

India 2009 - 2014: Broadband Roadmap for Inclusive Growth

September 2009

Accelerating Inclusive, Equitable and
Sustainable Growth of India through
Ubiquitous Broadband

VISION, STRATEGIES AND RECOMMENDED ACTIONS



Confederation of
Indian Industry



FOREWORD



New dimensions of ongoing Digital Revolution is evolving year-by-year, which is enabling an abundance of information to move faster, cheaper, in more intelligible forms, in more directions, and across borders of every kind. The case for broadband has already been established with surveys expounding the benefits of a networked and a connected economy.

In the field of communications, Broadband will play a critical role in our quest to transform India into a developed country. Few would have anticipated the deep changes in our society that the mobile and internet revolution has ushered in.

At CII, our efforts are directed towards harnessing and leveraging the power of technology to change communication, business and business procedures, connect knowledge to procedures and hence, impact profits and the lives of common citizens for the better. CII catalyses change by working closely with government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialised services and global linkages. CII's key endeavor is to support the government in the second phase of Bharat Nirman. The progressive policies that have been announced in this regard will certainly propel rural growth by harnessing the benefits of digital technology. The all pervasive broadband will act as the backbone connecting the whole country across the geographical, social and economic divide.

Keeping the above scenario in view the Confederation of Indian Industry has come up with the report - "*India 2009-2014: Broadband Roadmap for Inclusive Growth*", which is an effort to showcase the challenges and opportunities identified in supporting equitable and sustainable proliferation of Broadband. This report is a roadmap for accelerating inclusive, equitable and sustainable growth of India through ubiquitous broadband. It highlights the challenges on the supply side and demand side that need to be addressed by the industry and the government. It also scopes out the funds required to fuel the growth of Broadband in the country, highlights International Success Stories and puts forth key recommendations made towards propelling the growth of broadband in India. This study is an extension to the study carried out by CII in 2004 and delves into the progress made since then and the existing need gaps.

This Study has come out after conducting detailed analysis of in depth discussions with industry, government, and regulatory bodies. I thank all respondents for this survey for their inputs which will help to shape and guide the efforts of business, government and civil society in creating India's digital future.

A handwritten signature in black ink, appearing to read 'Banerjee'.

Chandrajit Banerjee
Director General
Confederation of Indian Industry (CII)



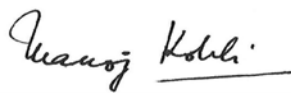
MESSAGE FROM CHAIRMAN

The eyes of the world are focused on India, which has seen unprecedented transformation in the Telecom Sector. This has primarily been achieved through consistent reforms, several innovative policies and vision of all the stakeholders involved. Taking this further, Government is on the verge of rolling out 3G and BWA spectrum that shall boost new investment and will further revolutionize the telecom services landscape in India. In order to leverage the large opportunities and to bring the envisioned development and emancipation of the country, the creation of a **National Digital Expressway of Broadband** needs immediate focus.

Broadband services not only play a principal role in the economic growth of a country, but also act as pillars of developmental infrastructure. It is imperative to note that several Asian economies including Malaysia, Korea and Hong Kong have benefited from Broadband proliferation where Government had shown strong will in creating digital infrastructure. This study “**India 2009-2014: Broadband Roadmap for Inclusive Growth**”, is an effort to showcase the challenges and opportunities to support equitable and sustainable proliferation of Broadband in India.

The Study presents a strong case for Government intervention in Broadband growth and also makes specific recommendations for all the key stakeholders. These steps are expected to bring down the cost of broadband considerably and result in equitable and inclusive growth – touching lives of over one-fourth rural citizens of India. Successful achievement of the target will culminate in 695 mn broadband users which include 309 million users in rural India.

The Government and the Industry should strive to work more closely than ever towards achievement of **Broadband Vision 2014**. In this context, it is a well researched position that aims at not only filling this gap but also suggests a way to jumpstart the India broadband story.

A handwritten signature in black ink that reads "Manoj Kohli". The signature is written in a cursive style and is positioned above a horizontal line.

Manoj Kohli
Chairman

CII National Committee on Telecom and Broadband

ACKNOWLEDGEMENTS:

We would like to express our appreciation for the valuable inputs and cooperation received from core group members that include Mr Narender Gupta, Mr. Saurabh Goel, Mr. Tarun Chitkara (Bharti Airtel); Mr. Harish Krishnan, Dr. Robert Pepper (CISCO); Mr Chetan Krishnaswamy (Dell); Mr P Ravindranath (while at HP); Mr. R Sivakumar, Mr Rahul Bedi, Ms. Valsa Williams, Mr Subodh Deshpande, (Intel); Mr. Deepak Maheshwari, Mr Ravi Garg, Mr Pankaj Ukey (Microsoft) and; Mr David Appasamy, (Sify). Various subject matter experts came forward and expressed their support for this study by giving key inputs and recommendations. We are grateful for their support and as a token of appreciation, have enclosed the list of dignitaries who contributed to this report.

This report would not have been possible without the valuable inputs of Mr. Harish Krishnan - spearheading the CII Telecom Sub Committee on Broadband, Ms. Suparna Pandhi Sr. Director & Head, Services Division and Ms. Arunima Sharma, Deputy Director, ICT, CII.

This report was prepared by a team from the eTech Group, IMRB International led by T.S. Mohan Krishnan and consisted of Deepak Halan, Amit Sharma, Jaya Vasisht, Dhairya Shah and Ayan Roy Choudhary.

Disclaimer: The study is prepared by IMRB for the Confederation of Indian Industry (CII). We acknowledge the comments and suggestions received from CII's core group on Broadband penetration. This study is the outcome of numerous discussions held with various people covering industry, academics, practitioners, policy makers, etc. The names of specific individuals are listed at the end of the report. Data from varied sources has been used in this report. While we do not take responsibility for authenticity of information from sources other than our primary research, all opinions and interpretations are the authors' responsibility.

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EXECUTIVE SUMMARY

“Investment in knowledge and in knowledge tools is going to be the key success factor for individuals or regions or nations”

- Hon’ble Prime Minister Dr. Manmohan Singh

Broadband in India – At the CROSSROADS

India has less than 1 broadband connection per 100 inhabitants with a mere 6.8 million connections in August 2009. Among BRIC nations, India lags behind both Brazil and China in terms of number of broadband connections as well as per capita penetrations.

India is far behind the national broadband target of 20 million connections by 2010 set to be achieved by the Indian government in its Broadband Policy 2004. If we continue at current pace of growth, this target may be achieved only by 2014. Hence, it is important that the growth in connections is tracked on a regular basis as broadband is increasingly becoming a key indicator of national economic well-being.

Why is Broadband availability crucial for the country?

With growing importance of knowledge and services in today’s globalizing economies across the world, broadband penetration has become a mandatory infrastructure condition that aids economic growth. Countries like Korea and Hong Kong (China) have benefitted by growth in Internet and Broadband.

Broadband penetration has a direct positive impact on growth in GDP as it enables efficient functioning of services across businesses and provides opportunities for employment. For example it is estimated, 40 - 50% of PDS food grains in India do not reach the intended citizens. Broadband will enable a more efficient food supply chain saving millions of tonnes of food grain wasted every year. In India, there are 110 million people who need some degree of training to become employable. Higher Broadband penetration would help create jobs for 21 million citizens in rural India in the next five years. Moreover, with broadband as a vehicle for knowledge, the government can fire the entrepreneur spirit in the lower strata of the society and improve their quality of life.

Also, in rural India alone, telemedicine will reduce GHG emissions by 0.28 mn MT by 2014. If a village has telemedicine facility, then its residents do not need to travel to the nearest hospital for consulting a doctor on their health diagnostic reports. The consolidated impact of lesser usage of vehicles (that emit GHG) means a reduction in the total GHG emissions.

Broadband enables access to a wide variety of applications such as e-governance, tele-medicine, education and many more.

The Broadband vision for India in the next 5 years – 214 million by 2014 to impact 695 million citizens

India was a Global Knowledge Economy in history, and today has the required potential to again become a global knowledge economy. The adequate broadband penetration level can enable India to use its potential to once again become the Global Knowledge Economy. Based on detailed analysis of demand side opportunities, a very ambitious target of 214 million broadband connections by 2014 is proposed - a 30 fold increase from the current level (~7 mn). This translates to 695 million connected Indians by 2014 allowing an equitable and inclusive growth in both urban (386 mn users) and rural (309 mn users) India. Our vision assumes greater focus on user concentrated touch points like educational institutions, public access points like CSCs, public healthcare centres although households and businesses will continue to be a significant contributor to volume.

Entities	Projected entities in 2014	Broadband Connections	Users Touched	Broadband connection-User ratio*
Households	248 mn	170 mn	186 mn	1: 1.1
MSMEs	8.91 mn	34 mn	76 mn	1: 2.4
Educational institutes & teachers	8.72 mn	9 mn	333 mn	1: 37 (students) 1:1 (teachers)
Public Access-CSC, cyber cafes, PHCs, Panchayat	1.5 mn	1.5 mn	100 mn	1:67
Total	267 mn	214 mn	695 mn	1: 3.25

*Note: BB Connection user ratio – e.g. 1:67 means that each public access connection will touch 67 unique users.

Achievement of the vision of subscriber connections and users reached will address significant challenges faced by India with respect to Education, Health, Agriculture and Governance. Just as telecom growth was heralded through PCOs, public shared access through CSCs and Cyber cafes will allow faster adoption of broadband especially in rural India. Thus, without diminishing the importance of broadband connection growth, the number of broadband users added every year is a preferable parameter for periodically tracking real broadband growth in a country like ours.

Broadband penetration will enable efficient delivery of programmes of various ministries and departments of central and state governments. Hence its adoption should be made part of budgetary allocation process. In this context, Indian economy could significantly benefit from the development of a forward-looking, technology neutral and convergence-aware Information & Communication Technology (ICT) Policy which integrates the IT, Internet and Telecom policy domains in the emerging convergence era.

Broadband penetration will also have a huge impact on job creation, innovation and growth of the Micro, Small & Medium Enterprises (MSME) sector.

Accelerated broadband impetus by government can significantly improve quality of life – particularly in rural India

Across the world, it is a recognized fact that governments have the biggest role in accelerating broadband use especially among less dense and lower economic strata to reduce the digital divide. There are only 3.3 million active internet users in rural India constituting 9% of the total 36 million active internet users in India. Public shared access via focused channels such as schools, CSCs etc is the way forward for providing a multiplier effect in rural areas since few rural citizens can afford a device and broadband connection. The government should ensure presence of a CSC in each of the approximately 600,000 villages being provided with high speed backhaul by 2014. Rural citizens require high speed applications (telemedicine, e-education) the most but have low affordability. Thus, the vision provided aims at catalyzing the process of bridging India's Digital Divide by enabling rural citizens to be a part of the high bandwidth digital highway.

- **Education:** The focus is increasingly shifting to quality of education even as the country aims to grow the enrollment and infrastructural facilities. While IT will never be able to replace teachers, it is a powerful supplement to the teachers and enhances their reach. Today, only about 10% of schools have personal computers and penetration of broadband is almost non-existent. India should connect all 1.72 million schools and all colleges with broadband by year 2014. Also, it should ensure that each institute has a computer lab with at least 1 computing device per 40 students. This will enable 326 million students to access broadband effectively. By 2014, it is estimated that there will be 7 million government school teachers in India. They should be provided with a laptop and a broadband connection. This will enable efficient and cost-effective educational and administrative knowledge transfer.
- **Health:** Currently, half of rural Indian households do not have access to proper and affordable primary healthcare. There is a need to incorporate Telemedicine as part of National Rural Health Mission (NHRM). By 2014, with increase in the number of Public Health Centers (PHCs) to 50,000 and Community Health Centers (CHCs) to 6,000, these need to be provided with high speed broadband connectivity and telemedicine facilities. Providing all doctors and paramedical personnel associated with these centres with a laptop and broadband connection will enable efficient and cost-effective administrative and medical knowledge transfer. This will enable affordable healthcare to reach 168 million rural households.
- **Agriculture:** Government should also enable its farmers to access timely information on agricultural practices including weather information as well as access to markets for their produce. Provision of broadband infrastructure will

enable easy flow of such high bandwidth hungry applications. Some other recommendations are - provide subsidized low cost access devices and applications to farmers by utilizing USO fund and allocate at least 5% of the agricultural budget towards developing ICT applications.

- **eGovernance:** Government of India has taken a significant step by launching Mission Mode Projects (MMPs) in May 2006 with the objective of web enabled delivery of services. 20 Mission Mode Projects (MMPs) have been approved out of the 27 MMPs under NeGP. Execution of the of all mission mode projects in a time bound manner would be key to make broadband more relevant for the common man. The SWAN scheme is vital to create a secure close user group (CUG) government network for the purpose of delivering G2G and G2C services. It is fully implemented in only 7 states so far. Hence there is a need to expedite work on the implementation side.
- **Anchor programs:** The National ID card project (UID) and a SPV (Special Purpose Vehicle) to provide back-end services to the large network of 1,00,000 Common Service Centers (CSCs) and the recent announcement to expand broadband coverage to connect every panchayat to a broadband network by means of the CSC Scheme in three years are some recent examples of governments resolve to reach its citizen through digital networks.

Broadband as a catalyst for entrepreneurship

By 2014, 6.66 million of the total 8.91 million Micro Small & Medium Enterprises (MSMEs) may still not have broadband connection going by current speed of growth of PC and broadband proliferation. Information and Communication Technology (ICT) can immensely improve the efficiency of MSMEs. In order to encourage usage of ICT in MSME, government should provide 100% depreciation to be given on all IT hardware investments to firms. A tax free PC rental and free broadband trial for 3 months at an investment of Rs. 8 billion could also be considered if found feasible.

Cyber cafes are both business enterprises as well as point of internet access for 37% of all users. They have decreased from 190,000 to 166,000 in the last one year. Some of the answers to the question 'How can we improve the situation of cyber cafes?' are to relax laws to enable them to flourish; promote them as multipurpose centre points with additional facilities such as telephony, ticketing etc and encourage PPP initiatives required to provide subsidized PCs and broadband connection.

Industry players in broadband ecosystem need to work in concert

Innovation through private entrepreneurship will be critical to sustain investment in broadband infrastructure. Some of the key actions for the industry include:

- Developing innovative bundled offers to drive down prices and thereby improving affordability of access devices and broadband connectivity to the common man.
- Providing secure, high speed and reliable broadband connectivity with high QoS standard will be necessary to improve desirability of a wide range of services on broadband network.
- Supporting development of a vibrant market for innovative content in various Indian languages to spur young and budding talent to take advantage of the low cost reach of Internet.
- Providing content targeted at rural markets will be critical to support government programmes. These need to be focused on education, healthcare, information, communication and entertainment needs keeping in mind the heterogeneous nature of Indian rural market.

Key Recommendations Snapshot

Government

- Develop a comprehensive ICT policy encompassing this vision through the programmes of various central and state government departments
- USO body to be given the responsibility of laying down high speed Fiber To The Kerb (FTTK) infrastructure to connect all villages and small towns. Estimated cost-Rs.180 billion to Rs. 360 billion depending on whether aerial or underground.
- Need to develop a comprehensive spectrum policy with short, medium & long term plans.
- 20 MMPs approved, need to expedite implementation of remaining 7
- Empower 326 million students and 7 million teachers with broadband enabled computers and thus higher quality education
- Empower 50,000 PHCs and 6,000 CHCs with broadband access to improve access to affordable and effective primary healthcare
- Provide tax rebates for broadband access and purchase / rental of access device by customers across all segments, including MSME.
 - Tax rebate should be provided to consumers for buying computer (say, up to Rs. 50,000/- in a block of 3 years).
 - Tax rebate for Internet & broadband access to consumers up to a sum of Rs. 1000/- per month.
- Allow 100% depreciation on capital expenditure on Information Technology & Telecommunication equipment.

Industry

- There are 16.45 million unutilized DSL capable wireline connections - use innovative bundling to increase broadband penetration
- Provide secure, high speed and reliable broadband connectivity with high QoS to improve desirability of a wide range of services on broadband network
- Develop content related to education, healthcare etc for rural markets to support government programmes.

