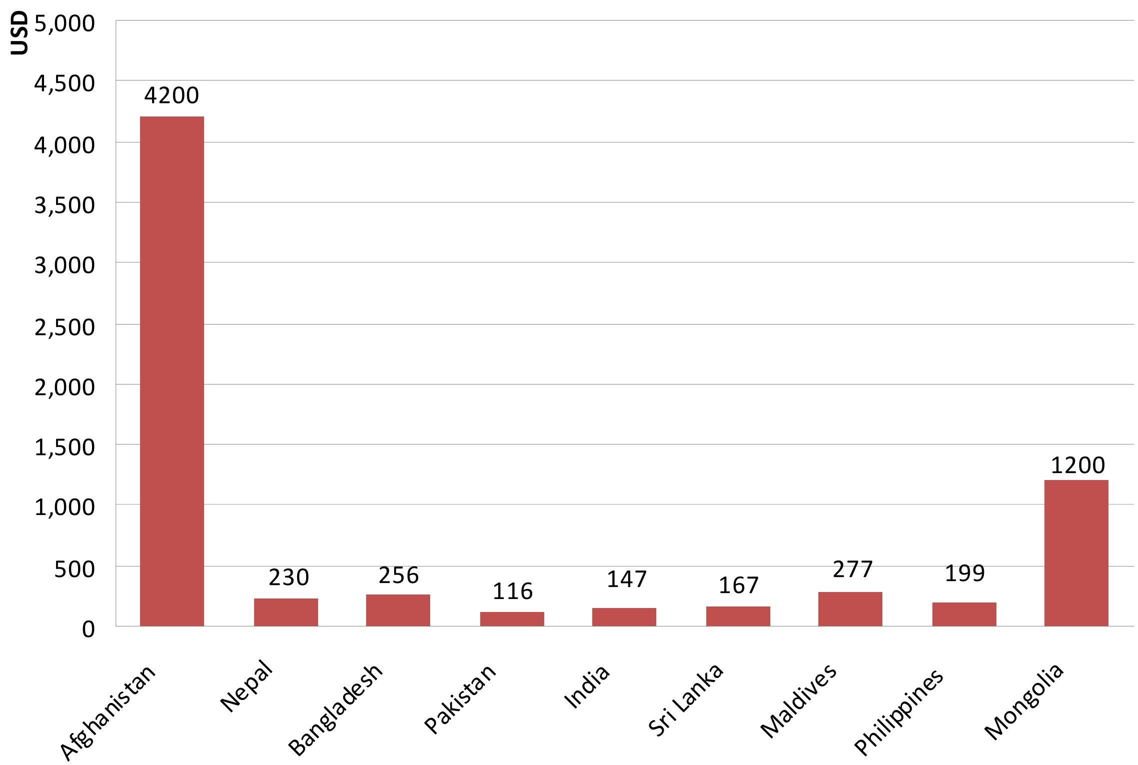

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Figure 4 -Annual cost, 2Mbps, 2km DPLC (tail cost), USD adjusted for PPP[1]

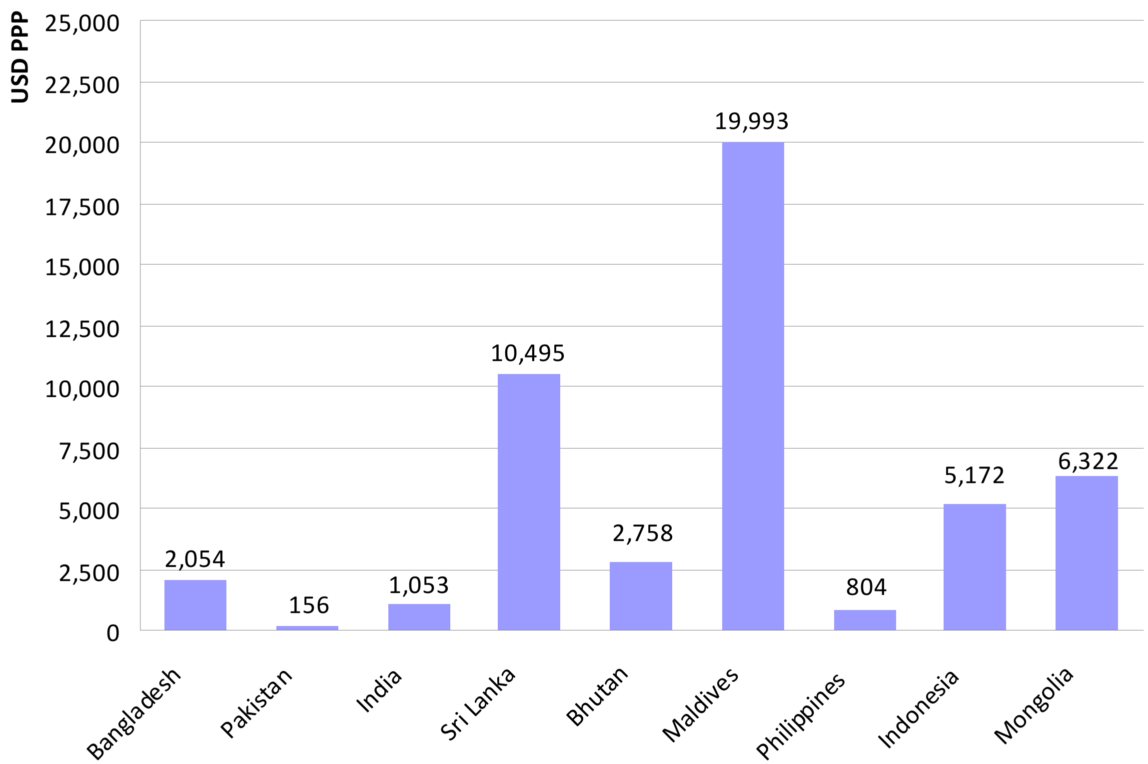

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Figure 5 - Annual cost, 2Mbps Broadband business connection (unlimited download), USD adjusted for PPP

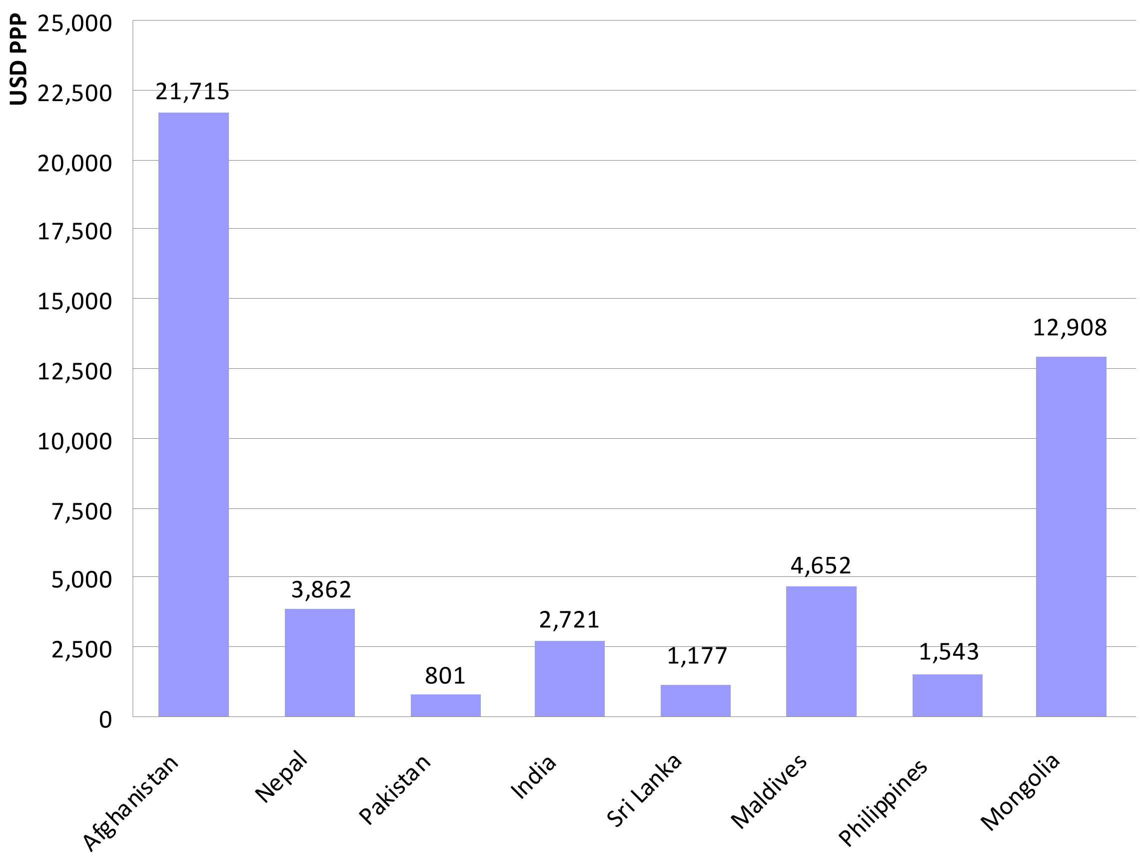

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Figure 6 - Annual cost, 256kbps Broadband residential connection (unlimited download), USD adjusted for PPP

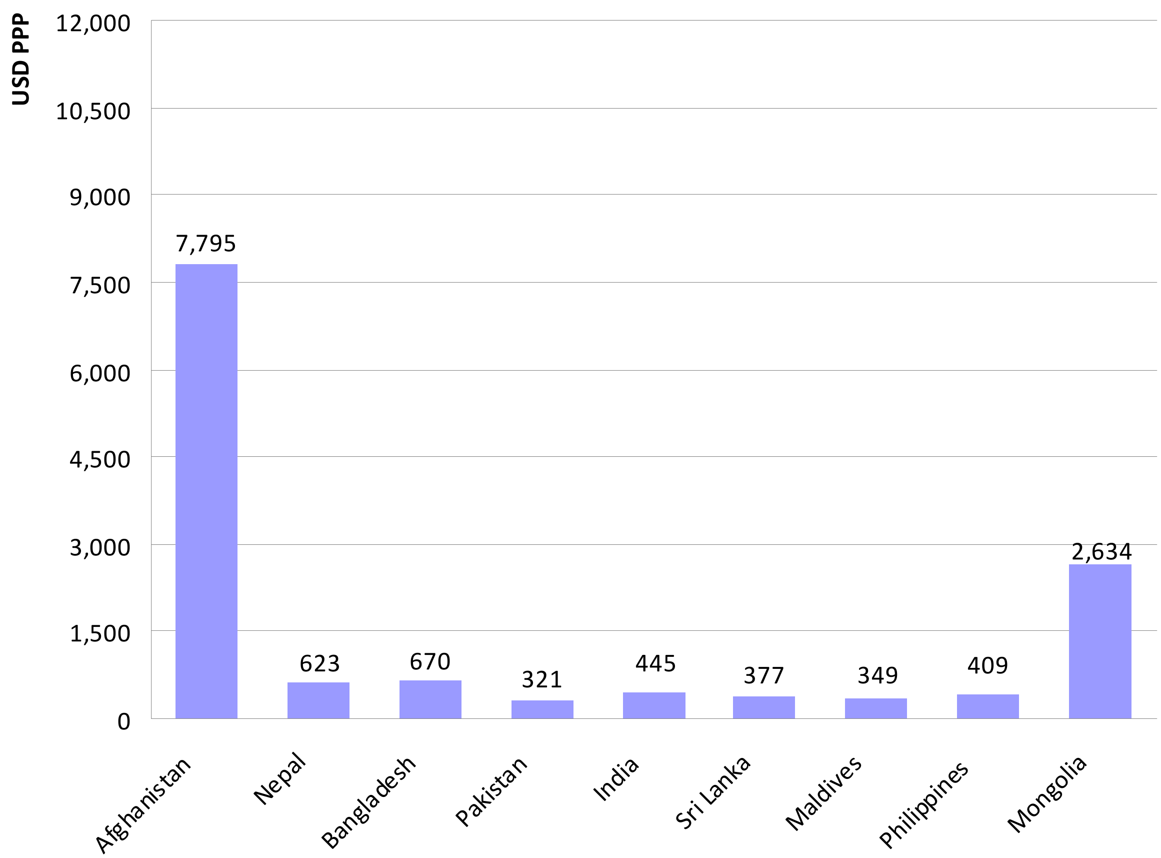

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Table 1- Broadband Prices in Emerging Asia in USD[2]

Country[3]	Annual cost, 2Mbps, 2km DPLC (tail cost)	Annual cost, 2Mbps, 100km DPLC[4]	Annual cost, 2Mbps Broadband business connection (unlimited download)	Annual cost, 256kbps Broadband business connection (unlimited download)	Annual cost, 256kbps Broadband residential connection (unlimited download)	Price per GB, for 2Mbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 1-4 GB data limit (Residential)	Price per GB, 1Mbps speed, 1GB data limit mobile internet	Value of 1 USD in local currency as at September 20, 2009[5]
					South Asia					
Afghanistan	[6]	[7]	11,700[8]	4,200[9]	4,200[10]					50.10
Nepal	[11]	[12]	1,423[13]	230[14]	230[15]					78.43
Bangladesh	786[16]	3,502[17]		598[18]	256[19]					70.25
Pakistan	56[20]	2,807[21]	289[22]	116[23]	116[24]		3[25]		2[26]	83.11
India	348[27]	3,607[28]	899[29]	147[30]	147[31]	3[32]		6[33]	8[34]	48.93
Sri Lanka	4,656[35]	10,519[36]	522[37]	167[38]	167[39]			4[40]	4[41]	114.87
Bhutan	999[42]	7,492[43]				4[44]	4[45]	3[46]	6[47]	48.05
Maldives	15,865[48]	41,422[49]	3,691[50]	1,665[51]	277[52]	22[53]	10[54]	9.25[55]		12.97
					South East Asia					
Philippines	392[56]		753[57]	250[58]	199[59]					47.82
Indonesia	3,025[60]	8,520[61]		741[62]		21[63]		8[64]	16[65]	9718.17
					East Asia					
Mongolia	(2880)[66]	(2880)[67]	5880[68]	1200[69]	1200[70]				3[71]	1418.61

If no data is shown, it indicates unavailability of information at time of research, or that a package closely fitting the category could not be found.

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[1] USD PPP estimates for 2009 were taken from the IMF World Economic Outlook (WEO) Database (October 2009), available at: http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

[2] Prices originally quoted in local currency have been converted into USD using exchange rates shown in final column.

[3] Countries are separated by region (South Asia vs South East Asia) and then listed in ascending order of projected GDP per capita current prices (U.S. dollars) for 2009 obtained from the World Economic Outlook database, Oct 2009
[4] Unless operator reports 100 km price, it is calculated using the price for 96 km link and 2 tail links (of 2km each).
[5] Exchange rates taken from http://www.oanda.com on 20 September 2009
[6] Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan 450 US $
[7] Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan 22500 $
[8] TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 2048kbps downlink 256 kbps
[9] TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 256kbps downlink 128 kbps
[10] TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 256kbps downlink 128 kbps
[11] Available package is for a lower speed of 64kbps. USD 574 for 2km link . See http://www.ntc.net.np/tariff/pstn_leased_charge.php
[12] Available package is for a lower speed of 64kbps. USD 1288 for 100 km link . See http://www.ntc.net.np/tariff/pstn_leased_charge.php
[13] NT ADSL 2 Mpbs package http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[14] NT ADSL 256 kpbs package http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[15] NT ADSL 256 kpbs package http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[16] Minimum Charge is 4,600 Tk/month for any distance below 20km. http://www.btrc.gov.bd/tariffs/btcl_domestic_transmission_charges.pdf
[17] Price Shown = (first 50km*230 BDT per kilometer) + (balance 50km * 180 BDT per kilometer) from http://www.btrc.gov.bd/tariffs/btcl_domestic_transmission_charges.pdf
[18] Zip SOHO speed16-20 kbps http://www.siriusbroadband.com/rate.php
[19] Zip Xpress. Speed not clear. http://www.siriusbroadband.com/rate.php
[20] Each kilometer between 0 -200km is PKR 2333. Hence price shown is 2*23333PKR. http://www.ntc.net.pk/tariffleasing.asp?menu_id=03.
[21] Each kilometer between 0 -200km is PKR 2333. Hence price shown is 100*23333PKR http://www.ntc.net.pk/tariffleasing.asp?menu_id=03.
[22] Pakistan Telecom Company Limited, *DSL-2Mbps Unlimited* package. http://www.ptcl.com.pk/contentp.php?NID=190#Bbunlimited
[23] National telecommunication Corporation, *Internet DSL NTC 256K package.* No distinction made between business and residential packages http://www.ntc.net.pk/tariffInternet.asp?menu_id=03
[24] National telecommunication Corporation, *Internet DSL NTC 256K package.* No distinction made between business and residential packages http://www.ntc.net.pk/tariffInternet.asp?menu_id=03
[25] Micronet Broadband *DSL Connect 9* 512/256kbps, 9GB limit per month http://www.dsl.net.pk/VolumePackages.php
[26] Mobilink Infinity 1Mbps speed 5GB *data* limit package http://www.mobilinkinfinity.com/tariff/
[27] BSNL 2Mbps 5km distance http://bsnl.co.in/service/leased_tariff.htm#high
[28] BSNL 2Mbps 100km distance http://bsnl.co.in/service/leased_tariff.htm#high
[29] MTNL Triband broad band Plan 2 http://mumbai.mtnl.net.in/triband/htm/tariff.htm
[30] MTNL, *TriB Unlimited, UL data – 256*, http://mtnldelhi.in/broadband/triband_tariff.htm. No distinction made between business and residential packages
[31] MTNL, *TriB Unlimited, UL data – 256*, http://mtnldelhi.in/broadband/triband_tariff.htm. No distinction made between business and residential packages
[32] MTNL, *TriB 649*, 256 Kbps up to 2 Mbps http://mtnldelhi.in/broadband/triband_tariff.htm
[33] BSNL *Home 2991*GB data download 256 Kbps up to 2Mbps http://www.bsnl.co.in/service/dataone_tariff.htm

[34] BSNL 3G data plan 399 (Postpaid/Prepaid) http://www.bsnl.in/service/3G/3G_files/3g.htm
[35] Price quoted by Sri Lanka Telecom
[36] Price quoted by Sri Lanka Telecom
[37] Dialog *OfficeNet* http://www.dialog.lk/business/broadband/officenet/
[38] Sri Lanka telecom, *Home Package* http://www.sltnet.lk/tariff.html
[39] Sri Lanka telecom, *Home Package* http://www.sltnet.lk/tariff.html
[40] Sri Lanka Telecom, *Entrée Package* 1GB http://www.sltnet.lk/tariff.html
[41] Mobitel *Zoom 890* 2GB data limit http://www.mobitel.lk/broadband/postpaid_internet.html
[42] Bhutan Telecom point to point Leased line service <10km. http://www.druknet.bt/btelecom/Point-to-Point-Leased-Line-Service.html
[43] Bhutan Telecom point to point Leased line service 100km. http://www.druknet.bt/btelecom/Point-to-Point-Leased-Line-Service.html
[44] Bhutan telecom, post-paid broadband, *Enterprise*, 15GB Limit http://www.druknet.bt/btelecom/Broadband.html
[45] Bhutan Telecom post-paid Broadband, *Home* 5GB Limit http://www.druknet.bt/btelecom/Broadband.html
[46] Bhutan Telecom post-paid Broadband, *Personal* 2.5GB Limit http://www.druknet.bt/btelecom/Broadband.html
[47] Bhutan Telecom post-paid Internet Packages, *Easy* 2.5GB Limit http://www.druknet.bt/btelecom/GPRSEDGE3G.html
[48] Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
[49] Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
[50] Raajje online *Biz broadband 2M* http://www.rol.net.mv/small-medium-biz/Biz-Broadband-2M.html
[51] Dhiraguu *Biz unlimited* http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_unlimited.php
[52] Raajje *Online ROL Value Pack* http://www.rol.net.mv/home-user/ROL-Value-Pack-256k.html
[53] Dhiraagu *Biz Premier4M* 4Mbps/512Kbps speed, 10GB data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_premier.php
[54] Dhiraagu *Biz Starter Package*, 512/128kbps Speed 5GB data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_starter.php
[55] Dhiraagu *home starter* 512/256 speed, 1GB data limit http://www.dhiraagu.com.mv/internet/starter.php
[56] Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
[57] PLDT *small biz micro* http://www.pldt.com.ph/prod-serv/business/bizdsl.htm
[58] Globe *Wired* Broadband Packages 384 kbps Business http://www.sme.globe.com.ph/GlobeCSME/View
[59] Globe Broadband *WiMax* Internet only package 512 Kbps. http://site.globe.com.ph/web/guest/broadband/offers/3?sid=tp0h1gilfhpu1253435955668
[60] No. 32/DJPT.1/KOMINFO/4/2008 distance 5km
[61] No. 32/DJPT.1/KOMINFO/4/2008 distance 100km
[62] ABLTech *SOHO package* http://abltech.com/price.html
[63] Indosat M2 *Broadband 3.5G - BIZZ* speed upto 3.6Mbps 5GB data limit http://www.indosatm2.com/index.php/business-solution/internet-services/im2-broadband-35g-bizz

[64] *PRIME (Postpaid 3.5G) Eco* Unlimited 384kbps upto 2GB data limit. 64kbps for further unlimited data. http://www.indosatm2.com/index.php/consumer-solution/internet-services/postpaid/im2-broadband-35g

[65] Indosat *3.5G Regular Quote Package Extra Light* 1.2 GB data limit http://www.indosat.com/Indosat_3.5G_Broadband

[66] Available package is for a lower speed of 1Mbps. USD 2,880 for 2km for Local ISP. Refer www.railcom.mn

[67] Available package is for a lower speed of 1Mbps. USD 2,880 for 100km for Local ISP. Refer www.railcom.mn

[68] Magicnet Co., Ltd www.magicnet.mn

[69] Magicnet Co., Ltd www.magicnet.mn

[70] Magicnet Co., Ltd www.magicnet.mn

[71] G-Mobile. 2GB data limit data package. www.g-mobile.mn

BROADBAND BENCHMARKS

Emerging Asia

Feb 2009

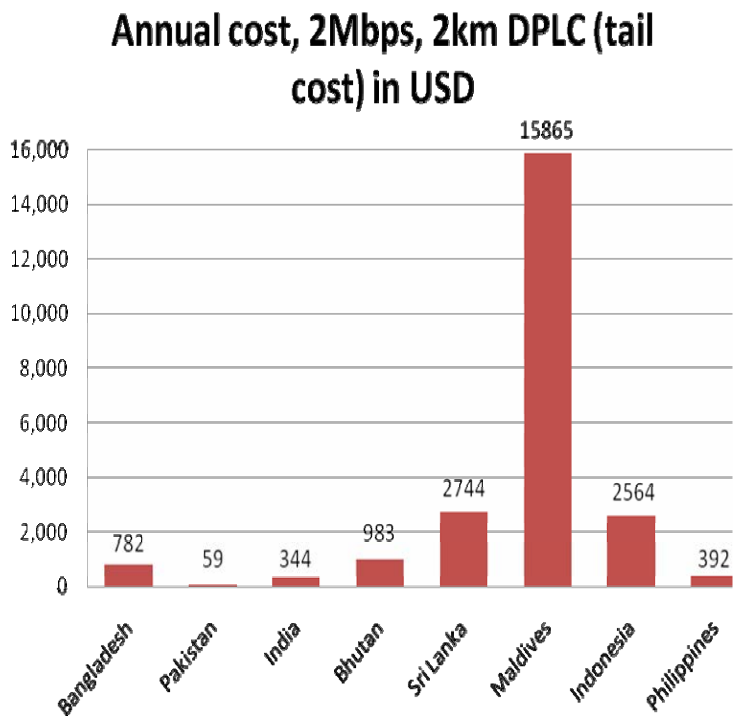

Figure 1

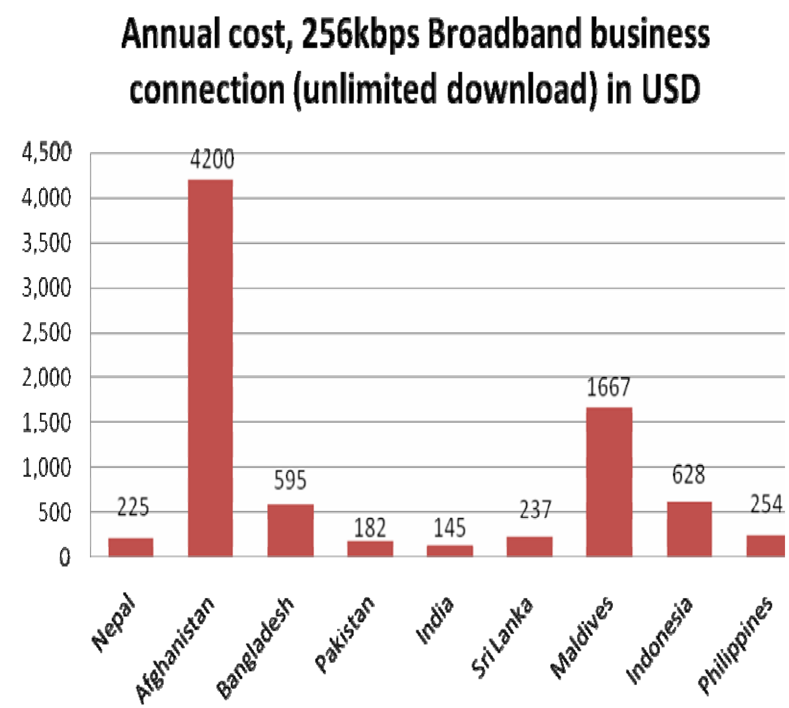

Figure 2

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Table 1- Broadband Prices in Emerging Asia in USD[1]

Country[2]	Annual cost, 2Mbps, 2km DPLC (tail cost)	Annual cost, 2Mbps, 100km DPLC	Annual cost, 2Mbps Broadband business connection[iii] (unlimited download)	Annual cost, 256kbps Broadband business connection (unlimited download)	Annual cost, 256kbps Broadband residential connection (unlimited download)	Price per GB, for 2Mbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 1- 4 GB data limit (Residential)	Price per GB, 1Mbps speed, 1GB data limit mobile internet	Value of 1 USD in local currency as at January 30, 2009[3]
South Asia										
Nepal	[4]	[5]	1,395[6]	225	225					79.98
Afghanistan	[7]	[8]	11,700[9]	4,200[10]	4,200					52.13
Bangladesh	782[11]	3,826[12]		595[13]	255[14]					70.58
Pakistan	59[15]	2,950[16]	759[17]	182[18]	182		4[19]	2[20]	2[21]	79.08
India	344[22]	3,569[23]	2,225[24]	145[25]	145[26]	3[27]		5[28]		49.44
Bhutan	983[29]	7,369[30]				4[31]	4[32]	4[33]	17[34]	48.85
Sri Lanka	2,744[35]	3,236[36]	526[37]	237[38]	237			9[39]	4[40]	114.13
Maldives	15,865[41]	41,422[42]	3,689[43]	1,667[44]	277[45]	22[46]	10[47]	9[48]		12.96
South East Asia										
Indonesia	2,564[49]	7,220[50]		628[51]	8,371[52]	17[53]		7[54]	14[55]	11,467.90
Philippines	392[56]		765[57]	254[58]	254[59]					47.03

If no data is shown, it indicates unavailability of information at time of research, or that a package closely fitting the category could not be found.

[1] Prices originally quoted in local currency has been converted into USD using exchange rates shown in final column.

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[2] Countries are separated by region (South Asia vs South East Asia) and then listed in ascending order of GDP per capita current prices (U.S. dollars**)** obtained from the World Economic Outlook database, Oct 2008
3 Exchange rates taken from http://www.oanda.com
4 Available package is for a lower speed of 64kbps. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
5 Available package is for a lower speed of 64kbps. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
6 http://www.ntc.net.np/adsl/adsl_tariffPlans.php
7 Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan 450 US $
8 Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan 22500 $
9 TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 2048kbps downlink 256 kbps
10 TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 256kbps downlink 128 kbps
11 Minimum Charge is 4,600 Tk/month for any distance below 20 Kilometers.
http://www.btrc.org.bd/newsandevents/btcl_domestic_transmission_charges.pdf
12 Price Shown = (first 50Km*250Tk) + (balance 50Km * 200Tk) from http://www.btrc.org.bd/newsandevents/btcl_domestic_transmission_charges.pdf
13 Zip SOHO speed16-20 kbps http://www.siriusbroadband.com/rate.php
14 Zip Xpress. Speed not clear. http://www.siriusbroadband.com/rate.php
15 0 -200km Distance Charges Per Annum Per Km http://www.ntc.net.pk/tariffleasing.asp?menu_id=03. Hence price shown = 2*2,333 PKR
[16] 0 -200km Distance Charges Per Annum Per Km http://www.ntc.net.pk/tariffleasing.asp?menu_id=03. Hence 100*2,333 PKR
17 Pakistan Telecom Company Limited, *DSL-2Mbps Unlimited* package. http://www.ptcl.com.pk/contentp.php?NID=190#Bbunlimited
18 Pakistan Telecom Company Limited, *DSL 512 Kbps Unlimited*. No distinction made between business and residential packages
http://www.ptcl.com.pk/contentp.php?NID=190#Bbunlimited
19 *Macronet DSL Connect 9* 512 down and 256 up, 9GB limit per month http://www.dsl.net.pk/VolumePackages.php
20 *Macro Broadband DSL@Home-7* download speed 512kbps limit of 7GB http://www.dsl.net.pk/HomePackage.php
21 Mobilink Infinity 1Mbps speed 5GB data limit package http://www.mobilinkinfinity.com/tariff/
22 BSNL 2mbps 5km distance http://bsnl.co.in/service/leased_tariff.htm#high
23 BSNL 2mbps 100km distance http://bsnl.co.in/service/leased_tariff.htm#high
24 MTNL Triband broad band Plan 4 http://mumbai.mtnl.net.in/triband/htm/tariff.htm
25 MTNL, *TriB Unlimited, UL data – 256*, http://mtnldelhi.in/broadband/triband_tariff.htm
26 MTNL *TriB UL data-256* http://mtnldelhi.in/broadband/triband_tariff.htm
27 BSNL *Business Combo Plan 6* GB free download 256 Kbps/ Up to 2 Mbps http://www.bsnl.co.in/service/dataone_tariff.htm
28 BSNL *Home 250* 1GB data download 256 Kbps/upto 2Mbps http://www.bsnl.co.in/service/dataone_tariff.htm
29 Bhutan Telecom point to point Leased line service <10km http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=35&Itemid=62
30 Bhutan Telecom point to point Leased line service for 100km http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=35&Itemid=63
31 Bhutan telecom, Monthly post-paid broadband, *Enterprise*, 15GB Limit
http://www.telecom.net.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112
32 Bhutan Telecom Post-paid Broadband data limit upto 5GB http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112

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33 Bhutan telecom, Monthly post-paid broadband, *Personal,* 2.5GB Limit
http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=113
34 Bhutan telecom, *Supreme Package* 1.2GB Limit http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=77&Itemid=124
35 Quote obtained via email from Sri Lanka Telecom marketing agent
36 Quote obtained via email from Sri Lanka Telecom marketing agent
37 Dialog *OfficeNe*t http://www.dialog.lk/en/broadband/products/officenet.html
38 Dialog Broadband Internet – *HomeNet* http://www.dialog.lk/en/broadband/products/homenet.html
39 Sri Lanka Telecom, *Entrée Package* 1GB http://www.slt.lk/data/forbusiness/115adsl.htm
40 Mobitel *Zoom* 2GM data limit http://www.mobitel.lk/broadband/postpaid_internet.html
41 Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
42 Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
43 Raajje online *Biz broadband 2M* http://www.rol.net.mv/small-medium-biz/Biz-Broadband-2M.html
44 Dhiraguu *Biz unlimited* http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_unlimited.php
45 Raajje *Online ROL Value Pack* http://www.rol.net.mv/home-user/ROL-Value-Pack-256k.html
46 Dhiraagu *Biz Premier4M* 4Mbps/512Kbps speed, 10GB data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_premier.php
47 Dhiraagu *Biz Starter Package*, 512/128kbps Speed 5GM data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_starter.php
48 Dhiraagu *home starter* 512/256 speed, 1GB data limit http://www.dhiraagu.com.mv/internet/starter.php
49 No. 32/DJPT.1/KOMINFO/4/2008 distance 5Km
50 No. 32/DJPT.1/KOMINFO/4/2008 distance 100Km
51 ABLTech *SOHO package* http://abltech.com/price.html
52 ABL Tech Business and Corporate package http://abltech.com/price.html
53 Indosat M2 *Broadband 3.5G - BIZZ* speed upto 3.6Mbps 5GB data limit http://www.indosatm2.com/index.php/business-solution/internet-services/im2-broadband-35g-bizz
54 *PRIME (Postpaid 3.5G) Eco* Unlimited 384kbps upto 2GB data limit. Then 64kbps for further unlimited data. http://www.indosatm2.com/index.php/consumer-solution/internet-services/postpaid/im2-broadband-35g
55 Indosat *3.5G Regular Quote Package Extra Light* 1.2 GB data limit http://www.indosat.com/Indosat_3.5G_Broadband
56 Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
57 PLDT *small biz micro* http://www.pldt.com.ph/prod-serv/business/bizdsl.htm
58 Globe *Wired* Broadband Packages 384 kbps Business http://www.sme.globe.com.ph/GlobeCSME/View
59 Globe Broadband *Plan Php 995*, Up to 384 kbps http://www.globelines.com.ph/inner.html#packages

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Broadband Quality of Service Experience (QoSE) Indicators[1]

Price is not the only dimension that is of interest to customers and regulators. Quality of Service Experience (QoSE) is integrally connected to price: an increase in quality is an invisible decrease in price and vice versa.

Broadband quality can be evaluated through speed tests. Test sites provide a variety of information about the speed of a link. Careful design and implementation of tests can shed light on the exact segment where inadequate capacity constrains speed. Carefully implemented tests can also be the basis for Service Level Agreements (SLAs) between operators and users and for regulatory action.

In the present tests, the methodology has been developed in collaboration with a team headed by Professor Timothy Gonsalves of IIT Madras. The following dimensions of quality have been measured for two networks in Bangladesh (Dhaka) three in India (Chennai and New Delhi) and four networks in Sri Lanka (Colombo).

Throughput (kbps)

Referred to as the "actual amount of useful data sent on a transmission"[2]. **Defined by the ITU as "an amount of user information transferred in a period of time" (ITU-T X.641 (97), 6.3.3.16)**, more commonly referred to as download or upload speeds.

A key advertised metrics in broadband services is the download speed. It defines how much information a user can received from a local or international server. Upload speed defines the speed in which the user can send information to local or international servers. It plays a significant role in responsiveness and real-time applications like VOIP (Voice Over Internet Protocol).

Throughput, or download and upload speeds, varies depending on the location of the server that holds the content. If the location is local, such as an ISP server, the throughput may be higher than it would be if the location is international.

Therefore the testing has included throughput for both local (ISP) and international (yahoo.com) servers.

Latency (ms)

"Latency refers to delays when voice packets transverse the network"[3]. It is measured in milliseconds by using the Round Trip Time (RTT). This is significant in systems that require two-way interactive communication, such as voice telephony, or ACK/NAK [acknowledge/not acknowledge] data systems where the round-trip time directly affects the throughput rate, such as the Transmission Control Protocol (TCP).

The ITU definition states that "Latency means transmission delay for FEC (Forwarding Equivalence Class) encoding, decoding, interleaving and de-interleaving" (ITU-T G.972 (04), 3025).

Jitter (ms)

"Jitter is uneven latency and packet loss"[4]. It is the variation of end-to-end delay from one packet to the next within the same packet stream/connection/flow. Jitter is more relevant for real-time traffic like VOIP. Ideally the figure should be low.

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E.g. Radio quality voice requires less than 1 ms Jitter, toll-quality voice requires less than 20 ms jitter, normal VoIP requires jitter to be less than 30 ms. Beyond 30 ms, VoIP performance will degrade.[5]
Also defined by ITU as "Short-term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time" (ITU-T G.701 (93), 2024).

Packet Loss (%) Number of packets (as a percentage) that does not reach the destination. Degradation can result in noticeable performance loss with streaming technologies, VOIP and video conferencing. **ITU states that "In general, IP-based networks do not guarantee delivery of packets. Packets will be dropped under peak loads and during periods of congestion. NOTE – In case of multimedia services, when a late packet finally arrives, it will be considered lost" (ITU-T H.360 (04), 5.3.2.2).**

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BROADBAND ENCHMARKS

Quality of Service Experience (QoSE)

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Results of QoSE testing[6] (Chennai, Colombo, Dhaka and New Delhi)

Fixed Broadband – Throughput (kbps)[7]

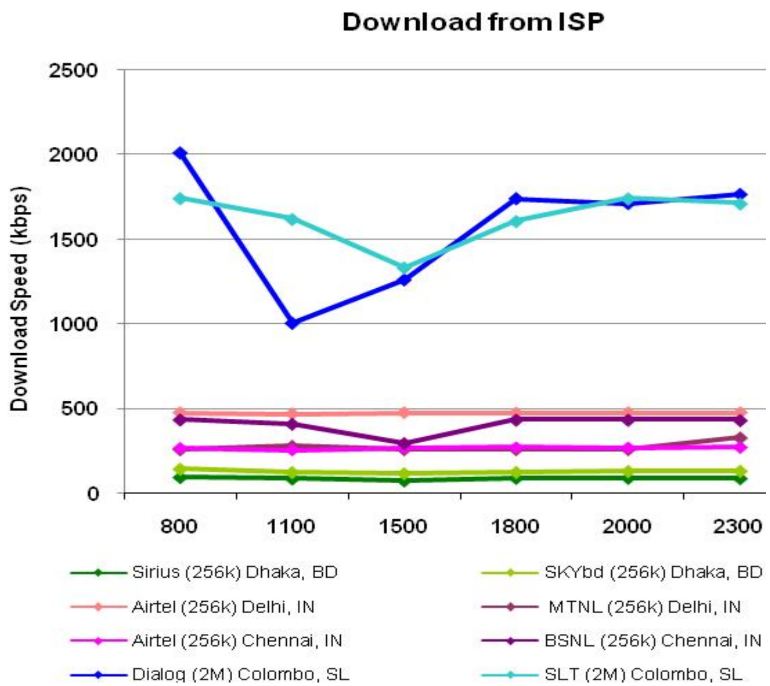

Figure 1[8]

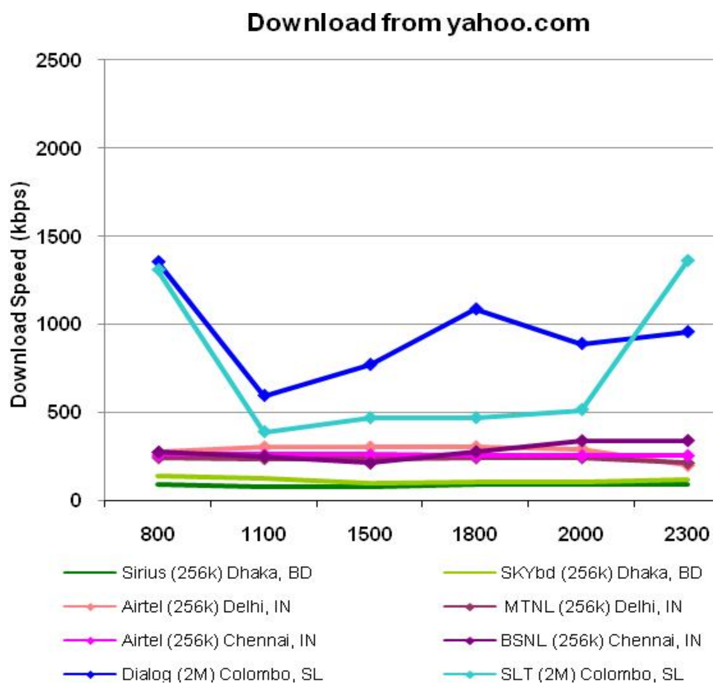

Figure 2

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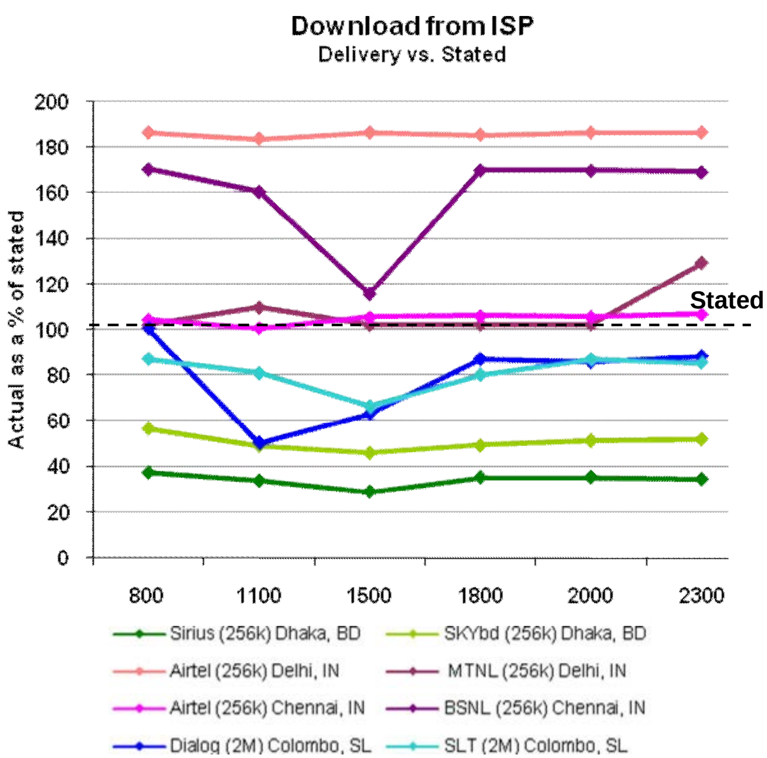

Figure 3

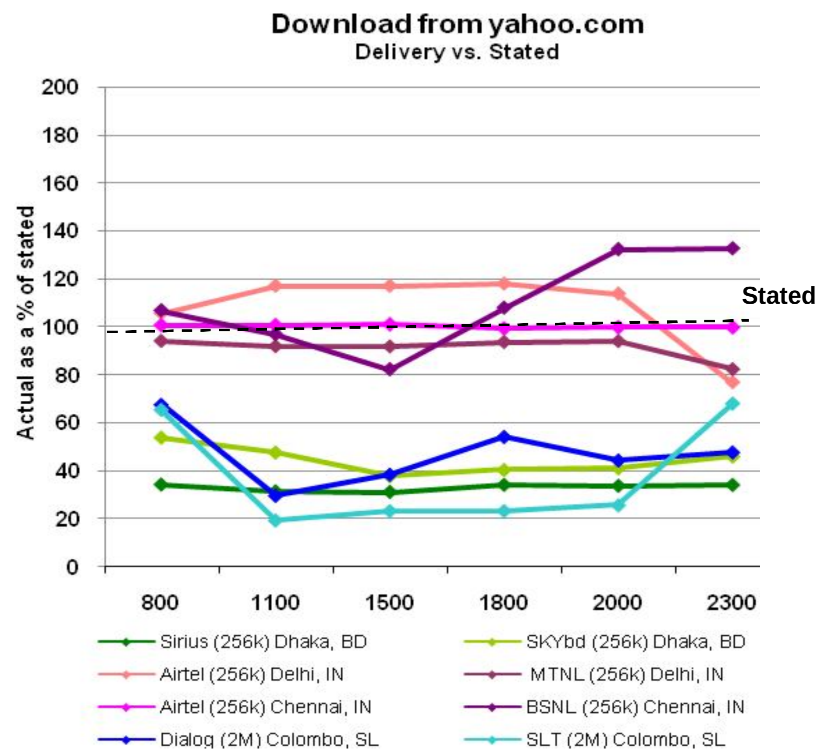

Figure 4

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Fixed Broadband - Jitter[9] and Packet Loss[10]

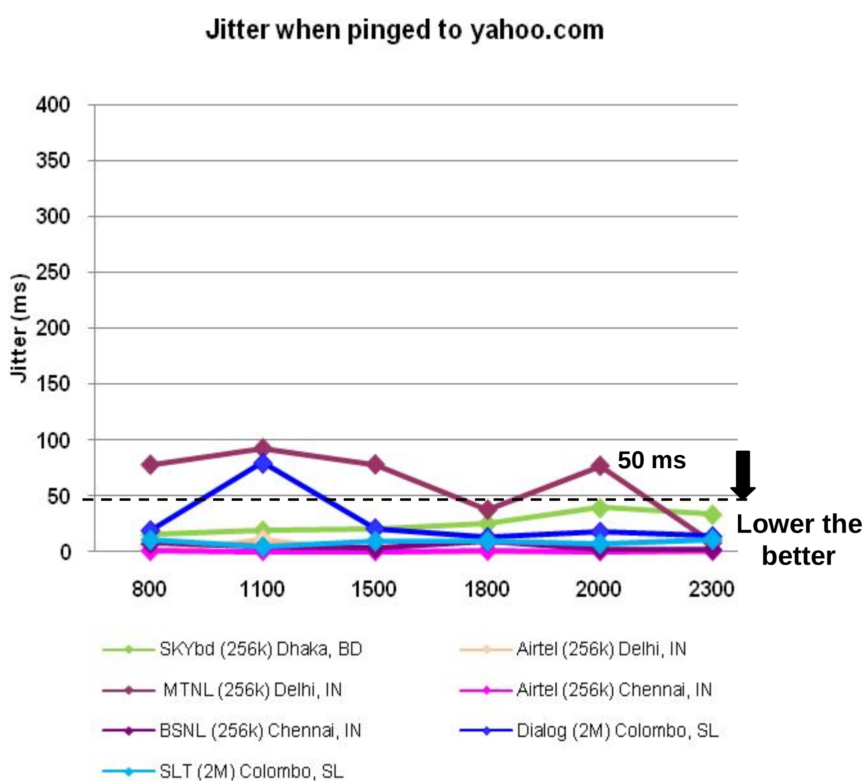

Figure 5[11]

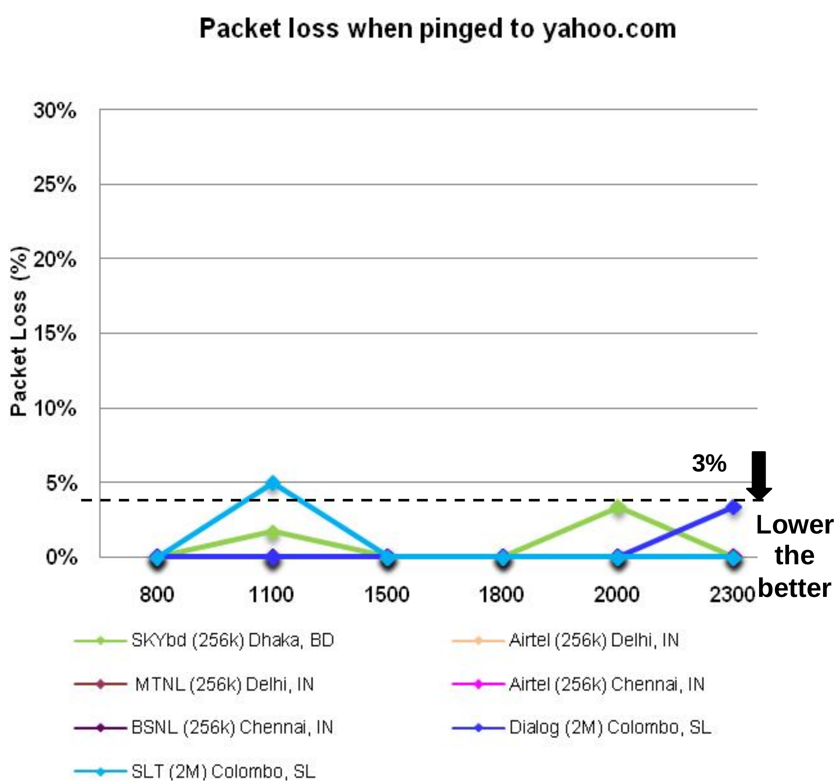

Figure 6

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Fixed Broadband - Latency[12]

