ASSOCIATION OF UNIFIED TELECOM SERVICE PROVIDERS OF INDIA

Response to TRAI's Consultation Paper No.9/2010 on National Broadband Plan

20th July, 2010

Background

Broadband access is widely recognized as catalysts for economic and social development of a country. Availability of broadband services at affordable price levels will contribute to higher GDP growth rates, provide for a larger and more qualified labor force, and make that labor pool more efficient. It is pertinent to mention that a number of proposals made by the TRAI in their submission on "Broadband India: Recommendations on Accelerating Growth of Internet and Broadband Penetration" dated 29th April 2004 had been made but these have not been implemented by the Government. Many of these recommendations are still relevant in the context of this National Broadband Plan and should be seen in conjunction while formulating the new Plan under this consultation.

However, the broadband penetration in India is low despite the fact that 104 service providers are serving broadband services. The net broadband addition per month is just 0.1 to 0.2 million in contrast to 18 million mobile connections per month. The broadband penetration is just 0.74% when compared with teledensity of 52.74%. TRAI through a consultation paper on "National Broadband Plan" dated June 10, 2010 has highlighted that a need is being felt to address the impediments and create an environment to encourage broadband growth. Stakeholders have been asked to provide their views on the consultation paper.

It needs to be noted that the "**National Broadband Plan**" should take a holistic view and should be a long term plan covering various aspects like customer requirements (demand drivers, affordability / constraints / learnings from success of rapid penetration of mobile telecom), technologies spectrum; nature and type of CPEs (PCs / modems / mobile devices); funding sources, regulatory aspects etc. The reasons and learning's from the time since the Broadband Policy 2004 had been announced should be taken into account for this proposed Plan. It should be based on a rigorous analysis and estimate of existing assets and information available for current state of broadband and those proposed in this Plan. The current paper however, seems to be focusing more on wireline (predominantly OFC) technology and the related infrastructure; thus there is a need to look at the plan taking into account all aspects of broadband from factors highlighted above. The proposed Plan needs to have clear targets, timelines and resources allocated for implementing the same to emerge as part of this Plan. Considering the significant potential of wireless in the speedy provision of broadband and constantly evolving wireless technologies these should be an intrinsic part of the Plan.

AUSPI'S RESPONSE TO TRAI'S CONSULTATION PAPER NO.9/2010 ON NATIONAL BROADBAND PLAN

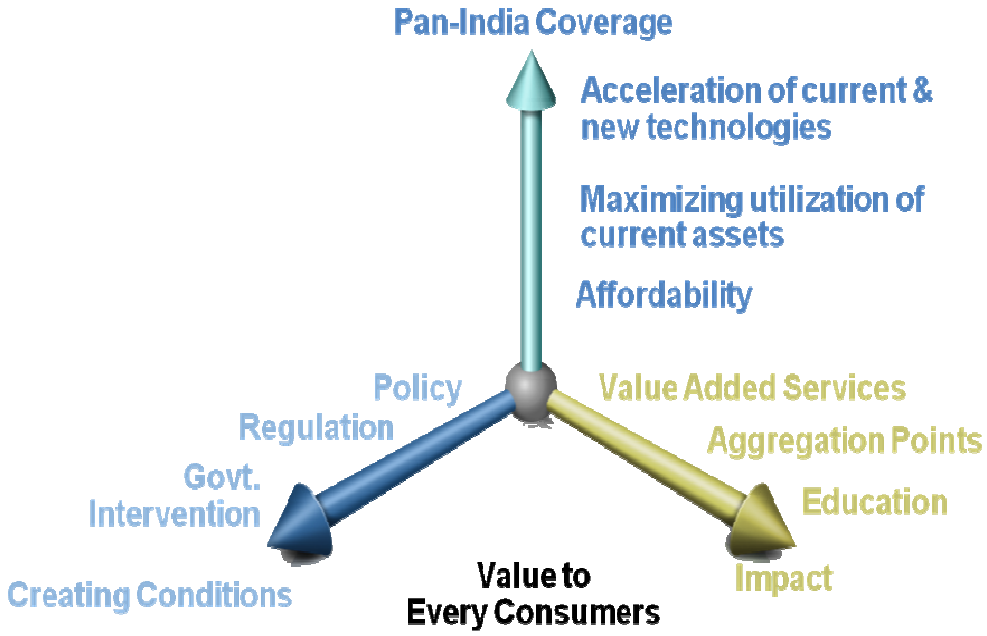
Chapter 2: Broadband – Demand & Supply

5.1 What should be done to increase broadband demand?

Broadband penetration is perceived to be the key impetus for the socio-economic development of a country. Its impact has been widely recognized internationally. However, India has very low broadband penetration.

One of the key attributes to low broadband penetration is the low demand. The following can be the drivers of demand.

Drivers of Broadband Acceleration



Source: Industry Analysis

Among many other factors as we perceive one of the main items for poor broadband penetration is wrong emphasis on the provision of access for broadband. As has been seen in the growth of mobile phones penetration in India, demand for broadband can be increased only through wireless means. Recent auction of 3G and Broadband Wireless Access spectrum would go a long way in this direction. However, Government must take adequate measures for making available various

spectrum bands for provisioning of Broadband in order to improve the uptake of broadband as follows.