Looking ahead to 2014, we can definitely achieve our vision, if we put in the required efforts. The government's clear vision and actions have helped transform the Information & Communication Technology (ICT) sector in India in recent past and has brought India on a global map. The need of the hour is an integrated and comprehensive blend of regulatory, fiscal and technology policies which will further help achieve an inclusive, equitable and sustainable growth of India through ubiquitous Broadband.

Investing in Optical fiber (FTTK) Infrastructure

Wireline infrastructure availability in India is lagging both at the backhaul as well last mile levels. However, the significant challenge is to first leverage the existing infrastructure to deploy broadband. In all, there are 16.45 million unutilized DSL capable wireline connections which are now reaching households and enterprise segment

The need is to provide a high speed, secure and pervasive network across the country. The solution lies in providing autonomy to the USO Fund administrator for using the fund towards creation of broadband infrastructure to be made sharable amongst all players in an equitable manner. As per Department of Telecom, the USOF has about Rs 176 billion in undistributed funds as of April 2009. It is recommended that the USO fund be invested in accelerating the creation of high capacity symmetric, ubiquitous and secure broadband infrastructure, i.e a ‘Content Delivery Network’ across the country using appropriate technologies – including but not limited to optical fiber, wireless, radio, satellite etc., depending on terrain involved.

The existing fiber infrastructure is highly inadequate to connect villages in rural India and even many small towns in urban India. The USO body should be given the responsibility of laying down high speed Fiber To The Kerb (FTTK) infrastructure across the country. It is estimated to cost around Rs. 180 billion to Rs. 360 billion depending on whether aerial or underground route is chosen. This will give India the much needed high speed, secure and pervasive network for delivery of broadband. FTTK infrastructure will bring down cost of broadband considerably and result in equitable and inclusive growth benefiting lives of 37% of all rural citizens by 2014.

There is also a need to provide a single-window clearance for laying telecom infrastructure and work towards lowering the taxes for towers and digging.

The declining trend in fixed line subscriber base is worrisome and needs urgent focus to revive demand and fulfillment of terrestrial lines.

Leverage the Wireless spectrum

- Every country has the same amount of radio spectrum and while traditionally certain key Government users were allocated large swathes of spectrum, considering that wireless is a fast and cheap way to extend access to people all over and especially in the rural and remote areas, it is imperative that we take a holistic look at how this precious and natural resource is used for the maximum benefit to the public at large.
- There is an urgent need to develop a comprehensive spectrum policy with short term, medium and long term plans for re-farming of required frequency bands. With full fledged launch of 3G and BWA services, wireless broadband holds immense potential given the high penetration of mobile phones and mobile

internet devices that are on the anvil. India needs to free more and more spectrum for broadband and allocate it in a time bound manner. As another report of CII on spectrum goes into detail on Spectrum, it has not been covered in more detail.

- Specific spectrum bands remain unutilized or underutilized almost everywhere and at the same time, there are opportunities for refarming through harmonization and also vacating spectrum from various other users as they can shift to newer technologies- including digital radio and terrestrial fiber. Part of the money raised through commercial usage of spectrum must be set aside for accelerating such endeavors.
- Sharing of passive as well as active infrastructure and better economic benefits to providers are essential for rural growth. Moreover, the power deficit in the country is a major challenge which impacts the performance.
- Spectrum charges must be commensurate with the demographics (population density, etc.) and the stage of economic development (per capita income, etc.) of the respective regions lest it should not become a deterrent.

Challenges on the demand side

A key barrier amongst households, both urban and rural, is the low penetration of broadband (<3%). PC literacy is also a major challenge in rural areas - only 3% of the total rural population is PC literate. With few relevant B2C and G2C services in the desired vernacular language and the depleting number of cyber cafes, accelerating growth of broadband is clearly an uphill task. The need of the hour is to develop smart connected communities that enable all stakeholders to share information and collaborate through technology and built up physical structure security. A pervasive network would enable citizens to benefit from a number of useful applications since the incremental cost of adding applications will be marginal and provide transformational changes to citizen service.

From the perspective of demand generation, government could set targets on bandwidth speed and price (affordability) per Mbps as specific benchmarks to be monitored and met over a period of time. It is felt that at least 50% connections should be 2 Mbps and above by the year 2014. This will enable critical applications (like telemedicine, e-education etc.,) that are also bandwidth hungry to be deployed to needy population.

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Chapter 1

1 Broadband Status: Where is India today?

Over the last few years, the number of broadband subscribers in India has shown a steady increase growing to over 6.8 million in August 2009. The proportion of broadband subscribers amongst a base of internet subscribers has grown from a mere 3% in March 2005 to over 40% in September 2008. However, the growth rate is still too low to enable India to meet the broadband target of 20 million by 2010 set by Government of India in its Broadband Policy 2004.

Currently, households in India have a broadband penetration of mere 2.6%. Moreover, this pertains only to urban India since there is almost a zero percent penetration in rural households. As per ICube 2008 (an annual syndicated research conducted by IMRB International), rural India had only 3.3 million active internet users which means that only 1% of the total rural population of India was accessing the internet.

Efforts have been made by the Government over the past few years towards creation of relevant content so that the internet can benefit more people in their daily lives. The efforts have largely been in the fields of governance, health and education. Awareness programs by the Government and PPP initiatives like the Computer Education Initiative has made citizens more aware about computer and broadband usage.

This section delves deeper into the current broadband status in India and also aims to benchmark India against rest of the world. The key challenges leading to demand and supply side constraints which result in abysmally low broadband penetration in the country is also highlighted.

1.1 India's Internet/ Broadband Report Card

Exhibit 1: Internet/ Broadband Report Card

Information area	Period	Data
Claimed Internet users*	Mar, 08	50 mn
Active Internet users#	Mar, 08	36 mn
Number of broadband subscribers	Dec, 08 (Aug, 09)	5.52 mn (6.8 mn)
Broadband subscribers/ 100 people (Based on population of July 2008)	Dec, 08 (Mar, 09)	0.48 (0.54)
Net increase in broadband users per 100 people	Dec, 07 to Dec, 08	0.19
% age of rural households with broadband	Dec, 08	Negligible
%age of Urban Households:		
- with ownership of computer	Dec, 08	10.4%
- with internet access		6.5%
- with broadband		2.6%
%age of Businesses (who at least have a landline)		
- with ownership of computers	Dec, 08	40.5%
- with internet access		28.4%
- with broadband		17.6%
% broadband subscribers who have speed of 2 Mbps or more	Dec, 08	3.7%
Bandwidth price per month DSL (1 Mbps)	Dec, 08	Rs 1650
Bandwidth price per month Wireless (1 Mbps)	Dec, 08	Rs 2500
% of 100,000 proposed CSCs rolled out	Dec, 08	25%

Source: TRAI, Gol, IMRB Databases, price info on ISP websites

* A claimed user is defined as the one who claims to have ever used Internet

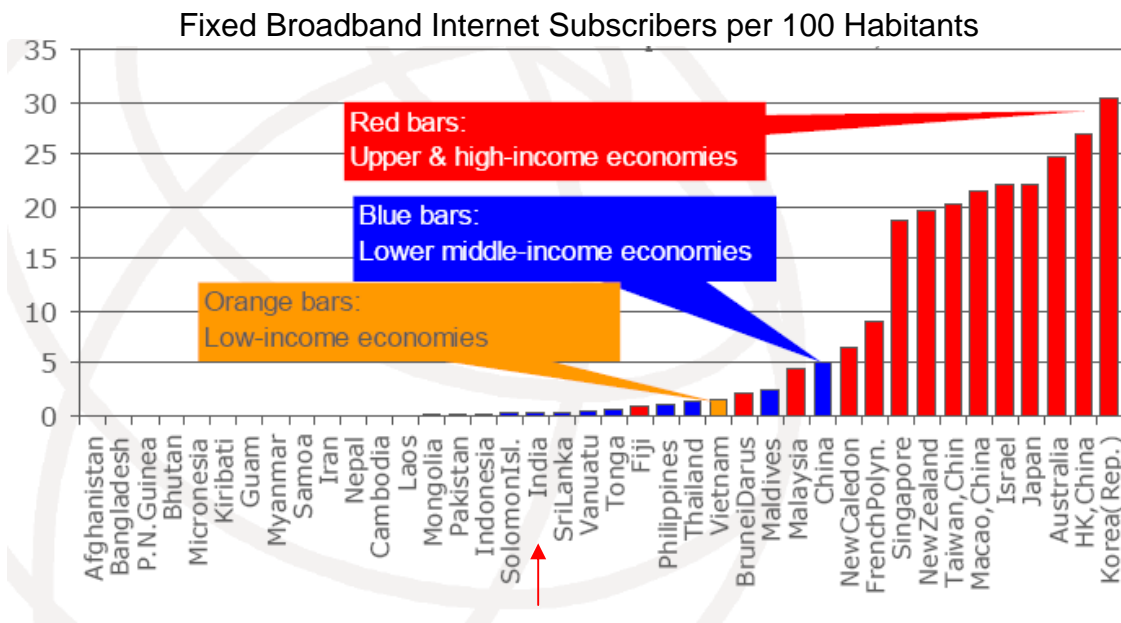
Active Internet Users are defined as those who have accessed Internet at least once in the last one month

Exhibit 1 proves that India is way behind on almost all parameters. India is behind the target set in 2004, low on penetration in households and businesses, low on speed of connection and high on price per bit of data transferred.

1.2 The Great Broadband Chasm: India behind rest of the world

India is a lower middle income economy with an average per capita income of Rs 38,084 (2008-09). Given the investment required for a broadband device and connection, few people are able to afford them. The exhibit in subsequent page highlights broadband penetration in India vis-à-vis other major countries.

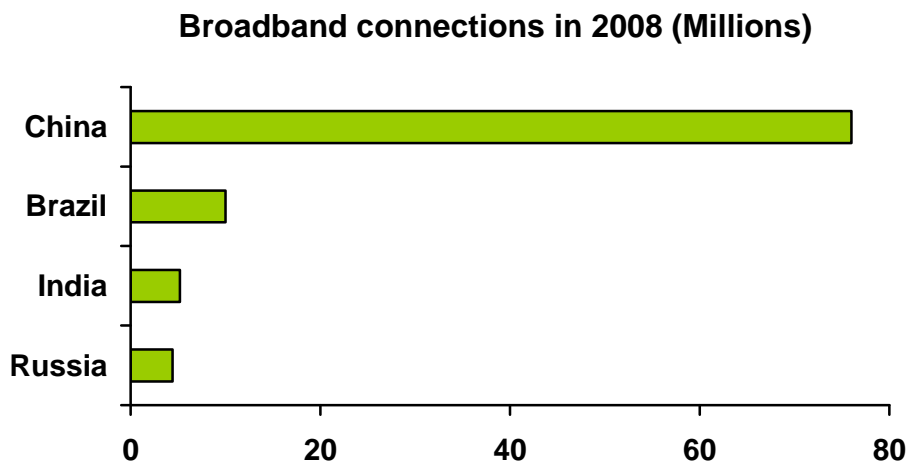
Exhibit 2: Cross country analysis: Broadband subscribers (Oct 2008)



Source: ITU World Telecommunication – Oct 2008

India continues to lag behind in terms of number of broadband subscribers even amongst lower middle income economies. Exhibit 2 above reflects the poor state of broadband internet subscribers in India with less than 1 in 100 habitants has got a broadband connection. In fact, the 2007 ICT Development index ranking put India at 118th position out of 158 countries measured on key ICT parameters.

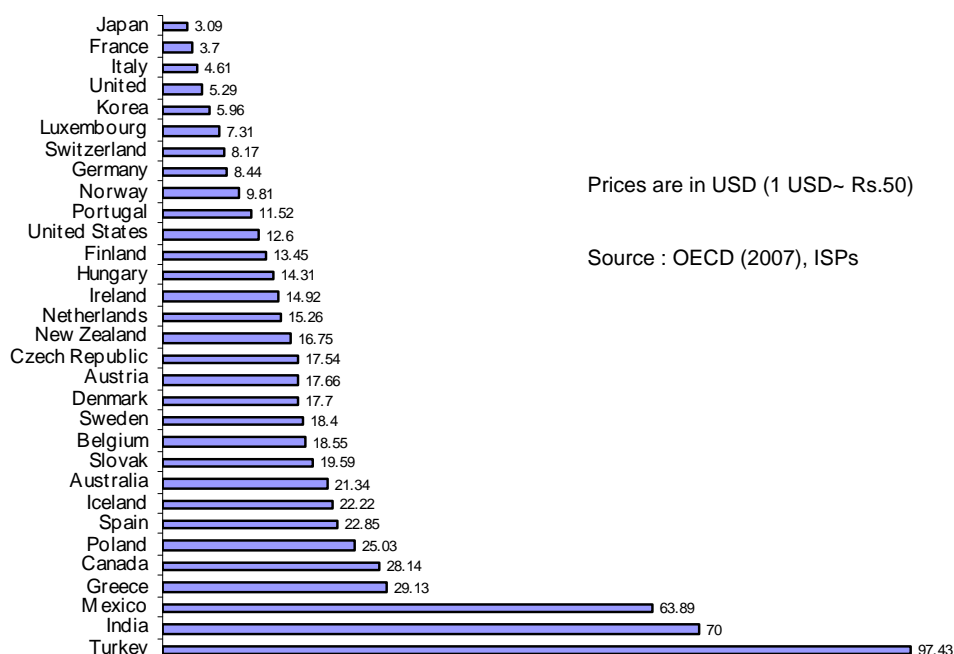
Exhibit 3: Broadband Scenario in BRIC Countries



Source: Internetworld Stats

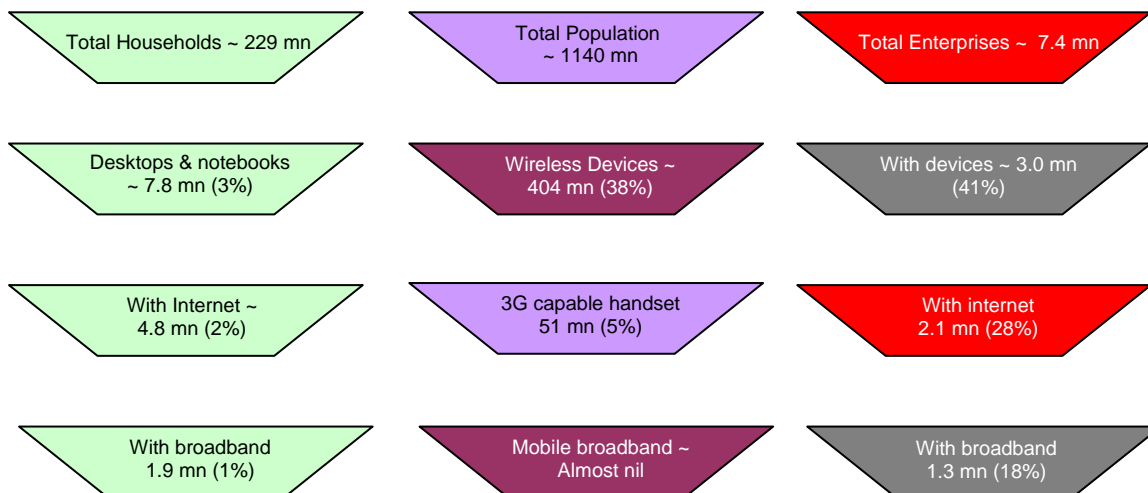
Among BRIC nations, India lags behind both Brazil and China in terms of number of broadband connections as well as per capita penetrations. Russia is also ahead of India on per capita connections. In fact, China is way ahead of India with the high growth of broadband mainly being attributed to successful bundling of service with landlines. In India, on the contrary, growth of landlines has been declining in recent times. Clearly, lack of physical infrastructure to haul internet traffic is a significant bottleneck in growth of Internet in India. Moreover, India has the highest monthly per Mbps price after Turkey. This makes a strong case for reduction in the per Mbps prices

Exhibit 4: Average broadband monthly price per advertised Mbit/s



1.3 Broadband - Only Scratching the Surface

The cost of the device is a major inhibiting factor in adoption of broadband in India. Exhibit 5 below provides a snapshot of penetration of devices (Mainly PCs and mobile phones), internet and broadband in the household and business enterprise segments.