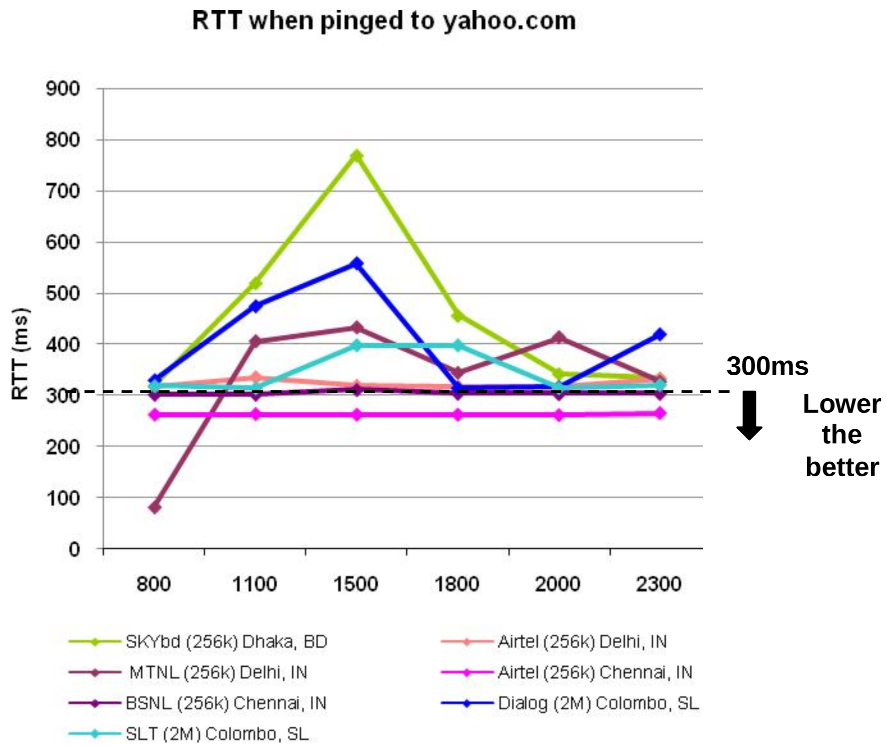

Figure 7

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Mobile Broadband – Throughput (kbps)

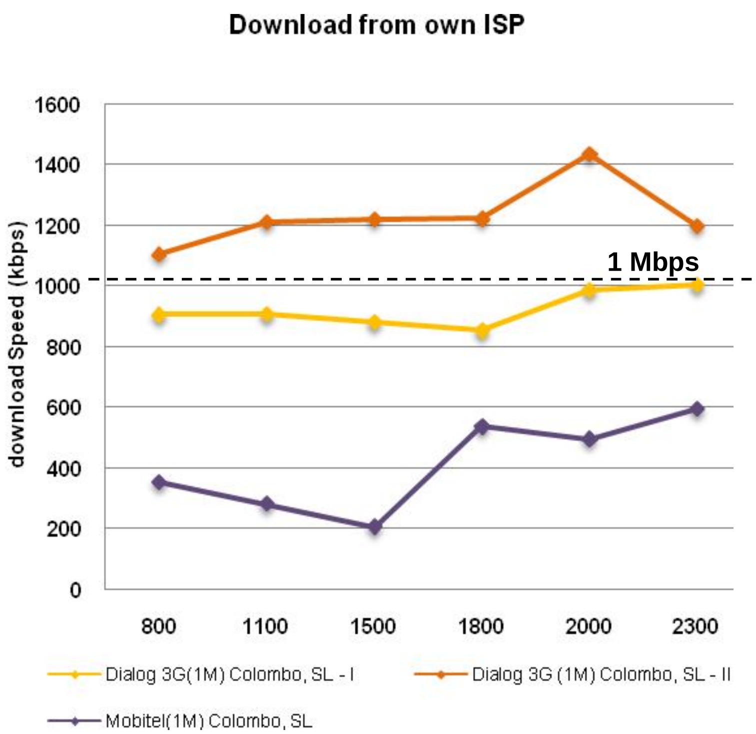

Figure 8[*+#]

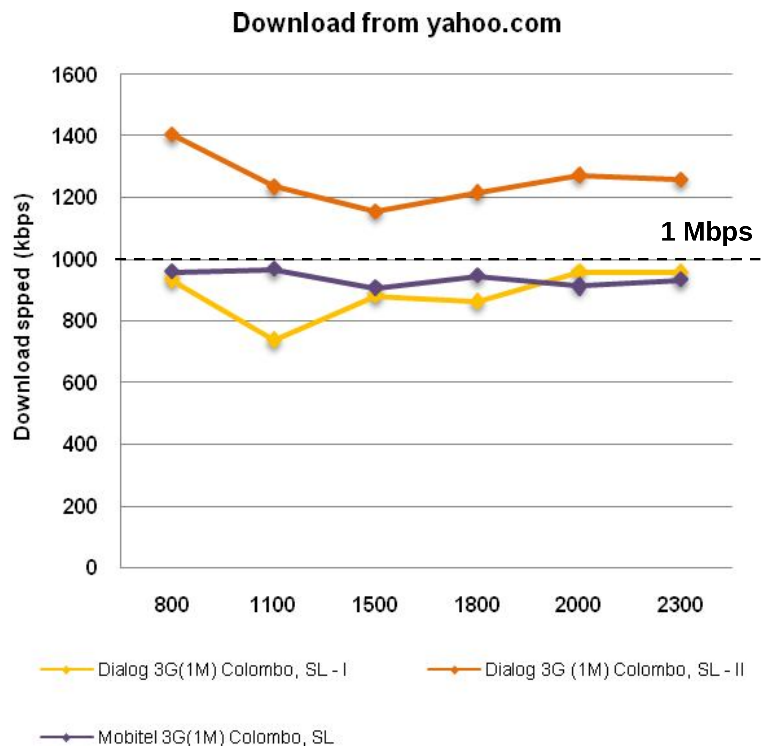

Figure 9

[*] Dialog 3G(1M) Colombo, SL I – Unlimited Mobile Broadband
[+] Dialog 3G(1M) Colombo, SL II – Dialog Mobile Broadband Large
[#] Mobitel 3G(1M) Colombo, SL – Zoom 890

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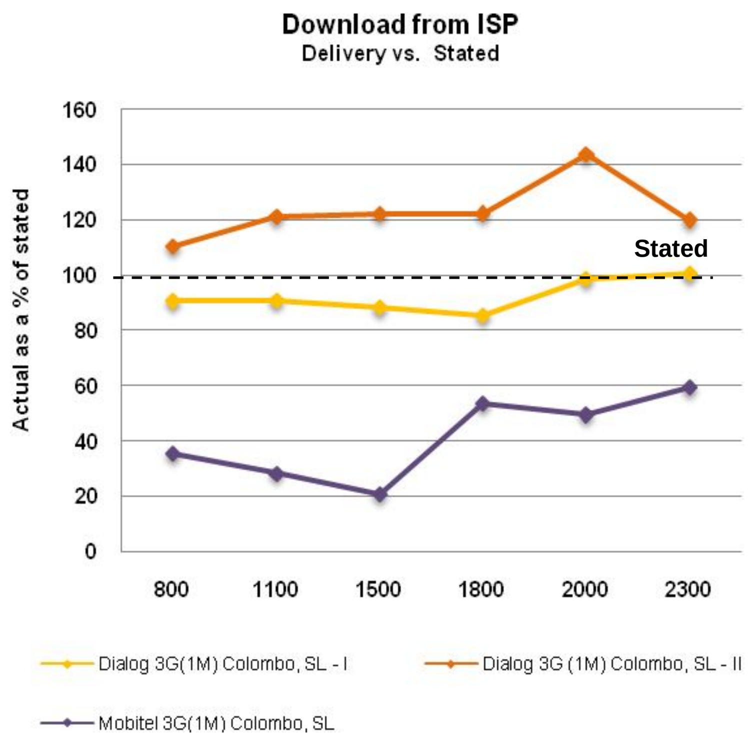

Figure 10[*+#]

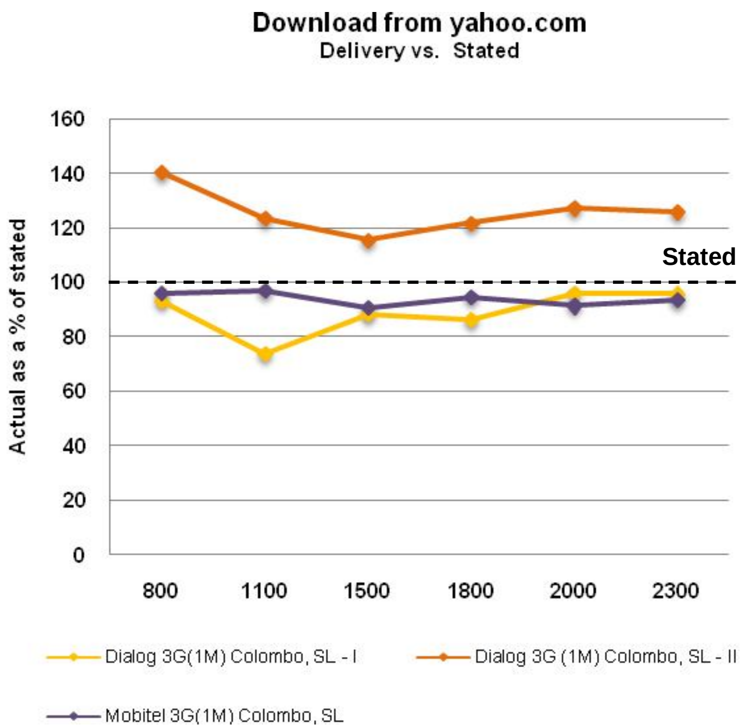

Figure 11

[*] Dialog 3G(1M) Colombo, SL I – Unlimited Mobile Broadband
[+] Dialog 3G(1M) Colombo, SL II – Dialog Mobile Broadband Large
[#] Mobitel 3G(1M) Colombo, SL – Zoom 890

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Mobile Broadband - Jitter[13] and Packet Loss[14]

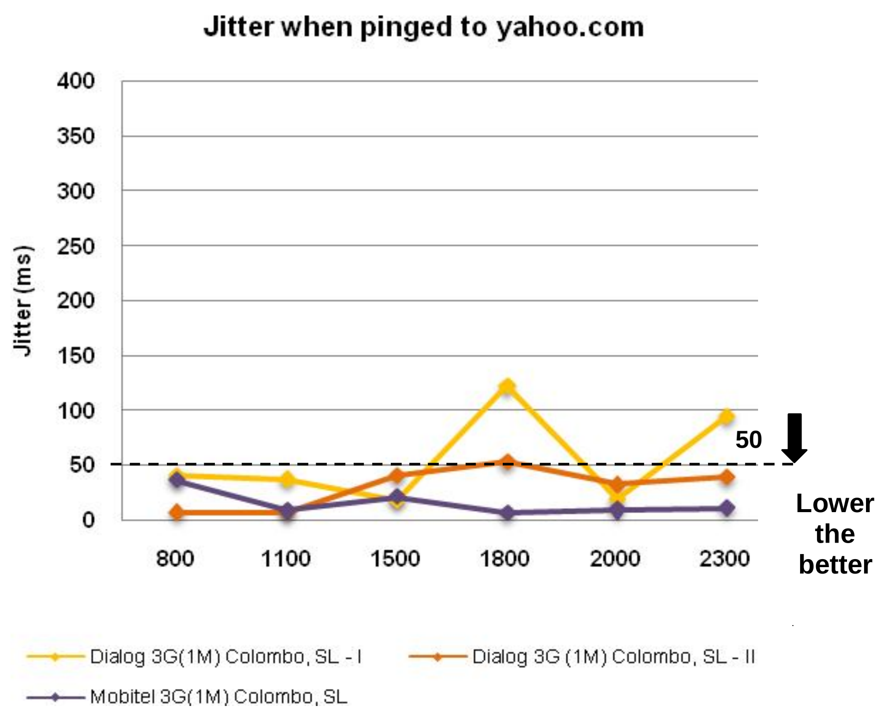

Figure 12*+#

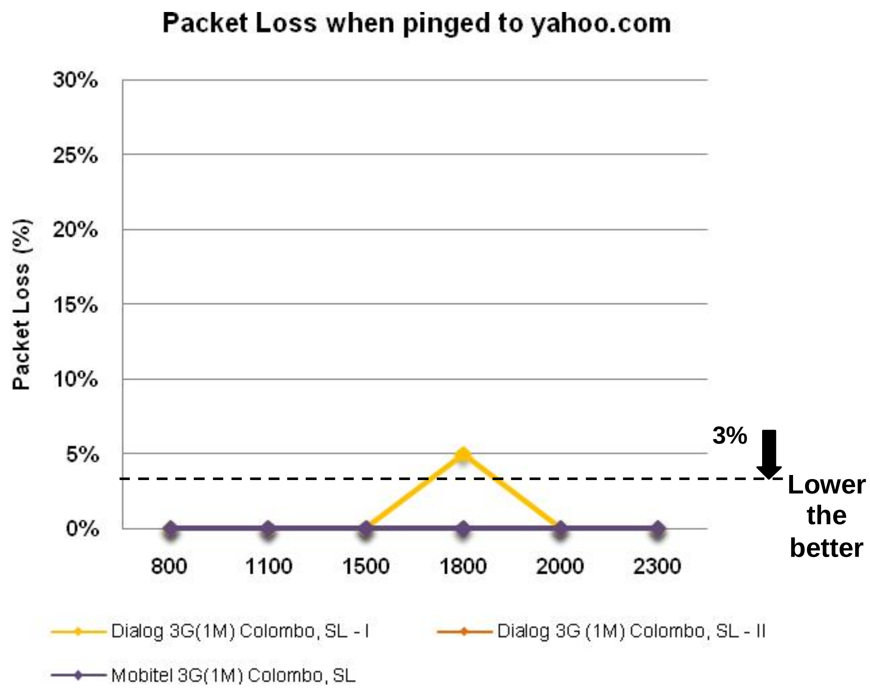

Figure 13

* Dialog 3G(1M) Colombo, SL I – Unlimited Mobile Broadband
\+ Dialog 3G(1M) Colombo, SL II – Dialog Mobile Broadband Large
\# Mobitel 3G(1M) Colombo, SL – Zoom 890

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Mobile Broadband - Latency[15]

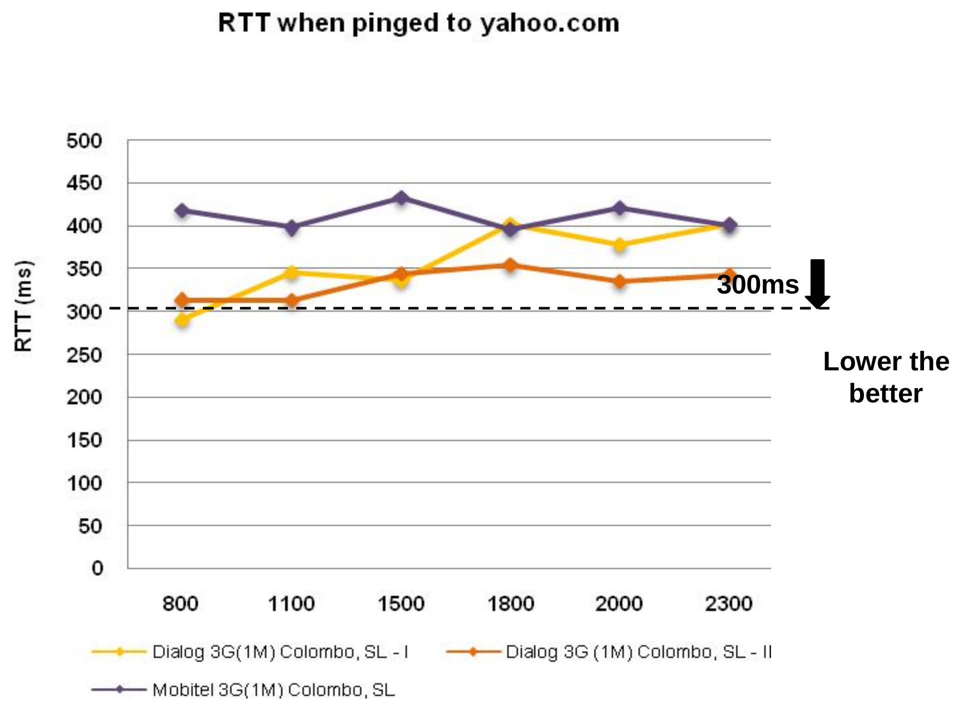

Figure 14*+#

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* Dialog 3G(1M) Colombo, SL I – Unlimited Mobile Broadband
+ Dialog 3G(1M) Colombo, SL II – Dialog Mobile Broadband Large
# Mobitel 3G(1M) Colombo, SL – Zoom 890

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1 http://www.lirneasia.net/projects/current-projects/2241/.
2 Dodd, A. (2005), “The Essential Guide to Telecommunication” Fourth Edition, Pearson Education, p. 14
3 Dodd, A. (2005), “The Essential Guide to Telecommunication” Fourth Edition, Pearson Education, p. 60
4 Dodd, A. (2005), “The Essential Guide to Telecommunication” Fourth Edition, Pearson Education, p. 60
5 Connection Magazine, http://www.connectionsmagazine.com/articles/5/049.html, CISCO Press Article
6 The connections were tested on:

SLT (Colombo) tested on	: 24 Feb, 2009 & 25 Feb, 2009
Dialog (Colombo) tested on	: 24 Feb, 2009 & 25 Feb, 2009
BSNL(Chennai) tested on	: 22 Feb, 2009 & 24 Feb, 2009
Airtel(Chennai) tested on	: 22 Feb, 2009 & 24 Feb, 2009
MTNL (Delhi) tested on	: 17 Feb, 2009 18 Feb, 2009 & 20 Feb, 2009
Airtel (Delhi) tested on	: 19 Feb, 2009 & 20 Feb, 2009
Sirius (Dhaka) tested on	: 31 Jan, 2009 & 1 Feb, 2009
SKYbd (Dhaka) tested on	: 06 Feb, 2009 & 08 Feb, 2009
Mobitel 3G(Colombo) tested on	: 24 Feb, 2009 & 25 Feb, 2009
Dialog 3G - Unlimited (Colombo) tested on	: 11 Feb, 2009, 12 Feb, 2009 & 13 Feb 2009
Dialog 3G – 1GB Limit (Colombo) tested on	: 24 Feb, 2009 & 25 Feb, 2009

7 The speed at which the subscriber can receive traffic from the ISP server and a commonly used International Server (e.g. yahoo.com). It plays a significant role in responsiveness and real-time applications like VOIP.
8 For Dialog WiMAX (2M) the reading for National domain is taken as the speed for ISP could not be obtained due to unknown technical reason
9 Jitter is the variation of end-to-end delay from one packet to the next within the same packet stream/ connection/ flow. Jitter experienced in packets, more relevant in Real-time traffic like VOIP. Ideally it should be zero.
10 Number of packets (in %) that does not reach the destination. This can result in highly noticeable performance issues with Streaming Technologies, VOIP and Video conferencing.
11 Loss and Delay information not available for Sirius Broadband package
12 Time taken for traffic to reach a particular destination.
13 Jitter is the variation of end-to-end delay from one packet to the next within the same packet stream/ connection/ flow. Jitter experienced in packets, more relevant in Real-time traffic like VOIP. Ideally it should be zero.
14 Number of packets (in %) that does not reach the destination. This can result in highly noticeable performance issues with Streaming Technologies, VOIP and Video conferencing.
15 Time taken for traffic to reach a particular destination.

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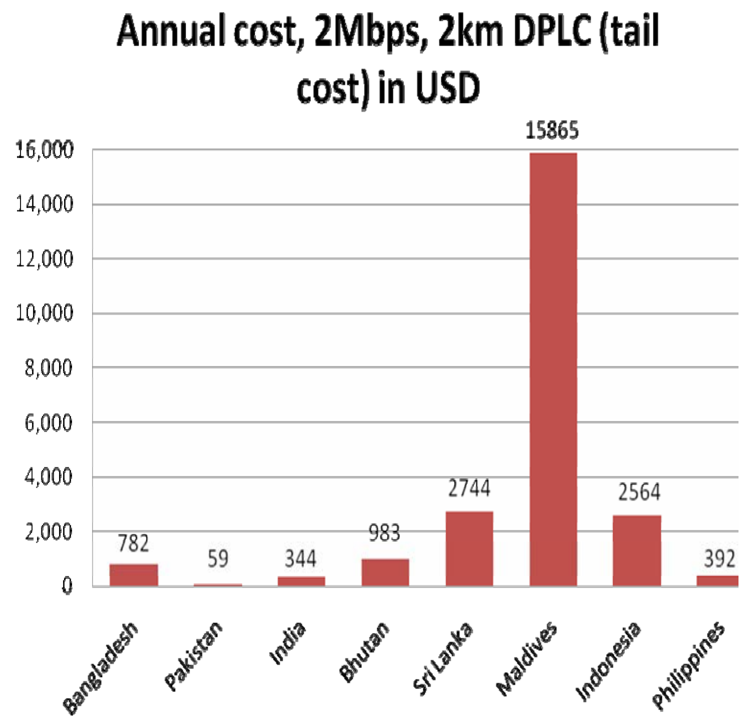

Figure 1

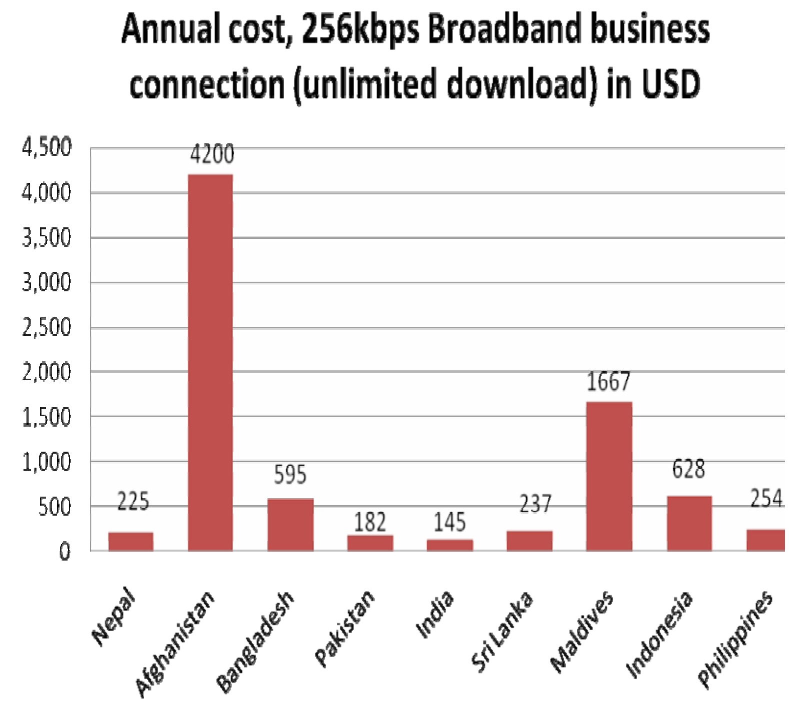

Figure 2

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BROADBAND BENCHMARKS

Emerging Asia

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Table 1- Broadband Prices in Emerging Asia in USD[1]

Country[2]	Annual cost, 2Mbps, 2km DPLC (tail cost)	Annual cost, 2Mbps, 100km DPLC	Annual cost, 2Mbps Broadband business connection[iii] (unlimited download)	Annual cost, 256kbps Broadband business connection (unlimited download)	Annual cost, 256kbps Broadband residential connection (unlimited download)	Price per GB, for 2Mbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 1- 4 GB data limit (Residential)	Price per GB, 1Mbps speed, 1GB data limit mobile internet	Value of 1 USD in local currency as at January 30, 2009[3]
South Asia										
Nepal	[4]	[5]	1,395[6]	225	225					79.98
Afghanistan	[7]	[8]	11,700[9]	4,200[10]	4,200					52.13
Bangladesh	782[11]	3,826[12]		595[13]	255[14]					70.58
Pakistan	59[15]	2,950[16]	759[17]	182[18]	182		4[19]	2[20]	2[21]	79.08
India	344[22]	3,569[23]	2,225[24]	145[25]	145[26]	3[27]		5[28]		49.44
Bhutan	983[29]	7,369[30]				4[31]	4[32]	4[33]	17[34]	48.85
Sri Lanka	2,744[35]	3,236[36]	526[37]	237[38]	237			9[39]	4[40]	114.13
Maldives	15,865[41]	41,422[42]	3,689[43]	1,667[44]	277[45]	22[46]	10[47]	9[48]		12.96
South East Asia										
Indonesia	2,564[49]	7,220[50]		628[51]	8,371[52]	17[53]		7[54]	14[55]	11,467.90
Philippines	392[56]		765[57]	254[58]	254[59]					47.03

If no data is shown, it indicates unavailability of information at time of research, or that a package closely fitting the category could not be found.

[1] Prices originally quoted in local currency has been converted into USD using exchange rates shown in final column.

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[2] Countries are separated by region (South Asia vs South East Asia) and then listed in ascending order of GDP per capita current prices (U.S. dollars**)** obtained from the World Economic Outlook database, Oct 2008
3 Exchange rates taken from http://www.oanda.com
4 Available package is for a lower speed of 64kbps. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
5 Available package is for a lower speed of 64kbps. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
6 http://www.ntc.net.np/adsl/adsl_tariffPlans.php
7 Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan 450 US $
8 Draft rates for the proposed Optical Fiber Cable (OFC) ring network around Afghanistan 22500 $
9 TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 2048kbps downlink 256 kbps
10 TS2 LinkStar VSAT service http://www.ts2.pl/en/NSS-6 uplink 256kbps downlink 128 kbps
11 Minimum Charge is 4,600 Tk/month for any distance below 20 Kilometers.
http://www.btrc.org.bd/newsandevents/btcl_domestic_transmission_charges.pdf
12 Price Shown = (first 50Km*250Tk) + (balance 50Km * 200Tk) from http://www.btrc.org.bd/newsandevents/btcl_domestic_transmission_charges.pdf
13 Zip SOHO speed16-20 kbps http://www.siriusbroadband.com/rate.php
14 Zip Xpress. Speed not clear. http://www.siriusbroadband.com/rate.php
15 0 -200km Distance Charges Per Annum Per Km http://www.ntc.net.pk/tariffleasing.asp?menu_id=03. Hence price shown = 2*2,333 PKR
[16] 0 -200km Distance Charges Per Annum Per Km http://www.ntc.net.pk/tariffleasing.asp?menu_id=03. Hence 100*2,333 PKR
17 Pakistan Telecom Company Limited, *DSL-2Mbps Unlimited* package. http://www.ptcl.com.pk/contentp.php?NID=190#Bbunlimited
18 Pakistan Telecom Company Limited, *DSL 512 Kbps Unlimited*. No distinction made between business and residential packages
http://www.ptcl.com.pk/contentp.php?NID=190#Bbunlimited
19 *Macronet DSL Connect 9* 512 down and 256 up, 9GB limit per month http://www.dsl.net.pk/VolumePackages.php
20 *Macro Broadband DSL@Home-7* download speed 512kbps limit of 7GB http://www.dsl.net.pk/HomePackage.php
21 Mobilink Infinity 1Mbps speed 5GB data limit package http://www.mobilinkinfinity.com/tariff/
22 BSNL 2mbps 5km distance http://bsnl.co.in/service/leased_tariff.htm#high
23 BSNL 2mbps 100km distance http://bsnl.co.in/service/leased_tariff.htm#high
24 MTNL Triband broad band Plan 4 http://mumbai.mtnl.net.in/triband/htm/tariff.htm
25 MTNL, *TriB Unlimited, UL data – 256*, http://mtnldelhi.in/broadband/triband_tariff.htm
26 MTNL *TriB UL data-256* http://mtnldelhi.in/broadband/triband_tariff.htm
27 BSNL *Business Combo Plan 6* GB free download 256 Kbps/ Up to 2 Mbps http://www.bsnl.co.in/service/dataone_tariff.htm
28 BSNL *Home 250* 1GB data download 256 Kbps/upto 2Mbps http://www.bsnl.co.in/service/dataone_tariff.htm
29 Bhutan Telecom point to point Leased line service <10km http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=35&Itemid=62
30 Bhutan Telecom point to point Leased line service for 100km http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=35&Itemid=63
31 Bhutan telecom, Monthly post-paid broadband, *Enterprise*, 15GB Limit
http://www.telecom.net.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112
32 Bhutan Telecom Post-paid Broadband data limit upto 5GB http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112

33 Bhutan telecom, Monthly post-paid broadband, *Personal,* 2.5GB Limit http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=113
34 Bhutan telecom, *Supreme Package* 1.2GB Limit http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=77&Itemid=124
35 Quote obtained via email from Sri Lanka Telecom marketing agent
36 Quote obtained via email from Sri Lanka Telecom marketing agent
37 Dialog *OfficeNe*t http://www.dialog.lk/en/broadband/products/officenet.html
38 Dialog Broadband Internet – *HomeNet* http://www.dialog.lk/en/broadband/products/homenet.html
39 Sri Lanka Telecom, *Entrée Package* 1GB http://www.slt.lk/data/forbusiness/115adsl.htm
40 Mobitel *Zoom* 2GM data limit http://www.mobitel.lk/broadband/postpaid_internet.html
41 Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
42 Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
43 Raajje online *Biz broadband 2M* http://www.rol.net.mv/small-medium-biz/Biz-Broadband-2M.html
44 Dhiraguu *Biz unlimited* http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_unlimited.php
45 Raajje *Online ROL Value Pack* http://www.rol.net.mv/home-user/ROL-Value-Pack-256k.html
46 Dhiraagu *Biz Premier4M* 4Mbps/512Kbps speed, 10GB data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_premier.php
47 Dhiraagu *Biz Starter Package*, 512/128kbps Speed 5GM data limit http://www.dhiraagu.com.mv/business/small_medium/b_internet/biz_starter.php
48 Dhiraagu *home starter* 512/256 speed, 1GB data limit http://www.dhiraagu.com.mv/internet/starter.php
49 No. 32/DJPT.1/KOMINFO/4/2008 distance 5Km
50 No. 32/DJPT.1/KOMINFO/4/2008 distance 100Km
51 ABLTech *SOHO package* http://abltech.com/price.html
52 ABL Tech Business and Corporate package http://abltech.com/price.html
53 Indosat M2 *Broadband 3.5G - BIZZ* speed upto 3.6Mbps 5GB data limit http://www.indosatm2.com/index.php/business-solution/internet-services/im2-broadband-35g-bizz
54 *PRIME (Postpaid 3.5G) Eco* Unlimited 384kbps upto 2GB data limit. Then 64kbps for further unlimited data. http://www.indosatm2.com/index.php/consumer-solution/internet-services/postpaid/im2-broadband-35g
55 Indosat *3.5G Regular Quote Package Extra Light* 1.2 GB data limit http://www.indosat.com/Indosat_3.5G_Broadband
56 Due to the unavailability of more updated data October 2008 data is shown http://lirneasia.net/wp-content/uploads/2008/11/microsoft-word-bb_price_qose_benchmarks-30_oct_2008.pdf
57 PLDT *small biz micro* http://www.pldt.com.ph/prod-serv/business/bizdsl.htm
58 Globe *Wired* Broadband Packages 384 kbps Business http://www.sme.globe.com.ph/GlobeCSME/View
59 Globe Broadband *Plan Php 995*, Up to 384 kbps http://www.globelines.com.ph/inner.html#packages

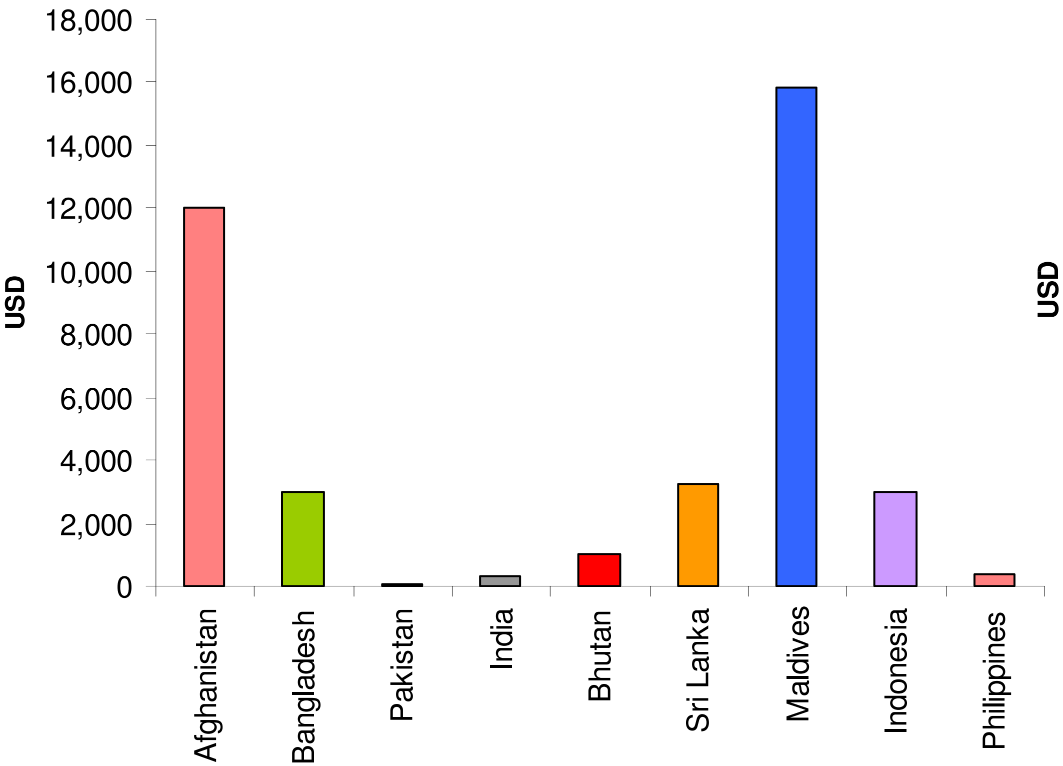
BROADBAND BENCHMARKS

Emerging Asia

Oct 2008

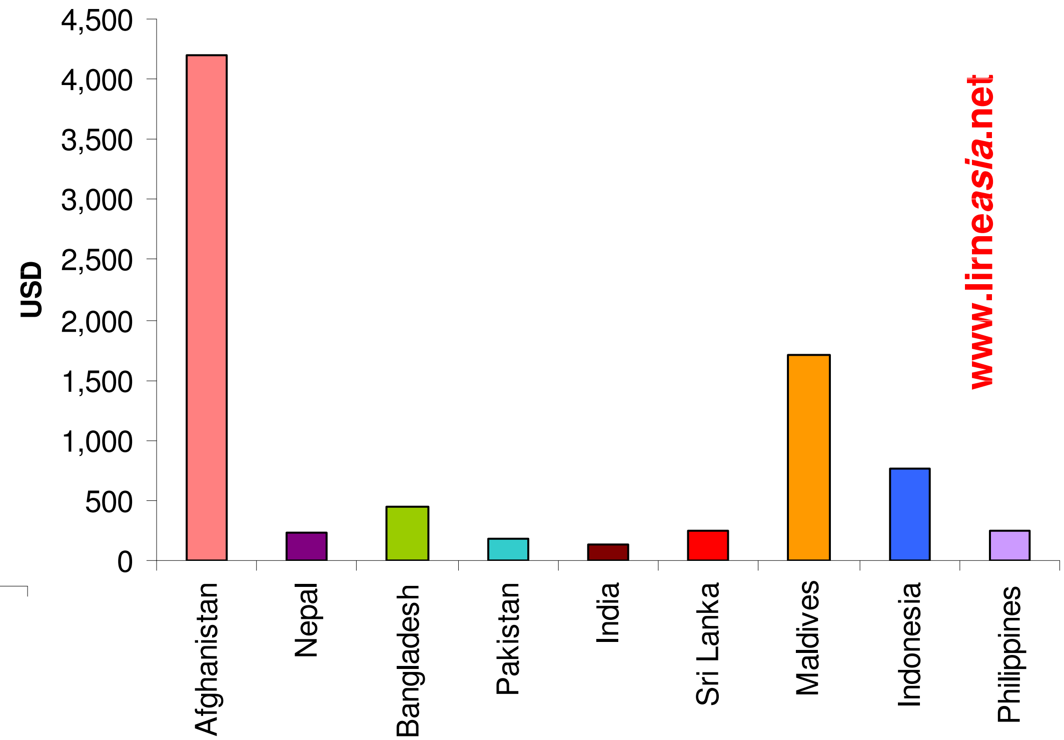
Annual Price 2Mbps, 2km leased line connection

Figure 1



Annual price 256kbps Business Broadband connection

Figure 2



Oct 2008

Table 1- Broadband Prices in Emerging Asia in USD[1]

Country[2]	Annual cost, 2Mbps, 2km DPLC (tail cost)	Annual cost, 2Mbps, 100km DPLC[3]	Annual cost, 2Mbps Broadband business connection[4] (unlimited download)	Annual cost, 256kbps Broadband business connection[4] (unlimited download)	Annual cost, 256kbps Broadband residential connection[4] (unlimited download)	Price per GB, for 2Mbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 5-10 GB data limit (Business)	Price per GB, for 256kbps, 1-4 GB data limit (Residential)	Price per GB, 1Mbps speed, 1GB data limit mobile internet
South Asia									
Afghanistan	12,000[5]	-[6]	11,700[7]	4,200[8]	4,200[8]	-	-	-	-
Nepal	-[9]	-[10]	1,567[11]	238[12]	238[12]	-	-	-	-
Bangladesh	3,000[13]	-[6]	-	444[14]	267[15]	-	-[16]	-	-
Pakistan	38[17]	1,924[18]	761[19]	187[20]	187[20]	-	2.70[21]	2.14[22]	2.24[23]
India	330[24]	3,423[25]	3,491[26]	139[27]	145[28]	3.05[29]	-	5.08[30]	-[31]
Bhutan	986[32]	7,392[33]	-	-	-	4.21[34]	4.33[35]	4.03[36]	17.54[37]
Sri Lanka	3,249[38]	6,350[39]	557[40]	251[41]	251[41]	-	-	9.10[42]	9.10[43]
Maldives	15,865[44]	41,422[44]	3,789[45]	1,709[46]	379[47]	22.9[48]	10.29[49]	9.50[50]	-
South East Asia									
Indonesia	2,958[51]	8,330[52]	-	765[53]	765[53]	21[54]	17[55]	17[55]	26.16[56]
Philippines	392[57]	-[6]	495[58]	256[59]	256[60]	-[61]	-	-[62]	-[63]

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Broadband Quality of Service Experience (QoSE) Indicators[64]

Price is not the only dimension that is of interest to customers and regulators. Quality of Service Experience (QoSE) is integrally connected to price: an increase in quality is an invisible decrease in price and vice versa.

Broadband quality can be evaluated through speed tests. Test sites provide a variety of information about the speed of a link. Careful design and implementation of tests can shed light on the exact segment where inadequate capacity constrains speed. Carefully implemented tests can also be the basis for Service Level Agreements (SLAs) between operators and users and for regulatory action.

In the present tests, the methodology has been developed in collaboration with a team headed by Professor Timothy Gonsalves of IIT Madras. The following dimensions of quality have been measured for two networks each in India (Chennai) and Sri Lanka (Colombo). Depending on the feedback that is received, the test methodology will be improved and extended to a larger number of locations, the objective being the development of Broadband QOSE indicators for South Asia.

Throughput (kbps) Referred to as the "actual amount of useful data sent on a transmission"[65]. **Defined by the ITU as "an amount of user information transferred in a period of time" (ITU-T X.641 (97), 6.3.3.16)**, more commonly referred to as download or upload speeds.
A key advertised metrics in broadband services is the download speed. It defines how much information a user can received from a local or international server. Upload speed defines the speed in which the user can send information to local or international servers. It plays a significant role in responsiveness and real-time applications like VOIP (Voice Over Internet Protocol).
Throughput, or download and upload speeds, varies depending on the location of the server that holds the content. If the location is local, such as an ISP server, the throughput may be higher than it would be if the location is international.
Therefore the testing has included throughput for both local (ISP) and international (yahoo.com) servers.

Latency (ms) "Latency refers to delays when voice packets transverse the network"[66]. It is measured in milliseconds by using the Round Trip Time (RTT). This is significant in systems that require two-way interactive communication, such as voice telephony, or ACK/NAK [acknowledge/not acknowledge] data systems where the round-trip time directly affects the throughput rate, such

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as the Transmission Control Protocol (TCP).
The ITU definition states that "Latency means transmission delay for FEC (Forwarding Equivalence Class) encoding, decoding, interleaving and de-interleaving" (ITU-T G.972 (04), 3025).

Jitter (ms)

"Jitter is uneven latency and packet loss"[67]. It is the variation of end-to-end delay from one packet to the next within the same packet stream/connection/flow. Jitter is more relevant for real-time traffic like VOIP. Ideally the figure should be low.
E.g. Radio quality voice requires less than 1 ms Jitter, toll-quality voice requires less than 20 ms jitter, normal VoIP requires jitter to be less than
30 ms. Beyond 30 ms, VoIP performance will degrade.[68]
Also defined by ITU as "Short-term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time" (ITU-T G.701 (93), 2024).