Exhibit 5: Penetration of broadband in homes & enterprises**Total entities ~ 236 mn, Total Population ~ 1140 mn**

- % has been worked out on base of Total Households/Enterprises;
- Device refers to Desktop/laptop
- Multiple connections ownership exists amongst enterprises

1. **Lack of devices-** The low penetration of devices in households and enterprises is one of the major concerns. Only 3% of the total households have Desktop PCs and Notebook PCs. On the other hand, while there are 51 million 3G capable handsets in use in India, mobile broadband services can only be launched once the 3G auction takes place. In the enterprise segment, the situation is somewhat better with 41% owning a fixed device. (*Only landline owning businesses has been taken into consideration for this analysis as there is no reliable estimate of micro enterprises.*)
2. **Broadband – need to grow substantially to make a dent:** Only 1% of the total Indian households and 18% of all enterprises own a broadband connection. MSMEs form 92% of the total business segment and PCs and broadband penetration amongst MSMEs is only 41% and 18% respectively.

1.4 Achieving Inclusive Growth: The Challenges Ahead**1. Challenges on the Supply Side**

- a. **Delay in spectrum assignment-** Delay in spectrum auctioning is stopping us from leveraging the advantage of new technologies for the benefit of the people.

- b. Decreasing wireline connections- The Wireline connections are reducing at a very fast pace with the increasing mobile penetration. There were 37.9 million wireline connections in Dec 2008 as compared to 39.25 mn in Dec 2007 (Source: TRAI). Moreover, wireline connections hold the promise of higher reliability and security.
- c. Low FTTK (Fiber to the Kerb) connections- The number of FTTK connections is very low presently. In contrast, Singapore offers broadband speeds up to 100 Mbps via FTTH (Fiber to the Home). This high speed connection enables high bandwidth applications to run smoothly.
- d. CAS penetration- Presently, CAS is implemented only in the top 4 metros and that too only partially. The CAS potential which we estimate as 73 million cable homes needs to be exploited further.

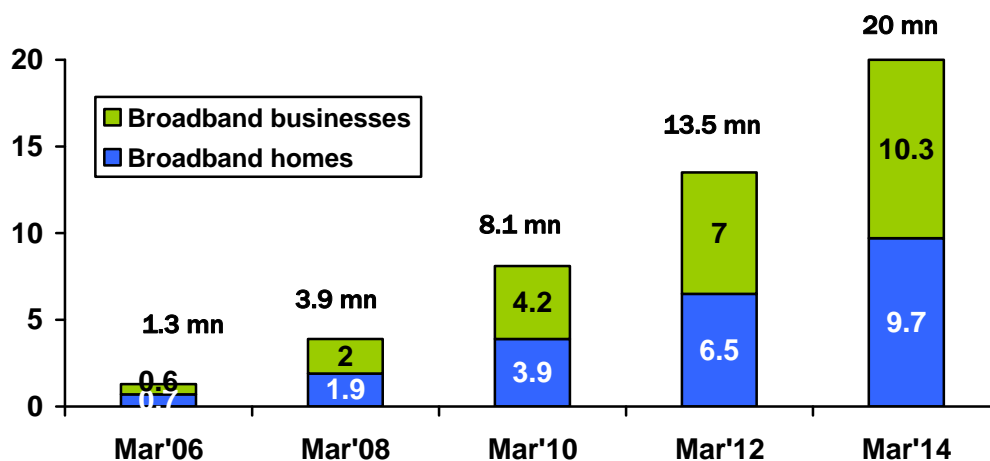
2. Demand side challenges

- a. Low PC penetration- Only 3% of all households in India have a desktop PC or notebook PC. Increase in broadband penetration is not possible without proliferation of affordable devices that enable access to broadband.
- b. Low PC literacy rate- Only 100 million people in India are PC literate out of a population of 1.14 billion. While 29% of urban India is PC literate, it is mere 3% in rural India.
- c. Few relevant B2C and G2C services- Deployment of applications that allow day-to-day tasks to be accomplished via broadband could result in a higher proportion of the people using internet. Mission Mode Projects (MMPs) were launched in May 2006 with the objective of web enabled delivery of services. So far only 20 MMPs have been approved out of the total 27 identified. Also few eGovernance projects have been identified and implemented in a few specific states. There is a need to be increase and accelerate these good initiatives uniformly across India.
- d. Access device cost- The lowest configuration PC costs about Rs 10,000. However, as per the NCAER Household Survey 2007, 85% of the households in India have an annual household income of less than or equal to Rs 2,00,000. Additional taxes and levies, take the access devices farther out of reach of the common man. Currently, the duties which stand at 4% on mobile phones and accessories are lower than that on computers, ICs, motherboards, monitors, routers and modems at 12%. The Government may bring down the levies to match that of mobile phones and accessories to encourage growth of such access devices. Low priced netbooks, which are being launched, should bring down price points and enable speedy proliferation of broadband.

- e. Limited numbers of public access points- Cyber cafes are the main usage point for 37% internet users in India but their number is depleting by the day. In the last one year, the number of cyber cafes has reduced from 190,000 to 166,000.
- f. Limited vernacular content- Due to the many different socio cultural profiles in India, there is a need for relevant content in local languages. Websites that currently exist in local languages are insufficient to cater to the large vernacular speaking population. Presently, there are only around 1,249 websites providing vernacular content. There is also a need for a higher proliferation of vernacular user interface (keyboards, software etc) to facilitate usage of vernacular content. The penetration of internet users in urban areas is around 15% but in rural areas it is less than 1%. Most of the content is in English although the English speaking population constitutes only 18% of India. This makes the content available on the Internet quite restrictive in nature.

1.5 Only 20 mn Broadband Subscribers by 2014 at Current Pace

Exhibit 6: Projections for Broadband subscribers at current growth rate



Source: Itops-2008, I-cube 2008 – syndicated studies of IMRB

The current rate of broadband growth is very distant to achieve the broadband vision set by Government of India in 2004. As per current growth rate, India will have about 20 million subscribers by 2014, a full 4 years beyond the target year of 2010. The Broadband Policy document of 2004 laid down a target of 20 million broadband subscribers by 2010 which seems hard to achieve keeping in mind that today the subscriber base stands at about 6.4 million

Given the current pace of growth in broadband connections, there will be 9.7 million subscribers in the household segment by 2014. This means a penetration of about 4% amongst the 250 million households expected to exist by 2014. In the business segment, there are likely to be 10.3 mn subscribers (Note: Businesses have multiple offices and multiple connections per location and hence 10.3 million does not translate into that many business entities being connected). India today serves as a back office to the whole world and has been focusing on establishing itself as a knowledge-based society. This level of growth does not augur well for India's aspiration of becoming a knowledge economy.

A major change in vision and strategic revamp is required in the broadband ecosystem to jerk it above the current growth trajectory. Only such a visionary approach towards growth of broadband can result in significant social, economic and environmental impact in India.

Realizing the strategic importance of broadband, Government of India needs to take some significant steps to ensure that broadband proliferates the country at an accelerated pace. Besides developed nations, governments of other countries such as South Korea, Malaysia, Singapore, Australia and the Middle-East have long realized that a good broadband infrastructure paves the way for both social and economic development. A few successful government initiatives have been discussed in Chapter 5 on "International Success Stories" to highlight the importance of governments as change agents in enabling broadband proliferation.



2 India 2014: Vision for inclusive broadband growth

A well connected economy built on a robust broadband network will address the aspirations of the citizens. It will also provide a mode of delivering government services to remotest areas of the country along with e-education and e-health that will improve the quality of service of a rural denizen.

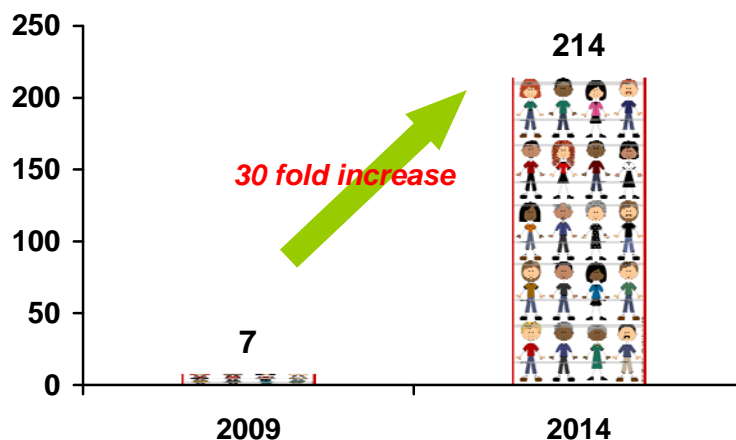
Over the past few years, the Government has taken several initiatives like Sarva Siksha Abhiyan, National Rural Health Mission, Bharat Nirman, NREGS and several other ambitious initiatives to improve the quality of life of Indian citizens who were still left untouched by reforms programme. These initiatives have been successful to a great extent although the benefits are yet to reach the remotest and poorest corners of the country. Broadband can not only enable wider public access to government information, a prerequisite of good governance, but also lead to effective administration and monitoring of quality of delivery of these programmes. Hence, there is a need for the Government to formulate an effective ICT Policy that takes broadband to where the Telecom Policy has taken mobile penetration in India. It is only then will we be able to unlock the true potential of a Knowledge Economy.

In this section, an ambitious target for broadband subscribers has been laid out along with a roadmap towards achieving the set goals. In the following pages, both rural and urban India has been dealt with separately along with various consumption segments such as households, MSMEs and public and quasi public access points (educational institutes, primary health care facilities, CSCs etc.,).

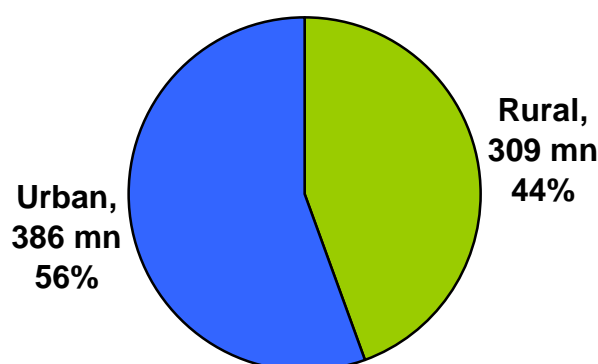
2.1 Connecting 695 million Indians through Broadband by 2014

India should aim for a visionary target of 214 million connections by 2014 in order to achieve an equitable and inclusive growth. It will culminate in 695 million broadband users in the country - 5 years from now. Our success in the software sector has shown that India has the capability to create intellectual property, global enterprises and move towards becoming a Knowledge Economy. However, achievement of this target i.e. a 30 fold increase in the subscriber base from now to 2014 would require a high level of coordinated initiative and innovation, willingness to think out-of-the-box by casting away outdated ideas by all stakeholders in the broadband eco-system not the least of which is the government.

Exhibit 7: Broadband Vision 2014 (BB connections in millions)



Source: Itops, Icube, NRS & IMRB analysis

Exhibit 8: 695 urban and rural Broadband users in 2014

Source: Itops, Icube, NRS & IMRB analysis

Out of the estimated 695 million broadband users across India in 2014, 309 million users will be from rural India while 386 million from urban India.

Exhibit 9: Entity wise Connections & Users – 2014

Entities	Projected entities in 2014	Broadband Connections	Users Touched	Broadband connection-User ratio*
Households	248 mn	170 mn	186 mn	1: 1.1
MSMEs	8.91 mn	34 mn	76 mn	1: 2.4
Educational institutes & teachers	8.72 mn	9 mn	333 mn	1: 37 (students) 1:1 (teachers)
Public Access-CSC, cyber cafes, PHCs, Panchayat	1.5 mn	1.5 mn	100 mn	1:67
Total	267 mn	214 mn	695 mn	1: 3.25

*Note: BB Connection user ratio – e.g. 1:67 means that each public access connection will touch 67 unique users. Also, the estimated users are non-overlapping across entities i.e. they are mutually exclusive of each other. Each user has been classified on basis of their main point of access and hence there is no double counting. (The broad methodology used to arrive at these estimates has been provided in Annexure 3)

Broadband users in rural India have been estimated keeping in mind - the share of wallet for communications, reducing device prices and Government subsidies. Cyber cafes have been projected from our syndicated study which annually maps the growth/ decline of cyber cafes. The potential of cable is estimated through the growth in cable homes and CAS implementation across the country. The potential of DSL has been mapped through our syndicated studies, decreasing landline connections and aspects related to sharing of infrastructure. The potential amongst MSMEs has been mapped via Itops, a bi-annual study of IMRB.

2.2 Vision 2014 – Bridging India’s Digital Divide

Despite efforts made by the Government, a wide chasm still exists between ICT usage in rural and urban India. The Broadband 2014 vision aims at catalyzing the process of bridging India’s Digital Divide. Public shared access is the way forward for increasing broadband usage in rural areas since few rural citizens can afford a device and broadband connection. Hence, most rural citizens are likely to access broadband through public access points such as CSCs, educational institutions, Panchayats etc. Each connection is envisioned to cater to at least 100 rural citizens. The scenario in urban areas will be very different with most users accessing broadband from homes, businesses or via their mobile phones.

The break up by different entities in urban and rural India is shown in the tables below.

Exhibit 10: Broadband urban and rural India Vision 2014

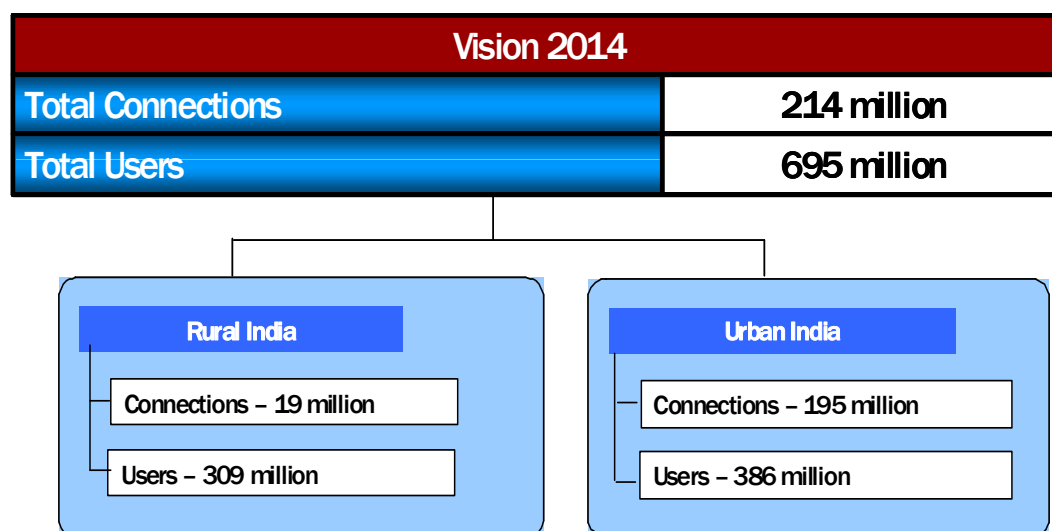


Exhibit 11: Broadband Rural India Vision 2014

Entities	Households	CSC & cyber café	Panchayat, Post Office, Public & Community Health Centers	Schools/ Teachers	Total
Connection (in mn)	10.60	0.67	0.38	7.50	19.15
Users/lives touched (in mn)	26	50	168	233	309*

*Note: This is the unduplicated broadband users overall across households, public access points and govt. administrative access points (Please refer to annexure 3 for more details on methodology used to arrive at estimates)

The vision for rural India is that in all about 19 million connections will be used by 309 million citizens. It is estimated there will be 10.6 million connections in homes (not infeasible given that 5-6 million already have DTH at home in rural India) and these will be used by 26 million users. Broadband will open the door to new knowledge to 233 million teachers and students in rural India.

The number of connections will be limited due to various factors such as literacy, affordability of device and connection, availability of power etc. Hence, most rural citizens will be connected using public access modes such as CSCs and cyber cafes as well as quasi public access modes such as schools wherein 8.4 mn connections will be used by more than 283 mn citizens. Majority of the rural users will be students. In a country like ours with youthful population, schools should be the prime focus in rural India where broadband must be made available to all those who are enrolled.