Packet Loss (%)

Number of packets (as a percentage) that does not reach the destination. Degradation can result in noticeable performance loss with streaming technologies, VOIP and video conferencing. **ITU states that "In general, IP-based networks do not guarantee delivery of packets. Packets will be dropped under peak loads and during periods of congestion. NOTE – In case of multimedia services, when a late packet finally arrives, it will be considered lost" (ITU-T H.360 (04), 5.3.2.2).**

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Results of QoSE testing[69]

Fixed Broadband - Download Speed[70]

Figure 3

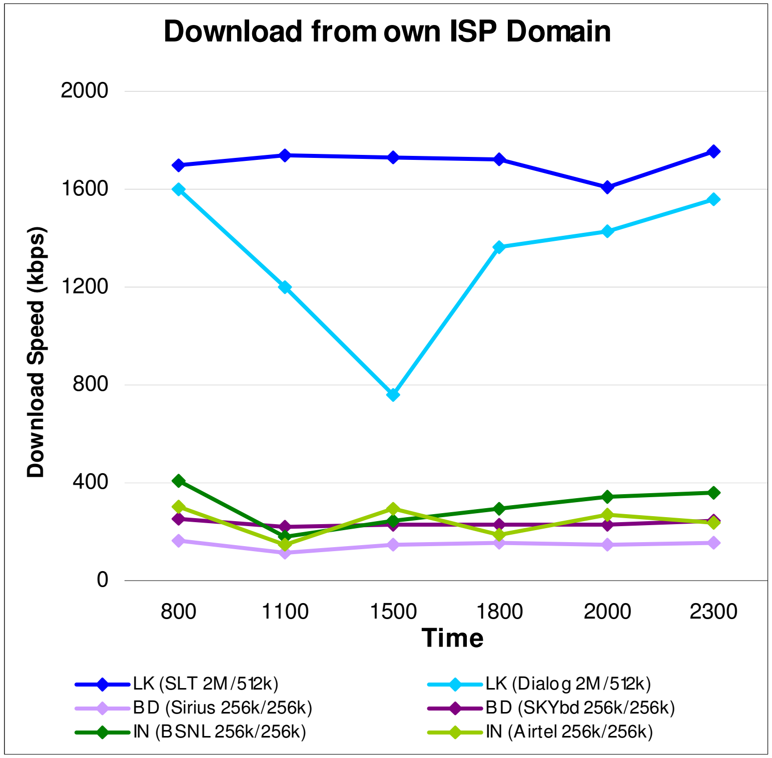

Figure 4

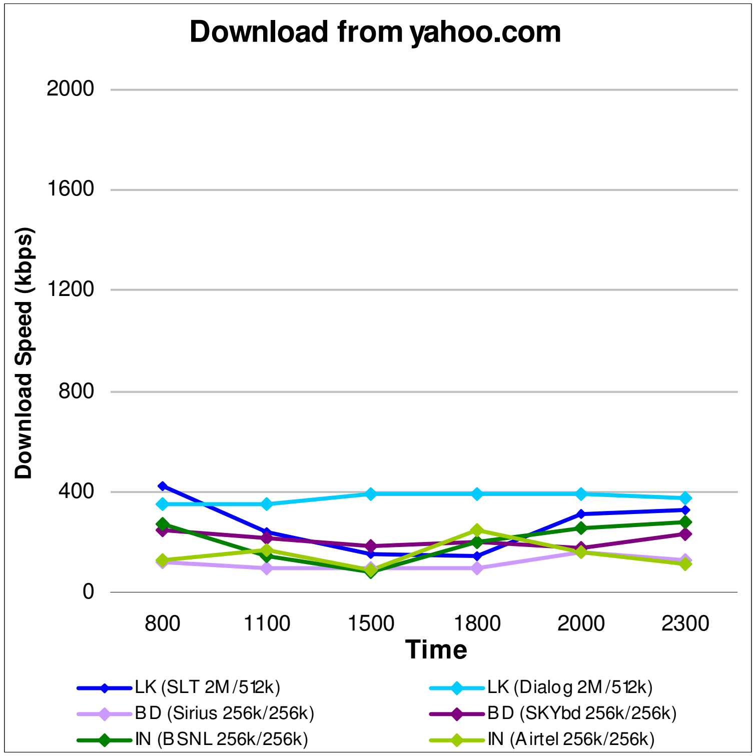

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Figure 5

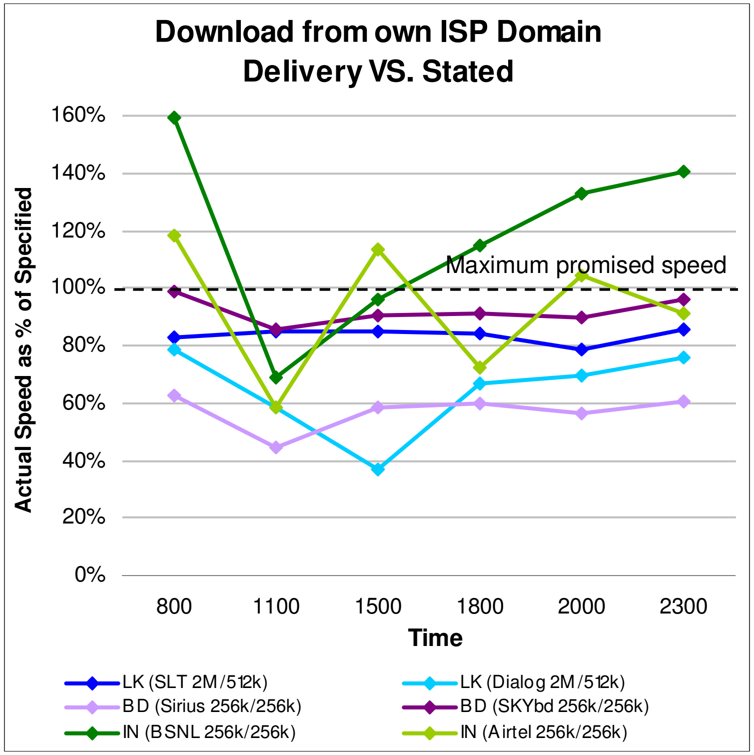
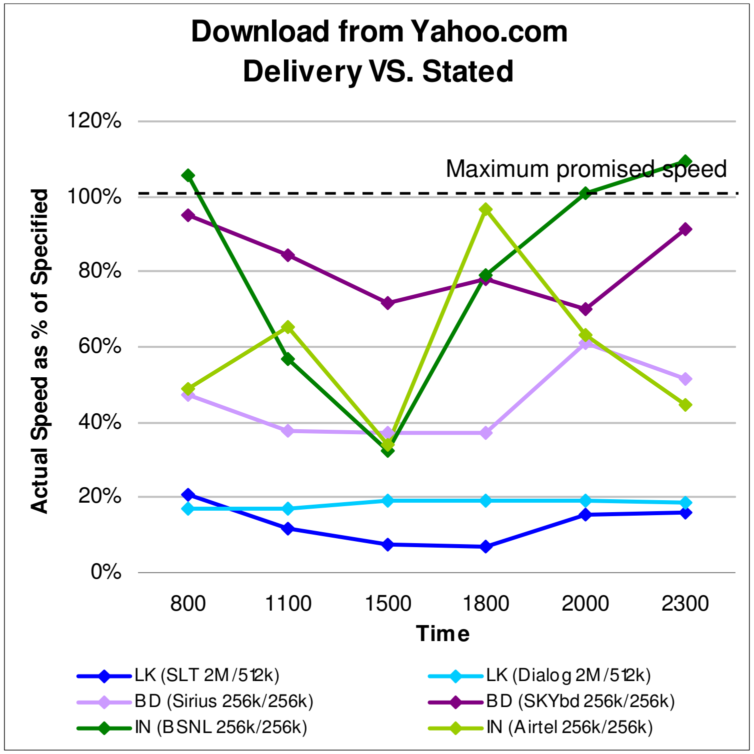


Figure 6



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Fixed Broadband - Jitter[71] and Packet Loss[72]

Figure 7[73]

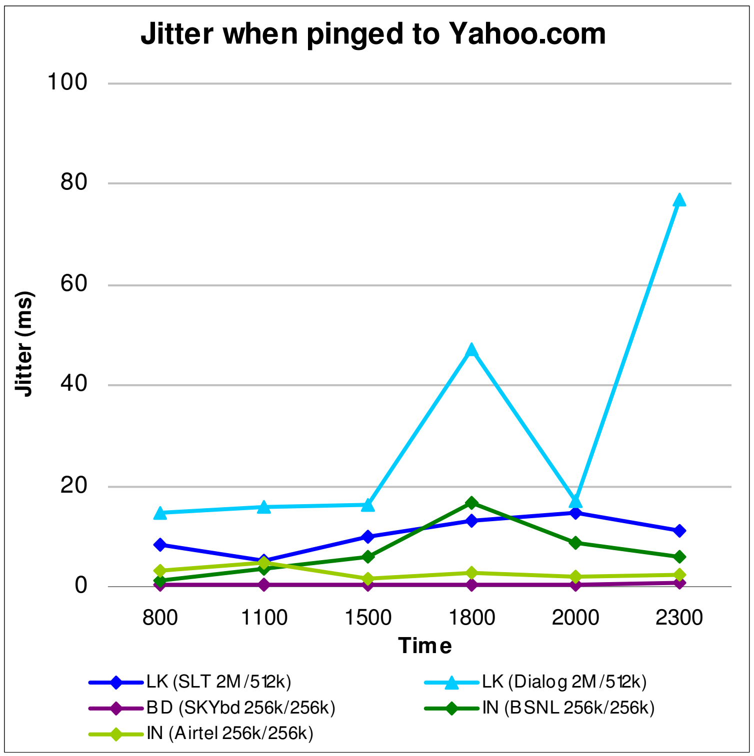
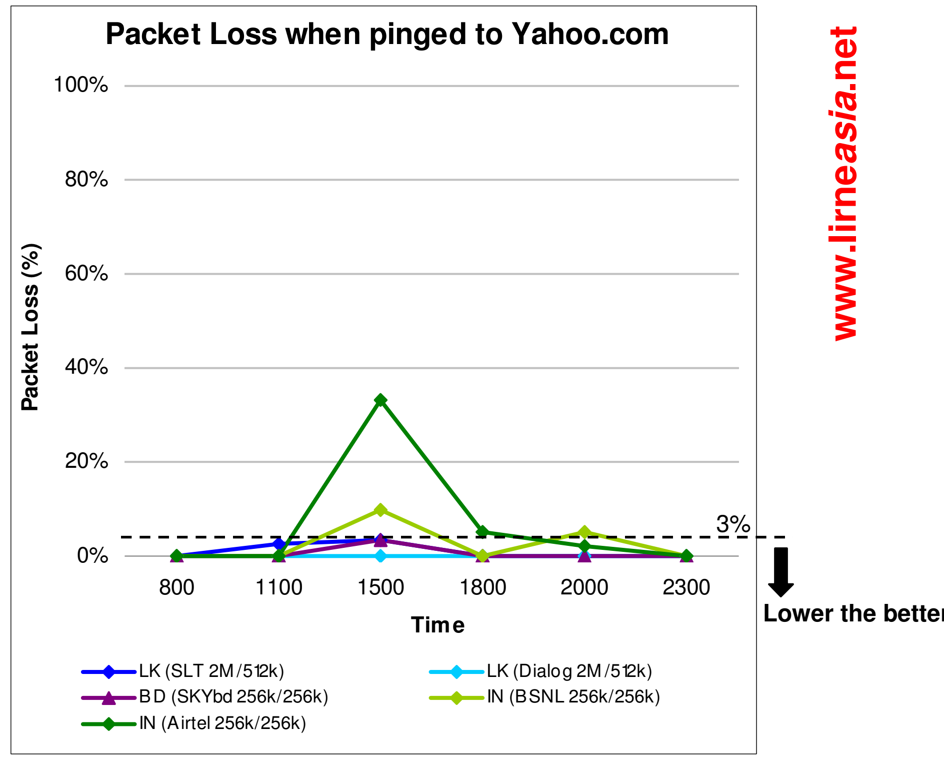


Figure 8[73]



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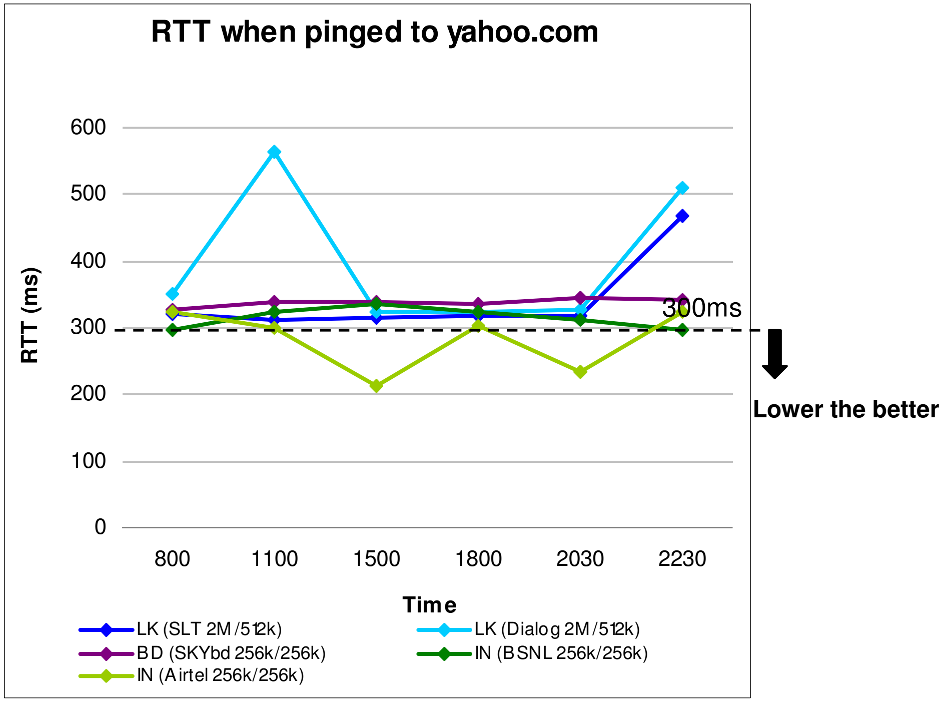
Fixed Broadband - Latency[74]

Figure 9[73]



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Mobile Broadband – Download Speed

Figure 10[75]

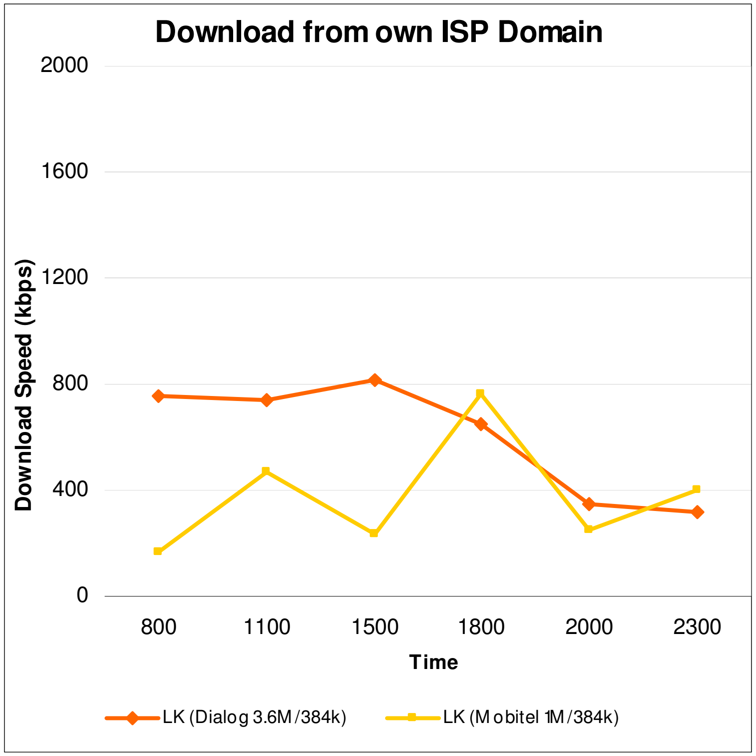

Figure 11

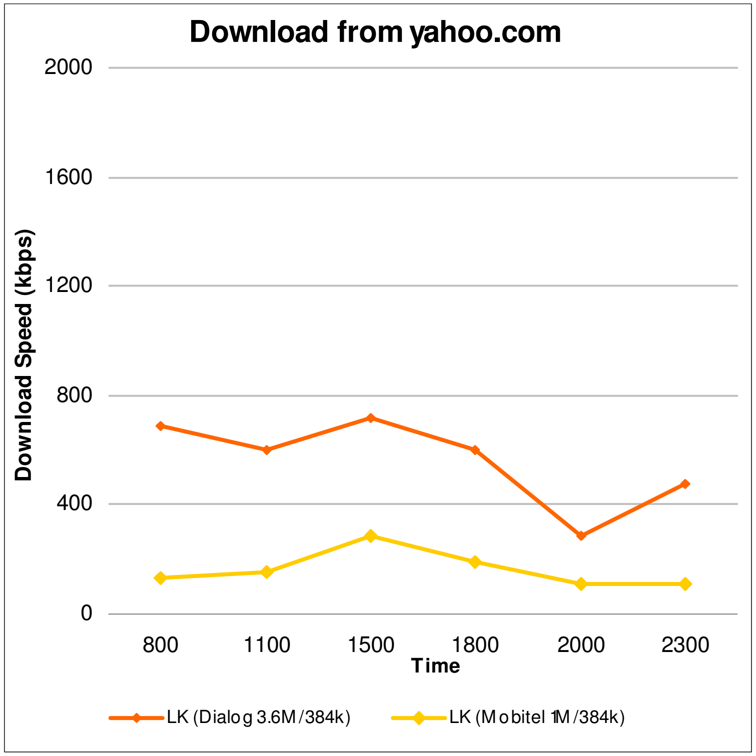

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Figure 12

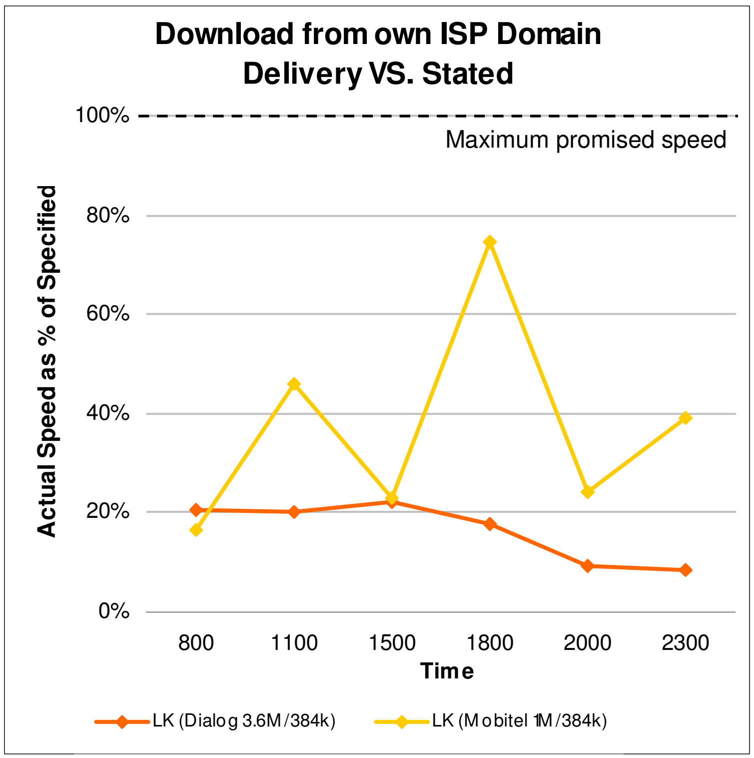
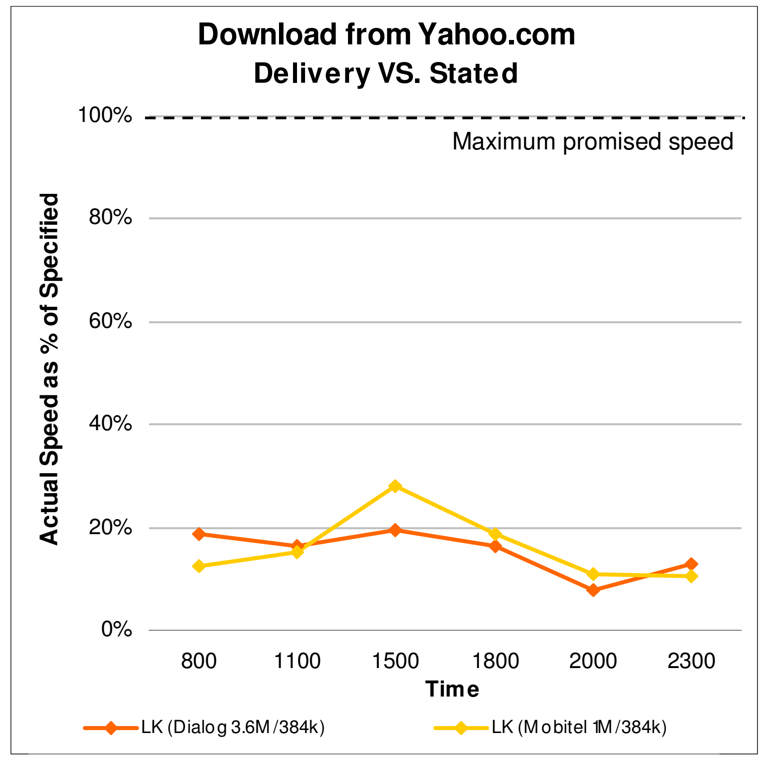


Figure 13



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Mobile Broadband - Jitter[71] and Packet Loss[72]

Figure 14

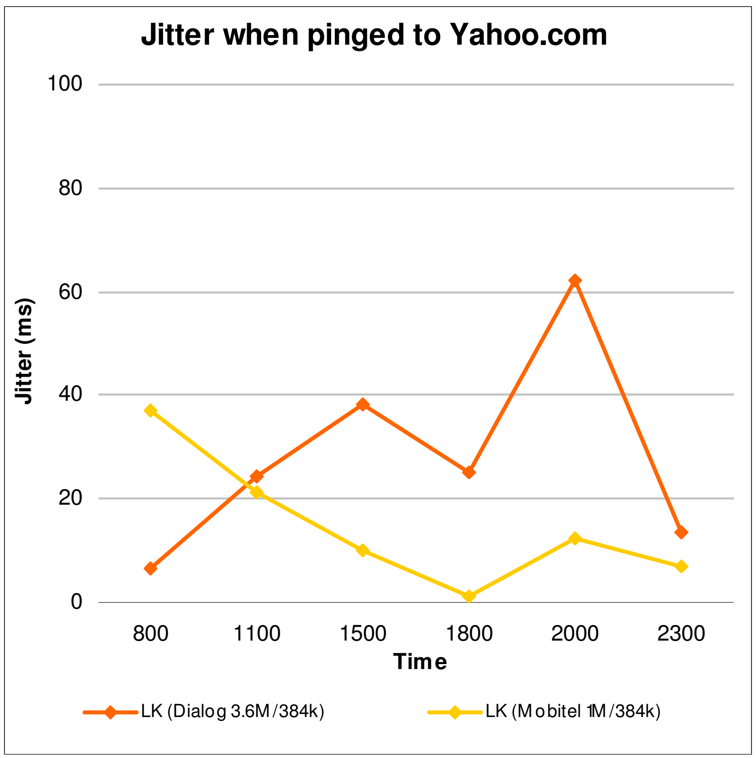
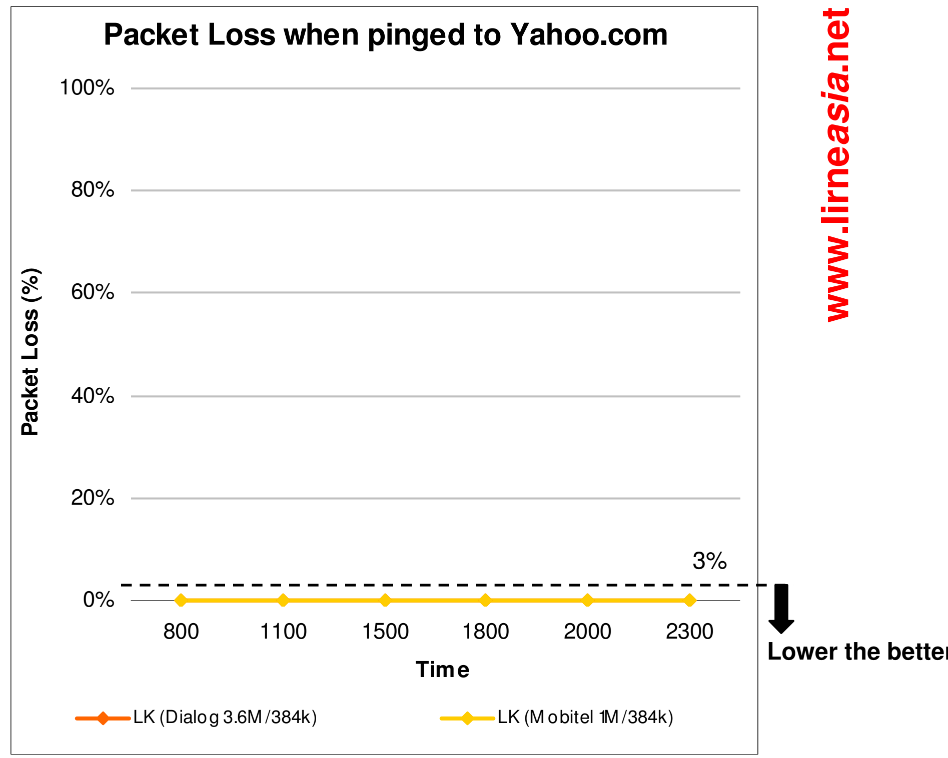


Figure 15



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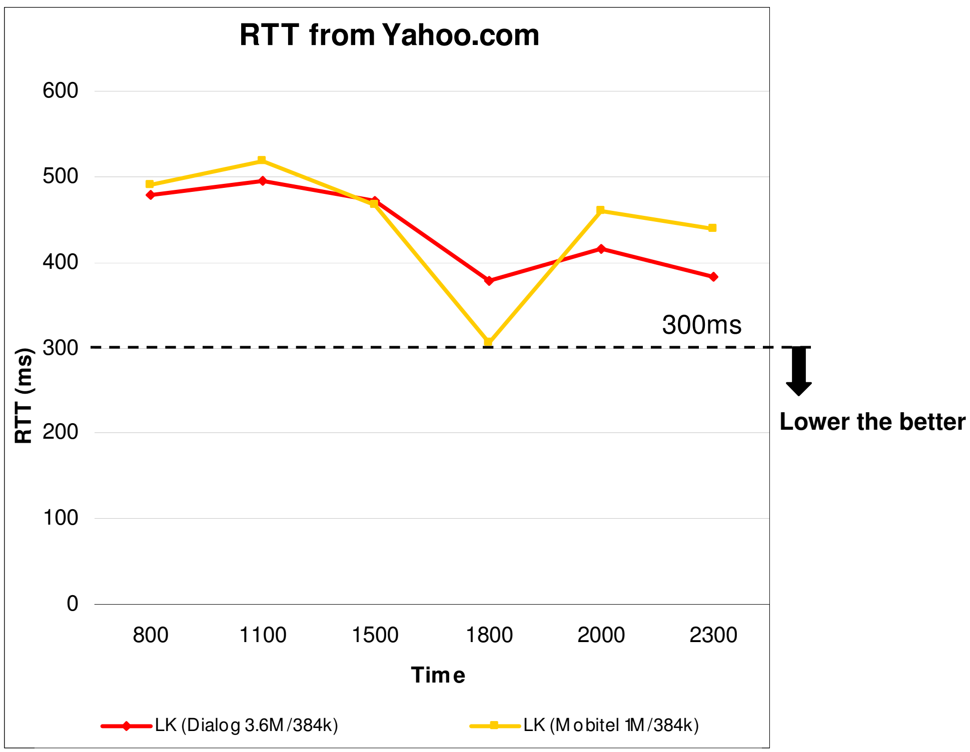
Mobile Broadband - Latency[74]

Figure 16



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[1] Prices quoted in local currencies have been converted to USD on the 23/10/08 using exchange rates quoted from http://www.domainit.com/currencyresults.html
[2] Countries are ranked according to the GDP per capita obtained from the World Economic Outlook database, Oct 2007.
[3] Cost of two tail charges + 96km link charge
[4] In the event this specific package was not found the closest available package (at the next/fastest bandwidth or next download/upload limit) is reported.
[5] Rates obtained from Afghanistan Telecom Regulatory Agency in October of 2007 quoted. More recent data not available at time of publication.
[6] '-' indicates that information was not available at time of research or package to closely fit the category could not be found.
[7] TS2, http://www.ts2.pl/en/NSS-6
[8] TS2, http://www.ts2.pl/en/NSS-6
[9] No Offering at this speed is available. Nepal Telecom offers 'Local point to point high speed data leased service' at a lower speed of 64kbps. A 10km link is USD 514. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
[10] No Offering at this speed is available. However Nepal Telecom offers 'National point to point high speed data leased service' at the lower speed of 64kbps. A 100km link is priced at USD 1,296.86. See http://www.ntc.net.np/tariff/pstn_leased_charge.php
[11] Nepal Telecom, *ADSL offerings*, http://www.ntc.net.np/adsl/adsl_tariffPlans.php2
[12] Nepal Telecom, *ADSL offerings*, there is no distinction between business and residential packages, http://www.ntc.net.np/adsl/adsl_tariffPlans.php
[13] Office of the Bangladesh Telecom Regulatory Commission, *Approval for Leasing or Sharing of Transmission Capacity (E1 etc),* BTRC/SS/GP-Tariff/Part-1/2005-325, for a 30km link.
[14] Sirius Broadband, *Premium Package*, 96-256Kbps. Information received from Sirius Broadband customer service.
[15] Sirius Broadband, *Xpress package*, http://www.siriusbroadband.com/rate.php
[16] Packages are based on time of use (off- peak, peak)
[17] Pakistan Telecom Company Limited, 0- 200Km rate x 2, http://www.ptcl.com.pk/contentb.php?NID=43
[18] Pakistan Telecom Company Limited, 0-200km rate x 100, http://www.ptcl.com.pk/contentb.php?NID=43
[19] Pakistan Telecom Company Limited, *DSL 2MB unlimited*, http://www.ptcl.com.pk/contentp.php?NID=47
[20] Pakistan Telecom Company Limited, *DSL 512 Kbps Unlimited*, There is no distinction between business and residential packages, http://www.ptcl.com.pk/contentp.php?NID=47
[21] Micronet Broadband, *DSL connect 9, 9GB*, http://www.dsl.net.pk/VolumePackages.php
[22] Micronet Broadband, 7GB, *DSL@Home-7*, http://www.dsl.net.pk/HomePackage.php
[23] Mobilink, *Infinity package,* 5GB, http://www.mobilinkinfinity.com/tariff/
[24] BSNL, 5km, http://www.bsnl.co.in/service/leased_tariff1.htm
[25] BSNL, 100km rate, http://www.bsnl.co.in/service/leased_tariff.htm#high
[26] MTNL, *TriBand Broadband, Unlimited Plan -4*, http://mumbai.mtnl.net.in/triband/htm/tariff.htm
[27] MTNL, *TriB Unlimited, UL data – 256*, http://mtnldelhi.in/broadband/triband_tariff.htm
[28] BSNL, *Home UL 750 package,* http://www.bsnl.co.in/service/dataone_tariff.htm
[29] BSNL, *Business 1200*, 256kbps-2MB, 8 GB data limit, http://www.bsnl.co.in/service/dataone_tariff.htm#business1
[30] BSNL, *Home 250*, 1GB Plan, http://www.bsnl.co.in/service/dataone_tariff.htm#business1

[31] No Offering at this speed is available, However, TATA Indicom, *Millennium Edition Plans (ME)*, 150kbps, 1GB Data Limit, is priced at USD 11.35, http://www.tataindicom.com/t-personal-internet-internetmobile.aspx
http://www.tataindicom.com/t-personal-internet-internetmobile.aspx
[32]Bhutan Telecom Ltd, 10km, http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=35&Itemid=62
[33] Bhutan Telecom Ltd, 100km, http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=35&Itemid=62
[34] Bhutan Telecom, *Enterprise 2Mbps*, 15GB, http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112
[35] Bhutan Telecom, *Office – 256*, 7GB, http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112
http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112
[36] Bhutan Telecom Ltd, *Home Package*, 256kbps, http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=64&Itemid=112
[37] B-Mobile, *Supreme*, 1.2GB, 1Mbps, Call from customer service
[38] Sri Lanka Telecom Rates for a 0-33km link. Price as quoted in Feb 2008
[39] Sri Lanka Telecom Rates for a 33-99km link. Price as quoted in Feb 2008
[40] Dialog, *Office Net Package*, 2Mbps/512kbps, http://www.dialog.lk/en/broadband/products/officenet.html
[41] SLT, *ADSL Home Express Package*, 512/128kbps, http://www.slt.lk/data/forbusiness/115adsl.htm
[42] SLT, *Broadband entrée package,* 512/128kps, http://www.slt.lk/data/forbusiness/115adsl.html
http://www.websurfer.com.np/cable_internet_service.php
[43] Mobitel, *Zoom 1024*, 1.5GB, http://www.mobitellanka.com/broadband/tariff.html
[44] Dhiraagu, http://www.dhiraagu.com.mv/tariffs/dhivehinet.php#dedicatedaccess
[45] ROL, *Biz Broadband 2M*, http://www.rol.net.mv/small-medium-biz/Biz-Broadband-2M.html
[46] Dhiraagu, *Biz unlimited*, 512/128kbps, http://www.dhiraagu.com.mv/beta/business/small_medium/b_internet/biz_unlimited.php
[47] ROL, *Broadband 256k Value*, http://www.rol.net.mv/home-user/ROL-Broadband-256k-Value.html
[48] Dhiraagu, *Biz Premier 4M*, 4MB/512kbps, 10 GB data limit, http://www.dhiraagu.com.mv/beta/business/small_medium/b_internet/biz_premier.php
[49] Dhiraagu, *Biz Starter Package*, 512/128kbps, 5GB, RF 0.25/MB, http://www.dhiraagu.com.mv/beta/business/small_medium/b_internet/biz_starter.php
[50] Dhiraagu, *Home Starter*, Up to 512kbps, 1GB data limit, RF 0.25/MB, http://www.dhiraagu.com.mv/beta/internet/starter.php
[51] Telkom, 5km, Siaran Pers No. 32/DJPT.1/KOMINFO/4/2008
[52] Telkom, 100km, Siaran Pers No. 32/DJPT.1/KOMINFO/4/2008
[53] ABLTECH, *Soho package*, http://abltech.com/price.html
[54] Indosat, http://www.indosatm2.com/popup.php/promo/Bizz
[55] PT Indosat, 3.6Mbps, 5GB, http://www.indosatm2.com/popup.php/promo/Bizz
[56] PT Indosat, *'You!'*, 3.6Mbps, 1.2GB, http://www.indosatm2.com/popup.php/promo/prime
[57] PLDT, http://www.pldt.com.ph/prod-serv/business/diginet.htm, information from Aug 2007.
[58] PLDT, *SmallBiz Micro*, http://www.pldt.com.ph/prod-serv/business/bizdsl.htm
[59] Globe Telecom, *Trader lite*, 384Kbps, http://www.sme.globe.com.ph/GlobeCSME/View/Content.aspx?eFtIJH3VkGkZ1MHH9FHehQ%3d%3d
[60] Globe Telecom, wireless access, 384Kbps, http://www.globelines.com.ph/DataServices_HomeUse.php

[61] No Offering available. Available packages are based on (limited by) hours of use and not downloadable capacity.
[62] No Offering to match this package is available. However Globe Telecom, 256Kbps, 30 hours of usage is priced at USD 12.20. See http://www.globelines.com.ph/DataServices_BusinessUse.php
[63] No Offering to match this package is available. However Globe Telecom, Plan 799, 1.8Mbps, 40 free hours of usage is priced at USD 16.38, http://www.globelines.com.ph/DataServices_BusinessUse.php
[64] http://www.lirneasia.net/projects/current-projects/2241/.
[65] Dodd, A. (2005), "The Essential Guide to Telecommunication" Fourth Edition, Pearson Education, p. 14
[66] Dodd, A. (2005), "The Essential Guide to Telecommunication" Fourth Edition, Pearson Education, p. 60
[67] Dodd, A. (2005), "The Essential Guide to Telecommunication" Fourth Edition, Pearson Education, p. 60
[68] Connection Magazine, http://www.connectionsmagazine.com/articles/5/049.html, CISCO Press Article
[69] The connections were tested on:

SLT tested on	: 21 Oct, 2008 & 22 Oct, 2008
Dialog tested on	: 21 Oct, 2008 & 22 Oct, 2008
BSNL tested on	: 22 Oct, 2008 & 24 Oct, 2008
Airtel tested on	: 05 Nov, 2008 & 07 Nov, 2008
Sirius tested on	: 18 Sep, 2008
SKYbd tested on	: 24 Sep, 2008
Mobitel (HSPA)	: 29 Oct, 2008 & 30 Oct, 2008
Dialog (HSPA)	: 22 Oct, 2008

[70] The speed at which the subscriber can receive traffic from the ISP server and a commonly used International Server (eg yahoo.com). It plays a significant role in responsiveness and real-time applications like VOIP.
[71] Jitter is the variation of end-to-end delay from one packet to the next within the same packet stream/ connection/ flow. Jitter experienced in packets, more relevant in Real-time traffic like VOIP. Ideally it should be zero.
[72] Number of packets (in %) that does not reach the destination. This can result in highly noticeable performance issues with Streaming Technologies, VOIP and Video conferencing.
[73] Information not available for Sirius Broadband package
[74] Time taken for traffic to reach a particular destination.
[75] Maximum download speed for Dialog is noted as 3.6Mbps as this is the maximum capacity of the modem provided by the operator.

International Voice Benchmarks

South Asia

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February 2010

Table 1: International Fixed Voice calls

All tariffs in USD	From/To	SAARC									
		Afghanistan	Bangladesh		Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	Skype
			Peak	Off-peak							
SAARC	Afghanistan		0.35	0.26	0.97	0.25	0.71	0.41	0.18	0.16	0.41
	Bangladesh	0.25*			0.39	0.20	0.24	0.20	0.12	0.16	0.16
	Bhutan	0.25*	0.26	0.22		0.20	0.55	0.26	0.18	0.16	0.26
	India	0.25*	0.26	0.22	0.11		0.31	0.20	0.10	0.16	0.11
	Maldives	0.25*	0.26	0.22	0.39	0.20		0.26	0.30	0.16	0.33
	Nepal	0.25*	0.26	0.22	0.39	0.20	0.47		0.18	0.16	0.39
	Pakistan	0.19*	0.26	0.22	0.39	0.20	0.31	0.20		0.16	0.2
	Sri Lanka	0.25*	0.26	0.22	0.39	0.15	0.31	0.20	0.18		0.17
South East Asia	Malaysia	0.11	0.26	0.22	0.97	0.20	0.28	0.51	0.02	0.11	0.02
	Singapore	0.11	0.26	0.22	0.39	0.20	0.24	0.51	0.12	0.11	0.02
	Thailand	0.25*	0.26	0.22	0.39	0.20	0.28	0.51	0.12	0.19	0.13
East Asia	China	0.11	0.35	0.26	0.65	0.25	0.24	0.51	0.02[1]	0.11	0.02
	Hong Kong	0.11	0.26	0.22	0.39	0.20	0.28	0.51	0.02	0.11	0.02
	Japan	0.11	0.35	0.26	0.65	0.25	0.31	0.51	0.06	0.11	0.03
	Mongolia	0.25*	0.35	0.26	0.97	0.25	0.71	0.51	0.12	0.35	0.24
Austral-Asia	Australia	0.11	0.35	0.26	0.39	0.25	0.31	0.51	0.02	0.11	0.02

[1] This tariff is applicable only for an IDD call to a mobile number

Europe	**France**	0.11	0.35	0.26	0.65	0.20	0.39	0.51	0.02	0.11	0.02
	Germany	0.11	0.35	0.26	0.65	0.20	0.39	0.51	-[2]	0.11	0.02
	Italy	0.11	0.35	0.26	0.39	0.20	0.39	0.51	0.02	0.11	0.02
	Sweden	0.25*	0.40	0.31	0.39	0.20	0.39	0.51	0.06	0.11	0.02
	Switzerland	0.25*	0.40	0.31	0.39	0.20	0.39	0.51	0.06	0.11	0.02
	UK	0.25*	0.35	0.26	0.39	0.15	0.39	0.51	0.18[3]	0.11	0.02
North America	**Bahamas**	0.25*	0.40	0.31	0.97	0.25	0.71	0.51	0.12	0.35	0.1
	Canada	0.11	0.35	0.26	0.39	0.15	0.24	0.51	0.18[4]	0.11	0.02
	Cuba	0.25*	0.40	0.31	0.97	0.25	0.71	1.37	0.83	0.77	1.18
	Mexico	0.11	0.40	0.31	0.97	0.25	0.71	0.51	0.12	0.11	0.1
	US	0.25*	0.35	0.26	0.39	0.15	0.24	0.51	0.02	0.11[5]	0.02
South America	**Argentina**	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.31	0.04
	Brazil	0.11	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.31	0.06
	Chile	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.35	0.02
	Peru	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.56	0.09
	Uruguay	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.56	0.15
	Venezuela	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.77	0.1
Africa	**Botswana**	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.31	0.2

[2] Tariff was not available
[3] Calls terminating on fixed lines in number series 844,845,870,871
[4] This tariff is applicable only for an IDD call to a mobile number
[5] This tariff is applicable only for an IDD call to a mobile number

	DR Congo	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.83	0.77	0.41
	Egypt	0.25*	0.44	0.35	0.97	0.25	0.39	0.51	0.18	0.31	0.21
	South Africa	0.25*	0.44	0.35	0.65	0.25	0.39	0.51	0.12	0.11	0.08
	Tanzania	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.35	0.35
	Tunisia	0.25*	0.44	0.35	0.97	0.25	0.47	0.51	0.24	0.77	0.29
Middle East	**Lebanon**	0.25*	0.35	0.26	0.97	0.25	0.71	0.51	0.18	0.22	0.14
	Saudi Arabia	0.25*	0.26	0.22	0.97	0.25	0.39	0.51	0.11	0.22	0.28
	Turkey	0.25*	0.35	0.26	0.97	0.25	0.39	0.51	0.12	0.11	0.04
	UAE	0.25*	0.26	0.22	0.65	0.20	0.39	0.51	0.14	0.22	0.31
Exchange rate [6]	**1 USD =**	47.35	67.97		46.16	48.93	12.62	72.69	84.05	114.20	1
Operator		**Afghan Telecom**	**BTCL**		**Bhutan Telecom**	**BSNL**	**Dhiraagu**	**Nepal Telecom**	**PTCL**	**SLT Telecom**	**Skype**
Source		http://www.afghantelecom.af/tarrif.htm	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=13&Itemid=27	http://www.bsnl.co.in/service/std_pulse.htm	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.ntc.net.np/tariff/pstn_charge.php	http://www.ptcl.com.pk/contentp.php?ID=122	http://www.slt.lk/data/forbusiness/031icalls.htm	http://www.skype.com/intl/en/prices/callrates/?currency=USD#allRatesTab

* Updated tariff data is unavailable. Therefore, data extracted from the October 2009 International Voice Benchmark report has been quoted.

[6] Retrieved on (February 23, 2010) from http://www.oanda.com/convert/classic

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Table 2: International Mobile Voice calls

All tariffs in USD	From/To	SAARC									
		Afghanistan	Bangladesh		Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	Skype
			Peak	Off-peak							
SAARC	Afghanistan		0.35	0.26	0.97	0.20	0.71	0.26	0.24	0.70	0.41
	Bangladesh	0.48			0.39	0.20	0.31	0.26	0.10	0.31	0.16
	Bhutan	0.48	0.26	0.22		0.20	0.55	0.26	0.24	0.53	0.26
	India	0.48	0.26	0.22	0.11		0.31	0.26	0.10	0.09	0.11
	Maldives	0.48	0.26	0.22	0.39	0.20		0.26	0.24	0.70	0.33
	Nepal	0.48	0.26	0.22	0.39	0.20	0.47		0.24	0.31	0.39
	Pakistan	0.48	0.26	0.22	0.39	0.20	0.31	0.26		0.31	0.16
	Sri Lanka	0.48	0.26	0.22	0.39	0.20	0.31	0.26	0.24		0.17
South East Asia	Malaysia	0.48	0.26	0.22	0.97	0.14	0.28	0.65	0.10	0.10	0.02
	Singapore	0.48	0.26	0.22	0.39	0.14	0.24	0.65	0.03	0.10	0.02
	Thailand	0.48	0.26	0.22	0.39	0.14	0.28	0.65	0.10	0.31	0.13
East Asia	China	0.48	0.35	0.26	0.65	0.20	0.24	0.65	0.03	0.06	0.02
	Hong Kong	0.48	0.26	0.22	0.39	0.14	0.28	0.65	0.03	0.10	0.02
	Japan	0.48	0.35	0.26	0.65	0.20	0.31	0.65	0.10	0.19	0.03
	Mongolia	0.48	0.35	0.26	0.97	0.20	0.71	0.65	0.24	0.19	0.24
Austral-Asia	Australia	0.53	0.35	0.26	0.39	0.14	0.31	0.65	0.03	0.19	0.02
Europe	France	0.53	0.35	0.26	0.65	0.14	0.39	0.65	0.03	0.22	0.02

	Germany	0.53	0.35	0.26	0.65	0.14	0.39	0.65	0.03	0.19	0.02
	Italy	0.53	0.35	0.26	0.39	0.14	0.39	0.65	0.03	0.22	0.02
	Sweden	0.53	0.40	0.31	0.39	0.14	0.39	0.65	0.03	0.22	0.02
	Switzerland	0.53	0.40	0.31	0.39	0.14	0.39	0.65	0.03	0.22	0.02
	UK	0.53	0.35	0.26	0.39	0.14	0.39	0.65	0.03	0.19	0.02
North America	**Bahamas**	0.53	0.40	0.31	0.97	0.14	0.71	0.65	0.24	0.10	0.10
	Canada	0.53	0.35	0.26	0.39	0.14	0.71	0.65	0.03	0.10	0.02
	Cuba	0.53	0.40	0.31	0.97	0.87	0.71	0.65	0.92	0.96	1.18
	Mexico	0.53	0.40	0.31	0.97	0.20	0.71	0.65	0.24	0.35	0.10
	US	0.53	0.35	0.26	0.39	0.14	0.24	0.65	0.03	0.10	0.02
South America	**Argentina**	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.22	0.04
	Brazil	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.26	0.06
	Chile	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.22	0.02
	Peru	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.70	0.09
	Uruguay	0.53	0.44	0.3	0.97	0.20	0.71	0.65	0.24	0.70	0.15
	Venezuela	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.70	0.06
Africa	**Botswana**	0.63	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.31	0.2
	DR Congo	0.63	0.44	0.35	0.97	0.20	0.71	0.65	2.31	0.70	0.41
	Egypt	0.63	0.44	0.35	0.97	0.20	0.39	0.65	0.20	0.26	0.21
	South Africa	0.63	0.44	0.35	0.65	0.20	0.39	0.65	0.10	0.22	0.08
	Tanzania	0.63	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.35	0.35
	Tunisia	0.63	0.44	0.35	0.97	0.20	0.47	0.65	0.24	0.70	0.29

Middle East	**Lebanon**	0.48	0.35	0.26	0.97	0.20	0.71	0.65	0.24	0.26	0.14
	Saudi Arabia	0.48	0.26	0.22	0.97	0.20	0.39	0.65	0.13	0.26	0.28
	Turkey	0.48	0.35	0.26	0.97	0.14	0.39	0.65	0.24	0.31	0.04
	UAE	0.48	0.26	0.22	0.65	0.20	0.39	0.65	0.13	0.26	0.31
Exchange rate [7]	1 USD =	47.35	67.97		46.16	46.16	12.62	72.69	84.05	114.02	1
Operators		**Roshan Telecom**	**BTCL**		**Bhutan Telecom**	**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**	**Mobilink GSM**	**Dialog**	**Skype**
Source		http://www.roshan.af/web/?page_id=472	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/mobile.html	http://www.airtel.in/wps/wcm/connect/airtel.in/airtel.in/home/foryou/broadband+and+fixed+line/fixed+line/PG_FY_HP_FL_revised_tarrifs	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.spicenepal.com/en/postpaid_tariff.php	http://www.mobilinkgsm.com/indigo/ddr.php	http://www.dialog.lk/personal/international/idd/rates/	http://www.skype.com/intl/en/prices/callrates/?currency=USD#allRatesTab

[7] Retrieved on (February 23, 2010) from http://www.oanda.com/convert/classic

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About International Voice Benchmarks:

LIRNEasia compiles and publishes the above

Please visit

http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/

LIRNEasia is a regional think tank whose mission is to improve the lives of the people of the emerging Asia- Pacific by facilitating their use of ICTs and related infrastructures; by catalyzing the reform of laws, policies and regulations to enable those uses through the conduct of policy-relevant research, training and advocacy with the emphasis on building in-situ expertise.

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October 2009

Table 1: International Fixed Voice calls (per minute charges when calling from a fixed line)

All tariffs in USD	From/To	SAARC											Skype
		Afghanistan	Bangladesh		Bhutan		India	Maldives	Nepal		Pakistan	Sri Lanka	
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak			
SAARC	**Afghanistan**		0.34	0.26	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.16	0.41
	Bangladesh	0.24			0.37	0.37	0.20	0.23	0.26	0.19	0.12	0.16	0.16
	Bhutan	0.24	0.26	0.21			0.20	0.54	0.26	0.19	0.18	0.16	0.26
	India	0.24	0.26	0.21	0.10	0.10		0.30	0.26	0.19	0.12	0.16	0.11
	Maldives	0.24	0.26	0.21	0.37	0.37	0.20		0.26	0.19	0.30	0.16	0.33
	Nepal	0.24	0.26	0.21	0.37	0.37	0.20	0.45			0.18	0.16	0.39
	Pakistan	0.18	0.26	0.21	0.37	0.37	0.20	0.30	0.26	0.19		0.16	0.16
	Sri Lanka	0.24	0.26	0.21	0.37	0.37	0.15	0.30	0.26	0.19	0.18		0.17
South East Asia	**Malaysia**	0.24	0.26	0.21	0.94	0.94	0.20	0.27	0.64	0.64	0.02	0.10	0.02
	Singapore	0.24	0.26	0.21	0.37	0.37	0.20	0.23	0.64	0.64	0.12	0.10	0.23
	Thailand	0.24	0.26	0.21	0.37	0.37	0.20	0.27	0.64	0.64	0.12	0.19	0.13
East Asia	**China**	0.24	0.34	0.26	0.62	0.62	0.25	0.23	0.64	0.64	0.02[1]	0.10	0.02
	Hong Kong	0.24	0.26	0.21	0.37	0.37	0.20	0.27	0.64	0.64	0.02	0.10	0.02
	Japan	0.24	0.34	0.26	0.62	0.62	0.25	0.30	0.64	0.64	0.06	0.10	0.03
	Mongolia	0.24	0.34	0.26	0.94	0.94	0.25	0.69	0.64	0.64	0.12	0.35	0.24
Austral-Asia	**Australia**	0.24	0.34	0.26	0.37	0.37	0.25	0.30	0.64	0.64	0.02	0.10	0.02
Europe	**France**	0.24	0.34	0.26	0.62	0.62	0.20	0.38	0.64	0.64	0.02	0.10	0.02
	Germany	0.24	0.34	0.26	0.62	0.62	0.20	0.38	0.64	0.64	-[2]	0.10	0.02
	Italy	0.24	0.34	0.26	0.37	0.37	0.20	0.38	0.64	0.64	0.02	0.10	0.02
	Sweden	0.24	0.38	0.30	0.37	0.37	0.20	0.38	0.64	0.64	0.06	0.10	0.02
	Switzerland	0.24	0.38	0.30	0.37	0.37	0.20	0.38	0.64	0.64	0.06	0.10	0.02
	UK	0.24	0.34	0.26	0.37	0.37	0.15	0.38	0.64	0.64	0.18[3]	0.10	0.02
North	**Bahamas**	0.24	0.38	0.30	0.94	0.94	0.25	0.69	0.64	0.64	0.12	0.35	0.10

[1] Mentioned tariff are applicable only for an IDD call to a mobile number
[2] No tariff mentioned
[3] Calls terminating on fixed lines in number series 844,845,870,871

America	**Canada**	0.24	0.34	0.26	0.37	0.37	0.15	0.23	0.64	0.64	0.02[4]	0.10	0.02
	Cuba	0.24	0.38	0.30	0.94	0.94	0.25	0.69	0.64	0.64	0.84	0.77	1.18
	Mexico	0.24	0.38	0.30	0.94	0.94	0.25	0.69	0.64	0.64	0.12	0.10	0.11
	US	0.24	0.34	0.26	0.37	0.37	0.15	0.23	0.64	0.64	0.02[5]	0.10	0.02
South America	**Argentina**	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.12	0.30	0.04
	Brazil	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.12	0.30	0.06
	Chile	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.12	0.35	0.02
	Peru	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.56	0.09
	Uruguay	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.56	0.15
	Venezuela	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.77	0.06
Africa	**Botswana**	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.30	0.18
	DR Congo	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.84	0.77	0.41
	Egypt	0.24	0.43	0.34	0.94	0.94	0.25	0.38	0.64	0.64	0.18	0.30	0.21
	South Africa	0.24	0.43	0.34	0.62	0.62	0.25	0.38	0.64	0.64	0.12	0.10	0.08
	Tanzania	0.24	0.43	0.34	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.44	0.35
	Tunisia	0.24	0.43	0.34	0.94	0.94	0.25	0.45	0.64	0.64	0.24	0.77	0.29
Middle East	**Lebanon**	0.24	0.34	0.26	0.94	0.94	0.25	0.69	0.64	0.64	0.18	0.22	0.14
	Saudi Arabia	0.24	0.26	0.21	0.94	0.94	0.25	0.38	0.64	0.64	0.11	0.22	0.28
	Turkey	0.24	0.34	0.26	0.94	0.94	0.25	0.38	0.64	0.64	0.12	0.10	0.04
	UAE	0.24	0.26	0.21	0.62	0.62	0.20	0.38	0.64	0.64	0.14	0.22	0.31
Exchange rate (September 20, 2009)[6]	1 USD =	50.10	70.25		48.05		48.93	12.97	78.43		83.11	114.87	-
Operators		**Afghan Telecom**	**BTCL**		**Bhutan Telecom**		**BSNL**	**Dhiraagu**	**Nepal Telecom**		**PTCL**	**SLT Telecom**	**Skype**[7]
Source		http://www.afghantelecom.af/tarrif.htm	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=13&Itemid=27		http://www.bsnl.co.in/service/std_pulse.htm	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.ntc.net.np/tariff/pstn_charge.php		http://www.ptcl.com.pk/contentp.php?NID=122	http://www.slt.lk/data/forbusiness/031icalls.htm	http://www.skype.com/intl/en/prices/callrates/?currency=USD#allRatesTab

[4] Mentioned tariff applicable only for an IDD call to a mobile number
[5] Mentioned tariff applicable only for an IDD call to a mobile number
[6] http://www.oanda.com/convert/classic
[7] Retrieved on 10 September 2009. Stated in USD

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Table 2: International Mobile Voice calls (per minute charges when calling from a mobile SIM)

All tariffs in USD	From/To	SAARC											Skype
		Afghanistan	Bangladesh		Bhutan		India	Maldives	Nepal		Pakistan	Sri Lanka	
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak			
SAARC	**Afghanistan**		0.34	0.26	0.94	0.94	0.19	0.69	0.24	0.24	0.24	0.70	0.41
	Bangladesh	0.45			0.37	0.37	0.19	0.30	0.24	0.24	0.10	0.30	0.16
	Bhutan	0.45	0.26	0.21			0.19	0.54	0.24	0.24	0.24	0.52	0.26
	India	0.45	0.26	0.21	0.10	0.10		0.30	0.24	0.18	0.10	0.09	0.11
	Maldives	0.45	0.26	0.21	0.37	0.37	0.19		0.24	0.24	0.24	0.22	0.33
	Nepal	0.45	0.26	0.21	0.37	0.37	0.19	0.45			0.24	0.30	0.39
	Pakistan	0.45	0.26	0.21	0.37	0.37	0.19	0.30	0.24	0.24		0.30	0.16
	Sri Lanka	0.45	0.26	0.21	0.37	0.37	0.19	0.30	0.24	0.24	0.24		0.17
South East Asia	**Malaysia**	0.45	0.26	0.21	0.94	0.94	0.13	0.27	0.60	0.60	0.10	0.10	0.02
	Singapore	0.45	0.26	0.21	0.37	0.37	0.13	0.23	0.60	0.60	0.03	0.10	0.23
	Thailand	0.45	0.26	0.21	0.37	0.37	0.13	0.27	0.60	0.60	0.10	0.30	0.13
	Mongolia	0.45	0.34	0.26	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.19	0.02
East Asia	**China**	0.45	0.34	0.26	0.62	0.62	0.19	0.23	0.60	0.60	0.03	0.10	0.02
	Hong Kong	0.45	0.26	0.21	0.37	0.37	0.13	0.27	0.60	0.60	0.03	0.10	0.03
	Japan	0.45	0.34	0.26	0.62	0.62	0.19	0.30	0.60	0.60	0.10	0.19	0.24
Austral-Asia	**Australia**	0.50	0.34	0.26	0.37	0.37	0.13	0.30	0.60	0.60	0.03	0.19	0.02
Europe	**France**	0.50	0.34	0.26	0.62	0.62	0.13	0.38	0.60	0.60	0.03	0.22	0.02
	Germany	0.50	0.34	0.26	0.62	0.62	0.13	0.38	0.60	0.60	0.03	0.19	0.02
	Italy	0.50	0.34	0.26	0.37	0.37	0.13	0.38	0.60	0.60	0.03	0.22	0.02
	Sweden	0.50	0.38	0.30	0.37	0.37	0.13	0.38	0.60	0.60	0.03	0.22	0.02
	Switzerland	0.50	0.38	0.30	0.37	0.37	0.13	0.38	0.60	0.60	0.03	0.22	0.02
	UK	0.50	0.34	0.26	0.37	0.37	0.13	0.38	0.60	0.60	0.03	0.19	0.02
North America	**Bahamas**	0.50	0.38	0.30	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.10	0.10
	Canada	0.50	0.34	0.26	0.37	0.37	0.13	0.69	0.60	0.60	0.03	0.10	0.02
	Cuba	0.50	0.38	0.30	0.94	0.94	0.82	0.69	0.60	0.60	0.93	0.96	1.18
	Mexico	0.50	0.38	0.30	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.35	0.11
	US	0.50	0.34	0.26	0.37	0.37	0.13	0.69	0.60	0.60	0.03	0.10	0.02
South America	**Argentina**	0.50	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.22	0.04
	Brazil	0.50	0.43	0.34	0.94	0.94	0.19	0.23	0.60	0.60	0.24	0.26	0.06

	Chile	0.50	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.22	0.02
	Peru	0.50	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.70	0.09
	Uruguay	0.50	0.43	0.34	0.94	0.94	0.19	0.23	0.60	0.60	0.24	0.70	0.15
	Venezuela	0.50	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.70	0.06
Africa	**Botswana**	0.60	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.30	0.18
	DR Congo	0.60	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	2.34	0.70	0.41
	Egypt	0.60	0.43	0.34	0.94	0.94	0.19	0.38	0.60	0.60	0.20	0.26	0.21
	South Africa	0.60	0.43	0.34	0.62	0.62	0.19	0.38	0.60	0.60	0.10	0.22	0.08
	Tanzania	0.60	0.43	0.34	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.35	0.35
	Tunisia	0.60	0.43	0.34	0.94	0.94	0.19	0.45	0.60	0.60	0.24	0.70	0.29
Middle East	**Lebanon**	0.45	0.34	0.26	0.94	0.94	0.19	0.69	0.60	0.60	0.24	0.26	0.14
	Saudi Arabia	0.45	0.26	0.21	0.94	0.94	0.19	0.38	0.60	0.60	0.13	0.26	0.28
	Turkey	0.45	0.34	0.26	0.94	0.94	0.19	0.38	0.60	0.60	0.24	0.30	0.04
	UAE	0.45	0.26	0.21	0.62	0.62	0.19	0.38	0.60	0.60	0.13	0.26	0.31
Exchange rate (September 20, 2009)[8]	1 USD =	50.10	70.25		48.05		48.93	12.97	78.43		83.11	114.87	-
Operators		**Roshan Telecom**[9]	**BTCL**[10]		**Bhutan Telecom**		**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**		**Mobilink GSM**	**Dialog**	**Skype**[11]
Source		http://www.roshan.af/web/?page_id=472	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=28&Itemid=42		http://www.airtel.in/wps/wcm/connect/Airtel.in/airtel.in/home/foryou/mobile/postpaid/tariffs/pg_fy_mb_posp_tariff	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.spicenepal.com/index.php?option=com_content&task=view&id=33		http://www.mobilinkgsm.com/idd/index.php	http://www.dialog.lk/en/mobile/services/services.html	http://www.skype.com/intl/en/prices/callrates/?currency=USD#allRatesTab

[8] http://www.oanda.com/convert/classic

[9] Rates are applicable for calling both Fixed and Mobile phones

[10] Grameenphone customer service recommend to use BTCL website

[11] Retrieved on 10 September, 2009. Stated in USD

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About International Voice Benchmarks:

LIRNE*asia* (www.lirneasia.net) compiles and publishes the above data every 6 months.

Please visit : http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/ for historical reports

LIRNEasia is a regional think tank whose mission is to improve the lives of the people of the emerging Asia- Pacific by facilitating their use of ICTs and related infrastructures; by catalyzing the reform of laws, policies and regulations to enable those uses through the conduct of policy-relevant research, training and advocacy with the emphasis on building in-situ expertise.

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February 2009

Table 1: International Fixed Voice calls

All tariffs in USD		SAARC													
		From Afghanistan				From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
		Saturday to Thursday		Friday		Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
		Peak	Off-peak	Peak	Off-peak										
SAARC	Afghanistan					0.34	0.26	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.16
	Bangladesh	1.15	1.15	0.86	0.86			0.37	0.37	0.19	0.30	0.25	0.19	0.13	0.16
	Bhutan	1.15	1.15	0.86	0.86	0.26	0.22			0.19	0.54	0.25	0.19	0.19	0.16
	India	0.86	0.86	0.65	0.65	0.26	0.22	0.18	0.18		0.30	0.25	0.19	0.10	0.16
	Maldives	2.88	2.88	2.16	2.16	0.26	0.22	0.37	0.37	0.19		0.25	0.19	0.31	0.16
	Nepal	1.73	1.73	1.29	1.29	0.26	0.22	0.37	0.37	0.19	0.46			0.19	0.16
	Pakistan	0.86	0.86	0.65	0.65	0.26	0.22	0.37	0.37	0.19	0.30	0.25	0.19		0.16
	Sri Lanka	1.73	1.73	1.29	1.29	0.26	0.22	0.37	0.37	0.14	0.30	0.25	0.19	0.19	
South East Asia	Malaysia	0.96	0.96	0.72	0.72	0.26	0.22	0.92	0.92	0.19	0.27	0.63	0.63	0.03	0.11
	Singapore	0.96	0.96	0.72	0.72	0.26	0.22	0.37	0.37	0.19	0.23	0.63	0.63	0.13	0.11
	Thailand	1.15	1.15	0.86	0.86	0.26	0.22	0.37	0.37	0.19	0.27	0.63	0.63	0.13	0.19
East Asia	China	1.17	1.17	0.88	0.88	0.34	0.26	0.61	0.61	0.24	0.23	0.63	0.63	0.03	0.11
	Hong Kong	0.96	0.96	0.72	0.72	0.26	0.22	0.37	0.37	0.19	0.27	0.63	0.63	0.03	0.11
	Japan	0.96	0.96	0.72	0.72	0.34	0.26	0.61	0.61	0.24	0.30	0.63	0.63	0.06	0.11
Austral-Asia	Australia	0.96	0.96	0.72	0.72	0.34	0.26	0.37	0.37	0.24	0.30	0.63	0.63	0.03	0.23
Europe	France	0.96	0.96	0.72	0.72	0.34	0.26	0.61	0.61	0.19	0.38	0.63	0.63	0.03	0.11
	Germany	0.96	0.96	0.72	0.72	0.34	0.26	0.61	0.61	0.19	0.38	0.63	0.63	0.03	0.11
	Italy	0.96	0.96	0.72	0.72	0.34	0.26	0.37	0.37	0.19	0.38	0.63	0.63	0.03	0.11
	Sweden	0.96	0.96	0.72	0.72	0.39	0.30	0.37	0.37	0.19	0.38	0.63	0.63	0.06	0.11
	Switzerland	0.96	0.96	0.72	0.72	0.39	0.30	0.37	0.37	0.19	0.38	0.63	0.63	0.06	0.11
	UK	0.96	0.96	0.72	0.72	0.34	0.26	0.37	0.37	0.14	0.38	0.63	0.63	0.03	0.11
North America	Bahamas	1.19	1.19	0.89	0.89	0.39	0.30	0.92	0.92	0.24	0.70	0.63	0.63	0.13	0.35
	Canada	0.96	0.96	0.72	0.72	0.34	0.26	0.37	0.37	0.14	0.23	0.63	0.63	0.03	0.11
	Cuba	2.88	2.88	2.16	2.16	0.39	0.30	0.92	0.92	0.24	0.70	0.63	0.63	0.88	0.77
	Mexico	1.15	1.15	0.86	0.86	0.39	0.30	0.92	0.92	0.24	0.70	0.63	0.63	0.13	0.11
	US	0.96	0.96	0.72	0.72	0.34	0.26	0.37	0.37	0.14	0.23	0.63	0.63	0.03	0.11

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All tariffs in USD		SAARC													
		From Afghanistan				From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
		Saturday to Thursday		Friday											
		Peak	Off-peak	Peak	Off-peak	Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
South America	Argentina	1.25	1.25	0.94	0.94	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.13	0.31
	Brazil	1.15	1.15	0.86	0.86	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.13	0.31
	Chile	1.15	1.15	0.86	0.86	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.13	0.35
	Peru	1.25	1.25	0.94	0.94	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.56
	Uruguay	1.34	1.34	1.01	1.01	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.56
	Venezuela	1.15	1.15	0.86	0.86	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.77
Africa	Botswana	1.15	1.15	0.86	0.86	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.31
	DR Congo	1.34	1.34	1.01	1.01	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.88	0.77
	Egypt	1.15	1.15	0.86	0.86	0.43	0.34	0.92	0.92	0.24	0.38	0.63	0.63	0.19	0.31
	South Africa	1.15	1.15	0.86	0.86	0.43	0.34	0.61	0.61	0.24	0.38	0.63	0.63	0.13	0.11
	Tanzania	1.48	1.48	1.11	1.11	0.43	0.34	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.44
	Tunisia	1.34	1.34	1.01	1.01	0.43	0.34	0.92	0.92	0.24	0.46	0.63	0.63	0.19	0.77
Middle East	Lebanon	1.15	1.15	0.86	0.86	0.34	0.26	0.92	0.92	0.24	0.70	0.63	0.63	0.19	0.22
	Saudi Arabia	0.86	0.86	0.65	0.65	0.26	0.22	0.92	0.92	0.24	0.38	0.63	0.63	0.11	0.22
	Turkey	0.86	0.86	0.65	0.65	0.34	0.26	0.92	0.92	0.24	0.38	0.63	0.63	0.13	0.11
	UAE	0.86	0.86	0.65	0.65	0.26	0.22	0.61	0.61	0.19	0.38	0.63	0.63	0.15	0.22
Exchange rate (January 26, 2009) http://www.oanda.com/convert/classic	1 USD =	52.13				69.68		49.04		49.69	12.95	79.55		79.47	114.20
Operator		Afghan Telecom				BTCL		Bhutan Telecom		BSNL	Dhiraagu	Nepal Telecom		PTCL[1]	SLT [2]Telecom
Source						http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=13&Itemid=27		http://www.bsnl.co.in/service/tele_tariff.htm	http://www.dhiraagu.com.mv/tariffs/international.php	http://www.ntc.net.np/tariff/pstn_charge.php		http://www.ptcl.com.pk/contentp.php?NID=122	http://www.slt.lk/data/forbusiness/031icalls.htm

[1] Calls terminating on fixed lines only. for UK number series 844,845,870,871 its PK Rs. 15
[2] Have not used any rates from Budget Calls

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Table 2: International Mobile Voice calls

All tariffs in USD		SAARC										
		From Afghanistan	From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
SAARC	Afghanistan		0.34	0.26	0.92	0.92	0.19	0.70	0.24	0.24	0.25	0.70
	Bangladesh	0.43			0.37	0.37	0.19	0.30	0.24	0.24	0.10	0.31
	Bhutan	0.43	0.26	0.22			0.19	0.54	0.24	0.24	0.25	0.53
	India	0.43	0.26	0.22	0.18	0.18		0.30	0.24	0.18	0.14	0.09
	Maldives	0.43	0.26	0.22	0.37	0.37	0.19		0.24	0.24	0.25	0.22
	Nepal	0.43	0.26	0.22	0.37	0.37	0.19	0.46			0.25	0.31
	Pakistan	0.43	0.26	0.22	0.37	0.37	0.19	0.30	0.24	0.24		0.31
	Sri Lanka	0.43	0.26	0.22	0.37	0.37	0.19	0.30	0.24	0.24	0.25	
South East Asia	Malaysia	0.43	0.26	0.22	0.92	0.92	0.13	0.27	0.59	0.59	0.10	0.10
	Singapore	0.43	0.26	0.22	0.37	0.37	0.13	0.23	0.59	0.59	0.03	0.10
	Thailand	0.43	0.26	0.22	0.37	0.37	0.13	0.27	0.59	0.59	0.10	0.31
East Asia	China	0.43	0.34	0.26	0.61	0.61	0.19	0.23	0.59	0.59	0.03	0.10
	Hong Kong	0.43	0.26	0.22	0.37	0.37	0.13	0.27	0.59	0.59	0.03	0.10
	Japan	0.43	0.34	0.26	0.61	0.61	0.19	0.30	0.59	0.59	0.10	0.19
Austral-Asia	Australia	0.48	0.34	0.26	0.37	0.37	0.13	0.30	0.59	0.59	0.03	0.19
Europe	France	0.48	0.34	0.26	0.61	0.61	0.13	0.38	0.59	0.59	0.03	0.22
	Germany	0.48	0.34	0.26	0.61	0.61	0.13	0.38	0.59	0.59	0.03	0.19
	Italy	0.48	0.34	0.26	0.37	0.37	0.13	0.38	0.59	0.59	0.03	0.22
	Sweden	0.48	0.39	0.30	0.37	0.37	0.13	0.38	0.59	0.59	0.03	0.22
	Switzerland	0.48	0.39	0.30	0.37	0.37	0.13	0.38	0.59	0.59	0.03	0.22
	UK	0.48	0.34	0.26	0.37	0.37	0.13	0.38	0.59	0.59	0.03	0.19
North America	Bahamas	0.48	0.39	0.30	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.10
	Canada	0.48	0.34	0.26	0.37	0.37	0.13	0.70	0.59	0.59	0.03	0.10
	Cuba	0.48	0.39	0.30	0.92	0.92	0.81	0.70	0.59	0.59	1.04	0.70
	Mexico	0.48	0.39	0.30	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.10
	US	0.48	0.34	0.26	0.37	0.37	0.13	0.70	0.59	0.59	0.03	0.10
South America	Argentina	0.48	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.22
	Brazil	0.48	0.43	0.34	0.92	0.92	0.19	0.23	0.59	0.59	0.25	0.10
	Chile	0.48	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.22
	Peru	0.48	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.70
	Uruguay	0.48	0.43	0.34	0.92	0.92	0.19	0.23	0.59	0.59	0.25	0.70
	Venezuela	0.48	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.70

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All tariffs in USD	To/From	SAARC										
		From Afghanistan	From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
Africa	Botswana	0.58	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.31
	DR Congo	0.58	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	2.51	0.70
	Egypt	0.58	0.43	0.34	0.92	0.92	0.19	0.38	0.59	0.59	0.21	0.26
	South Africa	0.58	0.43	0.34	0.61	0.61	0.19	0.38	0.59	0.59	0.10	0.22
	Tanzania	0.58	0.43	0.34	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.35
	Tunisia	0.58	0.43	0.34	0.92	0.92	0.19	0.46	0.59	0.59	0.25	0.70
Middle East	Lebanon	0.43	0.34	0.26	0.92	0.92	0.19	0.70	0.59	0.59	0.25	0.26
	Saudi Arabia	0.43	0.26	0.22	0.92	0.92	0.19	0.38	0.59	0.59	0.14	0.26
	Turkey	0.43	0.34	0.26	0.92	0.92	0.19	0.38	0.59	0.59	0.25	0.31
	UAE	0.43	0.26	0.22	0.61	0.61	0.19	0.38	0.59	0.59	0.14	0.26
Exchange rate (January 26, 2009) http://www.oanda.com/convert/classic	1 USD =	52.13	69.68		49.04		49.69	12.95	79.55		79.47	114.20
Operators		Roshan Telecom[3]	BTCL[4]		Bhutan Telecom		Bharti Airtel[5]	Dhiraagu	Spice Nepal[6]		Mobilink GSM[7]	Dialog GSM
Source		http://www.roshan.af/web/?page_id=472	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=28&Itemid=42		http://www.airtel.in/wps/wcm/connect/Airtel.in/airtel.in/home/foryou/mobile/postpaid/tariffs/pg_fy_mb_posp_tariff	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.spicenepal.com/index.php?option=com_content&task=view&id=33		http://www.mobilinkgsm.com/idd/index.php	http://www.dialog.lk/en/mobile/services/services.html

[3] Rates are applicable for calling both Fixed and Mobile phones

[4] Grameenphone customer service recommend to use BTCL website

[5] Calling a mobile number in Europe is USD 0.18

[6] Post-paid package IDD rates

[7] Rates as per the Budget and Easy Packages

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LIRNEasia is a regional think tank whose mission is to improve the lives of the people of the emerging Asia- Pacific by facilitating their use of ICTs and related infrastructures; by catalyzing the reform of laws, policies and regulations to enable those uses through the conduct of policy-relevant research, training and advocacy with the emphasis on building in-situ expertise.

July 2008

Table 1: International fixed voice calls

		SAARC										
		From Afghanistan	From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
SAARC	Afghanistan		0.35	0.26	0.98	0.98	0.28	0.70	0.29	0.22	0.22	0.94
	Bangladesh				0.59	0.59	0.28	0.30	0.29	0.22	0.14	0.32
	Bhutan		0.26	0.22			0.28	0.55	0.29	0.22	0.22	0.52
	India		0.26	0.22	0.31	0.31		0.30	0.29	0.22	0.12	0.32
	Maldives		0.26	0.22	0.59	0.59	0.28		0.29	0.22	0.36	0.32
	Nepal		0.26	0.22	0.59	0.59	0.28	0.46			0.22	0.32
	Pakistan		0.26	0.22	0.59	0.59	0.28	0.30	0.29	0.22		0.32
	Sri Lanka		0.26	0.22	0.59	0.59	0.17	0.30	0.29	0.22	0.22	
South East Asia	Malaysia		0.26	0.22	0.98	0.98	0.23	0.27	0.73	0.73	0.03	0.24
	Singapore		0.26	0.22	0.59	0.59	0.23	0.23	0.73	0.73	0.14	0.21
	Thailand		0.26	0.22	0.48	0.48	0.23	0.27	0.73	0.73	0.14	0.24
East Asia	China		0.35	0.26	0.79	0.79	0.28	0.23	0.73	0.73	0.03	0.24
	Hong Kong		0.26	0.22	0.59	0.59	0.23	0.27	0.73	0.73	0.03	0.24
	Japan		0.35	0.26	0.79	0.79	0.28	0.30	0.73	0.73	0.07	0.21
Australasia	Australia		0.35	0.26	0.59	0.59	0.28	0.30	0.73	0.73	0.03	0.24
Europe	France		0.35	0.26	0.79	0.79	0.23	0.38	0.73	0.73	0.03	0.21
	Germany		0.35	0.26	0.79	0.79	0.23	0.38	0.73	0.73	0.03	0.21
	Italy		0.35	0.26	0.59	0.59	0.23	0.38	0.73	0.73	0.03	0.21
	Sweden		0.40	0.31	0.59	0.59	0.23	0.38	0.73	0.73	0.07	0.24
	Switzerland		0.40	0.31	0.59	0.59	0.23	0.38	0.73	0.73	0.07	0.24
	UK		0.35	0.26	0.59	0.59	0.17	0.38	0.73	0.73	0.03	0.21
North America	Bahamas		0.40	0.31	0.98	0.98	0.28	0.70	0.73	0.73	0.14	0.94
	Canada		0.35	0.26	0.59	0.59	0.17	0.23	0.73	0.73	0.03	0.21
	Cuba		0.40	0.31	0.98	0.98	0.28	0.70	0.73	0.73	1.01	0.94
	Mexico		0.40	0.31	0.98	0.98	0.28	0.70	0.73	0.73	0.14	0.24
	US		0.35	0.26	0.59	0.59	0.17	0.23	0.73	0.73	0.03	0.21
South America	Argentina		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.14	0.94
	Brazil		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.14	0.94

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		From Afghanistan	From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
	Chile		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.14	0.94
	Peru		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.22	0.94
	Uruguay		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.22	0.94
	Venezuela		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.22	0.94
Africa	Botswana		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.22	0.37
	DR Congo		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	1.01	0.94
	Egypt		0.44	0.35	0.98	0.98	0.28	0.38	0.73	0.73	0.22	0.37
	South Africa		0.44	0.35	0.79	0.79	0.28	0.38	0.73	0.73	0.14	0.24
	Tanzania		0.44	0.35	0.98	0.98	0.28	0.70	0.73	0.73	0.22	0.94
	Tunisia		0.44	0.35	0.98	0.98	0.28	0.46	0.73	0.73	0.22	0.94
Middle East	Lebanon		0.35	0.26	0.98	0.98	0.28	0.70	0.73	0.73	0.22	0.43
	Saudi Arabia		0.26	0.22	0.98	0.98	0.28	0.38	0.73	0.73	-	0.43
	Turkey		0.35	0.26	0.98	0.98	0.28	0.38	0.73	0.73	0.14	0.37
	UAE		0.26	0.22	0.79	0.79	0.23	0.38	0.73	0.73	-	0.43
Exchange rate http://finance.yahoo.com/currency (May 21, 2008)	1 USD =	45.98	67.98		45.75		42.63	12.80	68.60		69.50	107.90
Notes		No data	Rates are applicable for calling Fixed phones									
Source		**Afghan Telecom**	**BTTB**		**Bhutan Telecom**		**BSNL**	**Dhiraagu**	**Nepal Telecom**		**PTCL**	**SLT Telecom**
		http://www.afghantelecom.af	http://www.bttb.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=13&Itemid=27		http://www.bsnl.co.in/service/tele_tariff.htm	http://www.dhiraagu.com.mv/tariffs/international.php	http://www.ntc.net.np/tariff/pstn_charge.php		http://www.ptcl.com.pk/contentp.php?NID=122	http://www.slt.lk/data/forhome/031incalls_idd.htm

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Table 2: International mobile voice calls

		SAARC										
		From Afghanistan	From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
SAARC	**Afghanistan**		0.38	0.29	-	-	0.22	0.70	0.36	0.36	0.29	0.74
	Bangladesh	0.49			0.59	0.59	0.22	0.30	0.36	0.36	0.12	0.32
	Bhutan	0.49	0.29	0.25			0.22	0.55	0.36	0.36	0.29	0.56
	India	0.49	0.29	0.25	0.31	0.31		0.30	0.29	0.22	0.16	0.14
	Maldives	0.49	0.29	0.25	0.59	0.59	0.22		0.36	0.36	0.29	0.23
	Nepal	0.49	0.29	0.25	0.59	0.59	0.22	0.46			0.29	0.32
	Pakistan	0.49	0.29	0.25	0.59	0.59	0.22	0.30	0.36	0.36		0.32
	Sri Lanka	0.49	0.29	0.25	0.59	0.59	0.22	0.30	0.36	0.36	0.29	
South East Asia	**Malaysia**	0.49	0.29	0.25	0.98	0.98	0.15	0.27	0.73	0.73	0.12	0.10
	Singapore	0.49	0.29	0.25	0.59	0.59	0.15	0.23	0.73	0.73	0.03	0.10
	Thailand	0.49	0.29	0.25	0.48	0.48	0.15	0.27	0.73	0.73	0.12	0.32
East Asia	**China**	0.49	0.38	0.29	0.79	0.79	0.22	0.23	0.73	0.73	0.03	0.10
	Hong Kong	0.49	0.29	0.25	0.59	0.59	0.15	0.27	0.73	0.73	0.03	0.10
	Japan	0.49	0.38	0.29	0.79	0.79	0.22	0.30	0.73	0.73	0.12	0.14
Austral-asia	**Australia**	0.54	0.38	0.29	0.59	0.59	0.15	0.30	0.73	0.73	0.03	0.14
Europe	**France**	0.54	0.38	0.29	0.79	0.79	0.15	0.38	0.73	0.73	0.03	0.23
	Germany	0.54	0.38	0.29	0.79	0.79	0.15	0.38	0.73	0.73	0.03	0.14
	Italy	0.54	0.38	0.29	0.59	0.59	0.15	0.38	0.73	0.73	0.03	0.23
	Sweden	0.54	0.43	0.34	0.59	0.59	0.15	0.38	0.73	0.73	0.03	0.23
	Switzerland	0.54	0.43	0.34	0.59	0.59	0.15	0.38	0.73	0.73	0.03	0.23
	UK	0.54	0.38	0.29	0.59	0.59	0.15	0.38	0.73	0.73	0.03	0.14
North America	**Bahamas**	0.54	0.43	0.34	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.10
	Canada	0.54	0.38	0.29	0.59	0.59	0.15	0.70	0.73	0.73	0.03	0.10
	Cuba	0.54	0.43	0.34	0.98	0.98	0.94	0.70	0.73	0.73	1.11	0.74
	Mexico	0.54	0.43	0.34	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.10
	US	0.54	0.38	0.29	0.59	0.59	0.15	0.70	0.73	0.73	0.03	0.10

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		From Afghanistan	From Bangladesh		From Bhutan		From India	From Maldives	From Nepal		From Pakistan	From Sri Lanka
			Peak	Off-peak	Peak	Off-peak			Peak	Off-peak		
South America	**Argentina**	0.54	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.23
	Brazil	0.54	0.47	0.38	0.98	0.98	0.22	0.23	0.73	0.73	0.29	0.28
	Chile	0.54	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.23
	Peru	0.54	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.74
	Uruguay	0.54	0.47	0.38	0.98	0.98	0.22	0.23	0.73	0.73	0.29	0.74
	Venezuela	0.54	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.74
Africa	**Botswana**	0.65	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.32
	DR Congo	0.65	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	2.80	0.74
	Egypt	0.65	0.47	0.38	0.98	0.98	0.22	0.38	0.73	0.73	0.24	0.28
	South Africa	0.65	0.47	0.38	0.79	0.79	0.22	0.38	0.73	0.73	0.12	0.23
	Tanzania	0.65	0.47	0.38	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.37
	Tunisia	0.65	0.47	0.38	0.98	0.98	0.22	0.46	0.73	0.73	0.29	0.74
Middle East	**Lebanon**	0.49	0.38	0.29	0.98	0.98	0.22	0.70	0.73	0.73	0.29	0.28
	Saudi Arabia	0.49	0.29	0.25	0.98	0.98	0.22	0.38	0.73	0.73	0.16	0.28
	Turkey	0.49	0.38	0.29	0.98	0.98	0.22	0.38	0.73	0.73	0.29	0.32
	UAE	0.49	0.29	0.25	0.79	0.79	0.22	0.38	0.73	0.73	0.16	0.28
Exchange rate http://finance.yahoo.com/currency (May 21, 2008)	1 USD =	45.98	67.98		45.75		42.63	12.80	68.60		69.50	107.90
Notes		Rates are applicable for calling both Fixed and Mobile phones	Rates are applicable for calling Fixed phones		Prepaid package IDD rates; Rates are applicable for calling Fixed phones		Prepaid package Airtel Regular IDD rates; Rates are applicable for calling Fixed	Rates are applicable for calling Fixed phones	Prepaid package IDD rates; Rates are applicable for calling Fixed phones		Prepaid package Jazz Budget IDD rates; Rates are applicable for calling Fixed	Rates are applicable for calling both Fixed and Mobile phones

						phones			phones	
Source		**Roshan Telecom**		**GrameenPhone**	**Bhutan Telecom**	**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**	**Mobilink GSM**	**Dialog GSM**
		http://www.roshan.af/web/?page_id=472			http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=28&Itemid=42	http://www.airtel.in/Prepaid_tarrifs.aspx?path=1/6/6/2&cid=2	http://www.dhiraagu.com.mv/beta/fixed/international_services/idd.php?country=bang	http://www.spicenepal.com/index.php?option=com_content&task=view&id=33	http://www.mobilinkgsm.com/idd/index.php	http://www.dialog.lk/en/mobile/services/services.html

About International Voice Benchmarks:

LIRNE*asia* compiles and publishes the above every six months.

Please visit
http://lirneasia.net/projects/benchmarks

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Table 1: International Fixed Voice calls

All tariffs in USD	From/To	SAARC									
		Afghanistan	Bangladesh		Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	Skype
			Peak	Off-peak							
SAARC	Afghanistan		0.35	0.26	0.97	0.25	0.71	0.41	0.18	0.16	0.41
	Bangladesh	0.25*			0.39	0.20	0.24	0.20	0.12	0.16	0.16
	Bhutan	0.25*	0.26	0.22		0.20	0.55	0.26	0.18	0.16	0.26
	India	0.25*	0.26	0.22	0.11		0.31	0.20	0.10	0.16	0.11
	Maldives	0.25*	0.26	0.22	0.39	0.20		0.26	0.30	0.16	0.33
	Nepal	0.25*	0.26	0.22	0.39	0.20	0.47		0.18	0.16	0.39
	Pakistan	0.19*	0.26	0.22	0.39	0.20	0.31	0.20		0.16	0.2
	Sri Lanka	0.25*	0.26	0.22	0.39	0.15	0.31	0.20	0.18		0.17
South East Asia	Malaysia	0.11	0.26	0.22	0.97	0.20	0.28	0.51	0.02	0.11	0.02
	Singapore	0.11	0.26	0.22	0.39	0.20	0.24	0.51	0.12	0.11	0.02
	Thailand	0.25*	0.26	0.22	0.39	0.20	0.28	0.51	0.12	0.19	0.13
East Asia	China	0.11	0.35	0.26	0.65	0.25	0.24	0.51	0.02[1]	0.11	0.02
	Hong Kong	0.11	0.26	0.22	0.39	0.20	0.28	0.51	0.02	0.11	0.02
	Japan	0.11	0.35	0.26	0.65	0.25	0.31	0.51	0.06	0.11	0.03
	Mongolia	0.25*	0.35	0.26	0.97	0.25	0.71	0.51	0.12	0.35	0.24
Austral-Asia	Australia	0.11	0.35	0.26	0.39	0.25	0.31	0.51	0.02	0.11	0.02

[1] This tariff is applicable only for an IDD call to a mobile number

Europe	**France**	0.11	0.35	0.26	0.65	0.20	0.39	0.51	0.02	0.11	0.02
	Germany	0.11	0.35	0.26	0.65	0.20	0.39	0.51	-[2]	0.11	0.02
	Italy	0.11	0.35	0.26	0.39	0.20	0.39	0.51	0.02	0.11	0.02
	Sweden	0.25*	0.40	0.31	0.39	0.20	0.39	0.51	0.06	0.11	0.02
	Switzerland	0.25*	0.40	0.31	0.39	0.20	0.39	0.51	0.06	0.11	0.02
	UK	0.25*	0.35	0.26	0.39	0.15	0.39	0.51	0.18[3]	0.11	0.02
North America	**Bahamas**	0.25*	0.40	0.31	0.97	0.25	0.71	0.51	0.12	0.35	0.1
	Canada	0.11	0.35	0.26	0.39	0.15	0.24	0.51	0.18[4]	0.11	0.02
	Cuba	0.25*	0.40	0.31	0.97	0.25	0.71	1.37	0.83	0.77	1.18
	Mexico	0.11	0.40	0.31	0.97	0.25	0.71	0.51	0.12	0.11	0.1
	US	0.25*	0.35	0.26	0.39	0.15	0.24	0.51	0.02	0.11[5]	0.02
South America	**Argentina**	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.31	0.04
	Brazil	0.11	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.31	0.06
	Chile	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.35	0.02
	Peru	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.56	0.09
	Uruguay	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.56	0.15
	Venezuela	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.77	0.1
Africa	**Botswana**	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.18	0.31	0.2

[2] Tariff was not available
[3] Calls terminating on fixed lines in number series 844,845,870,871
[4] This tariff is applicable only for an IDD call to a mobile number
[5] This tariff is applicable only for an IDD call to a mobile number

	DR Congo	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.83	0.77	0.41
	Egypt	0.25*	0.44	0.35	0.97	0.25	0.39	0.51	0.18	0.31	0.21
	South Africa	0.25*	0.44	0.35	0.65	0.25	0.39	0.51	0.12	0.11	0.08
	Tanzania	0.25*	0.44	0.35	0.97	0.25	0.71	0.51	0.12	0.35	0.35
	Tunisia	0.25*	0.44	0.35	0.97	0.25	0.47	0.51	0.24	0.77	0.29
Middle East	**Lebanon**	0.25*	0.35	0.26	0.97	0.25	0.71	0.51	0.18	0.22	0.14
	Saudi Arabia	0.25*	0.26	0.22	0.97	0.25	0.39	0.51	0.11	0.22	0.28
	Turkey	0.25*	0.35	0.26	0.97	0.25	0.39	0.51	0.12	0.11	0.04
	UAE	0.25*	0.26	0.22	0.65	0.20	0.39	0.51	0.14	0.22	0.31
Exchange rate [6]	**1 USD =**	47.35	67.97		46.16	48.93	12.62	72.69	84.05	114.20	1
Operator		**Afghan Telecom**	**BTCL**		**Bhutan Telecom**	**BSNL**	**Dhiraagu**	**Nepal Telecom**	**PTCL**	**SLT Telecom**	**Skype**
Source		http://www.afghantelecom.af/tarrif.htm	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=13&Itemid=27	http://www.bsnl.co.in/service/std_pulse.htm	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.ntc.net.np/tariff/pstn_charge.php	http://www.ptcl.com.pk/contentp.php?ID=122	http://www.slt.lk/data/forbusiness/031icalls.htm	http://www.skype.com/intl/en/prices/callrates/?currency=USD#allRatesTab

* Updated tariff data is unavailable. Therefore, data extracted from the October 2009 International Voice Benchmark report has been quoted.

6 Retrieved on (February 23, 2010) from http://www.oanda.com/convert/classic

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Table 2: International Mobile Voice calls

All tariffs in USD	From/To	SAARC									
		Afghanistan	Bangladesh		Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	Skype
			Peak	Off-peak							
SAARC	Afghanistan		0.35	0.26	0.97	0.20	0.71	0.26	0.24	0.70	0.41
	Bangladesh	0.48			0.39	0.20	0.31	0.26	0.10	0.31	0.16
	Bhutan	0.48	0.26	0.22		0.20	0.55	0.26	0.24	0.53	0.26
	India	0.48	0.26	0.22	0.11		0.31	0.26	0.10	0.09	0.11
	Maldives	0.48	0.26	0.22	0.39	0.20		0.26	0.24	0.70	0.33
	Nepal	0.48	0.26	0.22	0.39	0.20	0.47		0.24	0.31	0.39
	Pakistan	0.48	0.26	0.22	0.39	0.20	0.31	0.26		0.31	0.16
	Sri Lanka	0.48	0.26	0.22	0.39	0.20	0.31	0.26	0.24		0.17
South East Asia	Malaysia	0.48	0.26	0.22	0.97	0.14	0.28	0.65	0.10	0.10	0.02
	Singapore	0.48	0.26	0.22	0.39	0.14	0.24	0.65	0.03	0.10	0.02
	Thailand	0.48	0.26	0.22	0.39	0.14	0.28	0.65	0.10	0.31	0.13
East Asia	China	0.48	0.35	0.26	0.65	0.20	0.24	0.65	0.03	0.06	0.02
	Hong Kong	0.48	0.26	0.22	0.39	0.14	0.28	0.65	0.03	0.10	0.02
	Japan	0.48	0.35	0.26	0.65	0.20	0.31	0.65	0.10	0.19	0.03
	Mongolia	0.48	0.35	0.26	0.97	0.20	0.71	0.65	0.24	0.19	0.24
Austral-Asia	Australia	0.53	0.35	0.26	0.39	0.14	0.31	0.65	0.03	0.19	0.02
Europe	France	0.53	0.35	0.26	0.65	0.14	0.39	0.65	0.03	0.22	0.02

	Germany	0.53	0.35	0.26	0.65	0.14	0.39	0.65	0.03	0.19	0.02
	Italy	0.53	0.35	0.26	0.39	0.14	0.39	0.65	0.03	0.22	0.02
	Sweden	0.53	0.40	0.31	0.39	0.14	0.39	0.65	0.03	0.22	0.02
	Switzerland	0.53	0.40	0.31	0.39	0.14	0.39	0.65	0.03	0.22	0.02
	UK	0.53	0.35	0.26	0.39	0.14	0.39	0.65	0.03	0.19	0.02
North America	**Bahamas**	0.53	0.40	0.31	0.97	0.14	0.71	0.65	0.24	0.10	0.10
	Canada	0.53	0.35	0.26	0.39	0.14	0.71	0.65	0.03	0.10	0.02
	Cuba	0.53	0.40	0.31	0.97	0.87	0.71	0.65	0.92	0.96	1.18
	Mexico	0.53	0.40	0.31	0.97	0.20	0.71	0.65	0.24	0.35	0.10
	US	0.53	0.35	0.26	0.39	0.14	0.24	0.65	0.03	0.10	0.02
South America	**Argentina**	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.22	0.04
	Brazil	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.26	0.06
	Chile	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.22	0.02
	Peru	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.70	0.09
	Uruguay	0.53	0.44	0.3	0.97	0.20	0.71	0.65	0.24	0.70	0.15
	Venezuela	0.53	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.70	0.06
Africa	**Botswana**	0.63	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.31	0.2
	DR Congo	0.63	0.44	0.35	0.97	0.20	0.71	0.65	2.31	0.70	0.41
	Egypt	0.63	0.44	0.35	0.97	0.20	0.39	0.65	0.20	0.26	0.21
	South Africa	0.63	0.44	0.35	0.65	0.20	0.39	0.65	0.10	0.22	0.08
	Tanzania	0.63	0.44	0.35	0.97	0.20	0.71	0.65	0.24	0.35	0.35
	Tunisia	0.63	0.44	0.35	0.97	0.20	0.47	0.65	0.24	0.70	0.29

Middle East	**Lebanon**	0.48	0.35	0.26	0.97	0.20	0.71	0.65	0.24	0.26	0.14
	Saudi Arabia	0.48	0.26	0.22	0.97	0.20	0.39	0.65	0.13	0.26	0.28
	Turkey	0.48	0.35	0.26	0.97	0.14	0.39	0.65	0.24	0.31	0.04
	UAE	0.48	0.26	0.22	0.65	0.20	0.39	0.65	0.13	0.26	0.31
Exchange rate [7]	1 USD =	47.35	67.97		46.16	46.16	12.62	72.69	84.05	114.02	1
Operators		**Roshan Telecom**	**BTCL**		**Bhutan Telecom**	**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**	**Mobilink GSM**	**Dialog**	**Skype**
Source		http://www.roshan.af/web/?page_id=472	http://www.btcl.gov.bd/		http://www.druknet.bt/btelecom/mobile.html	http://www.airtel.in/wps/wcm/connect/airtel.in/airtel.in/home/foryou/broadband+and+fixed+line/fixed+line/PG_FY_HP_FL_revised_tarrifs	http://www.dhiraagu.com.mv/tariffs/international.php?country=all	http://www.spicenepal.com/en/postpaid_tariff.php	http://www.mobilinkgsm.com/indigo/ddr.php	http://www.dialog.lk/personal/international/idd/rates/	http://www.skype.com/intl/en/prices/callrates/?currency=USD#allRatesTab

[7] Retrieved on (February 23, 2010) from http://www.oanda.com/convert/classic

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October 2009

Table 1: Cost in USD for Incoming call while Roaming

Roaming in ↓		Home Country of Caller: Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal: Peak	Nepal: Off-peak	Pakistan	Sri Lanka
SAARC	Afghanistan		0.84	-	0.99	1.32	0.47	-	0.37	1.36
	Bangladesh	1.00		0.45	0.85	0.69	0.41	-	0.37	0.81
	Bhutan	-	1.55		1.72	2.43	1.25	-	-	2.09
	India	1.50	1.83	1.75		2.62	1.44	-	-	2.08
	Maldives	1.00	0.43	-	0.79		0.30	-	0.37	0.59
	Nepal	1.50	0.67	0.49	0.97	1.09			0.37	0.89
	Pakistan	1.00	0.49	0.21	-	0.63	0.20	-		0.61
	Sri Lanka	2.00	0.58	0.33	0.81	0.76	0.32	-	0.37	
South East Asia	Malaysia	2.00	0.52	-	0.7	0.68	0.27	-	0.37	0.44
	Singapore	1.50	0.68	0.21	0.9	0.80	0.23	-	0.37	0.60
	Thailand	1.50	0.88	0.60	1.1	1.12	0.58	-	0.37	0.60
East Asia	China	1.50	1.04	-	1.2	1.91	0.41	0.70	0.37	0.91
	Hong Kong	1.50	0.71	0.26	0.8	0.64	0.27	-	0.37	0.45
	Japan	-	0.34	-	0.5	1.75	0.29	-	0.37	0.22
	Mongolia	2.00	-	-	0.6	-	-	-	-	-
Austral-asia	Australia	1.00	0.81	0.00	1.0	1.02	-	-	0.37	0.68
Europe	France	1.50	0.92	-	1.3	0.38	0.54	-	0.37	0.90
	Germany	1.50	1.13	-	1.91	0.93	0.74	-	0.37	0.22
	Italy	2.00	2.06	0.00	1.92	2.59	0.00	-	0.37	1.13
	Sweden	2.00	0.38	-	0.5	0.38	0.00	-	0.37	0.25
	Switzerland	2.00	1.04	2.40	0.5	0.38	-	-	0.37	0.25
	UK	2.00	1.19	0.00	1.3	0.63	1.32	-	0.37	1.01
North America	Bahamas	-	-	-	1.5	-	-	-	-	1.93
	Canada	1.50	1.33	0.89	1.5	-	-	-	0.37	1.41
	Cuba	-	-	-	1.1	-	-	-		1.48