Exhibit 12: Broadband Urban India Vision 2014

Entities	Households /individuals	MSME/ Employees	Cyber cafes	Schools/ colleges Teachers	Total
Connection* (in mn)	159.2	34	0.45	1.5	195.15
Users# (in mn)	159.2	76	50	100	386

* Multiple connections exist amongst all the entities

#Also multiple users exist amongst MSME, Cyber café, Schools/ colleges. Number of users per connection in household is taken as one to avoid double counting


The urban India is envisaged to have 195 million connections to be used by 386 million citizens. There will be about 159 million connections in the home segment and 34 million connections catalyzing the growth of MSME.


Achievement of the vision of subscriber connections and users reached will address significant challenges faced by India with respect to Education, Health, Agriculture and Governance. The number of broadband users reached is a preferable parameter to track periodically instead of connections provided or homes reached.


Given its impact on efficient delivery of programmes by various ministries and departments of central and state governments, broadband enablement should be made part of budgetary allocation process. In this context, the country could significantly benefit from the development of a comprehensive ICT policy which integrates the IT, Internet and Telecom policy domains in the emerging convergence era.


2.3 Transform Broadband, Transform India: 2014


2.3.1 Social impact of broadband


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Education- By 2014, broadband should touch 326 million students and 7 million government teachers. Broadband aided education will be the primary tool to reach out to children in the villages. The 7 million government schools teachers will have access to broadband thus fostering more effective e-education and also be able to reach more students.
- 

Health- Currently, half of the rural households do not have access to primary healthcare. Telemedicine facilities in the CSCs connected to CHCs and PHCs will enable all the 168 million rural households in 2014 to have access to affordable primary healthcare.
- 


Governance- Every resident will have access to e-Governance facilities ensuring faster and better governance. The CSCs will enable the rural citizens to be a part of the e-Governance initiatives. eGovernance will ensure faster and efficient disposition of government related service to the common man.
- 

Agriculture: Availability of information on crop, weather and market access information should significantly improve the livelihood and productivity of Indian farmers even as government ramps up activities in the processed foods sector.
- 

Information- A knowledgeable society having access to all types of information will be formed. This will foster social, economic and environmental development in the society.
- 

Smart & Connected Communities – Internet will evolve from connecting people to connecting things. This leads to whole new possibilities of designing communities of the future where Transport, Physical Safety & Security, Power (grid) management, Building management, Water management apart from Education and Healthcare would run on collaborative tools that run a broadband infrastructure.

2.3.2 Economic Impact

- 

Employment- In India, there are 110 million people who need some degree of training to become employable. Higher Broadband penetration would help create jobs for these people. Almost 21 million of such jobs would be created in rural India (*Please refer to annexure3 for more details on methodology used to arrive at this estimate*)

- PDS- 40-50% of PDS food grains in India do not reach the intended citizens. Broadband will enable a more efficient food supply chain saving millions of tonnes of food grain wasted every year.

2.3.3 Environmental Impact

- Carbon footprint- Telecommuting is expected to reduce GHG (Green House Gas) emissions by 2 mn MT in India. In rural India alone, telemedicine will reduce GHG emissions by 0.28 mn MT by 2014. If a village has telemedicine facility, then its residents do not need to travel to the nearest hospital for consulting a doctor on their health diagnostic reports. The consolidated impact of lesser usage of vehicles (that emit GHG) means a reduction in the total GHG emissions.



3 Recommendations to drive demand for broadband

Greater adoption of broadband will lead to more subscribers thus raking in higher revenue for the players in broadband eco-system. More revenues should result in higher investments by the players thus creating a virtuous cycle of growth.

The Government of India has taken some initiatives in the areas of e-education and e-governance wherein broadband has helped in facilitation of delivery of services. National Knowledge Commission has already recommended interconnecting all universities in India via broadband. A budget of Rs. 46.12 billion has been allocated during the 11th Five Year Plan for the National Mission on Education through ICT. Under NeGP the CSCs have been identified to provide telemedicine facility.

About 27 MMPs (Mission Mode Projects) have been proposed to initiate e-governance services in the country by 2013. Currently, 20 projects have been approved.

3.1 Challenges and recommendations to grow demand for broadband










Areas like telemedicine, e-education, e-governance and e-entertainment cater to the basic needs of rural citizens. Applications related to these areas require adequate broadband connectivity in terms of volume and speed.

In case of entertainment, IPTV could be a major driver as it combines both entertainment and interactivity. Presently, IPTV penetration in India is negligible. In addition, other services like VOIP, mobile and e-commerce should enable greater adoption of broadband services. Internet telephony (VoIP) is already

permitted for calling abroad (including termination to Landline and Mobile) resulting in tariff reduction owing to increased competition. On the domestic front, Internet telephony is expected to be a killer application and contribute significantly to the domestic voice minutes among the retail user segment. Internet penetration in a country like India depends a lot on high utility applications, such as VOIP. Therefore it is important that VOIP is allowed in India and a level playing field needs to be ensured for Mobile operators and ISPs.

The need of the hour is to develop smart connected communities that enable all stakeholders to share information and collaborate through technology and build up physical structure security. A pervasive network would enable citizens to benefit from a number of useful applications since the incremental cost of adding applications will be marginal.

Exhibit 13: Demand Related Issues and Recommendations

Issues	Recommendations
<p>Education</p> <p> <i>Currently, school education in India does not integrate with the higher education system and is ailed by several problems, specifically related to quality delivery of education due to shortfall of teachers, non-availability of trained teachers, high student dropout rate etc. A hands-on approach enabling self-directed learning is the need of the day</i></p> <p> <i>Barely 10% of the schools have computers and broadband connectivity is almost non-existent</i></p>	<p> Broadband will allow students and teachers to explore beyond the limited horizon. While e-education will not replace teachers, it has tremendous potential to supplement and increase the reach of the teachers.</p> <p> Empower 1.72 mn schools and colleges with broadband in urban and rural areas and ensure there is at least 1 PC per 40 students. This will enable 326 mn students to access broadband by 2014.</p> <p> Provide each of the 7 mn government school teachers with a laptop and broadband connection as it will enable them to access quality content and also perform administrative duties much faster.</p> <p> Incorporate broadband aided education as part of the course curriculum.</p> <p> Encourage PPP initiatives to ensure timely maintenance of PCs/broadband connections.</p> <p> Empower teachers via professional development training programs to enable them to impart e-education more effectively.</p>
<p>Health</p>	<p> Expand the network and allow access to quality diagnosis and referral beyond first level of</p>

<ul style="list-style-type: none"> 📍 <i>50% of India does not have access to affordable primary healthcare</i> 📍 <i>Currently, there is only one doctor for 1700 patients</i> 	<p>treatment.</p> <ul style="list-style-type: none"> 📍 Empower 50,000 PHCs and 6,000 CHCs with broadband to enable them to provide better medical facilities. 📍 Empower all CSCs, PHCs and CHCs with telemedicine facilities to ensure high quality healthcare facilities at reduced costs in remote areas. 📍 Provide high-speed broadband connection to all rural telemedicine centers to enable doctors to access patient data (x-ray, ultrasound, etc) on real time basis. 📍 Provide all doctors and paramedics associated with PHCs and CHCs with a laptop and broadband connection. 📍 Automate all processes of PHCs and CHCs so that information technology (facilitated by laptop and broadband connection) can be used to increase the efficiency of the system e.g. via template based data entry for patients records, vaccine supply chain system that maintains the expiry date / batch numbers of the drugs supplied and a simple system that can be used to request for drugs, etc
<p>Agriculture</p> <ul style="list-style-type: none"> 📍 <i>Inability of farmers to access quality information on farm practice as well as access to market</i> 📍 <i>Relevant content in vernacular languages</i> 📍 <i>Few Internet access points available to farmers</i> 	<ul style="list-style-type: none"> 📍 All information relevant to farmers such as pre plantation consulting, inputs (pesticides, farm machinery etc), irrigation, financing and insurance (price, rain etc), etc should be made available in a user friendly vernacular format on common portals. Also, enable voice activated options for the less literate groups. 📍 Establish Agriculture Polytechnics at the block level and equip them with high speed broadband connections so that they can provide agriculture related information. 📍 Provide subsidized low cost access devices and applications to farmers by utilizing USO fund.











	<ul style="list-style-type: none"> Information and logistics management using technology including GIS needs to be established to enable farmers to access <i>mandi</i> prices, weather information, etc. Agricultural information search via SMS is being used currently – mobile broadband can make the search process easier for the farmers. At least 5% of the agricultural budget should be allocated towards developing ICT applications.
<p>Governance</p> <ul style="list-style-type: none"> <i>Only 20 Mission Mode Projects (MMPs) sanctioned out of the 27 MMPs under NeGP. There are 9 Central MMPs, 11 State MMPs and 7 integrated MMPs</i> <i>The SWAN scheme is vital to create a secure close user group (CUG) government network for the purpose of delivering G2G and G2C services. It is fully implemented in only 7 states so far</i> 	<ul style="list-style-type: none"> Need to expedite work on implementation of remaining MMPs. There are many elements to consider i.e. 11 State MMPs*35 states. Scope of one or multiple PPP at state level should be considered. SWAN and SDC should be implemented in all states by 2010.
<p>Entertainment</p> <ul style="list-style-type: none"> <i>Lack of broadband friendly vernacular content</i> 	<ul style="list-style-type: none"> Digitization of existing web content to allow optimal the bandwidth consumption. Make existing music, video and film industry content (especially with Govt. of India archive) available in all relevant vernacular languages to increase content and for adoption by public for appropriate use.

3.2 Catalyzing Growth on the Demand Side

Access points play a pivotal role in the growth of broadband. A large number of access points will ensure widespread usage and adoption of broadband.

The section recommends ways of increasing broadband penetration in households and enterprises. This section lays emphasis on public access points like cyber cafés and CSCs since they benefit the masses in rural and urban without having to invest in a device and broadband connection.

Exhibit 14: Access related Challenges and Recommendations

Issues	Recommendations
<p>Households</p> <p> <i>One of the highest monthly Mbit price in the world</i></p>	<ul style="list-style-type: none">  Innovative pricing models, such as prepaid broadband (on the lines of prepaid mobile) should be introduced to increase demand of broadband and a subsequent reduction in prices.  Promote more franchisee based models such as internet kiosks and ePCOs.  Tax rebate should be provided to consumers for buying computer (say, up to Rs. 50,000/- in a block of 3 years) and for Internet & broadband access up to a sum of Rs. 1000/- per month. Service tax on broadband to be reduced from the current 10.3% to 5% by 2014.  Easy availability for educational loans to students and employees for purchase of low cost devices including netbooks etc.,
<p>MSMEs</p> <p> <i>Only 18% of all the MSMEs are broadband enabled. By 2014, 6.66 mn MSMEs will be without broadband</i></p>	<ul style="list-style-type: none">  Provide incentives to MSMEs in the form of tax holiday on PC rentals, 100% depreciation on all IT investments and free broadband trials for 3 months. This initiative would require an investment of Rs 8 billion by GoI. <i>(Please refer to annexure3 for more details on methodology used to arrive at this estimate)</i>
<p>Cyber cafés</p> <p> <i>Declining number of cyber cafes (main point of internet access for 37% of</i></p>	<ul style="list-style-type: none">  Review laws to enable cyber cafes to flourish. For e.g. today all cyber café users need to be photographed as a security safeguard.  Cyber cafes should be promoted as multipurpose

<p><i>users) – there is a decreased from 190,000 to 166,000 in the last one year (Please refer to annexure 3 for more details on methodology used to arrive at this estimate)</i></p>	<p>centre points with additional facilities such as telephony, ticketing etc. The wide range of services offered would increase footfalls and with higher ARPU, the owner could give the user a discount on broadband access</p> <ul style="list-style-type: none"> ● Encourage PPP initiatives required to provide subsidized PCs and broadband connection
<p>CSCs</p> <ul style="list-style-type: none"> ● <i>As of May 09 only 40,750 CSCs had been rolled out (75-80% are broadband enabled). This project seems way behind schedule. , also the</i> ● <i>Limited awareness and services</i> ● <i>Lack of high-speed broadband connectivity – connectivity of 256kbps is envisaged</i> 	<ul style="list-style-type: none"> ● It is recommended that connectivity of CSCs be done on a war footing and in a time bound manner ● C2C, B2C and B2B services should also be provided via SWAN in addition to G2C and G2B services. ● 256 kbps connectivity seems inadequate for CSCs to operate, at least a 2 Mbps connectivity would make it feasible for the CSCs to roll out wide ranging services, from education, healthcare to providing Government services. ● CSCs to be set up in all 600,000 villages. (Of Rs.15 billion meant for subsidizing CSC operations, Rs. 10 billion is yet to be spent - this could be utilized immediately to add more CSCs). <i>Panchayat</i> space can be utilized for CSC setup which would serve the dual purpose of providing Government and other utility services. ● The industry should create innovative business models leveraging on the network of CSCs. This would enhance the socio-economic conditions and the market competitiveness of villagers. ● The SCAs to ensure rigorous selection, recruitment and training of the VLE who is face of the CSC and plays a key role in making it viable.

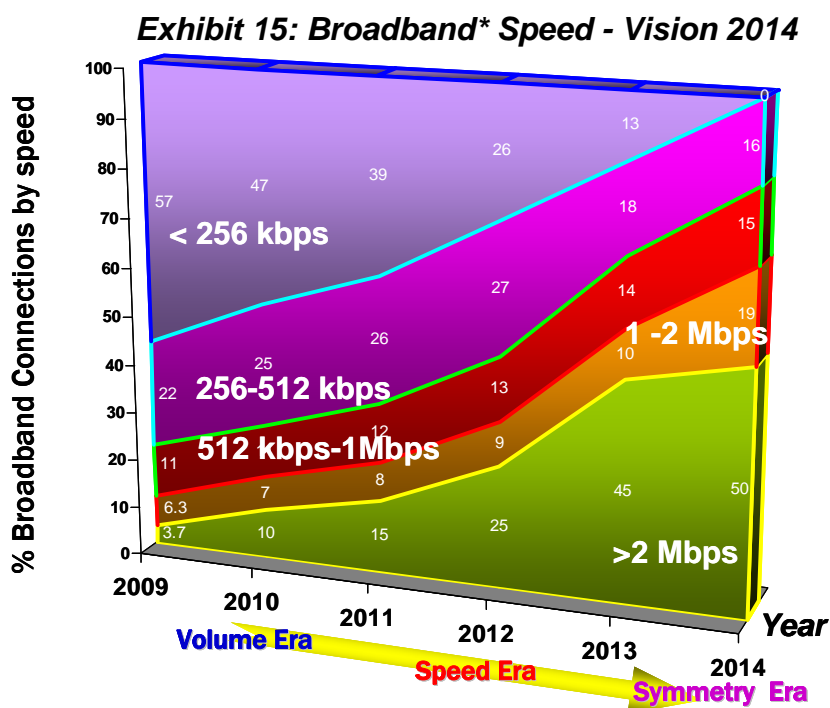
Innovation through private entrepreneurship will also be critical to sustain investment in broadband infrastructure. Some of the key actions for the industry include:

- Innovative bundling of services to drive down prices and thereby improve affordability of access devices and broadband connectivity to the common man
- Secure, high speed and reliable broadband connectivity with high QoS necessary to improve desirability of a wide range of services on broadband network
- Support development of a vibrant market for innovate content in various Indian languages to spur young and budding talent to take advantage of the low cost reach of Internet
- Content targeted at rural markets will be critical to support government programmes. These need to be focused on education, healthcare, information, communication and entertainment needs keeping in mind the heterogeneous nature of Indian rural market

3.3 Increasing Broadband Speed/symmetrical transmission critical to stimulate demand

India is lagging behind other countries in terms of broadband speed. China has rolled out a 1 Gbps backbone network while Australia plans to connect 90% of Australian homes and businesses with a National Broadband Network of 100 Mbps.

The speed of broadband connection is a major concern in India today – this can be mainly attributed to the high contention ratio (on an average 80-100 which at times is stretched to 300). The currently available broadband speeds are not capable of leveraging the full benefits of bandwidth intensive applications like telemedicine, e-education & video streaming. Rural citizens have a need for these high speed applications but have low affordability. Thus, based on assessment of potential applications that can run on the broadband network in 2014, a path to grow the broadband network beyond the current



* Below 256 kbps connections do not qualify as broadband but included for comparison purposes

In the above exhibit, we have taken actual data for 2009 and projected that the proportion of connections with speed below 256 kbps will gradually reduce over the next 5 years. For connections with speed above 256 kbps, we have projected that their proportion will increase over the next 5 years and that the share of 256-512 kbps connections will drop to give way to higher speed connections. Also, based on aspired application demand by 2014, connections of speed up to 256

kbps will cease to exist and at least 50% of all connections will have speeds above 2 Mbps. By 2012, we would have achieved the critical mass in volume terms (hence called Volume Era). From 2012 onwards, the focus will shift to provision of high speed broadband. The stakeholders should ensure backhaul and last mile infrastructure are in place around this time. By 2013-14, we should move beyond the Speed Era and along with speed targets should also strive to ensure maximum number of symmetrical connections (hence, called the Symmetry Era).

In many countries, targets are already being talked about in terms of 20 Mbps and above symmetric high speed broadband networks. Given this, the above targets are indeed modest.

From the perspective of demand generation, government could set targets on bandwidth speed and price (affordability) per Mbps as specific benchmarks to be monitored and met over a period of time. (As per ITIF rankings in 2008, Japan had the lowest per monthly 1 Mbps cost of US\$ Purchase power parity of 0.13 and provided 64 Mbps speed covering 55% of its households. On the other hand, South Korea covered 93% of the households at speed of 50 Mbps at cost of US\$ 0.37 per month per Mbps).



4 Recommendations to drive Supply of broadband

Providing broadband access to over two-third of population is going to be no small challenge. A lot of efforts need to be put in by the industry and the government to augment the “supply side” and create hard infrastructure to meet the vision target of 214 million connections by year 2010. The short term plan should be to utilize existing infrastructure that is either unutilized or under utilized. This is mostly seen in the wireline infrastructure. Wireless infrastructure should also be promoted aggressively to reach out faster to the masses that could not benefit from the wireline infrastructure.

4.1 Wireline infrastructure – Current perspectives

Wireline infrastructure availability in India is lagging both at the backhaul as well last mile levels. However, the bigger challenge is to first leverage the existing infrastructure to deploy broadband. In all, there are 16.45 million unutilized DSL capable wireline connections which are now reaching households and enterprise segments. Some steps are required to be taken up by the industry and government to utilize the existing wireline infrastructure comprehensively. Public money has been utilized to build this infrastructure and hence it should be optimally used for the benefit of the masses. Wireline broadband is advantageous due to reasons such as high security - the encryption of wireline data is very secure and highly reliable, high speed and hence is apt for critical data applications.

There are several broadband infrastructure related challenges that we face today. Currently, the number of fixed line phone is dwindling due to stiff competition from mobile telephony which has a number of value added services to offer in addition to mobility. Similarly, while cable penetration is high in India (over 80 million homes), the cable network needs of high quality to be broadband enabled.

In countries like Singapore, FTTH (Fiber to the Home) technology enables them to provide broadband speeds of 50 Mbps and above. In India, the uptake of Fiber to the home and business segment is very low due to high fiber and CPE cost.

Despite this, there is definitely a case for provision of shared high speed and reliable backbone fiber across the length and breadth of the country. Thereafter, cost effective last mile technologies can be used to provide broadband to the homes. Presently, fiber technology based SWAN (State Wide Area Network) is being laid down across the country by the Government of India. The challenges related to the right of way are copious and complex. Every state has a different law pertaining to the RoW issue. For example, in Gujarat, the taxes related to towers are based on their height, while in Bihar the telecom infrastructure companies have to pay monthly taxes to the government. Such challenges have to be met by implementing a uniform policy for telecom companies across all states & Union Territories.

4.2 The advantages of Wireline infrastructure









Wireline infrastructure primarily consists of cable, DSL and FTTK. The advantages of wireline broadband are highlighted below:

Exhibit 16: Benefits of Wireline

Factors	Benefits
Available infrastructure	The existing wireline broadband infrastructure consists of DSL (16.45 mn fixed line connections) and cable (73mn connections). This available infrastructure can be refurbished to provide broadband services <i>(Please refer to annexure 3 for more details on methodology used to arrive at this estimate)</i>
Security	The wireline broadband network encryptions are considered to be more safe (difficult to hack)
Speed	The highest speed possible in ADSL++, CAT 5 cable and FTTK (>50 Mbps) is much higher vis-à-vis the current broadband speeds (advertised speeds of 256 kbps to 16 Mbps). Hence, bandwidth intensive applications can be easily run using wireline broadband

4.3 Wireline Infrastructure- Issues and Recommendations

Exhibit 17: Wireline Issues and Recommendations

Issues	Recommendations
<p>Physical infrastructure</p> <p> <i>Existing physical infrastructure (fiber) is highly inadequate to connect rural India and small towns in urban India.</i></p>	<ul style="list-style-type: none">  There is a need to provide a high speed, secure and pervasive network for delivery of broadband. Hence, it is suggested that Fiber To The Kerb (FTTK) Infrastructure be put in place. It will use the backhaul and provide the necessary penetration from where the last mile connectivity can be provided to serve the users.  Facilitate reverse BOT (Build Operate Transfer) of such an infrastructure wherein fiber is laid down by GoI and then provided to all players including ISPs on an equitable, sharable rental terms.  It has been estimated that laying of underground fiber to all 600,000 villages would cost approx. Rs 360 billion while aerial fiber would cost approx. Rs 180 billion although underground fiber will be reliable and lasting solution. This infrastructure can be over and above the backbone laid by various public and private agencies. Such an infrastructure will not only connect the distant villages but also provide a link for wirelessly providing broadband through the 17,000 odd common tower infrastructure built through the USO fund. It is recommend that the USO fund be invested in accelerating the creation of high capacity symmetric, ubiquitous & secure broadband infrastructure, viz. the ‘Content Delivery Network’ across the country using appropriate technologies – including but not limited to optical fiber & wireless.  Utilize USO fund to build the infrastructure for FTTK. Autonomy to USO fund to enable quick decision in building this infrastructure.
<p>Right of Way (RoW)</p> <p> <i>About 6-9 months required for obtaining tower & digging clearance.</i></p>	<ul style="list-style-type: none">  Set up Single Window Clearance (approval for a project is given under one roof so that applicants do not have to visit many different departments).  Central Government to take lead in implementing uniform policy for broadband network expansion across all states & Union Territories (UTs). Hereby, a

<p>☹️ <i>Taxation is high (1:1 ratio between cost of digging and taxation) and not uniform across states.</i></p>	<p>single policy to be formed for broadband related laws and be applicable across all states & UTs</p> <p>☹️ An online application system would help speed up the process of broadband network expansion</p>
<p>Underutilized DSL</p> <p>☹️ <i>DSL is underutilized as 16.45 mn broadband compatible lines are lying unused</i></p>	<p>☹️ Bundle broadband with existing wire line connections to increase the uptake of broadband.</p> <p>☹️ Infrastructure created with public money to be made sharable amongst all players in an equitable manner.</p> <p>☹️ Adoption of the franchise model by incumbent would provide equal opportunity to the operators to act like a franchisee and work through PPPs (Public Private Partnerships)</p>
<p>Limited CAS penetration in households</p> <p>☹️ <i>CAS has been mandated only in the top 4 metros and that too partially</i></p> <p>☹️ <i>Cable industry is highly fragmented</i></p> <p>☹️ <i>No incentive for technology up gradation</i></p>	<p>☹️ Make CAS mandatory to achieve 40% digitization by 2012 and 100% by 2014. Digitization of cable would increase the uptake of broadband.</p> <p>☹️ TRAI has proposed digitization of 55 cities – this recommendation should be facilitated at the earliest.</p>

4.4 Wireless Infrastructure – Leverage the Wireless Spectrum

Villages and cities in India are scattered and the varied topography makes the task of connecting them even more challenging. On one hand, we have the jagged mountainous terrain of the North-East while on the other there are vast stretches of hot and dry sand dunes in Rajasthan. Deploying wireless infrastructure could be a cheaper and more viable option in these regions. However, the existing spectrum is limited and this restricts the number of people who can be offered high speed wireless broadband services. The Government has realized this and the 3G and BWA auction scheduled for later this year, is going to be a major step towards providing broadband to the common man. *(Please refer to annexure 3 for details on methodology used to arrive at 3G and BWA estimates)*

Every country has the same amount of radio spectrum and while traditionally certain key Government users were allocated large swathes of spectrum, considering that wireless is a fast and cheap way to extend access to people all

over and especially in the rural and remote areas, it is imperative that we take a holistic look at how this precious and natural resource is used for the maximum benefit to the public at large. Specific spectrum bands remain unutilized or underutilized almost everywhere and at the same time, there are opportunities for refarming through harmonization and also vacating spectrum from various other users as they can shift to newer technologies- including digital radio and terrestrial fiber. Part of the money raised through commercial usage of spectrum must be set aside for accelerating such endeavors

In case of wireless, there is no incremental last mile infrastructure cost per subscriber (except for the CPE) and it can simultaneously provide connectivity to a large population. Also 3G enabled mobile phones are going to play a major role in facilitating wireless broadband given their falling prices and high penetration. 3G and BWA technologies will enable multi media services on handheld as well as fixed devices. While BWA is more of a data technology, the final impact of 3G on broadband would depend on the extent to which the 3G spectrum is used for voice purposes.

In those rural areas, where wireless may not be feasible due to undulating terrain and LoS (Line of sight) issues, satellite technology would be required for broadband connectivity.

Emergence of new applications over Wi-Fi such as multiple-input multiple-output (MIMO), which provides high throughput and non-interfering wireless access for multimedia applications like IPTV, voice over Wi-Fi (VoWi-Fi) and convergence services will be a driving factor for wireless.

4.5 Wireless Infrastructure- Challenges and Benefits

Exhibit 18: Wireless: Challenges and benefits

Challenges facing broadband deployment in India	
Difficult geographical terrain	Villages and cities in India are scattered by location and India has varied geographical terrain such as desert areas, hilly areas, etc
Limited infrastructure	Lack of basic infrastructure such as electricity, roads etc
Benefits of using wireless broadband	
Ease of Installation	Wireless broadband provides better network coverage, thereby enabling a higher installation rate and lower deployment costs. Since capacity of wide magnitude can be tapped from any spot in the coverage area, the capacity utilisation is more efficient in comparison to fixed infrastructure










Economies of scale	With globally harmonized bands, the operators can benefit from economies of scale of the global volumes, for both base stations and CPE's
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4.6 Wireless infrastructure - Issues and recommendations

There is an urgent need to develop a comprehensive spectrum policy with short term, medium and long term plans for re-farming of required frequency bands. It is recommended for the growth of Wireless Broadband through 3G & BWA that planned auctions of 3G and BWA spectrum as per already notified guidelines be completed expeditiously so as to roll out these services by mid 2010.

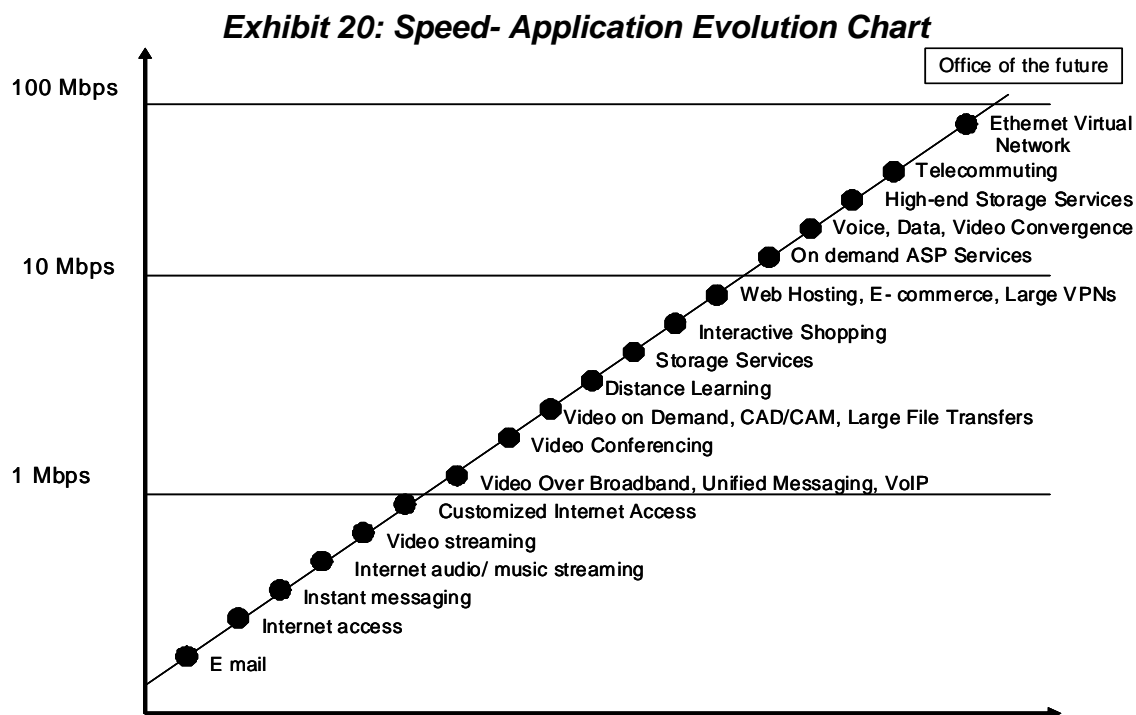
The power deficit in India is a major challenge which affects the performance of the telecom (and broadband enabling) towers more so in rural areas. Many villages get electricity only for 4-6 hours a day or less. The towers are the third highest diesel consuming sector, guzzling approximately 2000 metric tonnes per year. This merits concession especially in rural areas especially when telecom operators are aiming to reach underserved markets in India.

Exhibit 19: Wireless issues and recommendations

Issues	Recommendations
<p>Spectrum issues</p> <p><i>A key issue is that large population cannot be touched through wireline. This is where availability of spectrum can solve the problem. In case of Wi-Fi, certain spectrum bands still require a license for outdoor.</i></p> <p> <i>Proposed BWA spectrum allocation less than 20 MHz per operator</i></p> <p> <i>Limited wireless spectrum availability</i></p> <p> <i>License Requirements for hotspots</i></p>	<ul style="list-style-type: none">  Spectrum allocation strictly as per internationally ITUR and 3GPP approved harmonized bands to ensure no wastage of spectrum on guard bands due to proprietary / non appropriate technologies usage in standard / globally and regionally harmonized bands of 2.1 GHz, 2.3 GHz, 2.5 GHz, 3.5 GHz, etc.  Existing users in 698 – 806 MHz (FDD) band need to vacate the spectrum for BWA use.  BWA allocation per operator of 30 MHz.  700 Mhz spectrum is ideal for providing wireless broadband to rural areas as the signals can travel for long distances. It has lesser disturbance due to atmosphere or any physical structure.  Hotspot license requirements from WPC need to be liberalized.  Vacate unutilized and underutilized spectrum from

	<p>Defence Forces for BWA and 3G services.</p> <ul style="list-style-type: none"> ☉ Spectrum charges must be commensurate with the demographics (population density, etc.) and the stage of economic development (per capita income, etc.) of the respective regions lest it should not become a deterrent.
<p>Infrastructure issues</p> <ul style="list-style-type: none"> ☉ <i>Sharing and better economic benefits to providers essential for rural growth</i> 	<ul style="list-style-type: none"> ☉ Incentivize and encourage active infrastructure sharing. It can be towards reduction in local taxes, subsidy from USO, licensing fee benefits etc. This would result in reduced costs and translate into lower price for the end consumer.
<p>Power related Issues</p> <ul style="list-style-type: none"> ☉ <i>Limited electricity available in rural areas, only about 55% villages have been electrified</i> 	<ul style="list-style-type: none"> ☉ Electricity Board connection as public utility connection in urban/semi urban areas and at minimum possible rate in rural areas. ☉ At places where Electricity Board power is not available at all or is available for only a limited period of time - the government should incentivize setting up of renewable and green energy resources for the radio sites. ☉ The high cost of power should be subsidized. The USO fund should be used to provide a 50% subsidy on diesel consumed in rural areas especially given the fact that operators are reaching under-served areas of the country. ☉ Subsidize diesel cost for high capacity captive power generation in villages to provide local power at reasonable cost which would provide additional business opportunity to rural population. The subsidy would be far less than the cost of power lost during transmission to such remote locations.