	Mexico	1.50	1.25	-	1.3	1.92	0.70	-	0.37	0.91
	US	1.50	1.33	1.20	1.4	1.54	0.50	-	0.37	1.61
South America	Argentina	1.50	-	-	1.0	-	0.54	-	0.37	1.00
	Brazil	1.50	1.18	-	0.5	0.95	0.60	-	0.37	3.67
	Chile	-	0.43	-	1.1	-	-	-	0.37	0.25
	Peru	-	-	-	0.9	-	-	-	-	3.51
	Uruguay	1.50	-	-	0.5	-	-	-	0.37	1.63
	Venezuela	1.50	-	-	1.2	-	-	-	0.37	-
Africa	Botswana	-	-	-	0.5	-	-	-	0.37	0.35
	DR Congo	-	-	-	0.5	-	-	-	-	0.79
	Egypt	0.50	0.43	-	0.5	0.38	2.07	-	0.37	0.30
	South Africa	0.50	0.43	-	0.4	0.12	0.50	-	0.37	0.25
	Tanzania	0.50	0.43	-	0.5	-	-	-	0.37	0.40
	Tunisia	0.50	0.43	-	0.5	0.46	-	-	0.37	0.79
Middle East	Lebanon	2.00	-	-	0.5	-	-	-	0.37	0.30
	Saudi Arabia	1.50	1.06	-	1.3	2.38	0.20	-	0.37	1.21
	Turkey	2.00	1.06	-	2.6	0.38	0.27	-	0.37	1.40
	UAE	1.50	0.64	0.73	2.2	0.38	0.51	-	0.37	0.30
Exchange rate (September 20, 2009)[1] **1 USD =**		50.10	70.25	48.05	48.93	12.95	78.43		83.11	114.87
Source		**Roshan Telecom**	**Grameen Phone**[2]	**Bhutan Telecom**[3]	**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**		**Mobilink GSM**[4]	**Dialog**[5]
		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www1.grameenphone.com/index.php?id=234	http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44	http://www.airtel.in/wps/wcm/connect/airtel.in/Airtel.In/Home/ForYou/Mobile/Postpaid/Roaming/International/	http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php?id=all	http://www.spicenepal.com/en/international_voice.php		http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent Email : air@dialog.lk

1 http://www.oanda.com/convert/classic
2 Tariffs were stated in USD
3 Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf
4 A termination fee is added to the tariff mentioned. Tariffs were stated in USD
5 Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf

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Table 2: Cost in USD for Outgoing call to the visiting country while roaming

Roaming in ↓		Home Country: Afghanistan	Bangladesh	Bhutan		India		Maldives	Nepal		Pakistan	Sri Lanka	
				Peak	Off-peak	Peak	Off-peak		Peak	Off-peak		Peak	Off Peak
SAARC	Afghanistan		0.60	-	-	0.60	-	0.74	0.60	-	0.90	0.69	
	Bangladesh	1.50		0.51	-	0.44	-	0.61	0.44	-	0.90	0.46	
	Bhutan	-	1.29			1.23	-	1.89	1.25	-		1.50	
	India	2.50	1.07	1.14	-			1.61	1.00	-		1.29	
	Maldives	1.50	0.17	-	-	0.30			0.30		0.90	0.34	
	Nepal	2.50	0.41	0.49	-	0.48	-	0.75			0.90	0.66	
	Pakistan	1.50	0.41	0.46	0.27		-	0.58	0.41	0.22		0.45	0.25
	Sri Lanka	2.99	0.32	0.33	-	0.32	-	0.43	0.32		1.49		
South East Asia	Malaysia	2.99	0.44	-	-	0.25	-	0.37	0.19		0.90	0.33	
	Singapore	2.50	0.42	0.21	-	0.42	-	0.80	0.24		0.90	0.30	
	Thailand	2.50	0.62	0.60	-	0.61	-	0.84	0.61		0.90	0.30	
East Asia	China	2.50	0.70	-	-	0.70	-	0.84	0.42		0.90	0.80	
	Hong Kong	2.50	0.30	0.58	-	0.29	-	0.37	0.29		0.90	0.34	
	Japan	-	0.56	0.45	-	0.63	0.43	0.64	0.56		0.90	0.77	
	Mongolia	2.99	-	-	-	0.62	-	-	-				
Austral-asia	Australia	2.00	0.72	0.90	-	0.75	-	1.08	-		1.49	0.46	
Europe	France	2.00	0.84	0.82	0.44	0.82	0.36	1.09	0.82	0.34	1.49	0.87	
	Germany	2.00	0.79	-	-	1.42	-	1.58	0.78		1.49	0.41	
	Italy	2.50	1.29	0.69	-	0.67	-	1.66	0.58		0.90	0.63	
	Sweden	2.50	0.83	-	-	0.80	-	1.02	0.43		1.49	2.91	
	Switzerland	2.50	0.80	0.84	0.62	0.85	-	0.75	-		0.90	0.88	
	UK	2.50	0.52	0.51	0.20	0.46	-	0.29	0.49		0.90	0.49	
North America	Bahamas	-	-	-	-	0.98	-	-	-			0.57	
	Canada	2.50	0.99	1.02	-	0.99	-	-	-		1.49	1.31	
	Cuba	-	-	-	-	0.60	-	-	-			1.83	
	Mexico	2.50	0.85	-	-	0.85	-	1.22	0.70		1.49	0.80	

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	US	2.50	0.99	1.56		1.18	-	1.31	0.50	-	1.49	1.54	-
South America	**Argentina**	2.00	-	-	-	0.54	-	-	0.54	-	1.49	0.75	-
	Brazil	1.50	1.29	-	-	0.68	-	0.82	0.78	-	1.49	3.57	-
	Chile	-	0.44	-	-	0.60	-	-	-	-	1.49	0.59	-
	Peru	-	-	-	-	0.46	-	-	-	-	-	4.08	-
	Uruguay	1.50	-	-	-	0.75	-	-	-	-	1.49	1.03	-
	Venezuela	2.00	-	-	-	0.69	-	-	-	-	0.90	-	-
Africa	**Botswana**	-	-	-	-	0.30	0.21	-	-	-	1.49	0.30	-
	DR Congo	-	-	-	-	2.40	-	-	-	-	-	1.03	-
	Egypt	2.00	0.56	-	-	0.57	-	0.85	0.57	-	1.49	0.68	-
	South Africa	1.50	0.35	-	-	0.69	-	0.55	0.50	-	0.90	0.52	-
	Tanzania	2.00	0.41	-	-	0.45	-	-	-	-	0.90	0.57	-
	Tunisia	1.50	0.72	-	-	1.39	-	1.35	-	-	0.90	1.15	-
Middle East	**Lebanon**	2.99	-	-	-	0.59	-	-	-	-	0.90	0.50	-
	Saudi Arabia	2.50	0.93	-	-	0.93	-	0.31	0.24	-	0.90	1.07	-
	Turkey	2.99	0.80	-	-	0.86	-	1.30	0.74	-	1.49	1.16	-
	UAE	2.50	0.90	1.21	-	0.81	-	0.72	0.89	-	0.90	0.65	-
Exchange rate (September 20, 2009)[6] **1 USD =**		50.10	70.25	48.05		48.93		12.95	78.43		83.11	114.87	
Source		**Roshan Telecom**	**Grameen Phone**[7]	**Bhutan Telecom**[8]		**Bharti Airtel**		**Dhiraagu**	**Spice Nepal**		**Mobilink GSM**[9]	**Dialog**[10]	
		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www1.grameenphone.com/index.php?id=234	http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44		http://www.airtel.in/wps/wcm/connect/airtel.in/Airtel.In/Home/ForYou/Mobile/Postpaid/Roaming/International/		http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php?id=all	http://www.spicenepal.com/en/international_voice.php		http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent Email : air@dialog.lk	

[6] http://www.oanda.com/convert/classic
[7] Tariffs were stated in USD
[8] Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf
[9] A termination fee is added to the tariff mentioned. Tariffs were stated in USD
[10] Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf

Table 3: Cost in USD for Outgoing call to Home country while roaming

Roaming in ↓		Afghanistan	Bangladesh	Bhutan Peak	Bhutan Off-peak	India Peak	India Off-peak	Maldives	Nepal Peak	Nepal Off-peak	Nepal Economy	Pakistan	Sri Lanka Peak	Sri Lanka Off Peak
SAARC	Afghanistan		2.2	-	-	1.60	-	3.72	2.18	-	-	2.25	3.47	-
	Bangladesh	2.00		0.72	-	0.62	0.58	0.92	0.72	0.67	-	1.49	0.80	0.75
	Bhutan	-	2.13			1.52	-	3.12	2.06	-	-	-	2.99	-
	India	3.99	2.12	2.31	-			3.25	2.02	-	-	-	2.62	-
	Maldives	2.00	1.58	-	-	2.34	-		2.04	-	-	2.25	2.23	-
	Nepal	3.99	1.02	1.21	-	1.07	-	1.57				2.25	1.37	-
	Pakistan	2.00	0.27	0.46	-	-	-	0.38	0.30	-	-		0.79	0.60
	Sri Lanka	5.99	2.11	2.17	-	2.11	1.75	3.01	2.11	1.75	1.48	2.99		
South East Asia	Malaysia	5.99	2.54	-	-	2.33	-	3.79	2.87	1.91	-	3.49	2.59	-
	Singapore	3.99	1.84	1.43	-	1.63	-	2.88	1.51	-	-	2.25	4.88	-
	Thailand	3.99	1.69	1.89	-	1.67	-	2.29	0.82	-	-	2.25	3.31	-
East Asia	China	3.99	2.17	3.13	-	2.16	-	3.45	2.18	-	-	2.25	2.03	-
	Hong Kong	3.99	1.93	1.92	-	2.21	-	2.58	1.46	-	-	2.25	2.03	-
	Japan	-	3.13	4.12	-	3.48	-	2.50	2.38	1.80	-	2.25	4.28	-
	Mongolia	5.99	-	-	-	3.24	-	-	-	-	-	2.99		-
Austral-asia	Australia	5.49	2.07	3.97	-	2.22	-	10.71	-	-	-	2.99	4.50	-
Europe	France	3.99	2	3.75	-	2.86	-	3.69	2.13	-	-	3.2	3.76	-
	Germany	3.99	2.24	-	-	2.85	-	2.93	1.14	-	-	3.49	2.41	-
	Italy	5.99	3.57	2.78	-	3.83	-	4.61	3.48	-	-	3.2	4.12	-
	Sweden	5.99	2.52	-	-	2.96	-	4.17	2.84	-	-	3.49	0.78	-
	Switzerland	5.99	3.19	3.43	2.66	2.82	-	6.75	-	-	-	3.49	2.95	-
	UK	5.99	3.9	2.84	2.43	2.94	-	3.54	1.64	-	-	-	2.72	-
North America	Bahamas	-	-	-	-	4.99	-	-	-	-	-	2.99	2.28	-
	Canada	5.99	1.96	1.77	-	2.49	-	-	-	-	-	-	4.12	-
	Cuba	-	-	-	-	4.57	-	-	-	-	-	4.95	4.11	-
	Mexico	5.99	3.29	-	-	2.50	-	4.72	2.30	-	-	2.99	2.63	-

	US	5.99	4.14	2.66	-	2.27	-	6.18	4.79	-	-	2.99	4.64	-
South America	**Argentina**	3.99	-	-	-	2.40	-	-	2.40	-	-	4.95	3.94	-
	Brazil	2.99	5.5	-	-	2.16	-	3.24	2.50	-	-	4.95	7.90	-
	Chile	-	2.2	-	-	2.65	-	-	-	-	-	-	3.03	-
	Peru	-	-	-	-	2.15	-	-	-	-	-	3.20	4.08	-
	Uruguay	2.99	-	-	-	1.31	-	-	-	-	-	1.49	1.50	-
	Venezuela	3.99	-	-	-	2.68	-	-	-	-	-	2.99		-
Africa	**Botswana**	-	-	-	-	1.61	0.87	-	-	-	-	-	1.60	-
	DR Congo	-	-	-	-	2.48	-	-	-	-	-	3.20	2.74	-
	Egypt	3.99	2.27	-	-	3.15	2.02	4.66	2.74	-	-	1.49	3.73	-
	South Africa	2.50	0.66	-	-	0.69	-	1.80	1.71	-	-	3.49	1.03	-
	Tanzania	3.99	2.34	-	-	2.55	-	-	-	-	-	1.49	3.21	-
	Tunisia	2.50	1.57	-	-	3.18	-	3.15	-	-	-	2.25	2.72	-
Middle East	**Lebanon**	5.99	-	-	-	1.08	0.91	-	-	-	-	2.25	0.50	-
	Saudi Arabia	3.99	2.1	-	-	2.10	-	1.84	2.43	-	-	3.20	2.43	-
	Turkey	5.99	4.12	-	-	2.53	-	6.74	3.92	-	-	2.25	3.46	-
	UAE	3.99	1.63	1.46	-	2.93	-	4.71	1.35	-	-	2.99	4.27	-
Exchange rate (September 20, 2009)[11] 1 USD =		50.10	70.25	48.05		48.93		12.97	78.43			83.11	114.87	
Source		Roshan Telecom	Grameen Phone[12]	Bhutan Telecom[13]		Bharti Airtel		Dhiraagu	Spice Nepal			Mobilink GSM[14]	Dialog[15]	
		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www1.grameenphone.com/index.php?id=234	http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44		http://www.airtel.in/wps/wcm/connect/airtel.in/Airtel.In/Home/ForYou/Mobile/Postpaid/Roaming/International/		http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php?id=all	http://www.spicenepal.com/en/international_voice.php			http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent Email : air@dialog.lk	

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[11] http://www.oanda.com/convert/classic
[12] Tariffs were stated in USD
[13] Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf
[14] A termination fee is added to the tariff mentioned. Tariffs were stated in USD
[15] Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf

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Table 4: Sending a SMS while roaming

Roaming in ↓		Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
		Home Country							
SAARC	Afghanistan		0.50	-	0.50	-	0.56	0.37	0.57
	Bangladesh	0.60		0.15	0.14	0.17	0.17	0.37	0.19
	Bhutan	-	0.35		0.31	0.38	0.31	-	0.37
	India	0.60	0.43	0.47		0.53	0.39	-	0.53
	Maldives	0.60	0.25	-	0.25		0.45	0.37	0.29
	Nepal	0.60	0.20	0.24	0.19	0.25		0.37	0.27
	Pakistan	0.60	0.19	0.23	-	0.22	0.17		0.22
	Sri Lanka	0.60	0.23	0.24	0.23	0.32	0.23	0.37	
South East Asia	Malaysia	0.60	0.33	-	0.3	0.37	0.30	0.37	0.38
	Singapore	0.60	0.24	0.25	0.2	0.26	0.23	0.37	0.32
	Thailand	0.60	0.37	0.34	0.4	0.39	0.33	0.37	0.32
East Asia	China	0.60	0.29	-	0.3	0.28	0.33	0.37	0.33
	Hong Kong	0.60	0.39	0.34	0.4	0.38	0.36	0.37	0.44
	Japan	0.24	0.24	0.26	0.3	0.30	0.30	0.37	0.31
	Mongolia	0.60	-	-	0.2	-	-	-	-
Austral-asia	Australia	0.60	0.31	0.34	0.3	0.37	-	0.37	0.30
Europe	France	0.60	0.29	0.31	0.3	0.33	0.25	0.37	0.32
	Germany	0.60	0.29	-	0.2	0.25	0.27	0.37	0.25
	Italy	0.60	0.40	0.21	0.2	0.37	0.28	0.37	0.32
	Sweden	0.60	0.33	-	1.4	0.35	0.30	0.37	0.31
	Switzerland	0.60	0.28	0.30	0.3	0.31	-	0.37	0.34
	UK	0.60	0.22	0.20	0.3	0.24	0.23	0.37	0.19
North America	Bahamas	-	-	-	0.2	-	-	-	0.40
	Canada	0.60	0.30	0.27	0.3	-	-	0.37	0.40
	Cuba	-	-	-	1.0	-	-	-	1.14
	Mexico	0.60	0.35	-	0.3	0.40	0.25	0.37	0.29
	US	0.60	0.30	0.36	0.2	0.30	-	0.37	0.47

South America	**Argentina**	0.60	-	-	0.2	-	0.20	0.37	0.28
	Brazil	0.60	0.75	-	0.2	0.30	0.30	0.37	-
	Chile	-	0.25	-	0.2	-	-	0.37	0.24
	Peru	-	-	-	0.3	-	-	-	-
	Uruguay	0.60	-	-	0.2	-	-	0.37	0.29
	Venezuela	0.60	-	-	0.3	-	-	0.37	-
Africa	**Botswana**	-	-	-	0.1	-	-	0.37	0.14
	DR Congo	-	-	-	0.2	-	-	-	0.23
	Egypt	0.60	0.29	-	0.3	0.34	0.27	0.37	0.34
	South Africa	0.60	0.10	-	0.1	0.20	0.14	0.37	0.22
	Tanzania	0.60	0.15	-	0.1	-	-	0.37	0.20
	Tunisia	0.60	0.14	-	0.6	0.46	-	0.37	0.49
Middle East	**Lebanon**	0.60	-	-	0.3	-	-	0.37	0.50
	Saudi Arabia	0.60	0.43	-	0.4	0.22	0.20	0.37	0.49
	Turkey	0.60	0.25	-	0.3	0.30	0.21	0.37	0.40
	UAE	0.60	0.52	0.28	0.5	0.27	0.30	0.37	0.31
Exchange rate (September 20, 2009)[16] 1 USD =		50.10	70.25	48.05	48.93	12.95	78.43	83.11	114.87
Source		Roshan Telecom	Grameen Phone[17]	Bhutan Telecom[18]	Bharti Airtel	Dhiraagu	Spice Nepal	Mobilink GSM[19]	Dialog[20]
		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www.grameenphone.com/index.php?id=234	http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44	http://www.airtel.in/wps/wcm/connect/airtel.in/Airtel.In/Home/ForYou/Mobile/Postpaid/Roaming/International/	http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php?id=al l	http://www.spicenepal.com/en/international_voice.php	http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent Email : air@dialog.lk

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[16] http://www.oanda.com/convert/classic

[17] Tariffs were stated in USD

[18] Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf

[19] A termination fee is added to the tariff mentioned. Tariffs were stated in USD

[20] Due to the unavailability of more updated data February 2009 data is shown http://lirneasia.net/wp-content/uploads/2009/04/february-2009.pdf

About International Roaming Benchmarks:

LIRNEasia compiles and publishes the above

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LIRNEasia is a regional think tank whose mission is to improve the lives of the people of the emerging Asia- Pacific by facilitating their use of ICTs and related infrastructures; by catalyzing the reform of laws, policies and regulations to enable those uses through the conduct of policy-relevant research, training and advocacy with the emphasis on building in-situ expertise.

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February 2009

Table 1: Cost in USD for Incoming call while Roaming

Roaming In ↓		Home Country: Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan[1]	Sri Lanka
SAARC	Afghanistan		0.84	-[i]	0.97		0.48	0.38	1.37
	Bangladesh	0.96		0.44	0.84	0.69	0.39	0.38	0.81
	Bhutan	-	1.55		1.68	2.43	1.22	-	2.10
	India	1.44	1.83	1.72		2.62	1.51	-	2.09
	Maldives	0.96	0.43	-	0.77		0.29	0.38	0.59
	Nepal	1.44	0.67	0.48	0.96	-		0.38	0.90
	Pakistan	0.96	0.49	0.21	-	-	0.22		0.61
	Sri Lanka	1.92	0.58	0.32	0.80	0.73	0.31	0.38	
South East Asia	Malaysia	1.92	0.52	-	0.8	0.68	0.28	0.38	0.45
	Singapore	1.44	0.68	0.21	0.9	0.80	0.23	0.38	0.60
	Thailand	1.44	0.88	0.59	1.1	1.12	0.59	0.38	0.60
East Asia	China	1.44	1.04	-	1.2	1.91	-	0.38	0.92
	Hong Kong	1.44	0.55	0.26	0.8	0.64	0.28	0.38	0.45
	Japan	-	0.34	0.00	0.5	0.30	0.00	0.38	0.22
Austral-asia	Australia	0.96	0.81	0.00	0.9	1.02	-	0.38	0.68
Europe	France	1.44	1.77	-	1.3	0.38	0.54	0.38	0.90
	Germany	1.44	1.13	-	0.5	0.93	0.74	0.38	0.22
	Italy	1.92	2.06	0.00	0.5	2.59	0.00	0.38	1.14
	Sweden	1.92	0.39	-	1.2	-	0.00	0.38	0.25
	Switzerland	1.92	0.39	2.35	1.6	-	-	0.38	0.25
	UK	1.92	1.19	0.00	1.6	0.63	1.21	0.38	1.02

[1] Countries where operators charge Terminating Fee shall have higher incoming call charges by the same amount.

North America	Bahamas	-	-	-	1.5	-	-	-	1.94
	Canada	1.44	1.33	0.87	1.2	-	-	0.38	1.42
	Cuba	-	-	-	1.1	-	-	-	1.48
	Mexico	1.44	1.25	-	1.2	1.92	0.67	0.38	0.91
	US	1.44	1.33	1.18	1.5	1.54	0.48	0.38	1.62
South America	Argentina	1.44	-	-	1.1	-	0.52	0.38	1.01
	Brazil	1.44	1.18	-	0.7	0.95	0.58	0.38	3.70
	Chile	-	0.43	-	0.5	-	-	0.38	0.25
	Peru	-	-	-	0.9	-	-	-	3.53
	Uruguay	1.44	-	-	0.5	-	-	0.38	1.64
	Venezuela	1.44	-	-	1.2	-	-	0.38	-
Africa	Botswana	-	-	-	0.5	-	-	0.38	0.35
	DR Congo	-	-	-	0.5	-	-	-	0.80
	Egypt	0.48	0.43	-	0.5	0.38	2.07	0.38	0.30
	South Africa	0.48	0.43	-	0.5	-	-	0.38	0.25
	Tanzania	0.48	0.43	-	0.5	-	-	0.38	0.40
	Tunisia	0.48	0.43	-	0.5	-	-	0.38	0.80
Middle East	Lebanon	1.92		-	0.5	-	-	0.38	0.30
	Saudi Arabia	1.44	0.63	-	2.0	2.38	0.21	0.38	1.22
	Turkey	1.92	0.63	-	1.1	-	0.27	0.38	1.41
	UAE	1.44	0.64	0.72	0.5	0.38	0.52	0.38	0.30
Exchange rate (January 26, 2009)	1 USD =	52.13	69.68	49.04	49.69	12.95	79.55	79.47	114.20
		Roshan Telecom	**Grameen Phone**	**Bhutan Telecom**	**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**	**Mobilink GSM**	**Dialog GSM**
Source		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www.grameenphone.com/index.php?id=234	http://www.duknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44	http://www.airtel.in/Prepaid_tarrifs.aspx?path=1/6/6/2&cid=2	http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php	http://www.spicenepal.com/index.php?option=com_content&task=view&id=99	http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent

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Table 2: Cost in USD for Outgoing call to the visiting country while roaming

		Home Country											
Roaming In ↓		Afghanistan	Bangladesh	Bhutan		India		Maldives	Nepal		Pakistan	Sri Lanka	
				Peak	Off-peak	Peak	Off-peak		Peak	Off-peak		Peak	Off Peak
SAARC	Afghanistan		0.60	-	-	0.59	-	-	0.58	-	0.90	0.69	-
	Bangladesh	1.44		0.50	-	0.44	-	0.61	0.42	-	0.90	0.46	-
	Bhutan	-	1.29			1.20	-	1.89	1.22	-	-	1.51	-
	India	2.40	1.07	1.12	-			1.61	0.99	-	-	1.30	-
	Maldives	1.44	0.17	-	-	0.29	-		0.29	-	0.90	0.34	-
	Nepal	2.40	0.41	0.48	-	0.48	-	-			0.90	0.66	-
	Pakistan	1.44	0.41	0.46	0.26	-	-	-	0.39	0.22		0.45	0.26
	Sri Lanka	2.88	0.32	0.32	-	0.31	-	0.43	0.31	-	1.49		
South East Asia	Malaysia	2.88	0.44	-	-	0.29	-	0.37	0.19	-	0.90	0.34	-
	Singapore	2.40	0.42	0.21	-	0.41	-	0.57	0.23	-	0.90	0.30	-
	Thailand	2.40	0.62	0.59	-	0.59	-	1.12	0.58	-	0.90	0.30	-
East Asia	China	2.40	0.70	-	-	0.69	-	0.84	-	-	0.90	0.81	-
	Hong Kong	2.40	0.30	0.57	-	0.29	-	0.37	0.28	-	0.90	0.34	-
	Japan	-	0.56	0.45	-	0.51	-	0.64	0.55	-	0.90	0.77	-
Austral-asia	Australia	1.92	0.72	0.88	-	0.61	-	1.08	-	-	1.49	0.46	-
Europe	France	1.92	1.32	0.80	0.44	0.74	0.32	1.09	0.78	0.34	1.49	0.88	-
	Germany	1.92	0.79	-	-	0.71	-	1.59	0.74	-	1.49	0.42	-
	Italy	2.40	1.29	0.68	-	0.65	-	1.66	0.55	-	0.90	0.63	-
	Sweden	2.40	0.83	-	-	0.75	-	-	0.40	-	1.49	2.92	-
	Switzerland	2.40	0.80	0.82	0.60	1.13	-	-	-	-	0.90	0.89	-
	UK	2.40	0.52	0.50	0.20	0.72	0.43	0.30	0.43	-	0.90	0.49	-
North America	Bahamas	-	-	-	-	0.97	-	-	-	-	-	0.57	-
	Canada	2.40	0.99	1.00	-	0.67	-	-	-	-	1.49	1.31	-
	Cuba	-	-	-	-	0.59	-	-	-	-	-	1.84	-
	Mexico	2.40	0.85	-	-	0.68	-	1.22	0.67	-	1.49	0.80	-
	US	2.40	0.99	1.53	-	1.27	-	1.31	0.48	-	1.49	1.55	-
South America	Argentina	1.92	-	-	-	0.65	-	-	0.52	-	1.49	0.76	-

	Brazil	1.44	1.29	-	-	0.86	-	0.82	0.75	-	1.49	3.59	-
	Chile	-	0.44	-	-	0.51	-	-	-	-	1.49	0.60	-
	Peru	-	-	-	-	0.45	-	-	-	-	-	4.10	-
	Uruguay	1.44	-	-	-	0.74	-	-	-	-	1.49	1.04	-
	Venezuela	1.92	-	-	-	0.67	-	-	-	-	0.90	-	-
Africa	**Botswana**	-	-	-	-	0.30	0.21	-	-	-	1.49	0.30	-
	DR Congo	-	-	-	-	0.04	-	-	-	-	-	1.03	-
	Egypt	1.92	0.57	-	-	0.51	-	0.85	0.54	-	1.49	0.68	-
	South Africa	1.44	0.36	-	-	0.30	-	-	-	-	0.90	0.52	-
	Tanzania	1.92	0.41	-	-	0.73	-	-	-	-	0.90	0.57	-
	Tunisia	1.44	0.72	-	-	0.58	-	-	-	-	0.90	1.16	-
Middle East	**Lebanon**	2.88	-	-	-	0.58	-	-	-	-	0.90	0.51	-
	Saudi Arabia	2.40	0.93	-	-	0.91	-	0.31	0.24	-	0.90	1.07	-
	Turkey	2.88	0.74	-	-	0.71	-	-	0.70	-	1.49	1.17	-
	UAE	2.40	0.90	1.18	-	0.56	-	0.72	0.86	-	0.90	0.66	-
Exchange rate (January 26, 2009)	1 USD =	52.13	69.68	49.04		49.69		12.95	79.55		79.47	114.20	
Source		**Roshan Telecom**	**Grameen Phone**	**Bhutan Telecom**		**Bharti Airtel**		**Dhiraagu**	**Spice Nepal**		**Mobilink GSM**	**Dialog GSM**	
		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www.grameenphone.com/index.php?id=234	http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44		http://www.airtel.in/Prepaid_tarrifs.aspx?path=1/6/6/2&cid=2		http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php	http://www.spicenepal.com/index.php?option=com_content&task=view&id=99		http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent	

Table 3: Cost in USD for Outgoing call to Home country while roaming

Roaming In ↓		Home Country: Afghanistan	Bangladesh	Bhutan Peak	Bhutan Off-peak	India Peak	India Off-peak	Maldives	Nepal Peak	Nepal Off-peak	Nepal Economy	Pakistan	Sri Lanka Peak	Sri Lanka Off Peak
SAARC	Afghanistan		2.2	-	-	1.56	-	-	2.12	-	-	2.25	3.63	-
	Bangladesh	1.92		0.71	-	0.26	0.21	0.92	0.69	0.64	-	1.49	0.81	0.75
	Bhutan	-	2.13			1.50	-	3.12	2.02	-	-	-	3.01	-
	India	3.84	2.12	2.27	-			3.25	1.99	-	-	-	2.63	-
	Maldives	1.92	1.58	-	-	2.30	-		1.96	-	-	2.25	2.24	-
	Nepal	3.84	1.02	1.19	-	1.07	-	-				2.25	1.38	-
	Pakistan	1.92	0.27	0.46	-	-	-	-	0.31	-	-		0.80	0.60
	Sri Lanka	5.75	2.11	2.13	-	1.75	1.40	0.73	2.03	1.68	1.42	2.99		
South East Asia	Malaysia	5.75	2.31	-	-	2.30	-	3.80	2.83	1.89	-	3.49	2.61	-
	Singapore	3.84	1.84	1.40	-	1.61	-	2.89	1.45	-	-	2.25	4.91	-
	Thailand	3.84	1.69	1.85	-	1.61	-	2.29	0.78	-	-	2.25	3.33	-
East Asia	China	3.84	2.17	-	-	2.11	-	3.45	-	-	-	2.25	2.04	-
	Hong Kong	3.84	1.93	1.89	-	2.18	-	2.58	1.41	-	-	2.25	2.04	-
	Japan	-	3.13	4.04	-	2.85	1.81	2.50	2.34	1.77	-	2.25	4.31	-
Austral-asia	Australia	5.28	2.07	3.89	-	1.81	-	10.73	-	-	-	2.99	4.53	-
Europe	France	3.84	3.00	3.67	-	2.60	-	3.69	2.02	-	-	2.99	3.79	-
	Germany	3.84	2.24	-	-	2.03	-	2.93	1.08	-	-	3.2	2.43	-
	Italy	5.75	3.57	2.72	-	1.20	-	4.61	3.30	-	-	3.49	4.14	-
	Sweden	5.75	2.52	-	-	2.60	-	-	2.69	-	-	3.2	0.78	-
	Switzerland	5.75	3.19	3.37	2.60	2.27	-	-	-	-	-	3.49	2.97	-
	UK	5.75	3.9	2.78	2.38	2.33	1.97	3.54	1.42	-	-	3.49	2.73	-
North America	Bahamas	-	-	-	-	3.91	-	-	-	-	-	-	2.30	-
	Canada	5.75	1.96	1.73	-	1.91	-	-	-	-	-	2.99	4.14	-
	Cuba	-	-	-	-	4.50	-	-	-	-	-	-	4.13	-
	Mexico	5.75	3.29	-	-	2.25	-	4.73	2.21	-	-	4.95	2.64	-
	US	5.75	1.20	2.61	-	2.53	-	6.19	4.61	-	-	2.99	4.67	-

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South America	**Argentina**	3.84	-	-	-	2.63	-	-	2.31	-	-	2.99	3.96	-
	Brazil	2.88	5.5	-	-	3.38	-	3.25	2.41	-	-	4.95	7.95	-
	Chile	-	2.2	-	-	2.59	-	-	-	-	-	4.95	3.04	-
	Peru	-	-	-	-	2.10	-	-	-	-	-	-	4.10	-
	Uruguay	2.88	-	-	-	1.29	-	-	-	-	-	3.20	1.50	-
	Venezuela	3.84	-	-	-	2.62	-	-	-	-	-	1.49	-	-
Africa	**Botswana**	-	-	-	-	1.14	0.86	-	-	-	-	2.99	1.60	-
	DR Congo	-	-	-	-	2.45	-	-	-	-	-	-	2.76	-
	Egypt	3.84	3.14	-	-	2.47	1.99	4.67	2.60	-	-	3.20	3.76	-
	South Africa	2.40	0.65	-	-	0.54	-	-	-	-	-	1.49	1.04	-
	Tanzania	3.84	2.34	-	-	2.93	-	-	-	-	-	3.49	3.23	-
	Tunisia	2.40	1.57	-	-	1.37	-	-	-	-	-	1.49	2.73	-
Middle East	**Lebanon**	5.75	-	-	-	1.07	0.90	-	-	-	-	2.25	0.51	-
	Saudi Arabia	3.84	2.1	-	-	2.06	-	1.84	2.36	-	-	2.25	2.45	-
	Turkey	5.75	3.94	-	-	2.13	-	-	3.71	-	-	3.20	3.48	-
	UAE	3.84	1.63	1.43	-	2.39	-	4.72	1.31	-	-	2.25	4.30	-
Exchange rate (January 26, 2009)	1 USD =	52.13	69.68	49.04		49.69		12.95	79.55			79.47	114.20	
Source		**Roshan Telecom**		**Bhutan Telecom**		**Bharti Airtel**		**Dhiraagu**	**Spice Nepal**			**Mobilink GSM**	**Dialog GSM**	
		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www.grameenphone.com/index.php?id=234	http://www.drukne t.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44		http://www.airtel.in/Prepaid_tarrifs.aspx?path=1/6/6/2&cid=2		http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php	http://www.spicenepal.com/index.php?option=com_content&task=view&id=99			http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent	

Table 4: Sending and SMS while roaming

Roaming In ↓		Home Country: Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan[2]	Sri Lanka
SAARC	Afghanistan		0.50	-	0.49	-	0.48	0.37	0.57
	Bangladesh	0.58		0.15	0.14	0.17	0.16	0.37	0.19
	Bhutan	-	0.35		0.30	0.38	0.31	-	0.38
	India	0.58	0.43	0.46		0.53	0.40	-	0.53
	Maldives	0.58	0.25	-	0.24		0.43	0.37	0.29
	Nepal	0.58	0.20	0.24	0.19	-		0.37	0.28
	Pakistan	0.58	0.19	0.23	-	-	0.18		0.23
	Sri Lanka	0.58	0.23	0.23	0.23	0.32	0.22	0.37	
South East Asia	Malaysia	0.58	0.33	-	0.2	0.37	0.31	0.37	0.39
	Singapore	0.58	0.24	0.24	0.2	0.26	0.23	0.37	0.32
	Thailand	0.58	0.40	0.34	0.3	0.39	0.33	0.37	0.32
East Asia	China	0.58	0.29	-	0.3	0.28	-	0.37	0.34
	Hong Kong	0.58	0.39	0.34	0.4	0.38	0.37	0.37	0.44
	Japan	-	0.24	0.26	0.2	0.30	0.32	0.37	0.31
Austral-asia	Australia	0.58	0.31	0.33	0.3	0.37	-	0.37	0.30
Europe	France	0.58	0.29	0.30	0.2	0.33	0.26	0.37	0.33
	Germany	0.58	0.29	-	0.3	0.25	0.27	0.37	0.25
	Italy	0.58	0.40	0.20	0.2	0.37	0.30	0.37	0.32
	Sweden	0.58	0.33	-	0.3	-	0.27	0.37	0.31
	Switzerland	0.58	0.28	0.29	0.3	-	-	0.37	0.35
	UK	0.58	0.22	0.20	0.2	0.24	0.21	0.37	0.20
North America	Bahamas	-	-	-	0.2	-	-	-	0.40

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[2] In SMS are charged USD 0.13

	Canada	0.58	0.30	0.26	0.2	-	-	0.37	0.40
	Cuba	-	-	-	1.0	-	-	-	1.15
	Mexico	0.58	0.35	-	0.2	0.40	0.24	0.37	0.29
	US	0.58	0.30	0.36	0.3	0.30	-	0.37	0.47
	Argentina	0.58	-	-	0.2	-	0.19	0.37	0.28
	Brazil	0.58	0.75	-	0.4	0.30	0.29	0.37	-
South America	**Chile**	-	0.25	-	0.2	-	-	0.37	0.24
	Peru	-	-	-	0.1	-	-	-	-
	Uruguay	0.58	-	-	0.2	-	-	0.37	0.29
	Venezuela	0.58	-	-	0.3	-	-	0.37	-
	Botswana	-	-	-	0.0	-	-	0.37	0.15
	DR Congo	-	-	-	0.2	-	-	-	0.23
Africa	**Egypt**	0.58	0.29	-	0.3	0.34	0.27	0.37	0.34
	South Africa	0.58	0.10	-	0.1	-	-	0.37	0.22
	Tanzania	0.58	0.15	-	0.4	-	-	0.37	0.20
	Tunisia	0.58	0.14	-	0.2	-	-	0.37	0.49
	Lebanon	0.58	-	-	0.3	-	-	0.37	0.51
Middle East	**Saudi Arabia**	0.58	0.43	-	0.4	0.22	0.21	0.37	0.49
	Turkey	0.58	0.23	-	0.2	-	0.22	0.37	0.40
	UAE	0.58	0.52	0.28	0.3	0.27	0.30	0.37	0.31
Exchange rate (January 26, 2009)	1 USD =	52.13	69.68	49.04	49.69	12.95	79.55	79.47	114.20
		Roshan Telecom	**Grameen Phone**	**Bhutan Telecom**	**Bharti Airtel**	**Dhiraagu**	**Spice Nepal**	**Mobilink GSM**	**Dialog GSM**
Source		http://www.roshan.af/web/wp-content/uploads/Post-paid_Pre-paid_Roaming_Prices.xlsx.pdf	http://www.grameenphone.com/index.php?id=234	http://www.druknet.bt/btelecom/index.php?option=com_content&task=view&id=30&Itemid=44	http://www.airtel.in/Prepaid_tarrifs.aspx?path=1/6/6/2&cid=2	http://www.dhiraagu.com.mv/mobile/international_services/postpaid_charges.php	http://www.spicenepal.com/index.php?option=com_content&task=view&id=99	http://www.mobilinkgsm.com/IR/Tariffs.pdf	Tariff sent by the customer service agent

About International Roaming Benchmarks:

LIRNEasia compiles and publishes the above

Please visit

http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/

LIRNEasia is a regional think tank whose mission is to improve the lives of the people of the emerging Asia- Pacific by facilitating their use of ICTs and related infrastructures; by catalyzing the reform of laws, policies and regulations to enable those uses through the conduct of policy-relevant research, training and advocacy with the emphasis on building in-situ expertise.

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[i] Indicates the unavailability of tariff

International Roaming Benchmarks

08 August 2008

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Making a Local Call while roaming varies from USD 0.16 – 4.95

	Afghanistan	Australia	Bangladesh	Bhutan	Brunei	Cambodia	China	Cook Islands	Fiji	French Polynesia	Guam	Hong Kong	Indonesia	India	Japan	Korea	Laos	Macau	Malaysia	Maldives	Mongolia	Myanmar	Nepal	New Zealand	New Caledonia	Pakistan	Palau	PNG	Philippines	Reunion	Samoa	Singapore	Sri Lanka	Taiwan	Thailand	Tonga	Vanuatu	Vietnam
Australia	0.71		0.49	1.87	0.34	1.62	0.82	1.51	1.16	2.11	0.88	0.77	1.12	1.94	0.68		0.32	0.43	1.12	0.28	0.83		1.01	1.94	0.58	0.64		0.58	1.12	0.54		0.77	0.43	0.37	1.12	2.71	0.54	0.41
Bangladesh	0.44	0.60		1.44	0.28	1.19	0.70					0.29	0.45	1.12	0.54			0.36	0.51	0.16			0.42	1.05		0.42			0.28			0.25	0.30	0.29	0.62			0.37
Bhutan		0.94	0.39									0.28		1.20	0.48								0.51			0.49			0.17			0.22	0.35	0.28	0.63			
Brunei		1.38	2.07			2.07	0.83					1.38	1.38	2.41	0.75	2.41		0.45	1.38	2.41			0.62			0.67			1.38			1.38	2.41	0.37	1.38			0.33
Cook Islands	2.11	0.60	2.11	2.11	2.11	2.11	1.41		1.41	2.11	2.11	1.41	1.41	1.41		1.41	2.11	2.11	2.11	2.11	2.11	-	2.11		-	2.11	2.11	-	2.11		-	1.41	2.11	2.11	1.41	-	-	2.11
Fiji		1.03					0.53					0.45	0.53	2.61	0.74	0.44			0.28					0.63	0.29							0.34		0.45				
Fr. Polynesia		0.80					0.84	1.32	1.12			0.34		1.51	0.69	0.64			0.34					1.32	0.55				0.34			0.55	0.43	0.36	0.80	1.06	0.55	
Honk Kong	0.72	1.34	0.48	1.78	0.35	0.53	0.39	1.34	1.05	1.04	0.85		0.56	1.58	0.78	0.58	0.54	0.53	0.32	0.19	0.82	1.08	0.67	1.40		0.62		1.04	0.33	0.97		0.42	0.42	0.36	0.84		0.65	0.40
India	0.71	0.66	0.50	1.58		0.53	0.53					0.53	0.66		0.66	0.53	0.58	0.39	0.21	0.53	0.74		0.50	0.66		-			0.32	0.66		0.26	0.37	0.39	0.66			0.39
Japan	0.73	0.73	0.73		0.73	0.69	0.69		0.73	0.73	0.73	0.69	0.69	0.73		0.46	0.73	0.69	0.69	0.73	0.73		0.73	0.73	0.73	0.73	4.40	1.19	0.69	0.73		0.69	0.73	0.69	0.69			0.69
Korea	0.88		1.21	1.21	0.73	0.73	0.72				0.48	0.46	0.58	1.21	0.35		0.73	0.73	0.63	1.21	0.73	0.91	1.21			1.21			0.63			0.46	1.21	0.58	0.63			0.91
Macau		1.05	0.66		0.33	0.53	0.45				0.83	0.34	0.57	1.49	0.56	0.34	0.44		0.34	0.35				0.83		0.63	4.61	0.63	0.32			0.55	0.42	0.35	0.83			0.32
Malaysia	2.37	1.19	1.48		1.04	3.26	1.19				1.48	1.04	1.04	2.96	1.63	1.48	1.93	1.63		1.93	2.82		1.93	1.48		1.78			1.04	1.93		0.74	1.48	1.04	1.19			1.48
Maldives		1.27	0.62	1.92			0.85					0.37	0.63	1.63	0.65	0.38			0.37										0.35			0.58	0.43		0.86			
Mongolia	0.75	1.28	0.72				0.88					0.37	0.62	1.63	0.72	0.38		0.45	0.37	0.24						0.48			0.37			0.34	0.46	0.38	0.85			0.44
Nepal	0.60		0.40	1.44	0.28	0.43						0.29	0.50	1.38	0.48	0.30			0.21							0.45			0.28			0.26	0.37		0.66			
New Zealand		1.34	0.67		0.42	0.63	0.95	1.51	1.27	1.02		0.39	0.77	1.72	0.77	0.74		0.53	0.77				0.74		0.63	0.74		0.70	0.35		0.88	0.60	0.49	0.42	0.91	3.34	1.37	0.35
Pakistan	0.90	1.49	0.90		1.49	0.90	0.90					0.90	1.49		0.90	0.90		0.90	0.90	0.90			0.90	0.90				4.95	0.90		0.90	0.90	1.49	1.49	0.90			0.90
Philippines	2.62	1.31	1.31		1.31	1.31	1.75					1.31		2.62	1.31			1.31	1.31	1.31	1.31		1.75	1.31		1.31						1.31	1.31	1.31	1.31			1.31
Sri Lanka	1.91	1.45	1.45	4.22	0.82	2.67	1.45					0.82	1.45	4.22	0.46	1.02	1.91	1.45	1.02	0.82	0.46		1.91	0.46		1.45			1.45	1.45		0.82		0.82	1.45			1.02

Receiving a call while roaming: Distance Charge Only – USD 5.84

	Afghanistan	Australia	Bangladesh	Bhutan	Brunei	Cambodia	China	Cook Islands	Fiji	French Polynesia	Guam	Hong Kong	Indonesia	India	Japan	Korea	Laos	Macau	Malaysia	Maldives	Mongolia	Nepal	New Zealand	New Calcedonia	Pakistan	Palau	Papua New Guinea	Philippines	Reunion	Singapore	Sri Lanka	Taiwan	Thailand	Tonga	Vanuatu	Vietnam
Australia	0.58		0.49	1.87	0.34	0.33	0.82	0.34	1.03	0.34	0.88	0.86	0.95	1.12	-		0.32	0.43	0.95	0.19	-	0.84	1.12	-	0.36		-	0.95	-	0.86	0.43	0.37	0.95	-	-	-
Bangladesh	0.88	0.65		1.64	0.63	0.62	1.08					0.59	0.51	2.01	0.38			0.74	0.78	0.49		0.72	0.41		0.53			0.57		0.54	0.60	0.67	0.91			0.29
Bhutan		Free	0.39									0.28		1.84	Free							0.51			0.23			0.17		0.22	0.35	0.28	0.63			
Brunei		1.72	2.41			2.41	2.21					1.72	1.72	2.76	1.79	2.76		2.65	1.38	2.76		2.83			2.61			1.72		1.38	2.76	2.16	1.72			1.79
Cook Islands	0.70	0.70	0.70	0.70	0.70	0.70	0.70		0.70	0.70	0.70	0.70	0.70	0.70		0.70	0.70	0.70	0.70	0.70	0.70	0.70		-	0.70	0.70	-	0.70		0.70	0.70	0.70	0.70	-	-	0.70
Fiji		0.61					0.76					1.19	1.47	3.50	0.76	1.16			1.17				0.61	0.76						1.07		0.76				
French Polynesia		1.46					3.47	1.46	2.59			2.40		4.93	1.46				3.01				1.46	1.46				2.95		2.61	3.06	2.99	3.43	2.05	1.46	
Honk Kong	2.63	1.99	2.31	3.36	1.34	2.45	1.00	1.58	2.22	1.58	2.11		2.02	3.95	1.01	1.01	1.94	0.80	1.77	1.77	1.79	1.69	1.97		1.95		1.54	1.34	2.02	1.18	1.73	1.35	1.85		1.54	1.01
India - AirTel	1.14	1.14	1.14	1.14	1.14	1.14	1.14		1.14	1.14	1.14	1.14	1.14		1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14		-		1.14	1.14	1.14	1.14	1.14	1.14	1.14			1.14
India - Reliance	0.58	1.31	0.42	1.58		1.31	1.31					1.31	1.31		1.31	1.31	0.29	0.39	0.32	1.31	As Applicable?	0.50	1.31					As Applicable	1.31	0.26	As Applicable	1.31	0.66			1.31
Japan	0.73	-	0.73		0.73	-	0.69		-	-	0.73	0.69	0.69	0.73		-	-	0.69	-	0.73	-	0.73	-	-	0.73	4.40	1.19	0.69	-	0.69	0.73	0.69	0.69			-
Macau		0.34	1.78		1.57	1.77	0.60				2.07	0.50	1.14	3.52	0.54	0.55	1.68		1.06	1.58			1.26		1.59	5.84	1.24	1.00		1.10	1.66	0.90	1.50			1.24
Malaysia	2.37	1.19	1.48		1.04	3.26	1.19				1.48	1.04	1.04	2.96	1.63	1.48	1.93	1.63		1.93	2.82	1.93	1.48		1.78			1.04	1.93	0.74	1.48	1.04	1.19			1.48
Maldives		0.31	0.70	2.47			1.93	0.31				0.65	0.73	2.65	0.31	0.65			0.69									0.82		0.81	0.77		1.13			
Mongolia	1.73	0.79	1.70				1.78					1.04	1.26	3.11	0.79	0.66		1.56	1.33	1.35					1.21			1.21		1.26	1.51	1.29	1.80			1.29
Nepal	0.50		0.40	2.16	0.28	0.43						0.29	0.23	2.12	0.00	0.30			0.32						0.27			0.28		0.26	0.37		0.66			
New Zealand		0.70	0.70		0.70	0.70	0.70	0.70	0.70	0.70		0.70	0.70	0.70	0.70	0.70		0.70	0.70			0.70		0.70	0.70		0.70	0.70		0.70	0.70	0.70	0.70	0.70	0.70	0.70
Philippines	2.62	1.31	1.31		1.31	1.31	1.75					1.31		2.62	1.31			1.31	1.31	1.31	1.31	1.75	1.31		1.31					1.31	1.31	1.31	1.31			1.31
Singapore		1.76	4.59		4.59	4.59	2.47		4.59	4.59		1.76	3.53	3.53	2.47	4.59	4.59	4.59	1.41	4.59	4.59	4.59	2.47		4.59		4.59	2.47	4.59			1.76	1.76			4.59
Sri Lanka	1.80	1.28	1.28	4.12	0.72	2.58	1.28					0.72	1.28	4.12	0.35	0.93	1.80	1.28	0.93	0.72	0.35	1.80	0.35		1.28			1.28	1.28	0.72		0.72	1.28			0.93