4.7 Need for Speed – stakeholders need to plan roadmap



The next wave for broadband will be driven by bandwidth intensive applications such as telemedicine, video on demand, distance learning, entertainment etc. and mostly would require symmetric infrastructure. These applications currently have low uptake, given the lack of high speed broadband infrastructure. The true potential of this next-generation broadband network lies in the transformative new functionalities it enables. These functionalities including faster file transfers, streaming data such as video, real-time collaboration tools will support a broad range of Web-based applications delivering large benefits to citizens, educational institutions, businesses, society, and the economy.



Chapter 5

5 International Success Stories

5.1 Singapore:

Powered by fast broadband connectivity, Singapore is poised to become 'intelligent city' by 2015 (the project has been named as IN2015). It is planning to make strategic investments in deploying Next Generation National Infocomm Infrastructure. The capacity of the submarine cable is 28 Tbps with direct international capacity of 25 Gbps. Its high capacity will fuel Singapore's economy by supporting new industries like digital media and biomedical sciences in addition to education, financial services, governance, tourism and manufacturing & logistics. The Government of Singapore is playing an active role to ensure that the infrastructure is adequate. It has created a very competitive environment and made huge investments to make its broadband vision a success.

The model has been devised on three layers to provide open access:

- The first layer is of Network Companies (NetCo) - in the business of providing passive infrastructure like ducts, dark fibers etc to OpCos. It will be a high capital intensive business (~\$2bn). It is a utility like business with expected return of equity of 9% to 11%.
- The second layer pertains to operating companies (OpCos) - in the business of providing active equipments like switches, routers and access equipments and the expected return on equity is in the range of 16% to 19%
- The last layer consists of Retail Service Providers (RSPs). They will provide broadband services, Internet services, IPTV, video conferencing etc. The market for this service is very competitive and consists of more than 50

players. They require low capital investments (~\$50 to \$100 mn) and have economic lifespan of 5-7 years with more than 20% expected return on equity

5.2 South Korea:

The government of South Korea has subsidized the broadband and upgraded the broadband infrastructure in South Korea. This has led to faster uptake of broadband. The broadband penetration is now more than 93%. 10 mn people have access to high speed broadband up to 100 Mbps and the average speed is over 50 Mbps. In February 2009, the Korea Communication Commission (KCC) announced further upgradation of the broadband infrastructure. This will enable speeds up to 1 Gbps to every household in South Korea by 2012 i.e. 10 times their present connection speed. KCC is of the opinion that this high speed infrastructure will lead to creation of new companies, help originate new services and add up to 1,20,000 jobs. The total investment works out to \$24.6 bn.

5.3 The Middle-East:

Connectivity in Middle East countries has seen a major rise due to the liberalization drive. They are improving the digital infrastructure in the region, thus providing investment options in new sectors for foreign parties as well as local parties. Over the last 2 years, wireless broadband subscribers have grown at a CAGR of 78% in terms of volume and 44% in terms of revenue. 3G subscribers in the Middle-East are expected to surpass 4 million by 2010. Thus, wireless technologies will enable broadband connectivity across the tough terrains of the Middle East. Throughout the region, incumbent and alternative fixed-line operators are rolling out IPTV, helping the operators improve their main-line base and gradually increase spend per customer in the face of falling ADSL prices. New submarine cables connecting the Middle East to Europe have reduced the broadband prices significantly leading to higher demand. Beyond 2010, the inter-regional carriers will establish peering relationships leading to a decline in interregional bandwidth demand.

5.4 Australia:

Australia faces geographical problems similar to India because of its enormous size. In April 2009, the Australian government decided to lay down a National Broadband Network (NBN) across Australia at an investment of \$30 bn over the next eight years. This is expected to enable 90% of the users in Australia to browse internet at a speed of 100 Mbps i.e. 100 times faster than their present broadband speed. The remaining 10% of the population will be able to access broadband at 12Mbps.

5.5 The United States:

The U.S. eGovernance related spending is highlighted on an “IT Dashboard” so that common man can get details about these investments and track them over time. This brings transparency in the system and enables of the citizens to know how the public money is being spent. It is worth establishing a similar transparent initiative on monitoring eGovernance projects.

The US FCC (Federal Communications Commission), which is helping in policy to support US broadband stimulus package of USD 7.2 billion, changed broadband definition in April 2008 to mean 768Kbps, up from the previous definition of 200Kbps. Under the new definition, “basic broadband” defines download speeds between 768Kbps and 1.5Mbps. In April 2009, it has defined 7 slabs upwards of 784 kbps and is intent on identifying ways to stimulate higher penetration and bandwidth target for US which is seen to be lagging behind many European and Asian countries. FCC recently issued a fact-finding notice on its website seeking the public's input as it drafts a national broadband plan that is slated to be submitted to Congress.

Annexure-1: Study Methodology

The study was divided into two parts:

- Qualitative research
- Desk research / secondary Research

A. Qualitative Research

Qualitative research involved semi-structured in-depth interviews (jointly and individually conducted by CII and IMRB) amongst the following segments. Wherever possible the interview was tape recorded, transcribed and content analyzed.

1. **ISPs**
 - a. Sify
 - b. Tulip Telecom Limited
 - c. BSNL (Broadband Services)
 - d. VSNL
2. **Mobile service providers/ISPs**
 - a. Bharti Airtel
 - b. BSNL
3. **Online Content Providers**
 - a. Google
 - b. Rediff
 - c. NIC
 - d. Microsoft
4. **Regulatory bodies, GoI Departments & independent associations**
 - a. Department of IT
 - b. Department of Telecom
 - c. TRAI
 - d. USO Administrator
 - e. ISPAI
 - f. AUSPI
 - g. COAI
 - h. NIXI
 - i. ACTO
 - j. Center for Telecom Studies – IIM Ahmedabad

5. Equipment / Access device manufacturers/ Infrastructure players

- a. Indus Towers
- b. Intel
- c. Nokia
- d. HP India
- e. Nokia Siemens Network
- f. CISCO

B. Secondary research

As part of secondary research subscribed databases (ETIG, ISI) and a number of publications and websites were scanned. This involved summarizing, collation and/or synthesis of existing content and data on broadband. This phase also included data mining from several books, reports, white papers and articles. A part of the output from secondary research acted as input to the Qualitative Research

Some of the reports/books/journals referred are as follows:

- Annabel Z. Dodd, The Essential Guide to Telecommunications, Pearson Education, 2007
- Dan Steinback, The Mobile Revolution, Kogan Page, 2005
- ICube: An annual syndicated research conducted by IMRB International since 1998. These set of reports are based on primary survey conducted every year. The latest survey was conducted in March-April 2008 amongst 16,500 households covering 70,000 individuals across 30 major metros and small towns in India, with additional coverage of 1000 MSMEs and 250 cyber café owners. This study basically captures internet usage among the various respondents.
- ITOPS: ITOPS is a syndicated end-user based study on the IT hardware market conducted by the eTechnology Group of IMRB International in association with MAIT. ITOPS has been an annual exercise since 1996-97 and for the last five years the study has been conducted on a bi-annual basis, as well. The study is based on over 24,600 face-to-face interviews with end-users (Business Segment and Household Segment) spread over 22 cities, with data projected to the 'all India urban market'. It captures internet usage data of business organizations in terms of applications used.
- BDA FICCI Report on 3G and BWA – 2009
- Sudhir Gupta ,Exploitation of 700MHz frequency band, TRAI
- WiMAX Mobile Broadband Services, C S Rao, Samcomtel

- The designer's basic guide to WiMAX technology, standards and implementation, By Dr. S. Jagannathan, Head of Patents and Publications, Tata Elxsi Ltd.
- The Future for Wi-Fi® in India : Opportunities & Challenges, Tense telecom and Wi-Fi Alliance
- TRAI annual and quarterly reports
- NASSCOM Perspective 2020

Annexure-2: Glossary of Terms

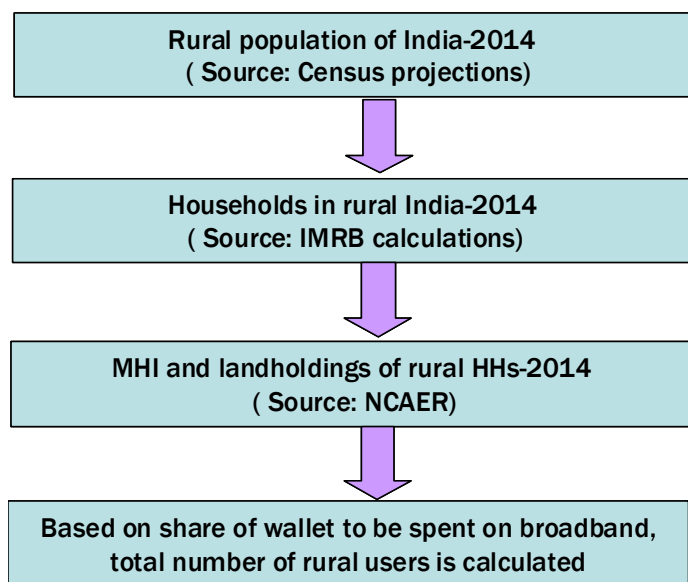
- a) B2B- Business to Business
- b) B2C- Business to Consumer
- c) BOT- Build-Operate-Transfer
- d) BRIC nations refers to Brazil Russia India China
- e) C2C- Consumer to Consumer
- f) CAS- Common Access Service
- g) CHC- Community Health Center
- h) CSC- Common Service Center
- i) DSL- Digital Subscriber Line
- j) EB- Electricity Board
- k) FTTK- Fiber To The Kerb
- l) G2B- Government to Business
- m) G2C- Government to Consumer
- n) GHG- Green House Gas
- o) ICT- Information and Communication Technology
- p) MMP- Mission Mode Project
- q) MSME- Micro Small and Medium Enterprise
- r) PDS- Public Distribution System
- s) PHC- Primary Health Center
- t) PPP- Public Private Partnership
- u) ROW- Right of Way
- v) SCA - Service Centre Agency
- w) SDC- State Data Center
- x) SWAN- State Wide Area Network
- y) USO Fund- Universal Service Obligation Fund
- z) VLE- Village Level Entrepreneur

Annexure-3: 2014 Forecast Methodology

A. Definition of broadband in India: (as per TRAI)

“An ‘always-on’ data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 256 kilo bits per second (kbps) to an individual subscriber from the Point Of Presence (POP) of the service provider intending to provide Broadband service where multiple such individual Broadband connections are aggregated and the subscriber is able to access these interactive services including the Internet through this POP. The interactive services will exclude any services for which a separate license is specifically required, for example, real-time voice transmission, except to the extent that it is presently permitted under ISP license with Internet Telephony.”

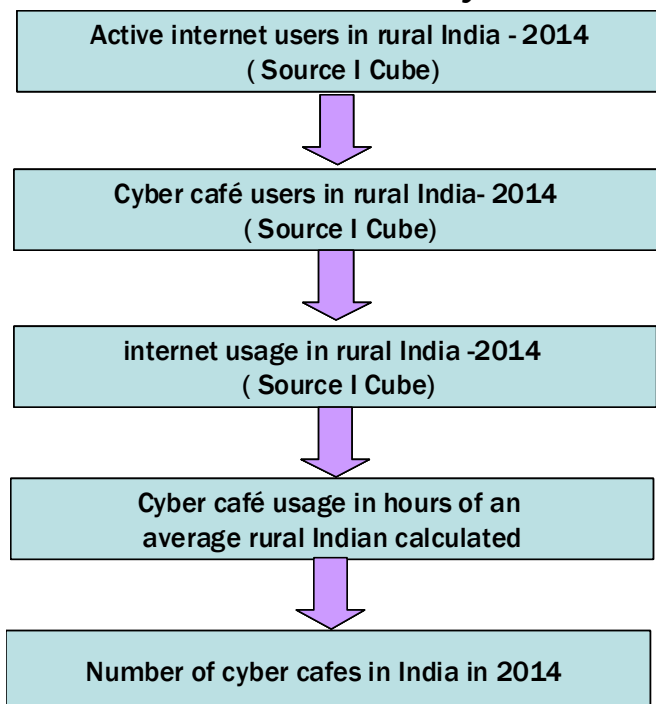
B. Broadband users: Rural India



Assumptions

- The threshold income has been decided keeping in mind the share of wallet on communications and entertainment (Source: Wallet Monitor)
- The access cost of broadband is assumed to be at Rs.300-400 per month
- The number of rural users are based on the purchasing power for broadband
- The projections for the data in 2014 were done from the current data

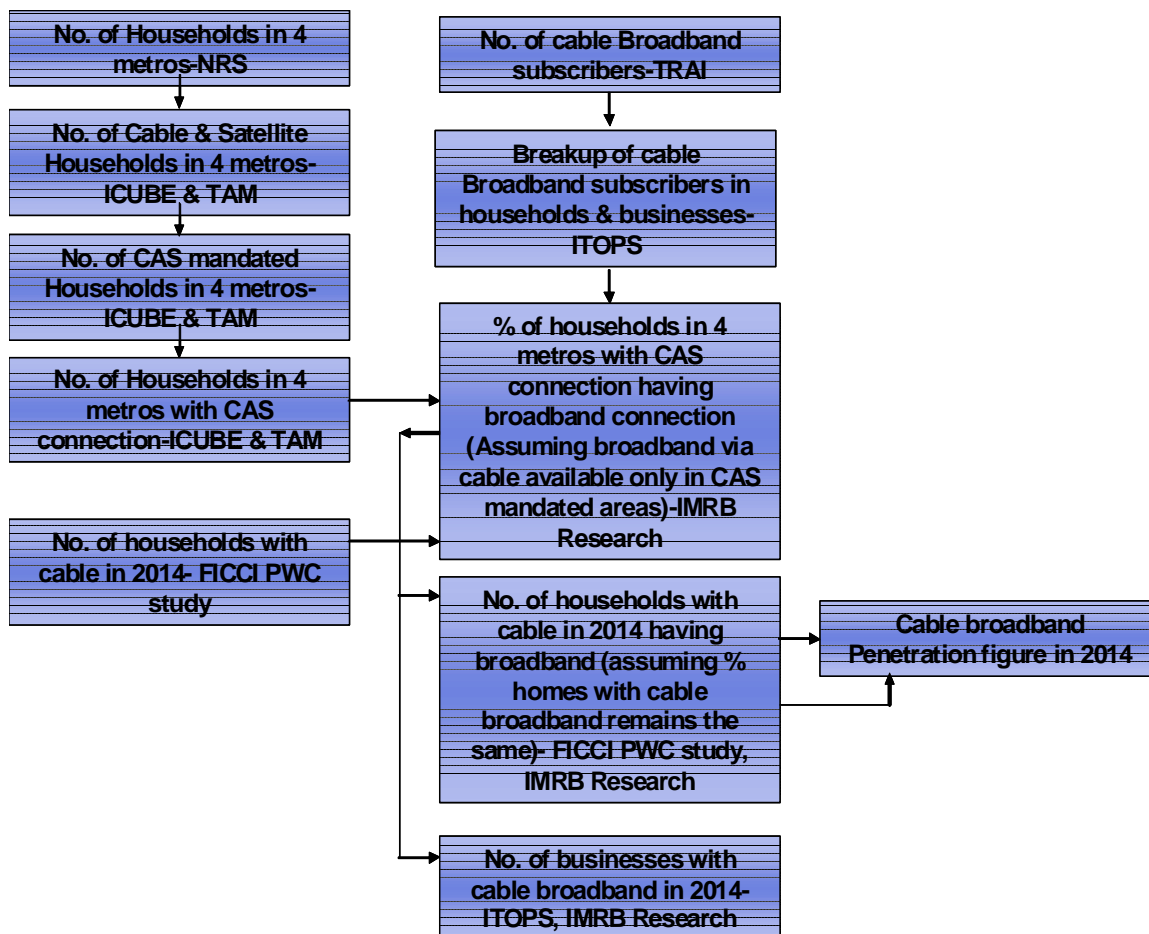
C. Broadband users: cyber cafes



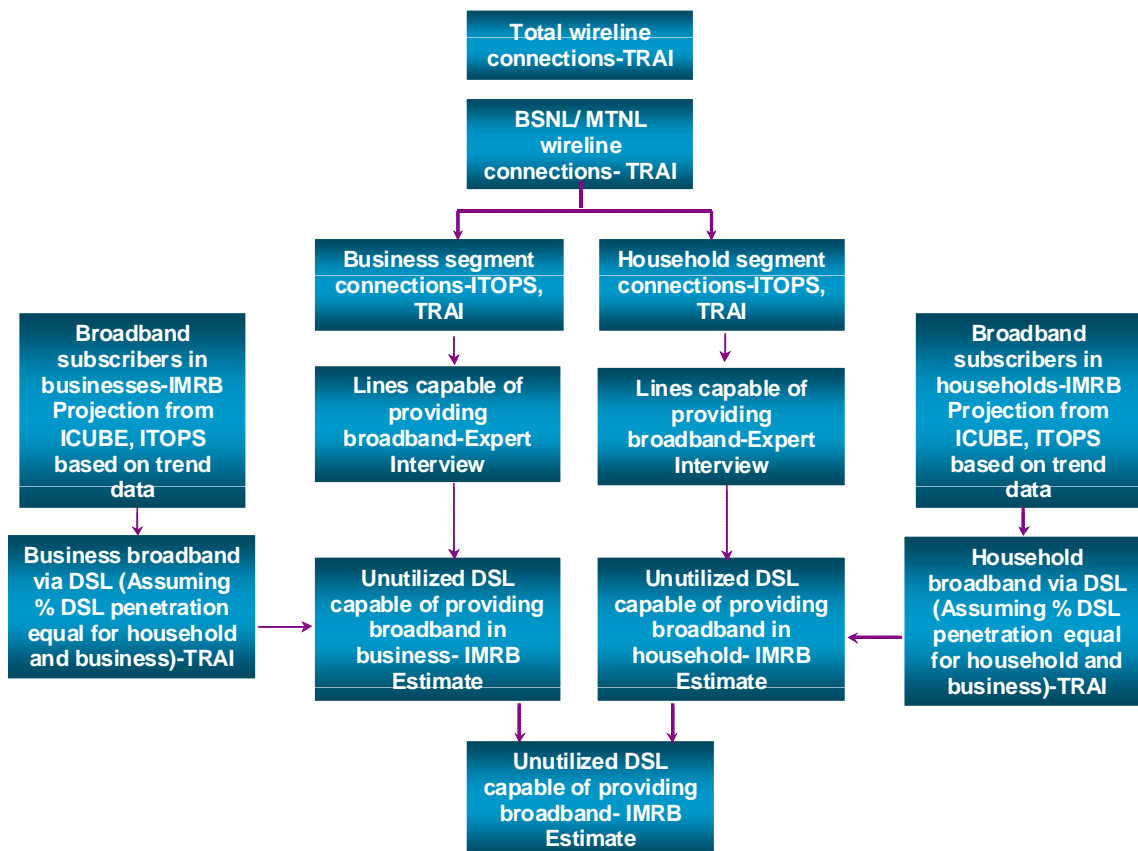
Assumptions

- A cyber café shall have an average of 10 terminals and the café shall remain open for 12 hours in a day.
- Projections for all the above data points in 2014 from the data available currently

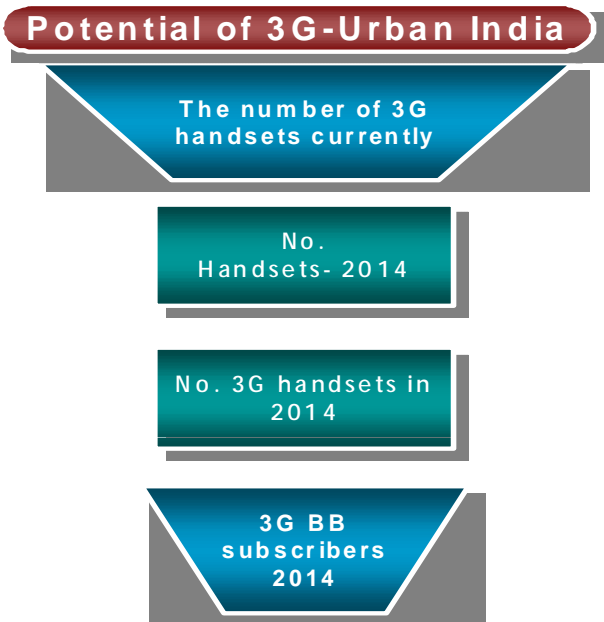
D. Cable Broadband



E.Total unutilized DSL Potential

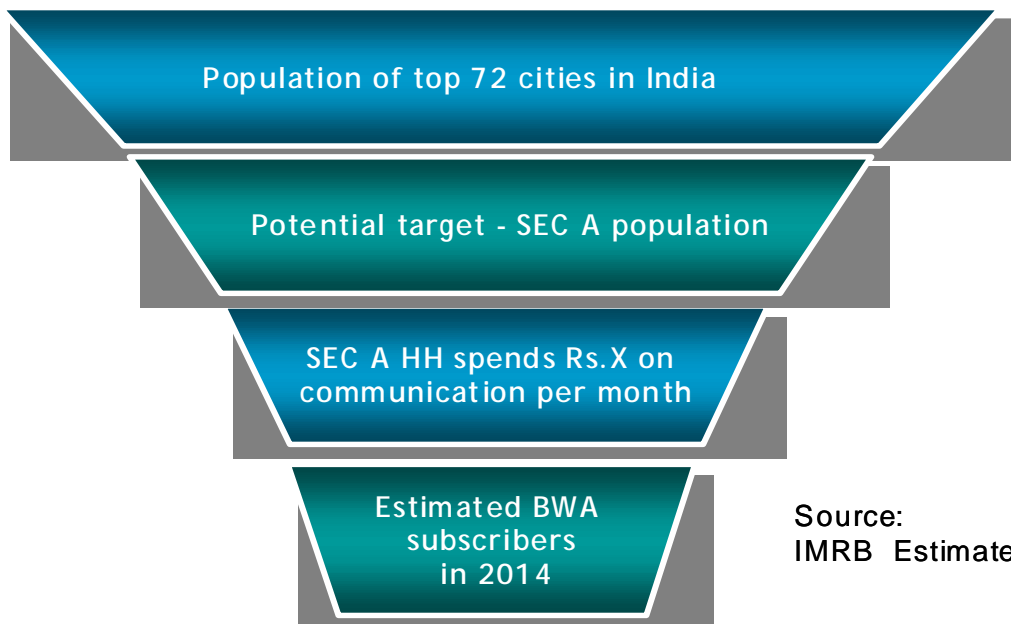


F. 3G Mobile Subscribers



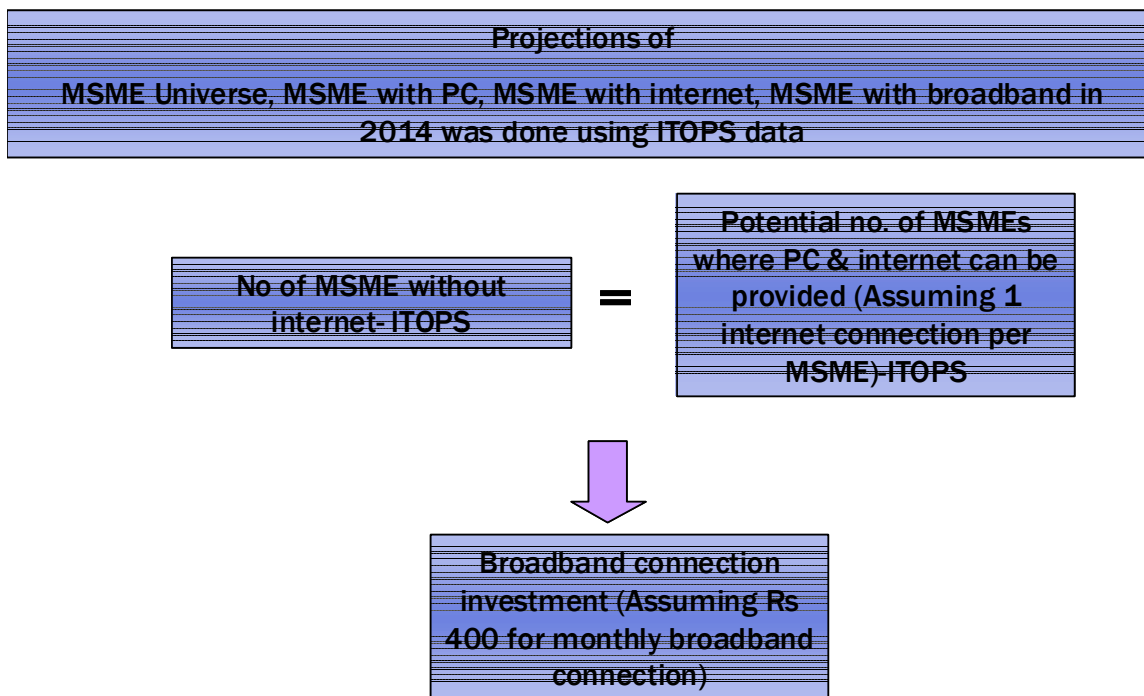
Source: IAMAI VAS report, IMRB Estimates, Other handset reports

G. BWA Subscribers

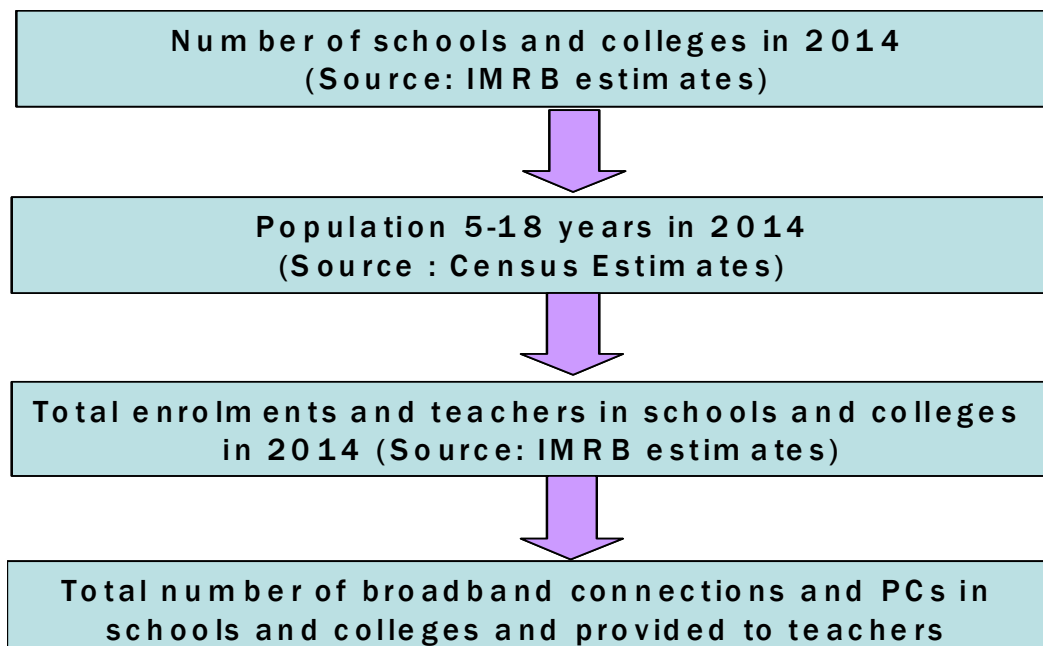


Source: IMRB Estimates

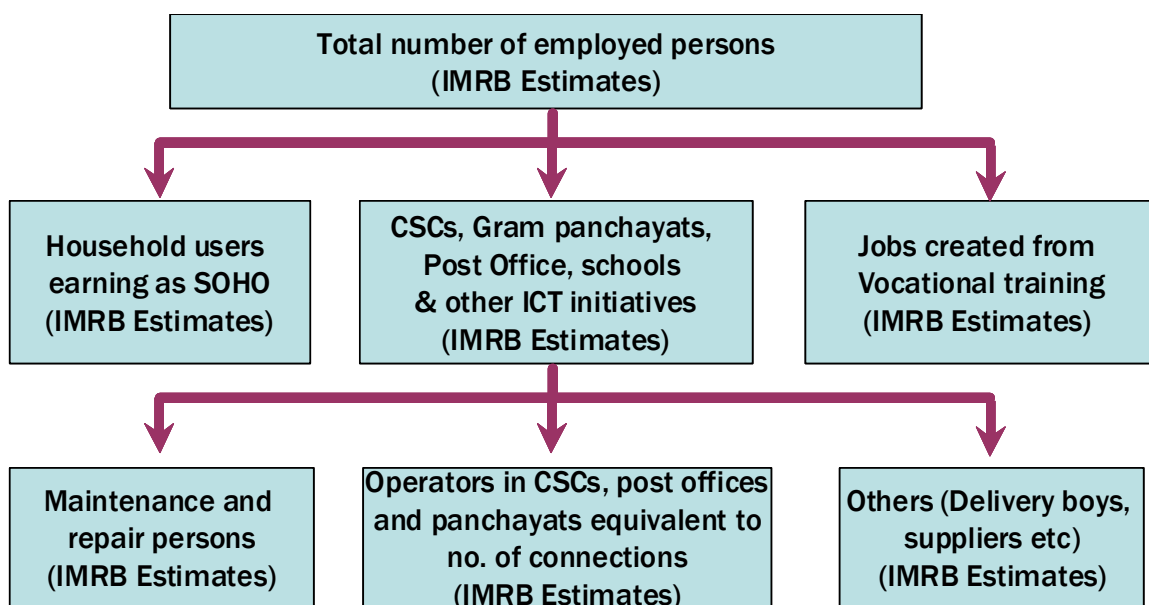
H. The Untapped MSMEs



I. Potential in the Education segment



J. New Employment Opportunities

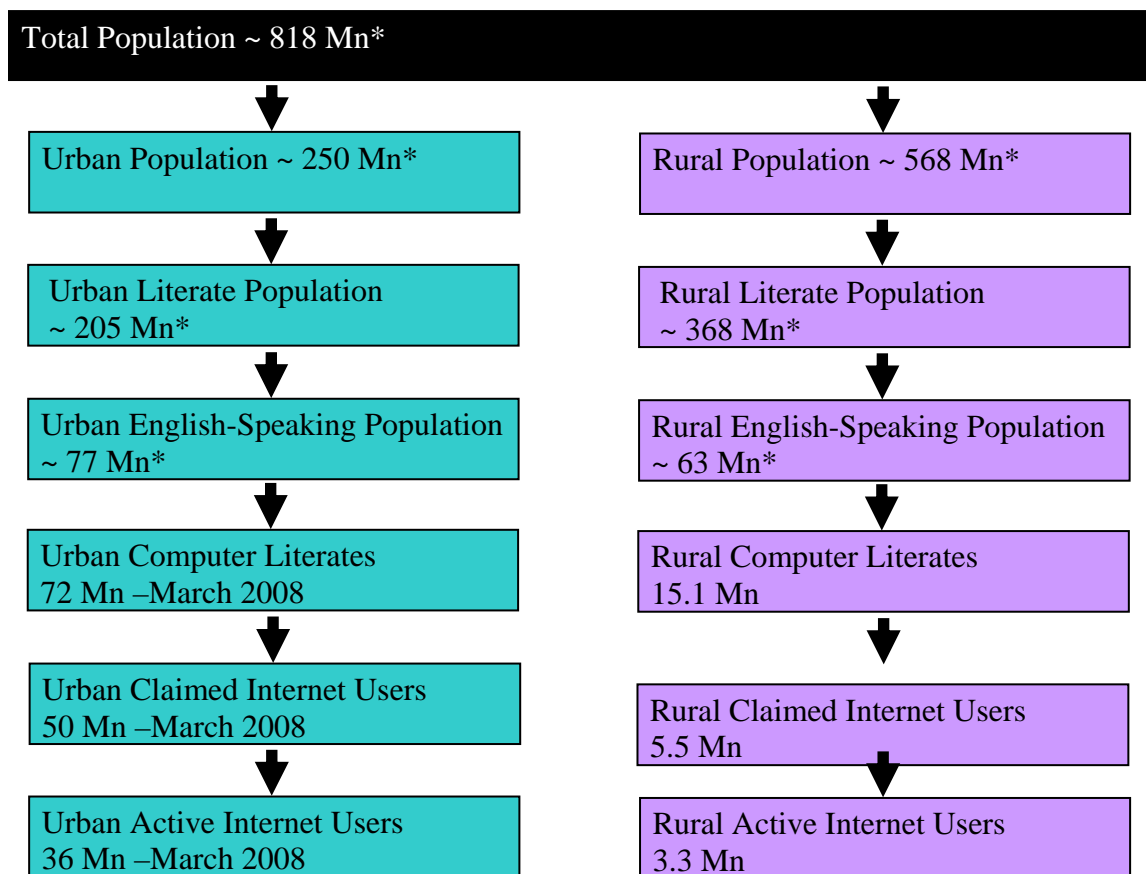


K. Investment in FTTK

Backhaul fiber in India has 40,000 PoPs (Points of Presence) with 10 lakh km route fiber. The vision is to cover all 6 lakh villages. Assuming an average distance of 6 kms for each village from PoP, the investment required per village per km would be approx. Rs 50,000 for aerial fiber and approx. Rs 1 lakh for underground fiber.