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Calling Home can be expensive: USD 0.32 – 11.16. MV roaming in AU 11.16 but AU roaming in MV 2.71….reciprocity?

can	Afghanistan	American Samoa	Australia	Bangladesh	Bhutan	Brunei	Cambodia	China	Cook Islands	Fiji	French Polynesia	Guam	Hong Kong	Indonesia	India	Japan	Korea	Laos	Macau	Malaysia	Maldives
Australia	2.58	2.69		0.95	3.09	1.29	3.60	3.38	2.91	2.92	2.51	1.51	1.89	1.94	3.53	2.17		0.81	1.62	1.94	2.71
Bangladesh	1.61		2.43		2.16	3.10	1.77	1.46					1.77	1.94	2.26	3.01			1.42	3.07	1.56
Bhutan			?	?									1.92		2.39	2.52					
Brunei			2.07	3.10			3.10	2.60					2.41	3.10	3.10	2.42	3.10		1.75	2.07	3.10
Cook Islands	5.27	-	0.60	5.27	5.27	5.27	5.27	3.16		3.16	5.27	5.27	3.16	3.16	3.16		3.16	5.27	5.27	5.27	5.27
Fiji			3.38					1.80					3.13	4.24	2.61	4.57	1.77			2.89	
French Polynesia			5.25					3.43	3.00	1.99			2.58		3.02	2.08	2.00			3.53	
Honk Kong	2.39		2.60	0.83	2.94	1.14	1.79	0.85	4.48	1.86	4.32	1.47		3.70	3.19	1.94	1.73	2.51	0.94	1.62	1.98
India - Reliance	1.87		2.76	0.39	2.37		2.76	2.76					2.76	2.76		2.76	2.76	3.42	1.74	2.71	2.76
Japan	3.49		1.65	1.65		2.57	3.49	1.61		1.65	1.65	1.65	1.61	3.49	1.65		1.15	2.57	1.61	1.61	3.49
Macau			1.62	1.09		3.24	1.79	0.81				1.67	0.70	2.47	4.49	3.06	1.15	1.15		2.68	3.51
Malaysia	1.78			1.19		0.74	2.67	0.89			1.78	1.33	0.74	0.74	2.67	1.33	1.19	1.33	1.33		1.33
Maldives			###	0.93	3.17			3.50					2.81	3.58	3.30	2.54	3.29			3.85	
Mongolia	3.14		9.31	1.34				3.64					1.98	2.69	3.30	3.84	1.63		1.78	4.01	3.47
Nepal	2.20			0.29	2.16	2.21	2.47						1.51	0.50	2.80	2.04	2.60			3.22	
New Zealand			5.41	1.19		1.48	2.07	3.83	2.71	2.67	2.74		2.00	4.92	3.48	2.42	2.25		1.27	1.72	
Pakistan	2.25		2.99	1.49		2.99	2.25	2.25					2.25	3.20		2.25	3.49		1.49	3.49	2.25
Singapore			1.76	4.59		4.59	4.59	2.47		4.59	4.59		1.76	3.53	3.53	2.47	4.59	4.59	4.59	1.41	4.59
Vanuatu	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10

can	Marshall Islands	Mongolia	Myanmar	Nepal	New Zealand	New Calcedonia	Pakistan	Palau	Papua New Guinea	Philippines	Reunion	Samoa	Singapore	Solomon Islands	Sri Lanka	Taiwan	Thailand	Timor Leste	Tonga	Vanuatu	Vietnam
Australia		4.37		2.53	3.53	1.92	0.42		1.17	1.94	2.83		1.89	1.94	3.66	1.05	1.94		3.88	1.06	1.22
Bangladesh				0.42	3.44		0.67			3.34			2.10		2.01	1.54	1.67				0.73
Bhutan				?			?			?			?		?	?	?				
Brunei				1.10			0.67			3.10			2.07		3.10	1.57	2.41				0.76
Cook Islands	-	5.27	-	5.27		-	5.27	5.27	-	5.27		-	3.16	-	5.27	5.27	3.16		-	-	3.16
Fiji					1.88	1.97							2.40			0.79					
French Polynesia					1.87	1.87				4.01			2.32		4.14	2.99	2.29		1.49	6.67	
Honk Kong		4.96	1.52	2.34	3.60		1.06		2.08	2.01	4.04		1.43		3.57	1.11	1.76			3.76	1.20
India - Reliance		3.79		1.00	2.76		-			3.76	2.76		1.45		2.08	1.58	1.79				1.58
Japan		3.49		1.65	1.65	2.57	1.65	8.08	5.32	1.61	2.57		1.61		3.49	1.61	1.61	3.49			2.57
Macau	0.52				3.38		1.12	8.06	2.53	2.30			2.34		3.60	1.07	2.01				1.08
Malaysia		1.33		1.33	0.89		1.19			0.74	1.33		0.44		1.19	0.74	0.89	2.67			0.89
Maldives										3.80			2.92		3.05		2.32				
Mongolia							0.37			4.81			2.50		4.91	3.02	2.29				1.31
Nepal							0.32			3.22			2.04		2.43		1.79				
New Zealand				2.92		2.07	1.19		1.41	2.74		3.16	1.90		4.11	1.72	1.83		1.69	3.16	1.19
Pakistan				2.25	2.25				4.95	3.49		3.49	2.3		2.99	1.49	2.3				1.49
Singapore		4.59		4.59	2.47		4.59		4.59	2.47	4.59					1.76	1.76				4.59
Vanuatu	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10		2.10

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Sending an SMS: up to USD 1.58

	Afghanistan	Australia	Bangladesh	Bhutan	Brunei	Cambodia	China	Cook Islands	Fiji	French Polynesia	Guam	Hong Kong
Australia	0.58		0.20	0.46	0.34	0.17	0.34	0.50	0.56	0.46	0.32	0.56
Bangladesh	0.37	0.34		0.33	0.28	0.12	0.29					0.38
Bhutan		0.36	0.16									0.36
Brunei		0.52	0.52			0.52						0.52
Cook Islands	0.56	0.56	0.56	0.56	0.56	0.56	0.56		0.56	0.56	0.56	0.56
Fiji		0.33					0.38					0.59
French Polynesia		0.44					0.34	0.43	0.61			0.44
Guam	0.25	0.25	0.25				0.25					0.25
India - AirTel	0.64	0.64	0.64	0.64	0.64	0.64	0.64		0.64	0.64	0.64	0.64
India - Reliance	0.58	0.53	0.18	0.39		0.53	0.53					0.53
Japan	0.92		0.92		0.92	0.92	0.92		0.92	0.92	0.92	0.92
Macau		0.40	0.22		0.33	0.32	0.31				0.30	0.44
Malaysia		0.59	0.59		0.59	0.59	0.59					0.59
Maldives		0.39	0.17	0.38			0.28					0.39
Mongolia	0.63	0.53	0.30				0.43					0.57
Nepal	0.50		0.16	0.33	0.00	0.28						0.38
New Zealand		0.56	0.56		0.56	0.56	0.56	0.56	0.56	0.56		0.56
Philippines	0.66	0.55	0.55		0.55	0.55	0.55					0.55
Singapore		1.06	1.06		1.06	1.06	1.06		1.06	1.06		1.06
Sri Lanka	0.42	0.42	0.21	0.42	0.42	0.42	0.42					0.42

	Indonesia	India	Japan	Korea	Laos	Macau	Malaysia	Maldives	Mongolia	Nepal	New Zealand	New Calcedonia
Australia	0.56	0.56	0.28		0.32	0.43	0.56	0.29	0.34	0.34	0.56	0.28
Bangladesh	0.15	0.46	0.23			0.13	0.34	0.25		0.21	0.35	
Bhutan		0.49	0.28							0.25		
Brunei	0.52	0.66		0.66			0.52	0.66				
Cook Islands	0.56	0.56		0.56	0.56	0.56	0.56	0.56	0.56	0.56		-
Fiji	0.14	0.69	0.43	0.44			0.49				0.39	0.29
French Polynesia		0.61	0.28	0.36			0.43				0.43	0.28
Guam	0.25	0.25	0.25	0.25		0.25	0.25					
India - AirTel	0.64		0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	
India - Reliance	0.53		0.53	0.53	0.58	0.34	0.37	0.53	0.29	0.26	0.53	
Japan	0.92	0.92		0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Macau	0.10	0.61	0.32	0.34	0.44		0.44	1.58			0.44	
Malaysia	0.59	0.59	0.59	0.59	0.59	0.59					0.59	
Maldives	0.17	0.53	0.30	0.30			0.38					
Mongolia	0.21	0.81	0.45	0.38		0.16	0.54					
Nepal	0.10	0.57	0.28	0.30			0.36					
New Zealand	0.56	0.56	0.56	0.56		0.56	0.56			0.56		0.56
Philippines		0.66	0.55			0.55	0.55	0.55	0.55	0.55	0.55	
Singapore	1.06	1.06	1.06	1.06	1.06	1.06	0.71	1.06	1.06	1.06	1.06	
Sri Lanka	0.21	0.74	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	

	Pakistan	Palau	Papua New Guinea	Philippines	Reunion	Singapore	Sri Lanka	Taiwan	Thailand	Tonga	Vanuatu	Vietnam
Australia	0.30		0.41	0.56	0.36	0.56	0.31	0.21	0.56	0.95	0.36	0.18
Bangladesh	0.20			0.17		0.25	0.22	0.16	0.35			0.15
Bhutan	0.24			0.21		0.26	0.25	0.15	0.36			
Brunei				0.52		0.52	0.66		0.52			
Cook Islands	0.56	0.56	-	0.56		0.56	0.56	0.56	0.56	-	-	0.56
Fiji						0.34		0.24				
French Polynesia				0.27		0.32	0.31	0.18	0.44	0.37	0.38	
Guam	0.25			0.25		0.25	0.25	0.25	0.25			
India - AirTel	-		0.64	0.64	0.64	0.64	0.64	0.64	0.64			0.64
India - Reliance				0.21	0.53	0.26	0.26	0.53	0.37			0.53
Japan	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			0.92
Macau	0.29	0.92	0.44	0.26		0.32	0.30	0.19	0.47			0.19
Malaysia	0.59			0.59		0.30	0.59	0.59	0.59			0.59
Maldives				0.23		0.27	0.32		0.39			
Mongolia	0.24			0.41		0.41	0.40	0.26	0.48			0.19
Nepal	0.23			0.23		0.26	0.26		0.38			
New Zealand	0.56		0.56	0.56		0.56	0.56	0.56	0.56	0.56	0.56	0.56
Philippines	0.55					0.55	0.55	0.55	0.55			0.55
Singapore	1.06		1.06	1.06	1.06			1.06	1.06			1.06
Sri Lanka	0.42			0.42	0.42	0.42		0.21	0.42			0.21

The EU Directive on Roaming has eliminated the variability of prices paid by customers (when roaming in the EU)

	Austria	Belgium	Bulgaria	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	The Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK	USA	Asia-Pacific	Other countries
Belgium	0.59		0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	1.10	1.20	2.00
Bulgaria	0.73	0.73		0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	4.41	4.41	4.41
Cyprus	0.35	0.35	0.35		0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	1.18	0.59-1.18	1.18
Czech Republic	0.69	0.69	0.69	0.69		0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	4.00	2.25	2.25
Estonia	0.58	0.58	0.58	0.58	0.58	0.58		0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	1.31	0.14-1.40	0.14-2.43
Finland	0.60	0.60	0.60	0.60	0.60	0.60	0.60		0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	2.95	2.95	2.95
Germany	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58		0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	1.49	2.99	2.99
Greece	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.77	1.19	0.71-1.19
Ireland	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59		0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	1.59	3.19	3.19
Lithuania	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.88	0.20-1.33	0.14-1.41
Luxembourg	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53		0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	3.31	4.09	4.09
Malta	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58		0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	1.17	1.40-2.10	1.86-2.10
Netherlands	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58		0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	1.75	2.25	2.25
Romania	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49		0.49	0.49	0.49	0.49	0.49	0.68	0.76	0.68-0.76
Slovakia	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65		0.65	0.65	0.65	0.65	2.71	3.89	3.89
Spain	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57		0.57	0.57	1.73	3.82	3.82
Sweden	0.58	0.58	0.58	0.58	0.58	0.50	0.58	0.50	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.50	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58		0.58	1.03	1.27	1.03-1.90
UK	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35		1.37	0.85	1.99

Sources: International Roaming Data

- **Afghanistan** *Roshan Telecom*
- **American Samoa** *American Samoa Telecom*
- **Australia** *Telstra*
- **Bangladesh** *GrameenPhone*
- **Bhutan** *Bhutan Telecom*
- **Brunei** *B Mobile*
- **Cambodia** *CamGSM*
- **China** *China Mobile*
- **Cook Islands** *Telecom New Zealand*
- **Fiji** *Vodafone*
- **French Polynesia** *Vini*
- **Guam** *GuamCell*
- **Hong kong** *CSL*
- **Indonesia** *Telkomsel*
- **India** *Bharti Airtel/Reliance Mobile*
- **Japan** *NTT DoCoMo*
- **Kiribati** *Telecom Services Kiribati Limited*
- **Korea** *SK Telecom*
- **Laos** *Lao Telecommunications*
- **Macau** *3*
- **Malaysia** Maxis
- **Maldives** *Dhiraagu*
- **Marshall Islands** *National Telecommunications Authority*
- **Micronesia** *FSMTC*
- **Mongolia** *MobiCom*
- **Myanmar** *MPT*
- **Nepal** *Spice Nepal*
- **New Zealand** *Vodafone*
- **New Caledonia** *Office des Postes et Télécommunications de Nouvelle-Calédonie*
- **Niue** *Telecom Niue*
- **Norfolk Island** *Norfolk Telecom,*
- **Northern Mariana Islands** *GuamCell*
- **Pakistan** *Mobilink GSM*
- **Palau** *Palau Mobile*
- **Papua New Guinea** *Bee Mobile,*
- **Philippines** *Globe Telecom*
- **Reunion** *Réunion Telecom,* **Samoa** *SamoaTel*
- **Singapore** *SingTel*
- **Solomon Islands** *Solomon Islands Telecom*
- **Sri Lanka** *Dialog GSM*
- **Taiwan** *Chunghwa Telecom*
- **Thailand** *AIS*
- **Timor L'este** *Timor Telecom*
- **Tonga** *Tonfon*
- **Vanuatu** *Telecom Vanuatu*
- **Vietnam** *Viettel*

All data are for August 2008

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***Title: Benchmarking Asia Pacific National Telecom Regulatory Authority Websites**

***By:** *Lara Alawattegama and Chanuka Wattegama*

***Date:** June 2008

***IDRC Project Number:** 104918-001
***IDRC Project Title:** Advancing evidence-based policymaking and regulation in the emerging Asia-Pacific to ensure greater participation in ICTs (Phase II)
***Country/Region:** India

***Full Name of Research Institution:** LIRNE*asia*

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***Abstract:** A National Regulatory Authority (NRA) in telecommunication, like any other government organization, uses its website not only to deliver citizen services but also to improve its transparency and effectiveness in its regulatory functions. This study benchmarks the way in which NRA's use their websites to improve their overarching objectives pertaining to regulatory affairs. The Survey hopes to evaluate how well NRA's achieve this objective in regard to telecom operators, investors, consumers, researchers and the general public. The results of the survey will be a useful tool for regulators to improve their websites. Each website is awarded marks for the availability of information and features that are useful to the regulator's stakeholders. A total of 31 websites are evaluated from a region of 62 economies. The results are presented individually as well as under different country clusters. The objective of the survey is to provide a benchmark methodology that can be used to assess NRA websites across a region. It does not attempt to create positive or negative images of the respective NRA websites but rather reports the quality of the website in comparison with its regional partners. LIRNE*asia* hopes this will be a tool to encourage NRA's to improve their websites so as to serve their stakeholders better

***Keywords:** NRA, telecommunications, websites

1 Methodology

1.1 Previous initiatives on parallel lines:

For its methodology and structure, this website survey has been largely guided by previous studies, some of which are given below:

- A study jointly by the United Nations and the American Society for Public Administration (Ronaghan, 2001). The goal of the study was to objectively present facts and conclusions that define a country's e-government environment and demonstrate its capacity to sustain online development. This was accomplished by a comparative analysis of fundamental ICT indicators and critical human capital measures for each UN Member State. An important outcome of this study was a final measure, the E-Government Index, which can be useful tool for policy-planners

- LIRNE.NET (Mahan, 2004) conducted a study that focused on the African region. This study which is more relevant to this website survey, benchmarks the websites of independent NRAs of 22 African states. This study has grown out of a collection of preliminary regional surveys examining the extent to which NRAs were using websites to inform and communicate with the public – including citizens, businesses and other governmental and non-governmental organizations.

- A study by LIRNE*asia* (Wattegama, 2005) created a methodology to benchmark the National Regulatory Authority (NRA) websites in the Asia-Pacific region, evaluating their usefulness in providing e-government services to telecom operators, investors, consumers, researchers and even the general public. Each website is awarded marks for quality of the e-government portal that it provides to its stakeholders. The study evaluated 27 NRA web sites of out a total of 62 economies.

As an improvement to the methodology this study focused more on the regulatory functions of an NRA without looking fully from the e-government angle. This is because the main obligation of a NRA is its regulatory functions and the way in which they achieve them and not purely delivering e-government services. Therefore, the study took a more regulatory focus with an emphasis on transparency, accountability while also providing its stakeholders, including consumers, with relevant information.

1.2 Selection of countries

The selection of countries was based on a minimal criterion to ensure the maximum number of NRA websites within the Asia-Pacific region could be included. It does not discrimate based on geography within the region, level of economic or human development achievements.

1.2.1 Asia and Pacific were defined as follows

Asia – The group of countries that in the region bordered by Russia, Turkey and Egypt and the Indian and Pacific Oceans (Wattegama, 2005). This includes the island nations within the Indian Ocean

Pacific – The island nations situated in the Pacific Ocean.

1.2.2 All the International Telecommunication Union (ITU) member states within this region were selected as the scope. This is because not all economies that were regulated by independent NRAs.

1.2.3 Effort was made to determine which authority was conducting telecom regulatory functions. In some countries the regulatory body was the Ministry of Telecommunications and Posts. Then the website for this authority was assessed.

1.2.4 The authority then chosen for every country needed to have a functional website. The study excluded countries that had websites which were under construction such as Afghanistan.

1.2.5 The website would need to have an English version.[1] Total of 31 countries out of 62 have been selected. The number of countries that were rejected for the various reasons are shown in the table below. Further details are shown in Annex 1

Table 1.1: Country exclusion based on different criteria

Criteria	Number of countries excluded for not meeting the criteria
NRA does not have a website	22
English language version not available	6
Website under construction	3
Total excluded	**31**

[1] This research does not suggest that every NRA should have a website in English. If not for the practical difficulty we faced in sites with non-English versions, the number would have been higher. In future attempts we try our best to evaluate the non-English sites probably with the assistance of local research partners.

1.3 Clustering of countries

Clustering countries is a useful concept for comparative purposes.

LIRNE*asia*'s previous study (Wattegama, 2005) clustered countries based on the e-readiness levels. However, this year with the change of focus e-readiness was no longer an appropriate measure. Therefore the clustering was done based on the total number of access paths (mobile and fixed telephone connections per 100 inhabitants, as it was a good indicator of the advancement of the telecom sector in a given country.

Table 1.2: Access paths per 100 inhabitants of selected economies

	Country	Number of access paths (mobile and fixed) per 100 inhabitants
1	Myanmar	1.2
2	Papua New Guinea	2.5
3	Nepal	6.4
4	Uzbekistan	9.4
5	Cambodia	18.1
6	Bhutan	20.6
7	Bangladesh	22.4
8	India	23.3
9	Lebanon	49.5
10	Georgia	50.9
11	Pakistan	51.1
12	Philippines	55.1
13	Sri Lanka	55.6
14	Vietnam	59.8
15	Azerbaijan	65.6
16	Jordon	90.4
17	Thailand	91.4
18	Brunei	99.9
19	Malaysia	104.2
20	Maldives	114.9
21	Saudi Arabia	130.9
22	New Zealand	142.4
23	Bahrain	149.2
24	Australia	149.5

25	Israel	166.6
26	Singapore	168.9
27	Taiwan	168.6
28	Qatar	178.6
29	Hong Kong	200.2
30	Macau	202.1
31	United Arab Emirates	205.0
		Source: ITU (2007)

Four clusters were made as quartiles. Except for the first one (which has seven) each of the rest has eight economies.

Table 1.3

Cluster number	**Countries**
Cluster 1	Myanmar, Papua New Guinea, Nepal, Uzbekistan, Cambodia, Bhutan, Bangladesh
Cluster 2	India, Lebanon, Georgia, Pakistan, Philippines, Sri Lanka, Vietnam, Azerbaijan
Cluster 3	Jordon, Thailand, Brunei Darussalam, Malaysia, Maldives, Saudi Arabia, New Zealand, Bahrain
Cluster 4	Australia, Israel, Singapore, Taiwan, Qatar, Hong Kong, Macau, United Arab Emirates
Note: Cluster 4 countries have the best telecom penetration figures while cluster 1 has the lowest.	

2. Methodology

Four aspects of the NRA sites were studied.

1. **Factual information and News**

   Focuses on information flows that are largely one-way. There are little or no interactive aspects to this component. This area attempts to evaluate the transparency of the NRA through ranking work plans and budgets. Apart from the mentioned, the section comprises of legislation, statistics, annual reports and sector news amongst others. This section carries 40 % of the overall score.

2. **Business information**

Deals with information and areas that are useful to operators, investors and prospective new entrants. It deals with issues pertaining to market entry, Interconnection and scarce resources. Importance is given to the provision of online forms and enquiries being entertained. This section carries 24 % of the overall score.

3. **General**

Deals with areas that are of general importance to all stakeholders such as white papers, organizational charts, contact details and local language availability. The general section carries great importance because it covers areas that are related to all the sections and therefore need to be easily to access. This section carries 24 % of the overall score.

4. **Consumer related information**

Deals with factors that are useful to consumers and includes consumer rights information and complaints processes. This category has a strong emphasis on interactive functions. This section carries 12 % of the overall score.

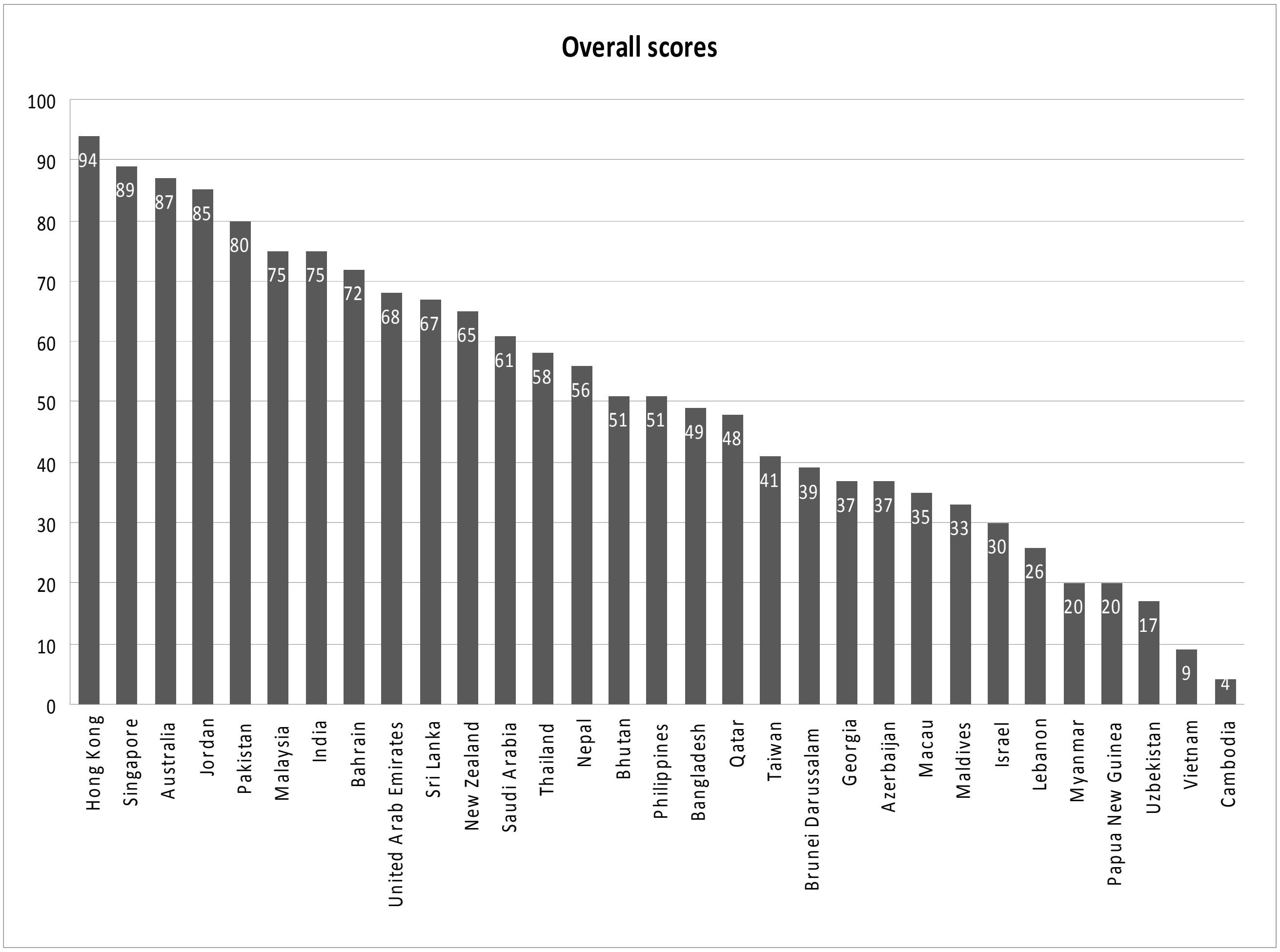
Within each of these four main categories, there are sub-categories. As the chart below shows each of the sub-categories were allocated a percent of the total score.

Table 2.1

	Category	**Category weight**	**Sub-category**	**Sub-category weight**
1	Factual information	40%	Regulatory acts, Laws, Legislation	8%
			Statistical information and sector indicators	8%
			Mission/ Vision Statement and work plan	6%
			Annual reports/ Budgets	6%
			Regulatory manuals	6%
			Organizational chart	2%
			USO Policy information, reports and plans	2%
			Sector news	2%
2	Business information	24%	Market entry details	8%
			Interconnection information	8%
			Scarce resources	8%
3	General	24%	Public consultation/ white papers	10%
			RFPs	5%
			Local language	3%
			Contact details	2%
			Updated information	2%
			Links to local/ intl sites	2%
4	Consumer- related information	12%	Consumer and citizen right's information	3%
			Information about public hearings	3%
			Equipment certification	3%
			Complaints process	3 %

2. Results

Figure 2.1: Overall Score



The countries are ranked in descending order according to the total score that the respective NRA website received.

Figure 2.2: Scores for Factual information and news

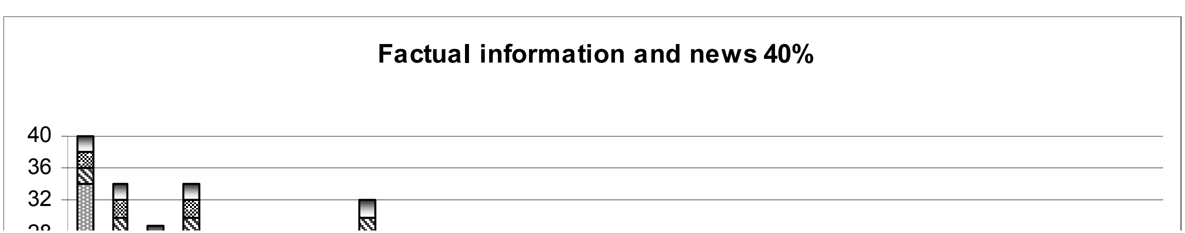


Figure 2.3: Scores for Business information

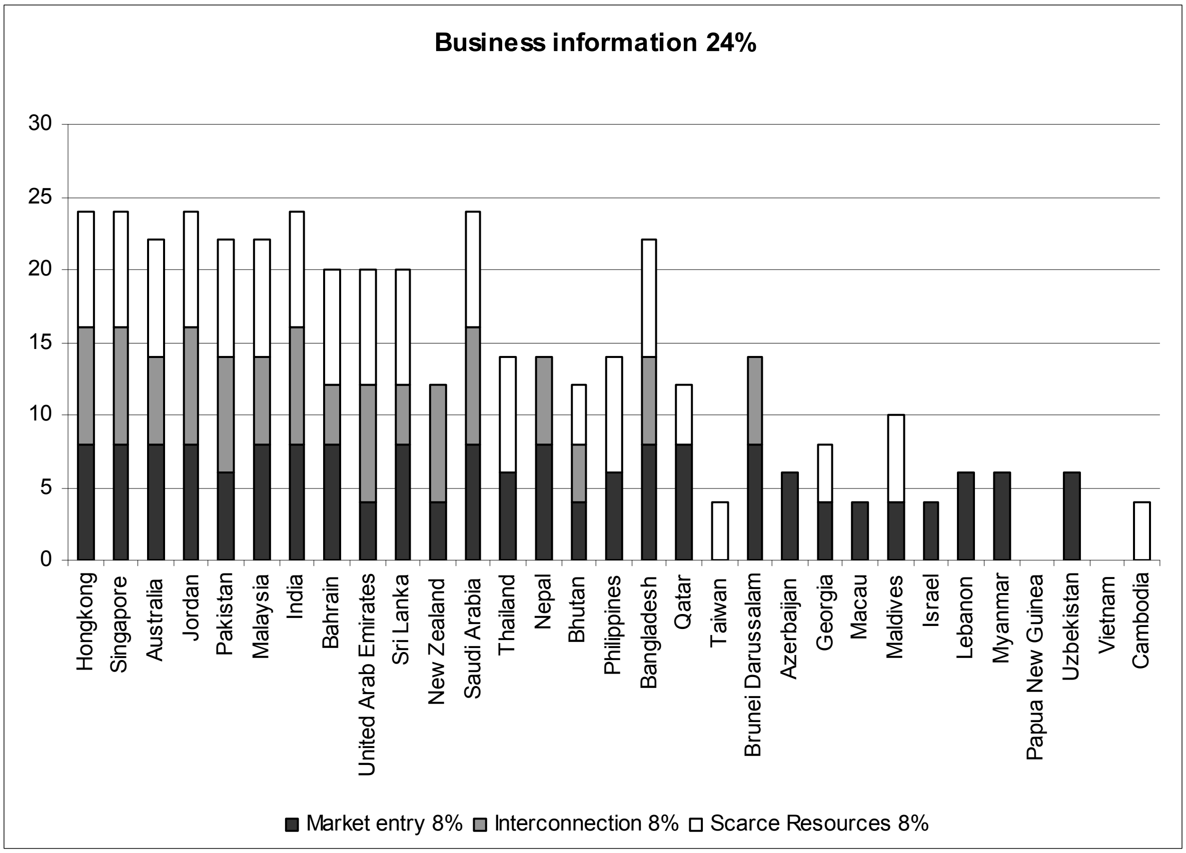


Figure 2.4: Scores for General information

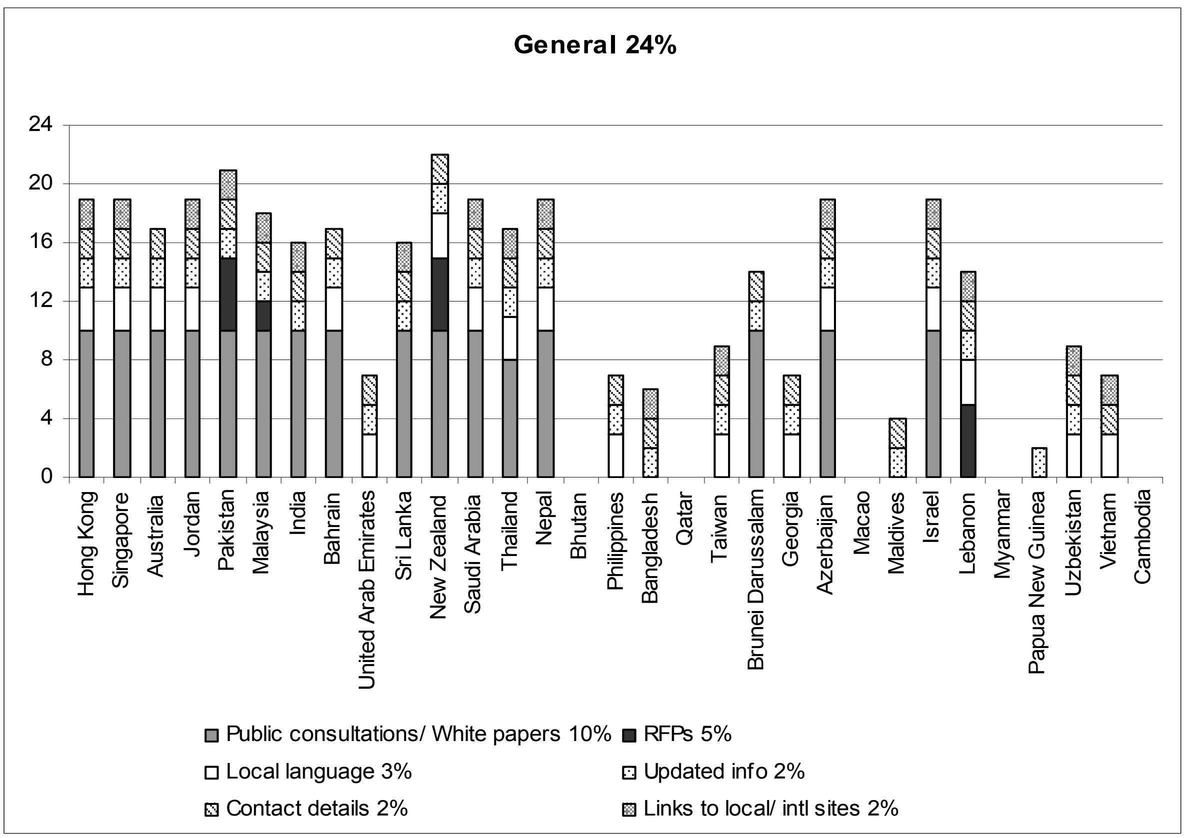


Figure 2.5: Scores for Consumer related information

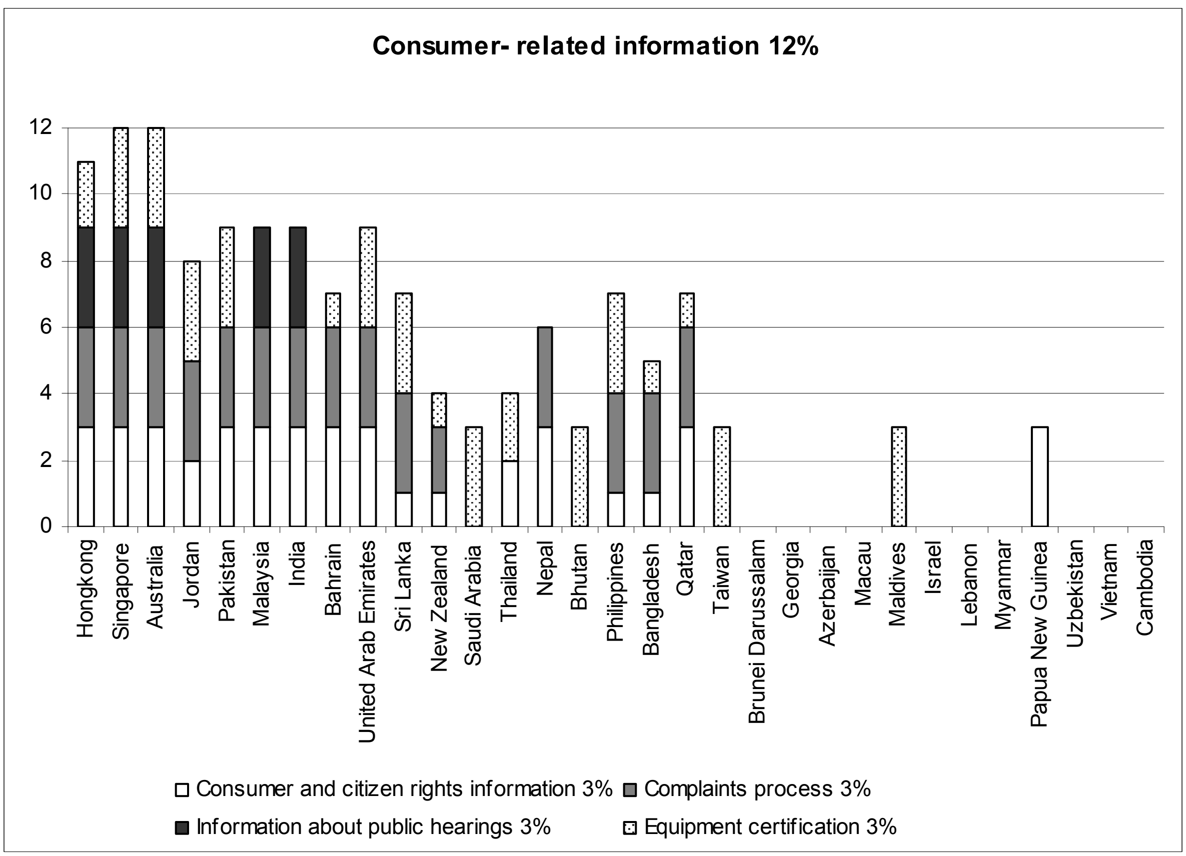


Figure 2.7: Cluster performances

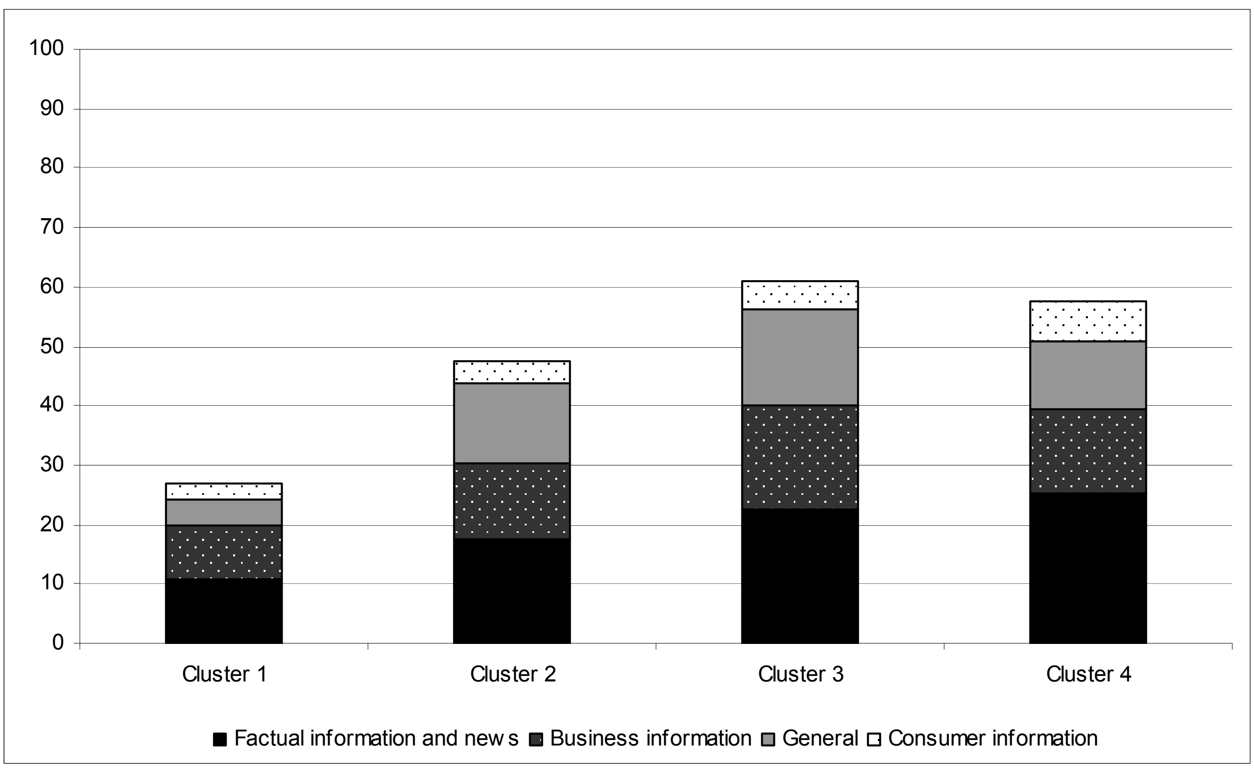


Figure 2.8 Cluster 1 performance

Figure 2.9 Cluster 2 performance

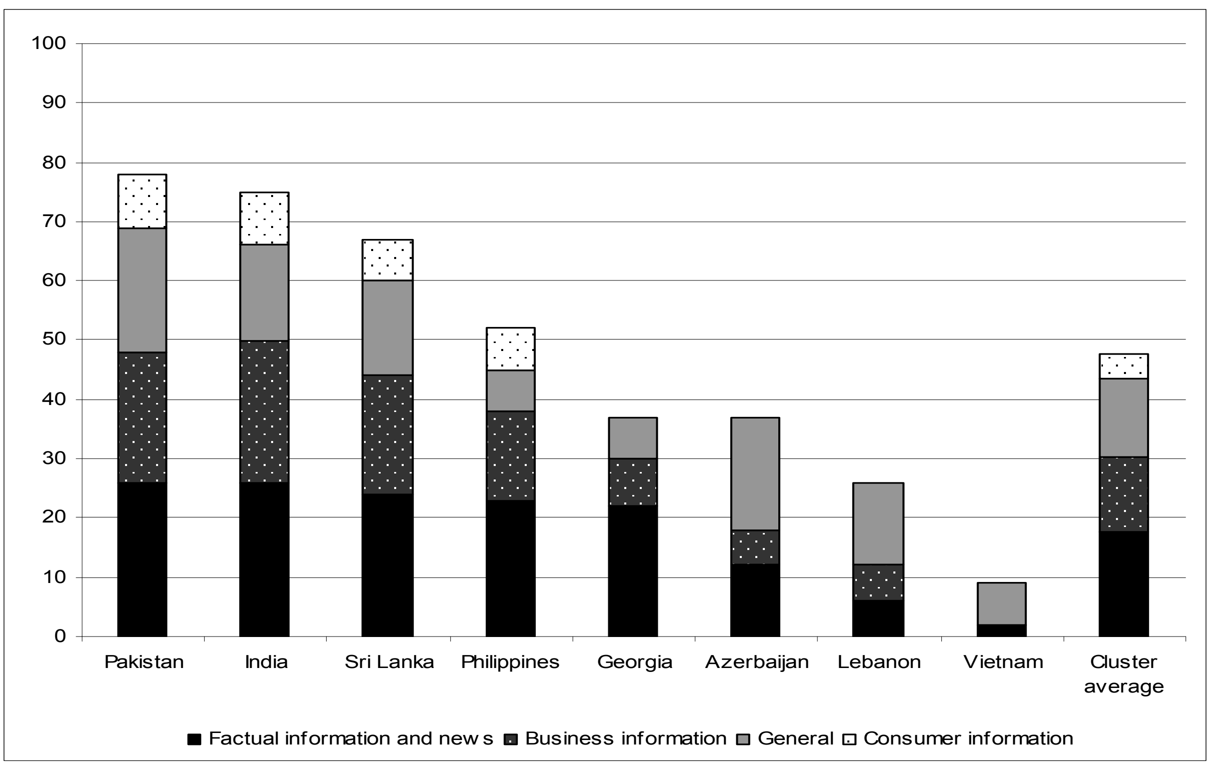


Figure 2.10 Cluster 3 performance

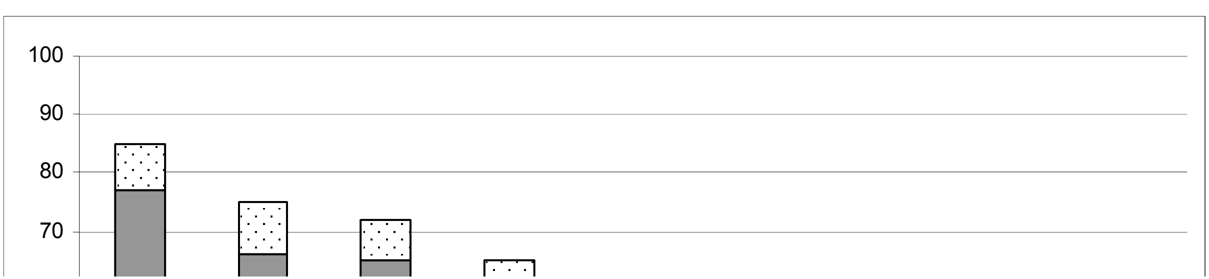
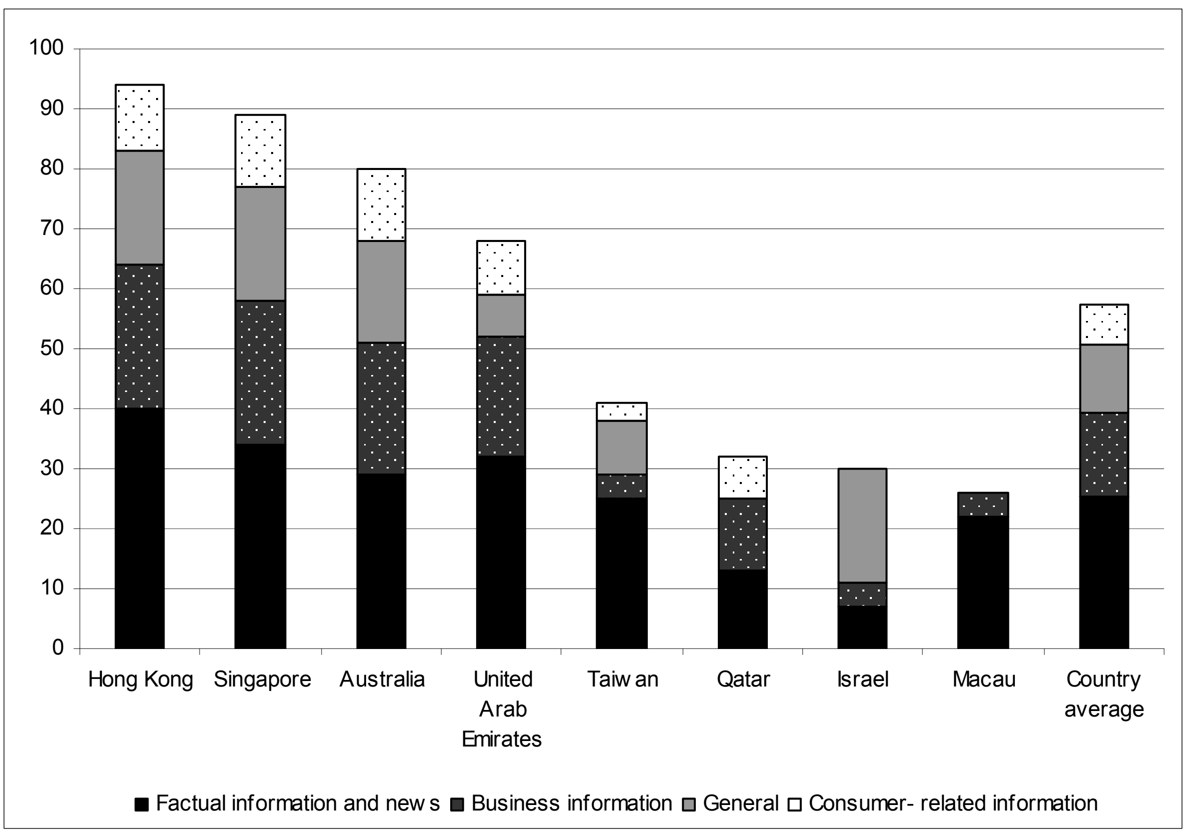


Figure 2.11 Cluster 4 performance



3. Limitations

This website survey attempted to capture as much aspects of the NRA website as possible, but there still can be limitations with methodology. This section briefly describes them and also explained how those limitations were addressed.