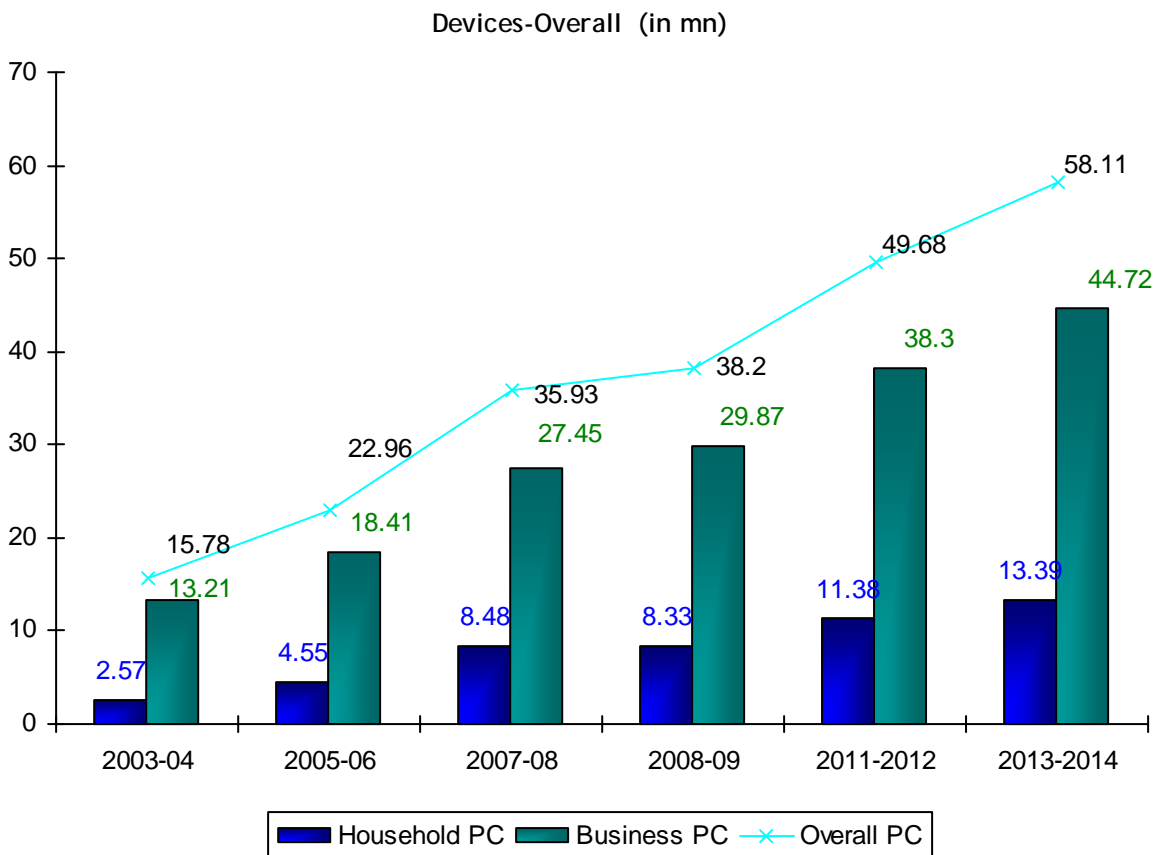
Annexure-4: Miscellaneous statistics on IT and Internet usage in India

A. Total Internet users in urban and rural India

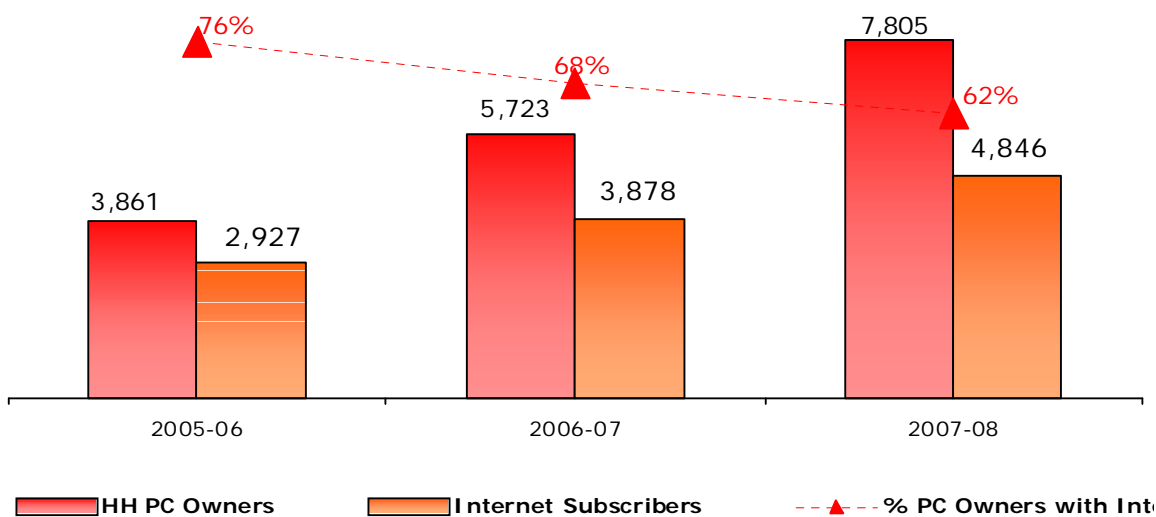


*Note: Population (2008) here is estimated as 12 years and above (based on NRS sampling frame applied to Icube 2008 study of IMRB International)

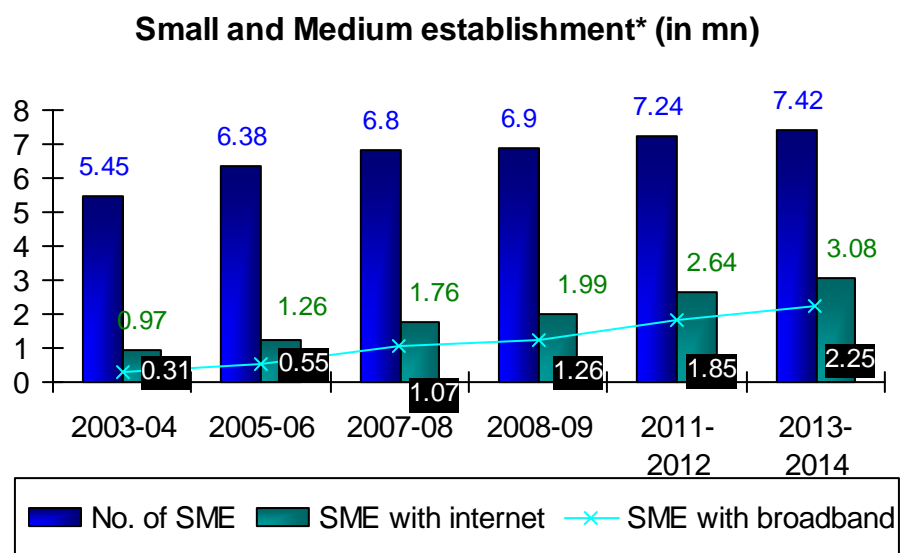
B. Estimated PC owning homes and businesses in India (2003-2014)



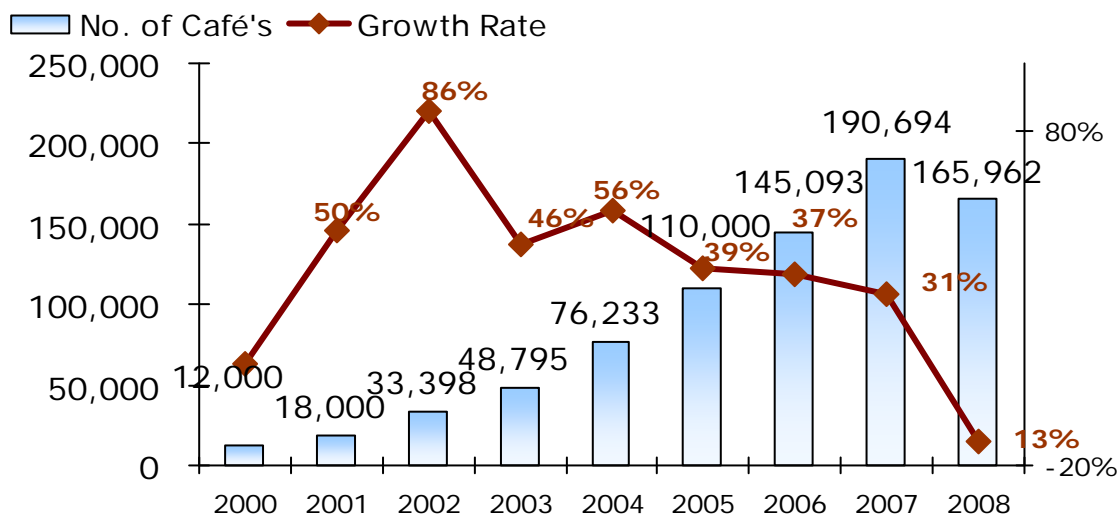
C. Estimated homes with internet connections (2005-2008)



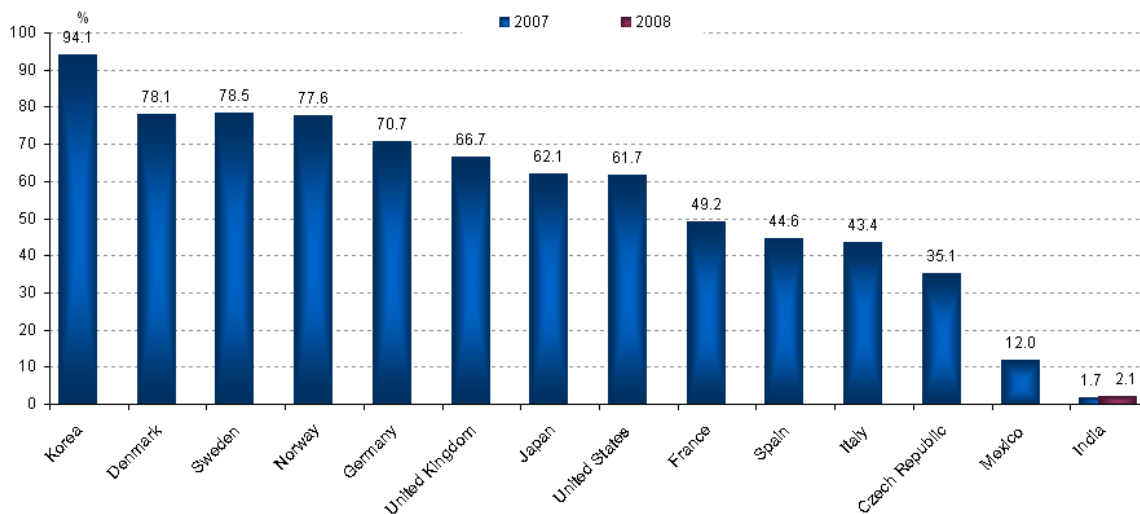
D. Estimated MSME users of broadband in India 2003-14



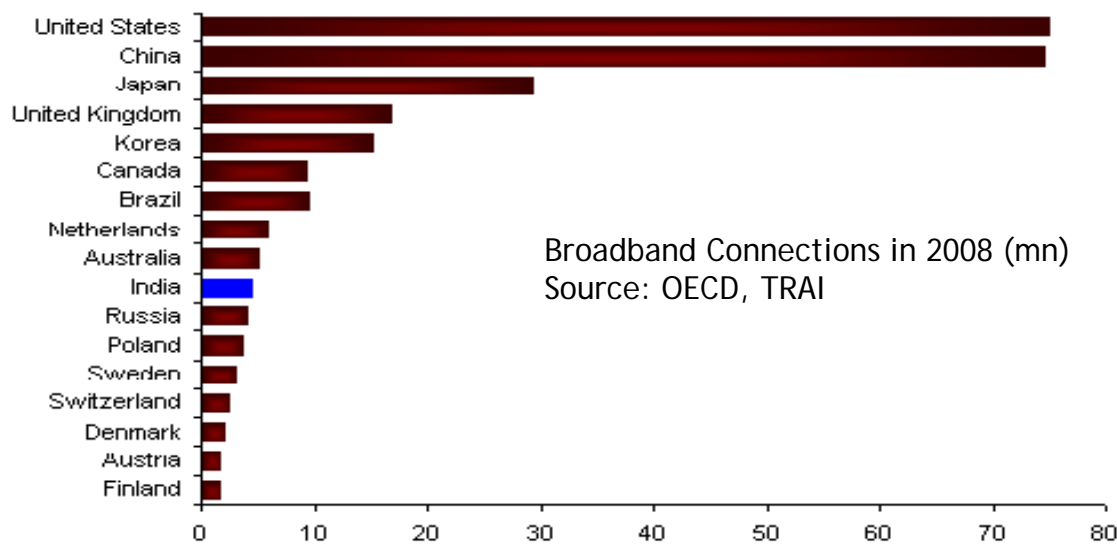
E. Cyber café growth in India



F. Households with ownership of home computer (Percentage of all households in 2007/2008)



G. Broadband penetration in a few countries (2008)



Annexure-5: Contributors to this Study:

We would like to thank all those who provided their valuable time and insights. The study would not have been possible without their contribution.

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Annexure-6: About eTech Group, IMRB International

The eTech Group has been active in the area of Office Automation; Telecommunications, IT, media and Convergence related markets for over a decade and half.

The group has been actively analyzing some of the technologies/markets like:

•**Telecommunications:** Basic & Cellular phone services, Video conferencing Voicemail, VPNs, WAP devices & services, Mobile VAS Usage and Attitude, Web 800, Televoting, Voice Portal Services, Mobile Banking/ Remittance/ Advertising

•**IT:** PCs, servers, printers, language keyboards, software, hardware/software channel management, Internet services, e-commerce, eGovernance, SaaS, Language software etc.

•**Media/convergence:** DTH, Marketing of media time slots by niche channels, Cable channel opportunity for advertising & usage of DVD technology, Opportunity for Edutainment and distance learning services, potential for Tele-medicine application etc.

The Group has experience in conducting various client based commissioned and syndicated market research studies over these years.

The study team consisted of T. S. Mohan Krishnan, Deepak Halan, Amit Sharma, Jaya Vasisht, Dhairya Shah and Ayan Roy Choudhary.

T. S. Mohan Krishnan, Senior Vice President of the eTech Group can be contacted at mohan.krishnan@imrbint.com. For any further information w.r.t this report, please contact Deepak Halan at deepak.halan@imrbint.com.



Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the growth of industry in India, partnering industry and government alike through advisory and consultative processes.

CII is a non-government, not-for-profit, industry led and industry managed organisation, playing a proactive role in India's development process. Founded over 114 years ago, it is India's premier business association, with a direct membership of over 7800 organisations from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 90,000 companies from around 385 national and regional sectoral associations.

CII catalyses change by working closely with government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialised services and global linkages. It also provides a platform for sectoral consensus building and networking.

Complementing this vision, CII's theme for 2009-10 is 'India@75: Economy, Infrastructure and Governance.' Within the overarching agenda to facilitate India's transformation into an economically vital, technologically innovative, socially and ethically vibrant global leader by year 2022, CII's focus this year is on revival of the Economy, fast tracking Infrastructure and improved Governance.

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