The weightage of marks awarded for different features has been point of a common criticism, Given there are no concrete rules that govern this, it is natural the emphasis of a critics not fully matching with the criteria used in the study.

Another difficulty was that differences in the roles played by the NRAs. Not every one of them performs the same functions. A challenge faced by the researchers was to treat an area which was not within the purview of an NRA. So it was decided to check whether the NRA website presents a link to the agency that specific function and award full marks if so. Therefore some NRA sites could score good marks even if the regulator does not perform certain key functions.

Not reviewing non-English websites is another limitation in this study. Many countries in Asia Pacific do not use English for their day-to- day activities. Depending on the needs a regulator may choose not to have an English version of the website. Six countries namely Yemen, South Korea, Mongolia, Indonesia, Kuwait and China were eliminated from the study for this reason. This study assessed only 31 (50 %) of a total of 62 countries. For this reason it can be argued it is not representative of the region. However one third of the countries in the region do not have NRA sites (some of them are micro states) so the exclusion is not as large as it seems.

5. Conclusion

Overall the websites performed relatively well in the factual information and news section with some exceptions. Of the 31 sites that were reviewed 58 % obtained total marks and 93 % scored at least half the marks allocated for the section regulatory acts, laws and legislature. In the statistical information and sector indicators section, 55 % scored total marks whilst 68 %

obtained at least half of the score. Overall, 55 % of the countries obtained 50 % of the marks allocated for that category. Of the total 31 countries included in the study 80 % had sector news made available via their websites. In regard to the clusters, the four clusters obtained the following average scores of 10.7, 17.6, 22.5 and 25 respectively out of a total of 40.

The section that focused on present and future operators and investors was called business information and carried 24 % of the total score. Most of the websites seem to have a satisfactory amount of data on market entry, interconnection and scarce resources. 42 % obtained full scores for market entry with 74 % obtaining at least half the score. 26 % of the countries received full scores for the interconnection section with 52 % obtaining at least half the score. 45 % of the countries reviewed obtained full marks for scarce resources whilst 65 % obtained at least half of the marks allocated for the section. An admirable fact is that 80 % of the countries provided contact information and the same number provided updated information on the website. It can be agued that updated information should be given importance within every section but this would make allocating scores a more tedious task. The clusters obtained 9, 12.5, 17.5 and 14 respectively. It is useful to note that cluster 3 has obtained a higher score than cluster 4, which is out of the expected pattern. This maybe due to the fact the countries in cluster 3 have economies that are growing and hence place more importance on these stakeholders.

The general category is important as it includes sections that are of general significance across all activities of the NRA. Within this category, 49 % of the countries scores full marks for the provision of public consultation/ white papers. 55 % of the total countries reviewed obtained at least half of the total marks allocated for the section. The clusters obtained the following scores: 4.5, 13.4, 16 and 11 out of a total of 24 %. It is interesting to note that 58 % of the countries had a local language version of their site as well. This adds value to the argument for local languages. Cluster 3 has obtained the highest score for this category. It is unusual for cluster 4 to obtain the second lowest score for this category but this maybe cause by the emphasis the websites play on consumer affairs.

Consumer-related information carries a total of 12 %. This category comprised of four sections that were allocated 3 % each. Under consumer and citizen rights information 39 % of the countries obtained full scores. 41 % of the countries have comprehensive information on the complaint process. However, the countries scored low marks on the sections for equipment certification and information on public hearings, with only 35 % and 16 % obtaining full marks for the sections respectively. Most of the websites did not have any information in regard to these two sections. However, it must be noted that equipment certification may not be in the domain of all NRAs such as India. In the rare cases that this arose, if the website provided a link to the relevant authority full marks were given to the website. The categories obtained the following marks: 2.4, 4, 4.8 and 6.8. Here it can be noted that the margin between cluster 3 and 4 are greater than those of the others. This is because the countries that belong to this cluster all have mature markets that place more emphasis on consumer affairs.
As figure 2.7 shows cluster 3 obtained an overall score higher than that of cluster 4. Cluster 3 scored the highest score under business information and general.

Within each clusters countries performed differently in the four categories, with some scoring more points for one and less for another. In cluster 1, Nepal proves to be the best performer with an overall score of 56/100. However, all six other countries within this cluster score less than 50% this reduces the overall cluster average to 26.8 percent. Overall, the cluster seems to score the least for the consumer-related information category and perform best in the business information section. This could be explained by the relative early stage of development the sectors in these countries are in. The NRA will place more focus on factors such as licensing, frequency allocation and interconnection details, whilst the NRA's with more mature sectors place greater focus on consumer affairs as the other areas have already been developed.

Cluster 2 performs overall better than cluster 1 which does not prove to be surprising. The countries in this cluster have more sophisticated regulation regimes that cluster 1 and hence will perform better in the survey. The cluster average was 47.6. The top three performers were Pakistan, India and Sri Lanka scoring 78, 75 and 67 respectively. Cluster 2 scores the lowest for the consumer related information category like in cluster 1. However, it scores the highest marks in the general category.

The average score for cluster 3 which is 61/100 is the highest of all four clusters. This is unusual as one would assume cluster 4 to have the best results. It could be argued that cluster 3 countries are those that have the highest growth rates and this is shown through the survey results. The top three performers are Jordon, Malaysia and Bahrain which scores of 85, 75 and 72 respectively. The cluster scores the lowest points for consumer related information and highest points for the business information category.

The fourth cluster consists of the countries with the highest number of access lines per 100 inhabitants. The cluster average was 57.5 percent. The top three performers were Hong Kong, Singapore and Australia with scores of 94, 89 and 80. The cluster performed best in the factual information and news category and scored the lowest in the general category.

This study did not place any importance on the usability and aesthetics of the websites to reduce the subjectivity. But it needs to be noted that websites such as those belonging to regulatory agencies of Singapore, Hong Kong, Pakistan and Australia was user-friendly. The sections were clearly labeled and did not require much searching to obtain the required information. Whilst other sites required the constant use of the search function (where available) for obtaining information.

The researchers noted many of the websites have made significant progress since the last survey that was carried out in 2005 though a better comparison is not possible due to the changes in methodologies. The number of NRA having websites also has increased. It has also been noted that many sites obtained low scores for not having basic information, they can provide with least effort. The top few websites can be recommended as benchmarks, and should be used as guides for others that look to improve their websites.

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Annex 1: List of countries that came within the scope of study

	Country	National Telecommunication Regulatory Agency	Regulator site	English version available (Y/N)	Considered for survey (Y/N)	If not reason

1	Afghanistan	Afghanistan Telecom Regulatory Board (ATRA)	http://www.atra.gov.af/index.htm	**Y**	**N**	UC
2	Armenia	Ministry of Transport and Communication	http://www.mtc.am/	**Y**	**N**	UC
3	Australia	Australian Communication and Media Authority	http://www.acma.gov.au/WEB/HOMEPAGE/pc=HOME	**Y**	**Y**	-
4	Azerbaijan	The Ministry of Communications and Information Technologies	http://www.mincom.gov.az/en/main.html	**Y**	**Y**	-
5	Bahrain	Telecom Regulatory Authority	http://www.tra.org.bh/en/home.asp?dfltlng=1	**Y**	**Y**	-
6	Bangladesh	Bangladesh Telecom Regulatory Commission (BTRC)	http://www.btrc.gov.bd/	**Y**	**Y**	-
7	Bhutan	Bhutan Infocomm and Media Authority	http://www.bicma.gov.bt/index.html	**Y**	**Y**	-
8	Brunei Darussalam	Authority for Info-communication Technology Industry	http://www.aiti.gov.bn/index.htm	**Y**	**Y**	-
9	Cambodia	Ministry of Posts and Telecommunications	http://www.mptc.gov.kh/	**Y**	**Y**	-
10	China	Ministry of Information Industry	http://www.mii.gov.cn/	**N**	**N**	EVNA
11	Cook Islands	-	-	**-**	**N**	NA
12	Fiji	Telecommunication Unit	-	**-**	**N**	NWS
13	Georgia	National Communication Commission	http://www.gncc.ge/index.php?lang_id=ENG&sec_id=10050	**Y**	**Y**	-
14	Hong Kong	Office of the Telecommunications Authority	http://www.ofta.gov.hk/en/index.html	**Y**	**Y**	-
15	India	Telecom Regulatory Authority of India (TRAI)	http://www.trai.gov.in/Default.asp	**Y**	**Y**	-
16	Indonesia	Badan Regulasi Telekomunikasi Indonesia (BRTI)	http://www.brti.or.id/index_en.php	**N**	**N**	EVNA
17	Iran	Ministry of Posts, Telegraph and Telephone	-	**-**	**N**	NWS
18	Iraq	Ministry of Transport and Communication	-	**-**	**N**	NWS
19	Israel	Ministry of Communications	http://www.moc.gov.il/8-en/MOC.aspx	**Y**	**Y**	-
20	Japan	Ministry of Internal Affairs and Communication	http://www.soumu.go.jp/joho_tsusin/eng/index.html	**N**	**N**	NFPS
21	Jordon	Telecommunication Regulatory Commission	http://www.trc.gov.jo/index.php?option=com_frontpage&Itemid=1&lang=english	**Y**	**Y**	-

22	Kazakhstan	Telecommunications and Post Dept	-	**-**	**N**	NWS
23	Kuwait	Ministry of Communication	http://www.moc.kw/	**N**	**N**	PP
24	Kyrgyzstan	State Communications Agency	-	**-**	**N**	NWS
25	Laos	Ministry of Communications, Transport, Posts and Construction	-	**-**	**N**	NWS
26	Lebanon	Ministry of Telecommunications	http://www.mpt.gov.lb/	**Y**	**Y**	-
27	Macau	DSRT	http://www.gdtti.gov.mo/eng/News/index.html	**Y**	**Y**	-
28	Malaysia	Malaysian Communication and Multimedia Commission	http://www.skmm.gov.my/	**Y**	**Y**	-
29	Maldives	Telecom Authority of Maldives (TAM)	http://www.tam.gov.mv/	**Y**	**Y**	-
30	Marshall Islands	Cabinet	-	**-**	**N**	NWS
31	Mongolia	ICTA	http://www.icta.gov.mn/	**N**	**N**	EVNA
32	Myanmar	Ministry of Communications, Posts, and Telegraphs	http://www.mpt.net.mm/	**Y**	**Y**	-
33	Nauru	Directorate of Telecommunications	-	**-**	**N**	NWS
34	Nepal	Nepal Telecommunication Authority	http://www.nta.gov.np/	**Y**	**Y**	-
35	New Zealand	Commerce Commission	http://www.comcom.govt.nz/index.aspx	**Y**	**Y**	-
36	Nieu	-	-	**-**	**N**	NA
37	North Korea	-	-	**-**	**N**	NA
38	Oman	Telecommunication Regulatory Agency	http://www.tra.gov.om/telecom.htm/	**Y**	**N**	UC
39	Pakistan	Pakistan Telecommunication Authority (PTA)	http://www.pta.gov.pk/index.php?cur_t=vnormal	**Y**	**Y**	-
40	Palau	-	-	**-**	**N**	NA
41	Papua New Guinea	Independence Consumer and Competition Commission	http://www.iccc.gov.pg/home.htm	**Y**	**Y**	-
42	Philippines	National Telecommunication Commission	http://portal.ntc.gov.ph/wps/portal/!ut/p/_s.7_0_A/7_0_9D?cID=6_0_FM&nID=7_0_LU	**Y**	**Y**	-
43	Qatar	Supreme Council of Information and Communication	http://www.ict.gov.qa/output/Page2.asp	**Y**	**Y**	-

		Technology				
44	Samoa	Ministry of Posts and Telecom	-	**-**	**N**	NWS
45	Saudi Arabia	Communications and Information Technologies Commission	http://www.citc.gov.sa/citcportal/Homepage/tabid/106/cmspid/%7B611C6EDD-85C5-4800-A0DA-A997A624D0D0%7D/Default.aspx	**Y**	**Y**	-
46	Singapore	Infocomm Development Authority	http://www.ida.gov.sg/home/index.aspx	**Y**	**Y**	-
47	Solomon Islands	Ministry of Transport, Works and Communication	-	**-**	**N**	NWS
48	South Korea	Korea Communication Commission	http://www.kcc.go.kr/gts.do?a=user.index.IndexApp&c=1001	**N**	**N**	EVNA
49	Sri Lanka	Telecommunication Regulatory Commission	http://202.124.172.4/trc_test/index.php	**Y**	**Y**	-
50	Syria	Syrian Telecommunication Establishment	-	**-**	**N**	NWS
51	Taiwan	National Communication Commission	http://www.ncc.tw/	**Y**	**Y**	-
52	Tajikistan	Ministry of Communications	-	**-**	**N**	NWS
53	Thailand	National Telecommunication Commission	http://eng.ntc.or.th/index.php	**Y**	**Y**	-
54	Timor-Leste	-	-	**-**	**N**	NA
55	Tonga	Telecommunication Commission	-	**-**	**N**	NWS
56	Turkmenistan	Ministry of Communications	-	**-**	**N**	NWS
57	Tuvalu				**N**	
58	UAE	Telecommunication Regulatory Commission	http://www.tra.gov.ae/	**Y**	**Y**	-
59	Uzbekistan	Communications and Information Agency	http://www.aci.uz/en/news/	**Y**	**Y**	-
60	Vanuatu	Ministry of Public works, Transport, Communication and Civil works	-	**-**	**N**	NWS
61	Vietnam	Ministry of Information and Communications	http://www.mic.gov.vn/details_e.asp?Object=271032875&news_ID=4539827	**Y**	**Y**	-
62	Yemen	Ministry of Telecommunication and Information Technology	http://www.mtit.gov.ye/	**-**	**N**	EVNA

Abbreviations for table:

EVNA English Version Not Available
NWS No Website
UC Under Construction

Overview: The Asian ICT Indicators Database

JULY 2008

1. Introduction

The **ICT Indicators Asia** initiative or **II Asia** for short aims *to foster coordination, cooperation and sharing amongst National Regulatory Authorities (NRAs) from Asia* (initially from the SAARC countries) in the *collection and dissemination of the latest and most accurate ICT Indicator data* from the region. This initiative is being facilitated by LIRNE*asia* as part of its efforts to build a regional repository of accurate and timely data on ICT indicators. Access to these indicators will encourage regional comparisons and their use in benchmarking ICT performance among countries within Asia. This initiative is complementary to LIRNEasia's activities in developing a standardized ICT Indicators Manual (draft available at http://www.ictindicators.org/files/Indicator%20manual%20V1.pdf) in collaboration with Asian NRAs).

While online databases for ICT indicators do currently exist (e.g. ITU's World Telecommunications Database), the reported data are not timely with frequent inaccuracies arising from a lack of incentives for contributing NRAs. As such, this Database Initiative builds on other work (such as the Partnership on Measuring ICT for Development) with the main principle of providing regional Asian NRAs (initially from SAARC) control over this initiative to collect and disseminate high-quality ICT Indicators' data.

As such the overall advantages and thus the objectives of this Database Initiative include:

- Provide instantaneous access to comparative regional data after reporting
- Provide incentives (i.e. timely access to regional data) for contributing data
- Have a minimal administrative and logistical footprint
- Involve negligible financial costs and be simple to implement.

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2. The Governance Structure

The governance of this initiative will be carried out by a Members' Council which shall consist of two tiers.

i. Tier 1 members will consist of NRA members, and will be the final decision making authority in all matters related to ***II Asia*** including governance, overall strategy and policies related to indicator creation, usage and access. All decisions require two-thirds majority amongst Tier 1 members.

ii. Tier 2 members, consisting mainly of telecom operators will be consulted prior to any amendments and/ or additions to the governance structure, overall strategy and policies related to indicator creation, usage and access. They may attend all meetings, but may not vote.

An Administrative Unit will be tasked with assisting the Member's Council in its duties and will have the responsibility of implementing the strategy and policies determined by the Members' Council. The Administrative Unit will be drawn from the pool of member representatives and are expected to require minimal time involvement (collectively not more than 1 to 2 man-days per month). Initially LIRNE*asia* will fulfill this responsibility.

The Chair of the Members' Council will be rotated amongst Tier 1 Members. The Chair will be responsible for organizing and presiding over periodic meetings and conference calls amongst members, coordinating ***II Asia*** activities with the Members' Council and the Administrative Unit, serving as the primary contact between the Members' Council and the Administrative Unit and in ensuring that the Members' Council is wholly involved in any important decisions made, directions taken, or guidance provided.

3. Adoption by SAARC National Regulatory Authorities

The ***II Asia*** was introduced to members of the SAARC National Regulatory Authorities (NRAs) at the Expert Forum on ICT Sector Indicators and Benchmarks Regulation for SAARC Regulatory Authorities which was held in Singapore on 14 – 15 June 2008 and which was co-organized by LIRNE*asia* and CONNECT*asia* Forum and funded by the IDRC. The basic elements were developed at expert forums held in New Delhi in March 2006 (co-hosted by TRAI) and in Singapore in March 2007 (co-hosted by the Institute for South East Asian Studies, Singapore).

14 representatives from seven National Regulatory Authorities within the SAARC region, namely Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Sri Lanka and Pakistan were present and received first-hand training on how to use the prototype database, built by LIRNE*asia*. During the discussion stages their respective suggestions were taken into consideration on how to improve the existing database.

The following key decisions were also taken:

- LIRNE*asia* will draw up a draft charter for circulation amongst NRAs which will outline the goals, objectives and data privacy issues. This document will be the starting point for formalizing the database initiative with NRAs.
- Pakistan Telecom Authority (PTA) will explore the support they could provide for this effort. Potential support could come from spearheading this initiative with other NRAs as well as providing support to host the database.
- Bangladesh Telecom Regulatory Commission (BTRC) will explore the possibility of taking up ***II Asia*** at the next South Asian Telecom Regulators Council (SATRC) meeting.
- Telecom Authority of Maldives (TAM) who has already started testing and using the database will also support in taking this initiative forward.
- LIRNE*asia* will provide access and technological assistance to use the existing database to all SAARC NRAs.

***Title: Expert Forum on ICT Sector Indicators and Benchmarks Regulation for SAARC Regulatory Authorities: Summary Report**

***By:** -

***Date:** 14 – 15 June 2008

***IDRC Project Number:** 104918-001

***IDRC Project Title:** Advancing evidence-based policymaking and regulation in the emerging Asia-Pacific to ensure greater participation in ICTs (Phase II)

***Country/Region:** Asia

***Full Name of Research Institution:** LIRNE*asia*

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***Abstract:** An Expert Forum on ICT Sector Indicators and Benchmarks Regulation for SAARC Regulatory Authorities, co-organized by LIRNEasia and Connectasia, and funded by the IDRC, was held from June 14th – 15th, 2008 at the Changi Village Hotel, Singapore. The forum brought together representatives from National Regulatory Authorities (NRAs), in addition to participants attending the 12th Executive Course on Telecom Reform, held prior to the event, at the same venue.

***Keywords:** -

Report:

An Expert Forum on ICT Sector Indicators and Benchmarks Regulation for SAARC Regulatory Authorities, co-organized by LIRNEasia and Connectasia, and funded by the IDRC, was held from June 14th – 15th, 2008 at the Changi Village Hotel, Singapore. The forum brought together representatives from National Regulatory Authorities (NRAs), in addition to participants attending the 12th Executive Course on Telecom Reform, held prior to the event, at the same venue. 14 representatives from seven National Regulatory Authorities (NRAs) within the SAARC region, namely Afghanistan, Bangladesh, Bhutan, India, Maldives, Sri Lanka and Pakistan, participated at the forum. The aim of this event was to present current research on ICT Indicators and Benchmarks and to obtain their feedback.

The dinner speech was made by Prof. Rohan Samarajiva, Executive Director of LIRNEasia, and former Director-general of the Telecommunications Regulatory Commission of Sri Lanka.
The research presented included findings from a study on broadband quality of service conducted in India, Sri Lanka and Singapore, an assessment of NRA websites, and a study on broadband and mobile price benchmarks conducted by LIRNEasia on a bi-annual basis.
A panel discussion was held where regulators were given the opportunity to respond to findings from the NRA website survey, which were communicated to the relevant NRAs, prior to the event. The

feedback obtained by these representatives was overall very positive, with several regulatory authorities expressing their appreciation of a survey of this nature being conducted among NRAs in South Asia. Many stated that they would use these findings to improve the overall appearance and functionality of their website. Furthermore, several regulators stated that they were in the process of improving their website, and intended to have an improved version up and running in the near future. Several valuable suggestions were made regarding the weighting given to different aspects of the website. These suggestions have been duly noted and will be used to improve the overall design of the survey, when it is conducted for a consecutive time in the next research cycle (2008 – 2010).

Participants were also given the opportunity to test-run the recently published website housing the ICT Indicators database. This online database enables National Statistical Organizations (NSOs) and other official organizations to post statistics on ICT indicators in their respective countries and have access to similar data reported by other countries. Although currently funded by donor agencies, LIRNEasia envisages that over time, this database will be funded by the users themselves, namely the NSOs and/or other relevant bodies actively using, and/or updating the database. The Expert forum evaluation were positive, with overall course content and speakers scoring averages of over 4 on a five-point scale. Furthermore, hotel facilities and airport transfers scored very well, each scoring an average of 4.17 and 4.00 and respectively. The hotel's location scored an average of 3.92, which is satisfactory, given the distance from the hotel to the city centre.

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ITU Asia-Pacific Centre of Excellence

Training Course on
Measuring ICT Access and Use
by Households and Individuals

Organised jointly by ITU and LIRNE*asia*

Hosted by MICT Thailand
TOT Academy

Bangkok, Thailand

19-23 October 2009

Table of Content

ITU Training Course on Measuring ICT Access and Use by Households and Individuals

Final Report

1. General aspects

The **ITU Training Course on Measuring ICT Access and Use by Households and Individuals** was held in Bangkok, Thailand, from 19-23 October 2009. The main objective of the course was to improve the capacity of national statistical offices from Asia-Pacific countries to produce internationally comparable statistics on ICT access and use by households and individuals.

The course was divided into the following five modules (see agenda in Annex 2):

- Module H-1: Introduction to household ICT statistics. Survey planning and preparatory work
- Module H-2: Statistical standards and topics. Data sources and collection techniques
- Module H-3: Questionnaire design. Household Survey design
- Module H-4: Data processing. Data quality and evaluation
- Module H-5: Data Dissemination

2. Participation

There were 54 applications received from national statistics offices of 24 countries of the Asia-Pacific region. Since, the course is designed to be delivered to a maximum of 25 participants, a number of criteria were used to select the candidates. These included candidates' background in statistics or economics, their role in conducting household surveys in their country (including all phases of survey implementation) and excellent level of English (as the training was conducted in English).

The course was attended by 26 participants from National Statistical Offices of the following 18 countries of the Asia-Pacific region: Afghanistan, Bangladesh, Cambodia, China, Fiji, Indonesia, Korea (Rep. of), Malaysia, Micronesia, Mongolia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Tonga and Viet Nam (see list of participants in Annex). In addition, staff members of LIRNE*asia,* MICT Thailand, and UNESCAP Statistics Division attended.

3. Course delivery

The main instructor that delivered the course was Mr. José Cervera, consultant to the ITU. ITU staff delivered several parts of the course, in particular related to the definitions of the core list of ICT household indicators and the ITU data collection and dissemination of ICT household statistics. The course is designed to be highly interactive and included group discussions, group exercises, as well as tests and evaluations for each of the five modules, all of which was managed and facilitated by ITU.

4. Overview of the training course outcome

Overall, the course was appreciated by the participants. The majority of participants evaluated its content, the support materials provided and the methodology as "good" (second highest level possible) while the organization of the training as "very good". English language is one of the barriers faced by the participants that attended the course. Participants appreciated very much the interactive nature of the training course and their involvement in group discussions. Also, the daily completion of tests was considered positively. The tests were graded every day to provide results and review difficult concepts the next morning, which allowed providing immediate feedback.

Since this is the first training of its kind delivered in the region[1], the participants highly appreciated the possibility to learn about harmonizing ICT statistics and exchanging country experiences. A number of countries in the region have started to include ICT access indicators in their ongoing surveys or censuses; others are planning to include them in their forthcoming surveys; and a few are envisaging carrying out an ICT survey.

[1] A training course on measuring ICT use in businesses was delivered to participants from the Asia-Pacific region in February 2008, organized by UNCTAD in collaboration with APCICT and UNSIAP in Incheon, Republic of Korea. For more information, see http://new.unctad.org/templates/Event____887.aspx

Therefore this training course has contributed to foster their work in this regard, for which they expect ITU and the *Partnership* to follow up.

The selected participants met the expectations of the organisers and the trainer; they had a good statistical knowledge and were familiar with the different steps of conducting surveys, in particular household surveys. As a preparation for the course, the participants were asked to provide a country paper highlighting the different household surveys conducted in their country and the methodology employed in each survey. Therefore, they were able to follow the training content and participate actively in all sessions. Trainer and facilitators of the training course observed a strong commitment from the participants to get the most benefit from the course in view of measuring ICT statistics in the future.

5. Evaluation of the course by participants

This section provides the results of the evaluation of the course carried out by the participants. Results are shown separately for the final overall evaluation of the course, and for each module.

5.1. General evaluation of the course

Issues considered in the final evaluation were the content of the course in view of the coverage of the topic, the depth of the technical level and the accuracy of the information delivered. It also assessed the quality of the support material, the methodology, the organisation, the duration and the number of participants of the training course. Participants were also asked to make general suggestions for improving the course. Detailed answers are provided in Annex 1. The scale used for this evaluation ranges from "very good" to "very poor".

5.1.1 Content evaluation:

The content of the course was evaluated in terms of three components. The first was the coverage of the topic, which was evaluated as "good" by the majority of the participants (58%), as "very good" by 31% and "adequate" by 11%. The technical level was assessed as "very good" by 32%, and assessed as "good" by 44% and "adequate" by the remaining 24%. The participants commented that technical issues such as sampling design and sampling error, which are usually the more complex technical issues in the survey process, should be treated in a greater detail during a much longer time schedule. "Accuracy" was rated as "very good" (46%), "good" (46%) and "adequate" by the rest (8%) of the participants.

5.1.2 Support material:

This includes the ITU Manual for Measuring ICT Access and Use by Households and Individuals and the presentation slides used to deliver the five modules. Overall, the participants rated the materials as “good” (53%) and “very good” (39%). Half of the participants evaluated the Manual as “very good” (50%) and 46% as “good”. Regarding the slides, 28% evaluated them as “very good” and 60% as “good”. Majority of the comments received were pertaining to the presentation slides, and included suggestions to include examples to better illustrate the messages included in the slide, or to increase the font to help reading easier. As tests are part of the modules, they also commented on the phrasing of the test questions, which they found difficult in certain cases. Specifically, the use of words “may” and “probably” was found to be confusing. There are also questions that need to be rephrased, because of its double-barrelled meaning which are not easy for non-native English speakers.

5.1.3 Methodology:

Participants evaluated the methodology as “very good” (42%) and “good” (46%). They praised especially the usefulness of sharing country experiences, group discussions, exercises and tests, which are an integral part of each of the course modules. However, they expressed interest in having more practical exercises and more examples to better illustrate the subjects being discussed.

5.1.4 Organisation:

The organisation of the course was highly appreciated in general. 56% rated it as “very good” and 38% as “good”. Participants particularly acknowledged the excellent training venue and logistics provided by TOT Academy, supportive staff of MICT Thailand and TOT Academy, and well-organized training delivery and facilitation of the instructors and ITU.

5.1.5 Duration:

62% of the participants considered the duration of the training course adequate (long enough), while 38% found it too short. Nobody considered the course as too long. Those that considered it too short suggested that the training should be delivered for at least 7 days (some suggested delivering the training for two weeks) with shorter day programme. This will allow them to better understand the technical topics discussed, and suggested to dedicate the afternoon session for more practical exercises and country experiences/examples.

5.1.6 Number of participants:

The number of participants was assessed as “adequate” (92%), while a few of them said it was too low (8%). In general, participants commented that the size was good enough to allow individual participation and sharing of country experiences. A number of suggestions were made by the participants, including the importance of having more countries represented in the course, rather than having two participants per country. As noted earlier, there were 24 countries that applied but certain candidates did the meet the required criteria. Therefore, in some cases, two qualified candidates from the same country were accepted. At the same time, it was mentioned that in the future, it should be ensured that participants have a good level of English to follow the course and participate in the discussions.

5.1.7 General suggestions:

The participants made some general suggestions for change and improvement of the course**.** The most common suggestion was to increase the duration of the course (but to shorten the daily schedule) in order for the participants to better absorb the information and to apply them directly to practical exercises. They particularly suggested increasing the duration of modules with technical content such as modules 2, 3 and 4. They also suggested adding a topic on analysis of survey results, as part of the data dissemination module (module 5). A number of participants requested to have examples while presenting the slides, and to include visual examples for technology-related terminologies. They also mentioned the importance of having a refresher course in a few years time to see how countries applied the knowledge acquired in the training and to share experiences of those that conducted the survey after the training. Countries also requested to bring the training to the Pacific countries where more countries with similar levels (both economic and NSO capacity) can participate and share experiences. They suggested conducting the training course in collaboration with the Secretariat of the Pacific Community (SPC).

5.2. Evaluation of the modules

Each day, an evaluation of each of the five modules was conducted. Participants were requested to evaluate the following aspects of every module:

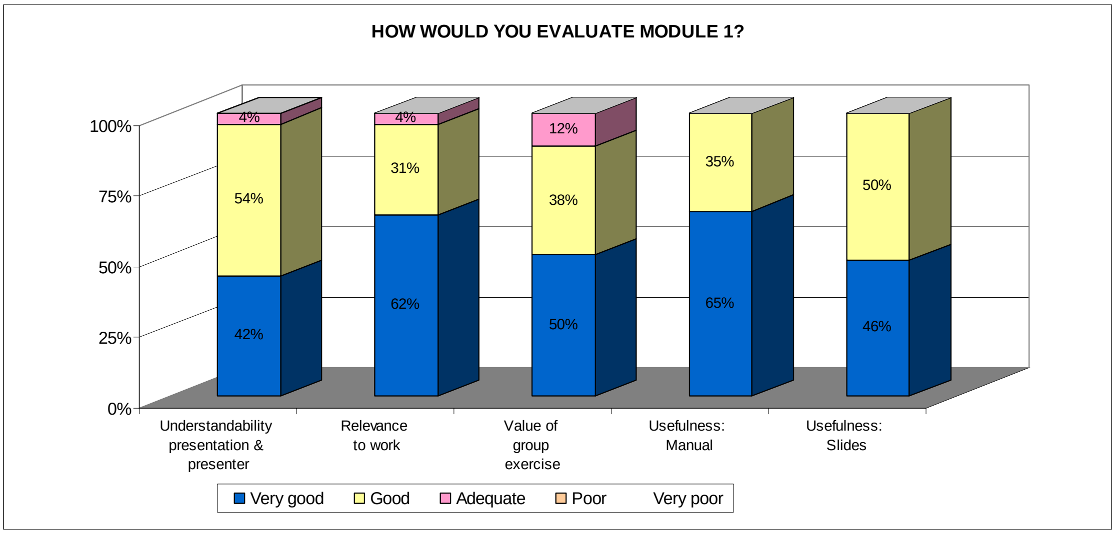
- Comprehensibility of the presentation and presenter
- Relevance of the module to their work, now or in the near future
- Value of group exercise in reinforcing learning
- Usefulness of supporting material: Manual and presentation slides

Similar to the final overall course evaluation, the scale used range from “very good” to “very poor”.

Participants were also asked which parts of the module they liked most/least, and to provide recommendations in order to improve each module.

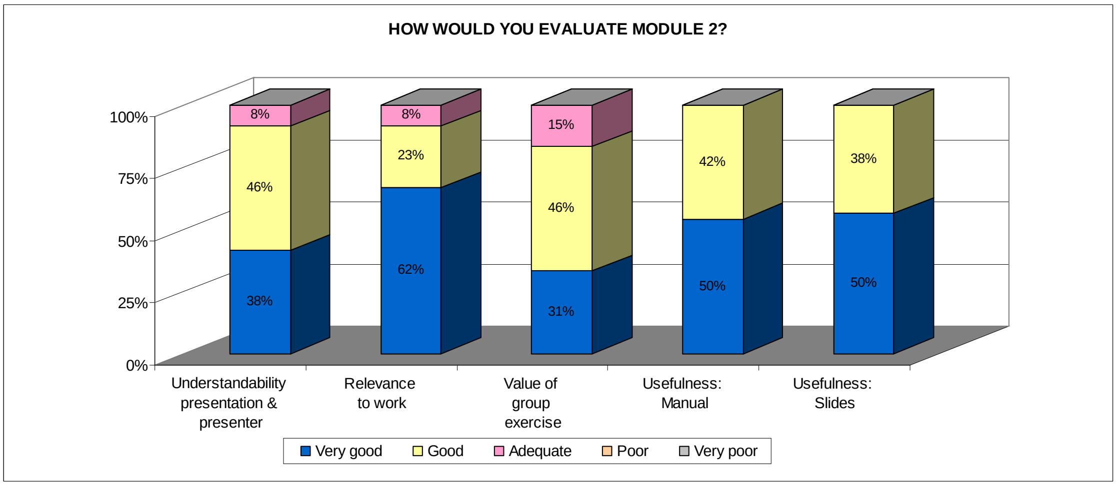
Module 1: Introduction to household ICT statistics. Survey planning and preparatory work

Module 1 was evaluated as either “very good”, “good” or “adequate” (see chart). Majority (70%) of the participants liked the survey planning part of the module while some liked the group exercise (13%) and the rest of the participants liked all parts of the module. Among the suggestions made by participants are: to increase the time for the module, to include some case studies or country examples while presenting the module, to increase the size of the font used in the slides, and to provide a form that can be used for group exercise.



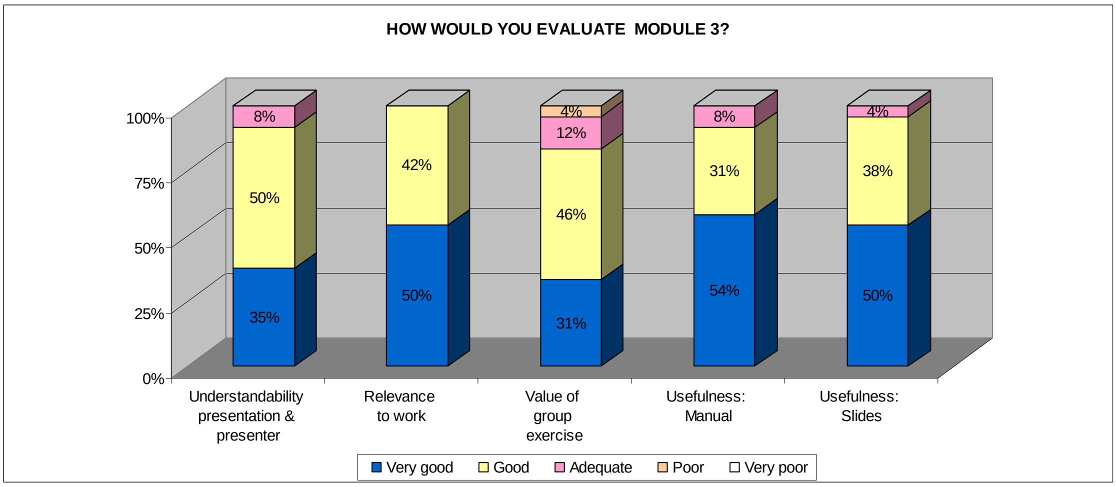
Module 2: Statistical standards and topics. Data sources and collection techniques

Module 2 was particularly relevant for the participants as they are mostly involve in the survey implementation in their respective countries. Almost half of the participants graded the module as “very good” (46%) while others said it is either “good” or “adequate”. The most liked topic was the core ICT household indicators including their definitions and clarifications. Others liked the group exercises and data collection techniques. They particularly highlighted the technical skills of the instructors in delivering the concepts. Most participants suggested including examples to illustrate the different technologies included in the core ICT household indicators and their sub-categories. They also suggested clarifying the note related to the activity excluded from the Internet banking and to explain more the different types of Internet access (narrowband, broadband).



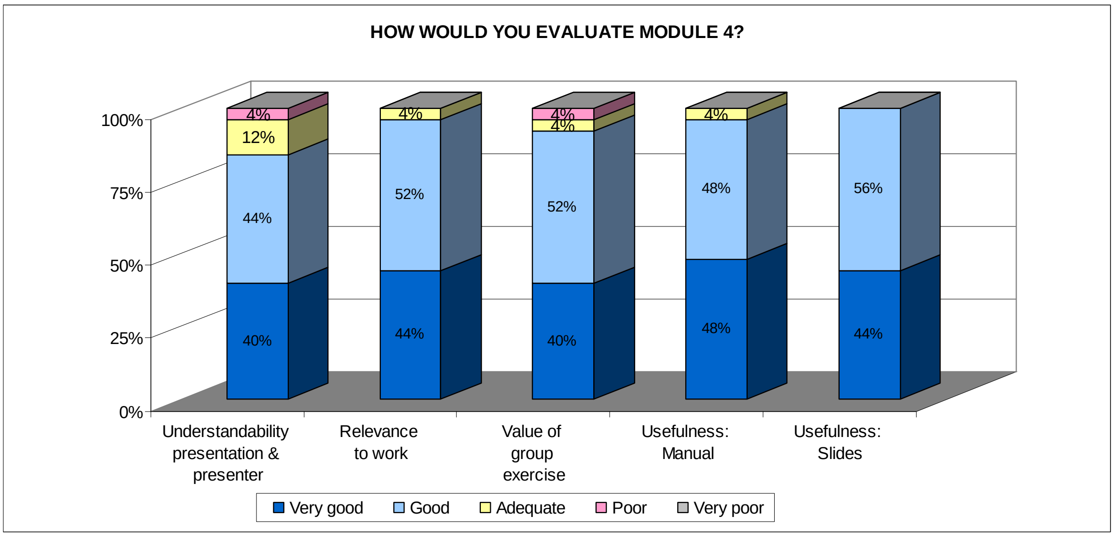
Module 3: Questionnaire design. Household Survey design

Overall, module 3 was evaluated as either “very good” (48%) or “good” (45%) (See chart for details of the different aspects). Forty per cent (40%) of the participants liked all parts of the module; while forty-five per cent (45%) liked the sampling techniques and questionnaire design parts and made particular emphasis on the importance of the two topics. The participants suggested including practical country examples or exercises on sampling design (which seems to be the most difficult area and at the same time very relevant for their work) and to increase the time allotted to group discussions.



Module 4: Data processing. Data quality and evaluation

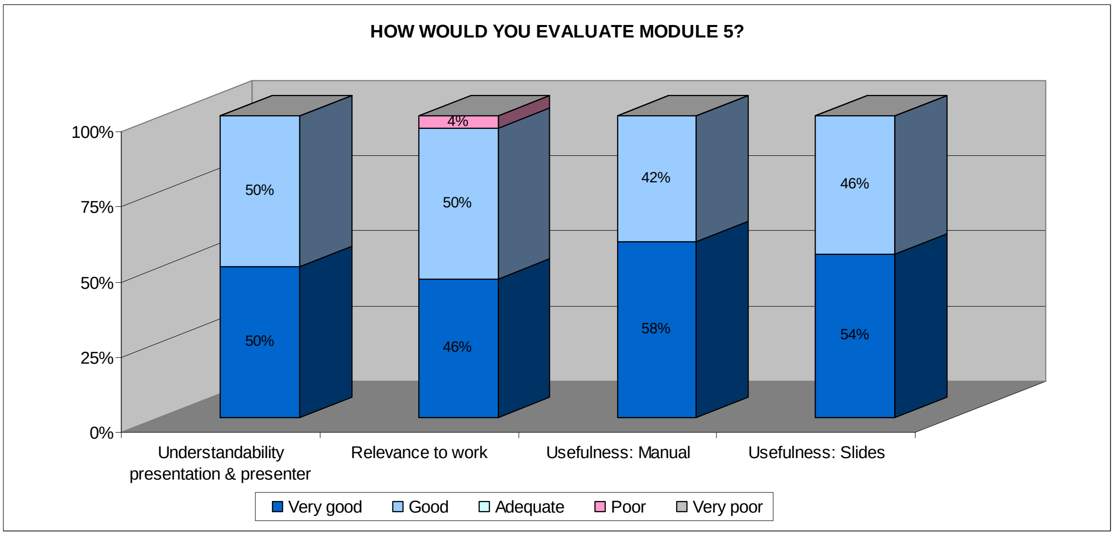
During the presentation of module 4, participants were very enthusiastic in learning how to compute the weights that will be applied to the sampled households or individuals to come up to the value of the in-scope population or the target population. For some countries, this subject was new and they highly appreciated to learn how to weight the data and compute the sampling error during the training. However, this module received the lowest assessments in terms of understandability aspect (see chart), which may be attributed to its technical nature (both for sampling error and weights computation). Although the overall evaluation is still “very good” and “good”, some participants found the module difficult to understand and graded it as “poor” (4%). The majority of the participants liked all parts of the module (37%), while 26% like the data editing part. They also liked the group exercises. For participants, the most complex parts of this module were sampling error calculation and weighting of data; therefore they recommended explaining these in more detail.



Module 5: Data Dissemination

Overall, this module was evaluated as “very good” (48%) or “good” (49%) by the participants.[2] Most participants liked all parts of the module while others particularly appreciated the metadata and country data dissemination parts of the module. Participants suggested providing examples showing how countries disseminate their survey results.

[2] This module doesn’t include a group exercise.



6. Main findings and recommendations for future training courses

6.1 Content of the Course

Since most of the participants in this training course are statisticians or professionals who work with statistics on a daily basis, their focus is more on technical issues and on more complex statistical subjects, such as sample design and weighting.

6.2 Methodology

A number of participants found the group exercises and tests very useful; particularly in reinforcing their learning of the modules. They suggested having more time allocated to explaining modules 2, 3 and 4 and more examples and exercises on sampling design, sampling error and weight calculation. Some participants further suggested changing the group members for every exercise to learn more from experiences of other countries. It should be noted that during the training, the same group members were maintained but different group members reported on each group exercise.

Participants recommended including more hands-on examples on how the different parts of the survey design and implementation are carried out in countries and the use of a data set to conduct some exercises along the course. This would probably make them better understand the survey process of ICT statistics. This can be done using one country example, to be used for the whole course, highlighting the different stages of survey design, implementation and dissemination of results.

6.3 Final remarks

The delivery of the training is considered highly successful. The interest to collect, or expand the collection of, ICT statistics was high among the participants from the region. It is to be expected that several of the countries will be able to produce a number of the ICT core indicators in the near future. Some countries may request further technical assistance from ITU, for example in the preparation and design of their questionnaires. Countries also requested bringing the training to the Pacific countries where more countries with similar levels (both economic and NSO capacity) can participate and share experiences. They suggested conducting the training course in collaboration with the Secretariat of the Pacific Community (SPC).

The training course itself was appreciated highly. Since this was the first time[3] the course was delivered in the region, an important conclusion is that the course can be considered as a useful capacity building tool available for ICT data producers in developing countries. However, taking into account comments made by the trainer and participants, some adjustments will be made to improve the course material (presentation slides, tests, group exercises) and the delivery. Useful comments were also received from the instructor and participants concerning the Manual, which will be taken into consideration when revising it.

As a follow-up, it may be considered offering a refresher course for countries that participated in the training. This follow-up course could focus on countries that already started to collect ICT household data following the training, and could be used to share experiences. It could also be used to improve the delivery of similar trainings in the future and the training materials, including the manual.

[3] See footnote 1 for reference to the UNCTAD training course delivered in the region in 2008; http://new.unctad.org/templates/Event____887.aspx

Annex 1. Final Evaluation

QUESTION 1

Q1. Duration:	Number of answers	Percentage
Too Long	0	0%
Long enough	16	62%
Too short	10	38%

QUESTION 2

Q.2 Number of participants:	Number of answers	Percentage
Too high	2	8%
Adequate	24	92%
Too low	0	0%

QUESTION 3

Suggestions of change	Number of answers	Percentage
yes	15	58%
No	11	42%

QUESTION 4

Q4. Technical content	Number of answers	Percentage
Overall		
very good	7	28%
good	14	54%
adequate	4	14%
poor	0	0%
very poor	0	0%
No reply	1	4%
coverage of the topic		
very good	8	31%
good	15	58%
adequate	3	12%
poor	0	0%
very poor	0	0%
No reply	0	0%
technical level		
very good	8	31%
good	11	42%
adequate	6	23%
poor	0	0%
very poor	0	0%
No reply	1	4%

accuracy		
very good	6	23%
good	16	62%
adequate	2	8%
poor	0	0%
very poor	0	0%
No reply	2	8%

QUESTION 5

Q5. Organisation	Number of answers	Percentage
very good	14	54%
good	10	38%
adequate	2	8%
poor	0	0%
very poor	0	0%

QUESTION 6

Q6. Support material	Number of answers	Percentage
Overall		
very good	10	38%
good	14	52%
adequate	2	8%
poor	0	0%
very poor	0	0%
Manual		
very good	13	50%
good	12	46%
adequate	1	4%
poor	0	0%
very poor	0	0%
Slides		
very good	7	27%
good	15	58%
adequate	3	12%
poor	0	0%
very poor	0	0%
No reply	1	4%

QUESTION 7

Q7. Methodology	Number of answers	Percentage
very good	11	42%
good	12	46%
adequate	3	12%
poor	0	0%
very poor	0	0%
No reply	0	0%

AGENDA

Monday, 19 October 2009

8:45 - 9:00	Registration of participants
9:00 - 10:45	**Opening session** • Welcome (MICT Thailand, Rohan Samarajiva, LIRNEasia) • Measuring ICT for Development (Susan Teltscher, ITU) • ICT Statistics-An Indian perspective (Payal Malik, LIRNE*asia*)
10:45 - 11:00	*Break*
11:00 - 11:30	**Introduction to the course** • *Contents, objectives and methodology* • Presentation of instructor and participants
11:30 - 13:00	**Module H-1: Introduction to household ICT statistics. Survey planning and preparatory work**
13:00 - 14:00	*Lunch*
14:00 - 15:30	**Module H-1: Introduction to household ICT statistics. Survey planning and preparatory work (cont.)**
15:30 - 15:45	*Break*
15:45 - 17:00	**Module H-1: Introduction to household ICT statistics. Survey planning and preparatory work (cont.)**
17:00 - 17:30	Test and Evaluation

Tuesday, 20 October 2009

9:00 - 10:30	**Module H-2: Statistical standards and topics. Data sources and collection techniques**
10:30 - 10:45	*Break*
10:45 - 13:00	**Module H-2: Statistical standards and topics. Data sources and collection techniques (cont.)**
13:00 - 14:00	*Lunch*
14:00 - 15:30	**Module H-2: Statistical standards and topics. Data sources and collection techniques (cont.)**
15:30 - 15:45	*Break*
15:45 - 17:00	**Module H-2: Statistical standards and topics. Data sources and collection techniques (cont.)**
17:00 - 17:30	Test and evaluation

Wednesday, 21 October 2009

9:00 - 10:30	**Module H-3: Questionnaire design. Household Survey design**
10:30 - 10:45	*Break*
10:45 - 13:00	**Module H-3: Questionnaire design. Household Survey design (cont.)**
13:00 - 14:00	*Lunch*
14:00 - 15:30	**Module H-3: Questionnaire design. Household Survey design (cont.)**
15:30 - 15:45	*Break*
15:45 - 17:00	**Module H-3: Questionnaire design. Household Survey design (cont.)**
17:00 - 17:30	Test and evaluation

Thursday, 22 October 2009

9:00 - 10:30	**Module H-4: Data processing. Data quality and evaluation**
10:30 - 10:45	*Break*
10:45 - 13:00	**Module H-4: Data processing. Data quality and evaluation (cont.)**
13:00 - 14:00	*Lunch*
14:00 - 15:30	**Module H-4: Data processing. Data quality and evaluation (cont.)**
15:30 - 15:45	*Break*
15:45 - 17:00	**Module H-4: Data processing. Data quality and evaluation (cont.)**
17:00 - 17:30	Test and evaluation

Friday, 23 October 2009

9:00 - 10:30	**Module H-5: Data dissemination**
10:30 - 10:45	*Break*
10:45 - 12:30	**Module H-5: Data dissemination (cont)**
12:30 - 13:00	Test and evaluation
13:00 - 14:00	*Lunch*
14:00 - 15:00	**Final course evaluation and discussion**
15:00 - 16:00	**Closing remarks** **Handing out of Training Certificates**

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Workshop on Mobile Broadband Quality of Service Experience (QoSE) measuring approaches

Report Type: Workshop Report

*Date: 30 April 2009

*IDRC Project Number: 104918-001

*IDRC Project Title: Advancing evidence-based policymaking and regulation in the emerging Asia-Pacific to ensure greater participation in ICTs (Phase II)

Country/Region:* Sri Lanka

*Full Name of Research Institution: LIRNE*asia*

*Address of Research Institution: 12 Balcombe Place, Colombo 8, Sri Lanka

*This report is presented as received from project recipient(s). It has not been subjected to peer review or other review processes.

Workshop report:

Workshop on Mobile Broadband Quality of Service Experience (QoSE) measuring approaches

Colombo, Sri Lanka. 30 April 2009

Table of contents:

1.0 Background

LIRNEasia has been involved in Broadband QoSE1 research since 2007, but the focus so far has largely been on fixed broadband. In collaboration with a team headed by Professor Timothy Gonsalves of IIT Madras, LIRNEasia designed the Ashoka Tissa Broadband Quality of service methodology[2] in 2007 and have performed quality of testing ever since, in every six month interval[3].

However with the recent expansion of 3G networks, more and more consumers have tend to use the mobile phone not only for voice but more than voice activities such as web browsing, downloading music files, downloading wall papers and so on. This more than voice us of the mobile phone was seeing even among the bottom of the pyramid consumers[4].

Hence there was a need to monitor the quality of service experience in mobile broadband and thereby arose the need to develop a methodology that will suite an actual mobile broadband connection.

2.0 Workshop Objectives

This one day workshop was conducted at Taj Samudra, Colombo Sri Lanka with the focus to brainstorm a suitable methodology to test the quality of service experience of mobile broadband connections. The participants were expected to contribute using their past experience and knowledge and contribute in to the workshop. (See Annex 1 for the agenda)

They were also required to answer the following questions and take the discussion to an advance level.

<u>Key questions:</u>

1. From a quality perspective, is Mobile BB different from Fixed BB? If so how?
2. Should we focus on the same quality parameters as in the case of Fixed BB (throughput, latency and packet loss) or should we use a different set? For example, should we test throughput on the move and/or changing from one cell to another? Should such parameters specifically defined with related to Mobile BB? (eg RTT vs. Mobile RTT)

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[1] See http://en.wikipedia.org/wiki/Quality_of_service_experience for a definition.
[2] See http://www.lirneasia.net/wp-content/uploads/2008/03/broadband-quality-test-plan1.pdf for the methodology
[3] All the reports are published at http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/
[4] LIRNE*asia* Teleuse@BOP3 study http://lirneasia.net/projects/2008-2010/bop-teleuse-3/

3. Is Mobile BB quality technology-dependent to the extent that testing cannot be technology-neutral?
4. In Mobile BB, what should be tested – link from handset to operator or (as in case of Fixed BB) link to the cloud, or both?
5. Should testing be done using a handset? Can PC simulation be used?
6. Does the type of handset significantly affect the quality? (In Fixed BB testing we treat PCs as equivalent) If, so how do we take this factor into account? (NB: This point is different from 3)
7. Do we have any tools for Mobile BB testing? If yes, do they cover all aspects discussed above? If no, will it be feasible to develop a single universal tool?
8. How should the regulators ensure quality delivery? Should the process be different from that for Fixed BB?
9. Will users play the same vital role in Mobile BB testing, as in Fixed BB?
10. Should the advertising standards in Mobile BB differ from those in Fixed BB?

3.0 Participants

No	Name		Organization/Institute
1	Mr	Ahmed Majeed	Dhiraagu
2	Mr	Arif Sargana	Pakistan Telecommunication Authority
3	Dr	Arun Mehta	
4	Mr	Champika Munasinghe	Mobitel
5	Mr	Chandana Gunasekera	Mobitel
6	Mr	Chanuka Wattegama	LIRNEasia
7	Mr	Dananjaya Ponnamperuma	Mobitel
8	Dr	Dileeka Dias	University of Moratuwa
9	Mr	Hamidur Rashid	
10	Mr	Harsha Purasinghe	Microimage
11	Ms	Helani Galpaya	LIRNEasia
12	Mr	Heru Sutadi	Badan Regulasi Telekomunikasi Indonesia
13	Mr	Hussain Niyaz	Wataniya
14	Mr	Indrajith Samarajiva	Blogger
15	Mr	Kalinga Athulathmudali	Blogger
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22	Mr	Ramalingam Ragunathan	Midas
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25	Mr	Revantha Udugampola	Multi Service Networking
26	Mr	Robindra Mangtani	GSMA
27	Dr	Rohan Samarajiva	LIRNEasia
29	Mr	Ruwan Maldeniya	Tigo
31	Ms	Sulochana Sooriyaarachchi	University of Moratuwa
32	Mr	Suren Rupasinghe	Microimage
33	Dr	Timothy Gonsalves	IIT Madras
34	Ms	Zulaika Ibrahim	Telecommunications Authority of Maldives

4.0 Presentations and discussion

4.1 Panel 1 – Researches and advanced users

The researches and advanced users pointed out that the service providers are not using the technology that would allow them to use a better quality of service for the customers. They also indicated how the service providers use to deceive the customers by false advertising in the past. Advertising should be prompt, operator should advertise according to what they can supply, not the capacity of the technology. The user does not care the speed of the tower all they want to know is what they will be paying for. User requires knowing the exact number. It was also discussed that in fixed network minimum throughput can be ensured as characteristics of the connection do not change with time. In mobile it is hard to predict minimum broadband speed. Since all the characteristics of the connection method, change with the change in tower.

4.2 Panel 2 - Telecom Operators

They pointed out that there are few base stations with E1 and in order to upgrade you must know the customers and average units are statistical and depends on the place where testing. If it's a mobile broadband it means that we are using at Mobile. May not be like fixed line. So if he requires a non static broadband connectivity he can use the fixed line
Testing in Mobile broadband can be technology neutral. Fixed broadband can be comparable to Mobile though Mobile has some different issues as 80 percent of the quality issues are caused in the radio interface Therefore they recommended to test in many different locations.

It was also indicated that accessibility should be included in the QoSE.

4.3 Panel 3 – Regulators

Experience from Maldives, Pakistan and Indonesia was brought to the panel. They talked about their experience in Broadband quality of service and what they do in order to facilitate better connectivity.

4.4 Panel 4 – LIRNE*asia* project partners

The need to do a continuous moderating brought up in the discussion. It was also expressed the need to create a modal which gives useful information to be published simplified data and which will help the customer. Since it mobile QoSE it was shown the need to publish data in mobile.

Annexes

Annex 1

Time		Session Chair (Where applicable)	Speakers/Panelists
0815 - 0830	Registration		
0830 - 0845	Introductions and Comments from the Chair	Rohan Samarajiva	Rohan Samarajiva
0845 - 0915	Keynote Address		Robindra Mangtani, Technical Director, GSM Association
0915 - 1015	***Panel Discussion 1:*** Researchers and Advanced users	Chanuka Wattegama	Dileeka Dias, Nuwan Waidhyanatha, Kalinga Athulathmudali, Indrajith Samarajiva, Revantha Udugampola
1015 – 1045	Coffee Break		
1045-1215	***Panel Discussion 2:*** Telecom Operators	Dileeka Dias	Ranga Kariyawasam (Dialog), Dhananjaya Ponnamperuma (Mobitel), Ruwan Maldeniya (Tigo), Ahmed Majeed (Dhiraagu), Hussain Niyaz (Wataniya)

1215 – 1300	***Panel Discussion 3:*** Regulators	Helani Galpaya	Heru Sutadi (Indonesia), M Arif Sargana (Pakistan), Zulaika Ibrahim (Maldives)
1300 - 1400	Lunch		
1400 - 1530	***Panel Discussion 4:*** LIRNE*asia* project partners	Timothy Gonsalves	R. Thirumurthy, Shan Shanmugarajaha, Hamidur Rashid, Arun Mehta
1530 – 1600	Coffee Break		
1600 - 1700	Wrap-up	Helani Galpaya, Chanuka Wattegama	

Expert Forum on ICT Sector Indicators and Benchmark Regulation for SAARC Regulatory Authorities

14-15 June 2008

Changi Village Hotel
Singapore

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Conference on Infrastructure Regulation: What Works, Why, and How do we know?
26 – 27 February 2009, University of Hong Kong

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Conference on

Infrastructure Regulation: What Works, Why, and How do we know?

on 26 – 27 February 2009

in the Council Chambers, Meng Wah Complex.

Hosted by the Faculty of Social Sciences, The University of Hong Kong

Regulation of public infrastructure has been a hotly debated topic for more than a century. Yet we know little about what works and why despite tremendous advances in its design and enforcement. No less significantly, how do we know what works and what does not?

The conference will address the following questions: Does regulation work? What kind of regulation works? What kinds don't work? Why do some forms of regulation work and not others? How do we know whether they work or not? How do we isolate the effects of different political, economic and legal contexts? Are there systematic differences among water, telecommunications, and energy infrastructure that necessitate particular regulatory design?

Infrastructure industries are often natural monopolies or oligopolies. They touch on the lives of all citizens and thus pose vital challenges in ensuring fairness in access and price, irrespective of public or private ownership. They have a long history of regulations and thus offer an excellent opportunity for seeking answers to these questions.

The conference will bring together distinguished scholars and practitioner who are experts in the area to address essential issues in regulations through conceptual and empirical studies. The conference will be divided into a number of panels, each consisting of 3-4 papers.

CONFERENCE CHAIRS: M Ramesh (HKU) and Rohan Samarajiva (LIRNE*asia*)

ORGANIZING COMMITTEE: Eduardo Araral (NUS), Daryl Jarvis (NUS), M Ramesh (HKU), Rohan Samarajiva (LIRNE*asia*), and Wu Xun (NUS).

ORGANIZERS: Faculty of Social Sciences, University of Hong Kong; Institute of Water Policy, Lee Kuan Yew School of Public Policy, Singapore; LIRNE*asia,* Sri Lanka.

SPONSOR: International Development Research Centre (*IDRC*), *Canada.*

Conference on
"Infrastructure Regulation: What Works, Why, and How do we know?"
on 26 – 27 February 2009
in the Council Chambers, Meng Wah complex,
Faculty of Social Sciences, The University of Hong Kong.

PROGRAM

DAY 1	**February 26th, 2009**	
8:30-8:45	Registration	
0845-1015	Ian Holliday, Dean, Faculty of Social Sciences, HKU. Welcome Address M. Ramesh, Brief comments on objectives 1.0 Conceptual Issues in Regulation & Governance (Chair: Rohan Samarajiva) 1.1 Pradip Baijal (India) Keynote 1.2 M Ramesh (Hong Kong, SAR) and Eduardo Araral (Singapore). "The State, Market, and Regulations" 1.3 Daniel Diaz Fuentes (Spain), Judith Clifton Marcos Fernández & Julio Revuelta "Understanding consumer behaviour for better regulation"	
1015-1045	Break	Council Chambers Foyer
1045-1145	2.0 Approaches to Evaluation of Regulation (Chair: M. Ramesh) 2.1 Farid Gasmi (France) Paul Noumba & Laura Recuero Virto "Political accountability and regulatory performance in infrastructure industries: An empirical analysis" 2.2 Helani Galpaya (Sri Lanka) & Rohan Samarajiva "Perceptions of informed stakeholders to measure regulatory efficacy"	
1145-1235	3.0 Telecommunications (Chair: M.H. Au) 3.1 Chalita Srinuan (Sweden/Thailand), Pratompong Srinuan & Erik Bohlin "Does liberalization matter to the mobile telecommunication sector performance and investors? A case of listed companies across countries" 3.2 Chanuka Wattegama (Sri Lanka) and Nilusha Kapugama "Measuring regulatory efficacy by analyzing regulatory web sites"	
1235-1400	Lunch	

1400-1510	4.0 Electricity (Chair: Payal Malik) 4.1 Sunil Tankha (Netherlands) "Partial Privatisation and Nested Regulation: Feasible Alternatives to Orthodox Privatization and Regulation" 4.2 Rajesh Kumar (India) "Assessing Regulatory Performance: The Case of the Indian Power Sector" 4.3 Puree Sirasoontorn (Thailand) "Electricity Tariff Regulation in Thailand: Analyses and Applications of Incentive Regulation"	
1510-1530	Break	Council Chambers Foyer
1530-1645	5.0 Water 1 (Chair: Eduardo Araral) 5.2 Alberto Asquer (Italy) "Water Infrastructure Regulation in Italy: How Does it Work, Does it Work, and Why?" 5.3 Edouard Perard (France) "Private sector participation and regulatory reform in water supply: The southern Mediterranean experience" 5.4 Anja-Nadine Koenig (Kenya) "Evaluating regulatory systems: experience from the water sector in Kenya"	
1830-2100	Dinner	
DAY 2	**February 27th, 2009**	
0900-1005	6.0 Water 2 (Chair: Eduardo Araral) 6.1 Andy Whitford (USA), Helen Smith & Anant Mandawat "Disparities in Access to Clean Water and Sanitation: Institutional Causes" 6.2 Mariela Verónica Rocca (Argentina) "State regulation in the drinking water and sanitation services of Buenos Aires Metropolitan Area (1993-2006)" 6.3 David Ehrhardt (France), Nils Janssen & Nimisha Tailor "Can Regulation Improve the Performance of Government-Controlled Water Utilities?"	
1005-1030	Break	Council Chambers Foyer

1030-1140	7.0 Electricity 2 (Chair: Wu Xun) 7.1 Payal Malik (India), "Independent Regulation of Electricity Utilities in India: Constraints on Performance and the Achievements of the Delhi Regulatory Contract" 7.2 Rajendra Kumar (India) "Regulating the Independent Power Producers: Comparative Analysis of the Performances of Andhra Pradesh, Gujarat, and Tamil Nadu in India" 7.3 Junki Kim (South Korea) "The Electricity Industry Reform in Korea: Lessons for Further Liberalization"	
1140-1230	8.0 Regulatory Risks (Chair: M Ramesh) 8.1 Darryl Jarvis (Singapore) "Risk and Regulation: Institutional Processes and Political Risk in the Thai Energy Sector" 8.2 Eduardo Araral (Singapore) "The effects of price regulation on the performance of water utilities: Evidence from Asia"	
1230-1430	Lunch	
1430-1530	9.0 Panel Discussion by Practitioners (Chair: Rohan Samarajiva) 9.1 Y.K. Ha, Deputy Director General of Telecom, Hong Kong SAR China 9.2 Sudha Mahalingam, Member, Petroleum & Natural Gas Regulatory Board of India (TBC) 9.3 Direk Lavanasiri, Chairman of the Energy Regulatory Commission	
1530-1600	Break	Council Chambers Foyer
1600-1700	10.0 Conclusion and lesson-drawing (Coordinator: Ramesh) 10.1 Conclusions and lessons 10.2 Publication Plan	The Discussion will be led by the conference organizers: Rohan Samarajiva, Wu Xun, M Ramesh, Darryl Jarvis, and Eduardo Araral
	Dinner on your own	

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3 February 2009, National College of Public Administration and Governance, University of Philippines, Diliman, Manila

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+ About 25 students from the National College of Public Administration and Governance, University of Philippines also attended

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Infrastructure Regulation: What Works, Why, and how do we Know it? Lessons from Asia and Beyond

Writers Workshop 24 October 2009

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ใบลงชื่อผู้ร่วมการเสวนา **Thailand’s regulatory environment and spectrum challenges**

วัน จันทร์ ที่ 19 ตุลาคม2552 เวลา 14.00 น. – 16.00 น.

จัดโดย LIRNEasia, SriLanka, คณะนิเทศศาสตร์ จุฬาลงกรณ์ มหาวิทยาลัย และ บริษัท สยาม อินเทลลิเจนซ์ ยูนิต จำกัด

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ใบลงชื่อผู้ร่วมการเสวนา Thailand's regulatory environment and spectrum challeng

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ใบลงชื่อสื่อมวลชน (Press)

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Press Release

Not all Asian Telecom Regulators value the power of web

They spearhead perhaps the fastest growing industry at national level, not to mention the sector's increasing contribution to GDP, but surprisingly not even the Telecom Regulators of some Asia Pacific economies have recognised the power of web, as revealed by a website benchmarking survey conducted by LIRNEasia, a regional telecom policy and regulatory think tank.

Fifteen Asia and Pacific Telecom Regulator websites, out of 31 evaluated, have failed to score even half the marks for their performance, while 22 regulators not even having an electronic presence. Six Regulators seem to have thought having a local language version is adequate completely ignoring the possibility of foreign investors looking for information in their sites.

A Telecom Regulator, like any other government organization, uses its website not only to deliver citizen services but also to improve its transparency and effectiveness in regulatory functions. LIRNEasia's study awarded marks for each Regulatory Authority website for its effectiveness in regulatory communication. The Survey evaluated how well they achieve this objective looking from the angle of telecom operators, investors, consumers, researchers and the general public.

Not surprisingly Hong Kong, Singapore and Australia were the countries to have best Telecom Regulator sites. They were informative, user friendly and updated with information relevant not just for public but rest of the stakeholders. The best example is the website of the Office of Telecommunications Authority (OFTA) of Hong Kong, which under its 'Industry Focus' provides gamut of information for prospective investors such as mobile, fixed and broadband market information, licensing procedures, interconnection and Universal Service Obligation information. Infocomm Development Authority of Singapore, is another innovative site that presents which even performance rates of widely used broadband packages, something which will be extremely useful to a prospective user. Australian Communication and Media Authority website, though not limited to telecommunication, provides important information to investors and consumers.

However, some developing countries too are not that behind. Both India and Pakistan have scored more than 75% marks. Pakistan Telecommunication Authority (PTA) was the top in South Asia just behind more advanced counterparts, largely because it did not have a local version of a site which the researchers thought a must for Asian countries with only selected sections of their populations read English. Telecommunications Regulatory Authority of India (TRAI) in addition to losing marks for lack of local language version did not get the marks awarded for not using it as a tool for transparency – especially in procurement. The websites were given high marks if they were used to provide documentary information on deals at every stage.

In general the distribution of marks was an indication of the economic development and the Internet penetration, but there were clear exceptions. Website of the Telecommunications Regulatory Commission of Sri Lanka scored a bit higher marks than that of Commerce Commission in New Zealand that plays the role of Telecom Regulator among other things. Nepal Telecommunication Authority from a country with number of access paths (mobile

SIMs and fixed telephones) of 6.4 per a hundred in population scored more marks as National Telecommunication Commission of tech savvy Philippines, with access paths more than eight times higher.

However, some of the poorest performers were also the countries with least telecom penetration. Websites of Ministry of Posts and Telecommunications in Cambodia, Ministry of Communications, Posts and Telegraphs in Myanmar, Communications and Information Agency of Uzbekistan and Independent Consumer and Competition Commission of Papua New Guinea all representing countries with less than 10 access paths per every 100 on average basis, score less than 20 for their websites too. Perhaps the regulators might not have taken them too seriously because anyway the facilities for users to access them are low.

Not reviewing non-English websites is another limitation in this study. Many economies in Asia Pacific do not use English for their day-to- day activities. Depending on the needs, a regulator may choose not to have an English version of the website. Six economies namely Yemen, South Korea, Mongolia, Indonesia, Kuwait and China have been eliminated from the study for this reason.

This study has also shown an improvement from the previous one by LIRNEasia, which has been conducted in 2004, where only 33 Telecom Regulatory Authorities had websites . This time the number has increased to 37. However, only 31 of these have been evaluated for the lack of English version sites.

Press release:

Hong Kong Regulator tops the best Telecom Regulatory Authority sites

Office of Telecommunications Authority (OFTA) of Hong Kong had the web site that scored highest marks in a website benchmarking survey conducted by LIRNEasia, a regional telecom policy and regulatory think tank. The sites were benchmarked for their efficacy and regulatory communication. The Survey evaluated how well a telecom regulatory authority uses its website not only to deliver citizen services but also to improve its transparency and effectiveness in regulatory functions, looking from the angle of telecom operators, investors, consumers, researchers and the general public.

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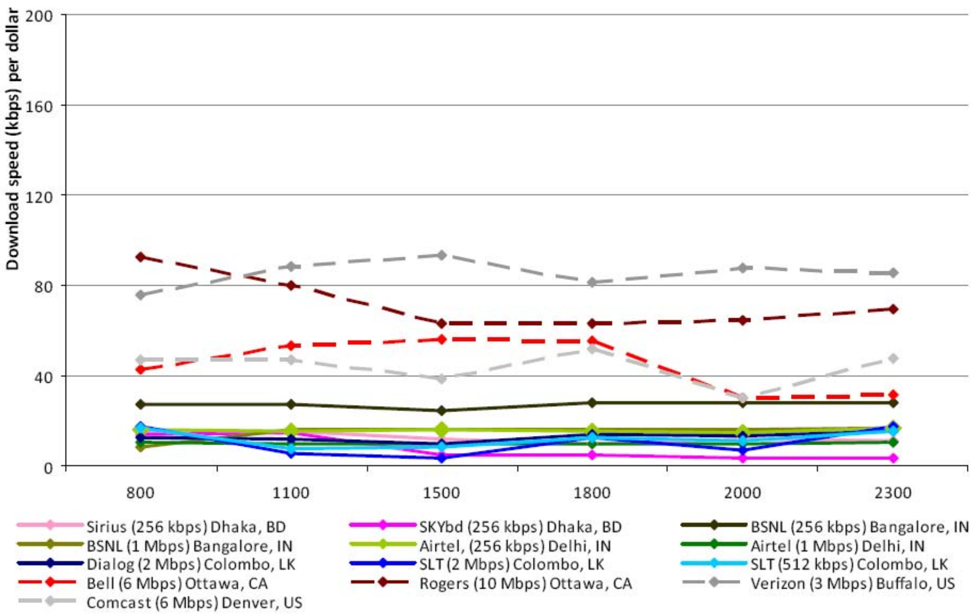
Press Release 4

South Asians receive less value for money in broadband quality, shows study

Despite the expanding markets and plummeting prices, when it comes to quality, what the South Asian broadband users receive is significantly less than what is enjoyed by their North American counterparts, a study by LIRNE*asia* an Asia based telecom policy think tank shows. It has come to this conclusion after comprehensively testing popular broadband packages in Indian metros New Delhi, Chennai and Bangalore with Bangladesh and Sri Lanka capitals. When compared with the test results of comparable broadband packages in USA (Buffalo and Denver) and Canada (Ottawa) the performance of the South Asian packages were seen significantly low.

While the four North American packages delivered between 40-100 kbps per US Dollar most of the times of the day when accessing an international server, none of the South Asian packages could deliver more than 30 kbps per Dollar at any time of the day under same conditions. The best was BSNL in Bangalore which maintained this limit consistently. The rest of the packages offered 20 kbps/Dollar throughout the day.

Figure 1: The speed for money each package/operator delivers



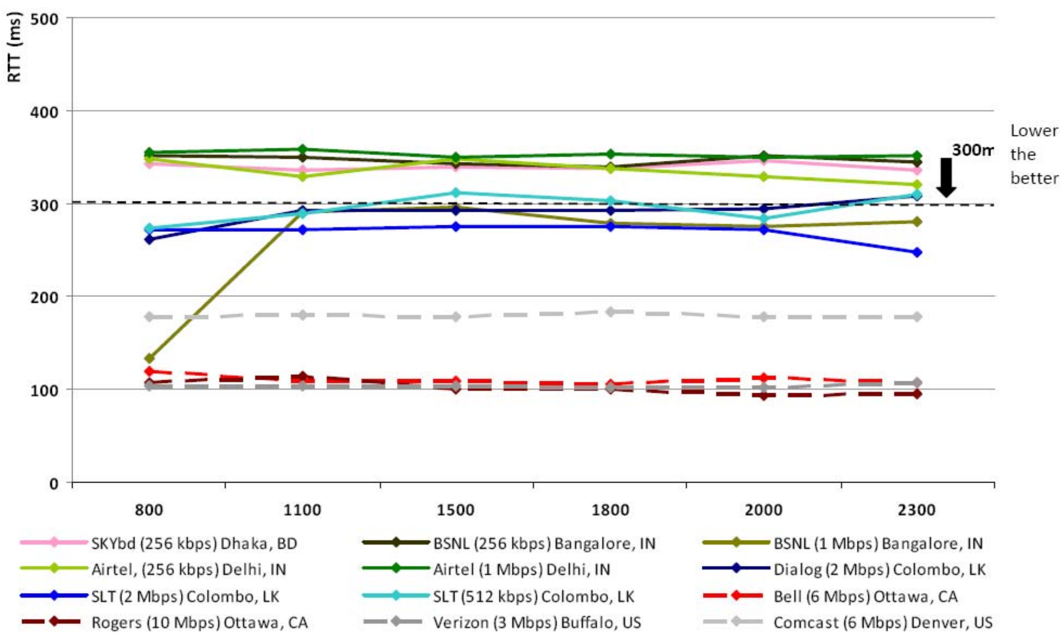
Source: LIRNEasia test results, Quarter 3, 2009

The probable reason may be because South Asia does not have the same infrastructure as in North America. Whatever limited infrastructure is available shared by a large number of users, thus reducing what each one receives. The regulators normally define the maximum number of simultaneous users an operator allows per link. India is the only country that specifies such ratio. In 2009 January LIRNE*asia* and the TeNeT Group recommended that the Telecommunication Regulatory Authority of India (TRAI) should adopt the same standards followed in UK by specifying 1:20 contention ratio for business connections and 1:50 for residential, but the adopted ratios were 1:30 (business) and 1:50 residential.

Another reason for South Asian users to receive less value for money is the pattern of server access. It has been observed that unlike users in countries like Japan and China, where users access local servers most of the time (for local language content), South Asians most of the time access USA or Europe based servers. This may be due to the relatively higher cost of website hosting in India compared to the US and Europe. As a result, even Indian sites are often hosted abroad. This clogs the international bandwidth, a rare and expensive commodity.

The issues in international bandwidth limitations are seen when the 'Round Trip time' for data packets were analysed. This is the time it takes for data packets to reach a destination server and return. While the four North American broadband packages tested reported round trip times to a server located in Europe varying from 100 milliseconds to 200 milliseconds, the packages from South Asia were above the ideal 300 millisecond limit.

Figure 2: Round Trip Time when accessing an international server



Source: LIRNEasia test results, Quarter 3, 2009

LIRNEasia with its partner organization- the Indian Institute of Technology, Madras, have been testing broadband quality since the beginning of 2008. The first tests were conducted manually. Later the test methodology was standardised and a software application was developed to get more accurate results.

A direct approach to monitor Quality of Service Experience (QoSE) would be for the regulator to reach deep into the innards of the telecom network to install monitoring equipment and take remedial actions as per the licenses or the governing statute whenever the data indicate below-standard performance, says LIRNEasia. Dearth of financial and human resources can be a key challenge for such an approach. The second approach is based largely on user activism. Educated users are expected to voluntarily contribute their time and computing resources towards building a performance database which in turn will be used in creating the bigger picture.

A comprehensive methodology to benchmark Broadband Quality of Service Experience (QoSE), based on the latter approach has been developed jointly by LIRNE*asia* and the TeNeT Group of the Indian Institute of Technology Madras (IIT-M). While there is no barrier for regulators to use it, the methodology is largely user centric. Instead of depending on one time pinging, this methodology uses AT-Tester, an open source software tool to monitor all crucial QoSE broadband metrics over a longer period, on both weekends and weekdays, covering peak as well as off-peak traffic. The traffic is also monitored within segments, ISP, local and international.

The methodology adapts the concept of Volunteer Computing (or Public Service Computing), where complex computing tasks are broken up into smaller chunks and are then run in the background of large numbers of computers of volunteers who are simultaneously engaged in other tasks. AT-Tester is installed in a large number of computers that are connected to the Internet and run in the background. The outcome is aggregated in real-time on a server and made available through the site www.broadbandasia.info. This approach would take the quality of the results to a whole different level, averaging out anomalies and allowing continuous coverage.

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Press Release -2

India broadband users face bottlenecks in accessing international servers

Broadband users in India should not be complacent if they find accessing a local server is fast enough. The bulk of the broadband quality issues happen only when accessing an international server. This is because of the serious capacity limitations in the links between western hemisphere and India, says LIRNEasia, an Asia Pacific telecom policy think tank releasing its test results of widely used broadband packages in India. LIRNEasia has jointly carried out these tests with TeNeT group of IIT Madras.

The situation in South Asia is different from many other parts of the world, say the researchers. For example, in the west and even in some Asian countries like Japan, Korea and China the users might be reaching national servers most of the time. A Japanese internet user has fewer reasons to visit an English content in a server based in USA. Chinese use social networking sites in Mandarin. However, users in India frequently visit servers based in North America and USA. Unfortunately this high demand is not supplemented with the supply in international links. That is why the users experience significant speed drops when reaching international servers, they claim further.

The tests have revealed that when tested, the same package offers very different speeds when reaching a local and an international server. This happens irrespective of the package type, operator and even with location. The same pattern is observed in all seven metros.

Jointly responding to a Telecommunication Regulatory Authority's (TRAI) consultation paper titled 'Bandwidth required for ISPs for better connectivity and improved Quality of Service, in January 2009 LIRNEasia and TeNeT Group of IIT Madras said that the broadband quality should be monitored not just in the 'last mile' – the segment between the user and the ISP, but extend at least up to the first entry point to USA or Europe. Maintaining adequate capacity in that segment too is the responsibility of the operator by purchasing enough. If the operators are held responsible for the performance in the last mile they may not invest in increasing the infrastructure requirements in the international links. The ultimate victims will be the users, they further argued.

To ensure adequate bandwidth for the users, LIRNEasia and TeNeT recommended adopting the same UK standards for contention ratios; 1:20 for business and 1:50 for residential. Contention ratio is the maximum limit a single link can be shared with simultaneous users. While it does not share the link proportionately between the users higher the number, lower the quality each user will experience. TRAI adopted the ratios 1:30 for business and 1:50 for residential.

LIRNEasia with its partner organization- the in Indian Institute of Technology, Madras, have been testing broadband quality since the beginning of 2008. The first tests were conducted manually. Later the test methodology was standardised and a software application was developed to get more accurate results.

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Press Release - 1

Speed is not everything; broadband users in India suffer even with 'fast' links

Many of the India broadband providers keep their promises delivering the advertised speeds to the users, but that per se is not a reason for celebration, says LIRNE*asia*, a telecom policy think tanks releasing the test results for popular broadband packages in India. LIRNE*asia* with the TeNeT Group, their research partners in IIT Madras, used the AT-Tester, an Open Source based application to test six different broadband quality parameters. The test results from several Indian metros for 2-3 packages from each location were analysed to see whether broadband quality is within the acceptable limits.

The issue is not just with the speed, say the researchers. It may be the most important and well know quality metric, but in addition to speed, a good broadband connection should maintain other metrics as well. Depending upon the application a drop in other metrics may result in the user not experiencing the anticipated quality.

One important metric, apart from download and upload speeds is 'Round Trip Time' (RTT) or Latency. Put simply, this is the time data packets take to reach a destination server and return. For example, if a user in India is accessing a server in the US, the data packets have to travel almost the distance around the world. This is a sub-second period, as the signals travel at the speed of light, but in communications even such a minute delay matters for the user's experience. It may not be visible in watching an online video clip (as the data is usually buffered) but for two-way interactive applications like Voice over IP (VoIP) maintaining RTT as low as possible is critical. Even for one-way applications such as browsing and streaming video, a high RTT limits the achievable download speed.

The Telecommunication Regulatory Authority of India (TRAI) had specified the maximum limits to be 120 milliseconds to reach any local server and return, and 350 (terrestrial link) and 800 (satellite link) milliseconds in case of an international server. It normally takes more when the communication is through a satellite link. This is best illustrated when a newsreader in a studio talks to a reporter half way around the world. The signal travels from the newsreader via communication satellite situated in geosynchronous orbit to the reporter and then goes all the way back to geosynchronous orbit and then to the studio, resulting in a journey of over one hundred thousand kilometers . This time lag is easily noticeable.

Despite that, LIRNE*asia* says India should adopt more stringent standards, followed by the Singapore regulator. All Singapore broadband providers are required to maintain Round Trip times of 85 millisecond locally and 300 milliseconds internationally, irrespective of the type of the link they use.

LIRNE*asia*'s test results show many Indian broadband providers could not maintain the 300 millisecond limit. On the other hand when the same application is used to test broadband links in North America, two Canadian packages and one USA package showed Return Trip times around 100 milliseconds when accessing a European server. The worst case scenario from North America was one USA operator delivering around 180 milliseconds, about half what India operators could achieve.

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A direct approach to monitor Quality of Service Experience (QoSE) would be for the regulator to reach deep into the innards of the telecom network to install monitoring equipment and take remedial actions as per the licenses or the governing statute whenever the data indicate below-standard performance, says LIRNEasia. Dearth of financial and human resources can be a key challenge for such an approach. The second approach is based largely on user activism. Educated users are expected to voluntarily contribute their time and computing resources towards building a performance database which in turn will be used in creating the bigger picture.

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The methodology adapts the concept of Volunteer Computing (or Public Service Computing), where complex computing tasks are broken up into smaller chunks and are then run in the background of large numbers of computers of volunteers who are simultaneously engaged in other tasks. AT-Tester is installed in a large number of computers that are connected to the Internet and run in the background. The outcome is aggregated in real-time on a server and made available through the site www.broadbandasia.info. This approach would take the quality of the results to a whole different level, averaging out anomalies and allowing continuous coverage.

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Press Release -3

India's Broadband Quality: Serious mismatches between advertised and delivered

There is little relation between the advertised broadband speed and actually delivered according to the findings of a research project jointly carried out by LIRNEasia, an Asia Pacific telecom policy think tank and TeNeT Group of IIT Madras. The actual speed, measured using an Open Source based software application named AT-Tester by the research team shows the advertised broadband speeds in India can rarely be helpful when selecting a broadband package.

In the South Asian context, it is usual for the operators to advertise for higher speed than they could offer, says the researcher. This has been observed in the testing done in Sri Lanka and Bangladesh. The Indian scenario is more complicated by the stipulation of Telecommunication Regulatory Authority of India to advertise the lowest speed instead of the highest. For example, a widely used series of broadband packages by BSNL, earlier advertised for 256kbps-2Mbps is now advertised for 256 kbps. The actual speeds vary within a large range.

The BSNL 256Kbps 'Limited' package, named so as it offers a cap for the downloadable quantity, mostly allows the user to achieve download speed of around 1 Mbps. A user familiar with the quality of service offered by this package, when converting to the *BSNL 256 kbps Unlimited* package to avoid high data transfer charges, will not able to enjoy the same download speed since the actual speed is around 256 kbps. This is not the fault of the operator but a complication that may arise based on wrong perceptions of a broadband user.

The research has also shown that among the six SAARC countries India offers the lowest prices for a 256 kbps broadband connection. The annual cost in February 2009 was USD 145, having dropped from USD 241 a year ago. Prices for the same in Pakistan are a bit more at USD 182. Nepal offers it for USD 225 and Sri Lanka USD 237. There is a general trend of decrease in prices in all these countries. This is most visible in the case of Bangladesh and Nepal that have experienced a drastic drop in prices, possibly with the rapid expansion of the infrastructure.

LIRNEasia, with its partner organization- Indian Institute of Technology, Madras, has been testing broadband quality since the beginning of 2008. The first tests were conducted manually. Later the test methodology was standardised and a software application was developed to get more accurate results.

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Options for lowering intra-SAARC international voice telephony tariffs

The South Asian Association for Regional Cooperation (SAARC) was created in 1985 to foster regional and economic cooperation within South Asia. It has made several attempts to improve connectivity within the region by actions including the lowering of telecommunication prices among member countries, but has met with little success so far.

In its most recent effort to reduce international call tariffs within the region, the Colombo Declaration of the 15th SAARC Summit (August 2008) points out in paragraph 6 that "a*n effective and economical regional tele-communication regime is an essential factor of connectivity, encouraging the growth of people-centric partnerships.*" The Declaration stresses "***the need for the Member States to endeavour to move towards a uniformly applicable low tariff, for international direct dial calls within the region***."[1]

A recent study on international call rates among the members of SAARC and the rest of the world shows that in most countries, calls to distant destinations (for example: US, UK, and Canada) are significantly cheaper than calls within the region. India, Pakistan and Sri Lanka have the lowest international prices, but not for SAARC destinations. Only Nepal's published rates to member countries are significantly lower than to non-member countries, while published rates from Afghanistan and Bangladesh are lower (not significantly) for Asia, including SAARC, than the rates to distant destinations.[2]

Why are international call rates high?

The cost of an international call is made up of three components: (a) cost from caller to international exchange; (b) cost of hauling the call from the international exchange of Country A (for example, from Sri Lanka) to a destination exchange in Country B (for example, to India); and (c) cost of terminating the call, i.e., cost of hauling the call from destination country's international exchange to the recipient's phone. While (a) is the cost of a local call (declining), and (b) is rapidly declining, especially on heavy-traffic routes, (c) is usually a monopolistically set price. The biggest factor influencing the cost of international calls is, therefore, the termination charge (c). Competition is also a key determinant. If there is little/no competition in the international-outgoing-call market, operators may maintain high margins even if termination charges are reduced.

Options for reducing international call prices

- *Option 1*

Order that all incoming international calls be charged the same termination charges as domestic calls.

- *Option 2*

What matters is that calls to SAARC countries should cost less than calls outside the SAARC. **The regulatory authority should simply issue a rule that per-minute tariffs for international calls to SAARC destinations (peak/off-peak) must be equal to or lower than tariffs to non-SAARC destinations.** It need not get involved in how an operator achieves this.

[1] http://www.slmfa.gov.lk/saarc/index.php?option=com_content&view=article&id=97:the-colombo-declaration

[2] Detailed information on intra-SAARC and extra-SAARC prices/minute is available at http://lirneasia.net/projects/benchmarks

If this is to be achieved on a sustainable basis (i.e., cost is below the retail price), it will be necessary for the operators to negotiate lower termination rates from their SAARC counterparts. If an operator provides evidence that the refusal of one or more SAARC operators to reduce termination charges to the necessary levels is making it impossible to reduce retail prices, that operator should be given a time-bound waiver from the rule. During that period, the relevant regulatory authority, with the assistance of the Foreign/External Affairs Ministry as required, should initiate discussions with the counterpart regulatory authority with jurisdiction over the offending operator on reducing the termination charges in order to implement SAARC policy. In the unlikely event that this proves impossible, the exemption should be extended and the matter referred to the SAARC Secretariat.

- *Option 3*

Each regulatory authority within the SAARC should issue an information request to all the operators authorized to provide international voice calls to supply detailed information on a per-minute basis of termination charges paid to all operators in all countries and all termination charges levied on incoming calls. **Based on this information, the regulatory authority can ensure that operators in SAARC countries are offered termination charges as low as any that are on offer.** The regulatory authority in each country can then ensure that retail prices of calls to SAARC countries are the lowest on offer.

Comparative assessment

Option 1 is a simple proposal that can be implemented quickly, but it is likely to be resisted at the outset by the operators and by those who believe in maximizing foreign-exchange earnings from international calls. It will, for example, not be consistent with Bangladesh's current international telephone policy. It is fully GATS compliant and has the advantage of ending the international bypass problem and shutting down the attendant inflow of black money.

Option 2 is superior to Option 3 because it is less intrusive and focuses on the desired end result, leaving the method by which it is achieved to the operators. Option 2 can be implemented very quickly. Option 3 will take a lot of doing because even in government-owned monopoly times, it was difficult to extract information on termination charges. It cannot achieve results quickly.

Conclusion

Achieving lower call rates within SAARC will have several positive outcomes: a) promoting the welfare of the people of South Asia by facilitating affordable communication, b) fostering business and economic partnerships within SAARC, c) building trust and understanding among the citizens of SAARC countries, and d) giving credibility to SAARC as a regional body capable of furthering regional and economic growth. Now that the resolution has been adopted, it is imperative that quick action is taken to implement it, yielding benefits to all stakeholders and improving the credibility of SAARC.

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International voice tariffs within SAARC: A cause for concern

The South Asian Association for Regional Cooperation (SAARC) was created in 1981 to foster regional and economic cooperation within South Asia. Citing inadequate telecom facilities between members as a hindrance to better economic cooperation, the body recognized communication as a key area of cooperation and devised a Plan of Action on Telecommunications in 1998 (and revised in 2004); the Plan detailed the requirements of reduced telecom tariffs, as well as the provision of roaming facilities with feasible charges between member countries.[1]

In a previous effort to ensure lower tariffs between the region, SAARC countries who were also members of the WTO entered an exception to the Most Favored Nation (MFN) principle in the General Agreement on Trade in Services in 1997, for "*different accounting rates for different neighbouring countries covered by Telecommunication Agreements entered into by [each SAARC country] with Governments of neighbouring countries [other SAARC countries]*."

These attempts indicate the commitment of SAARC to keep telecom tariffs between its members low. However, taking a closer look at the International Direct Dialing (IDD) rates between the member countries of SAARC and the rest of the world, from fixed and well as mobile phones (Annexes 1 and 2 respectively), it is found that the tariffs charged by operators in the region are inconsistent with the proposals above.

Of the eight member states, only Nepal provides calls to all other member countries at significantly lower rates than to non-member countries, while call rates from Afghanistan and Bangladesh are lower (not significantly) for all of Asia, including the countries of SAARC, than the rates charged for more distant destinations. The other four SAARC countries, on the other hand, provide cheaper calls to destinations further away (for example: US, UK, Canada, etc) than to their own neighbors.

This kind of pricing violates the General Agreement on Trade in Services and provides seemingly little benefit to member states in SAARC; it does not bode well considering SAARC's objectives to be an effective body for fostering regional cooperation and economic development. As such, it is imperative that the current tariff situation is rectified.

Taking the case of the European Union (EU) as a successful regional body, it is clear that member states enjoy several benefits, including limited travel restrictions in terms of visa requirements, and fairer communication costs within the region. While the EU is currently consulting on reducing termination rates,[2] the body has already implemented an effective policy on roaming among its members, leading to savings of up to 60 per cent for consumers using their mobile phones to roam within the EU.[3]

Recommendation

Using this model for communication as a benchmark, LIRNE*asia* proposes that immediate action is taken to lower IDD tariffs within the SAARC region.

In order to lower international call charges, LIRNE*asia* recommends that SAARC directs all regional regulatory authorities to reduce termination charges for SAARC originated international traffic,

[1] http://www.saarc-sec.org/main.php?t=2.3 and http://www.saarc-sec.org/main.php?t=2.3.10

[2] http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1016&format=HTML&aged=0&language=EN&guiLanguage=en

[3] http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/457&format=HTML&aged=0&language=EN&guiLanguage=en

ideally to domestic levels, and to exempt member countries from universal service levies where possible. This, however, poses a problem, for the reason that it violates the General Agreement on Trade in Services, by lowering termination prices and limiting the universal service levy to SAARC countries only, and there are two ways around this problem:

a. Charge domestic termination charges from all incoming international calls and exempt international calls from all levies. This will eliminate the bypass business at one stroke and end the corrosive effects of the black money it generates.

b. If that is too radical a move, the regulators can at least insist that operators from SAARC countries seeking to terminate traffic in other SAARC countries must be offered the lowest termination charges on offer. This will not bring down intra-SAARC call charges to domestic levels except perhaps in the case of calls to Pakistan, but it will at least eliminate the current SAARC surcharges.

Where there is a lack of competition (all except Pakistan, India and Sri Lanka), LIRNE*asia* is of the view that it will be necessary to compel operators to pass on the savings from lowered termination charges to their customers.

Conclusion

Achieving lower call rates within SAARC will have several positive outcomes: a) promoting the welfare of the people of South Asia by facilitating affordable communication, b) fostering business and economic partnerships, and c) giving credibility to SAARC as a regional body capable of furthering regional and economic growth. It is clear that bringing down international call charges within the region is one of importance and requires the commitment of multiple stakeholders including SAARC, who as the body for economic and regional development has the largest role to play in this regard. As a first step, the recommendations made here can be taken up for discussion at the forthcoming SAARC Summit in Colombo.