- Refarm immediately spectrum efficient 900 MHz band for providing 3G and LTE services and/or future technologies.

- 700 MHz band (698-806 MHz) should be harmonized on priority for LTE services as being at lower frequency band, it is most suited for rural broadband coverage

- Refarming of 2.5 – 2.69 GHz band for broadband. Also, major part of 2.5-2.69 GHz is currently with ISRO where it is underutilized and is being sublet to private sector companies. This band should be refarmed from ISRO and should be utilized for Broadband service.

- 700 MHz band (698-806 MHz) should be harmonized on priority for LTE services as being at lower frequency band, it is most suited for rural broadband coverage.

- Usage of guard band for provisioning of broadband. This is already being done in several countries

- Usage of 450 MHz and1900 MHz bands for broadband for CDMA operators.

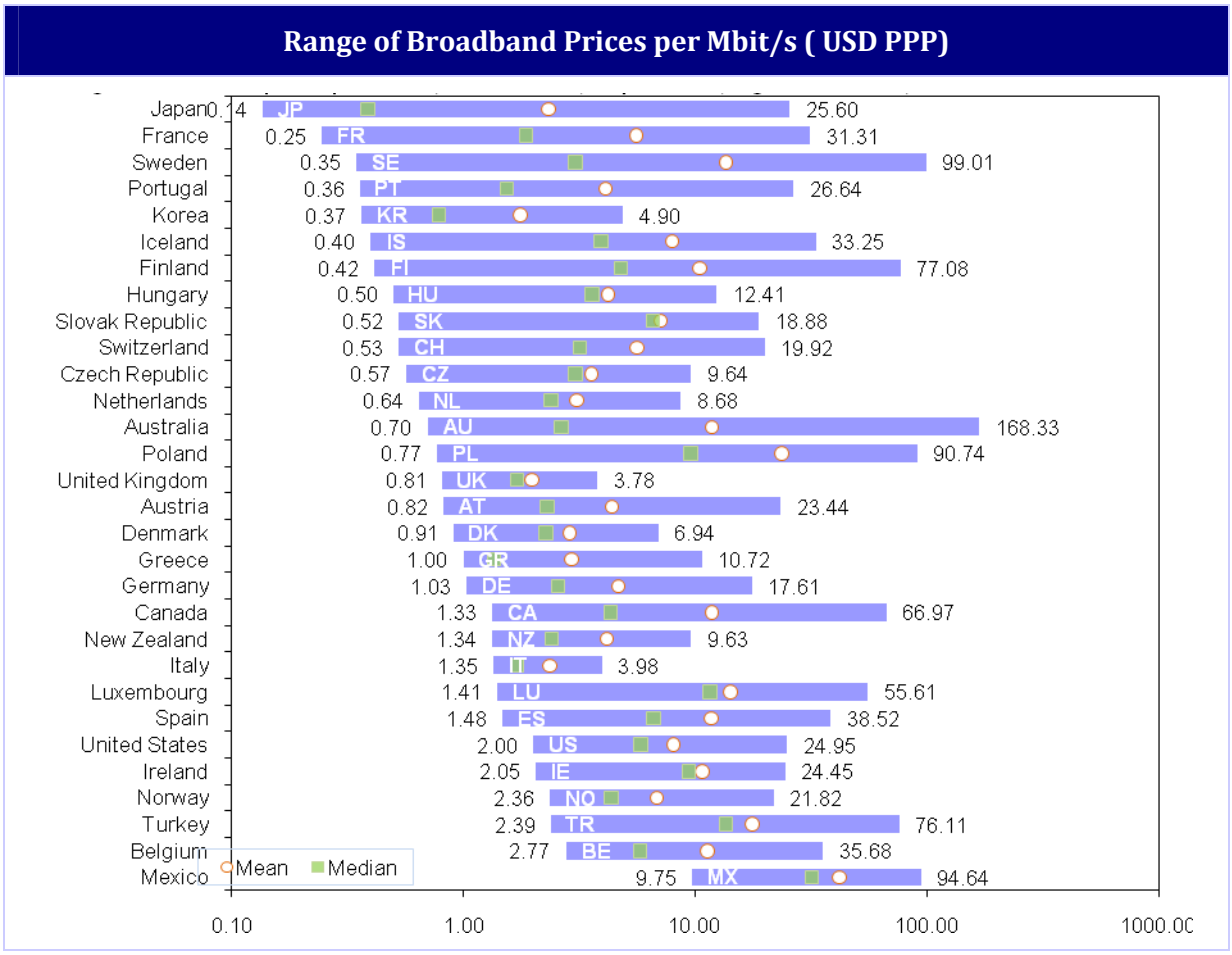
- Additional 40MHz of 2.1GHz should be freed up for commercial usage.

Some other related issues to increase broadband demand are:

1) Low cost Customer Premise Equipment – Cost of CPE to be reduced as it is posing a major hindrance for the growth of Broadband services. It is clearly evident that most future users of internet would have the first hand experience of internet on handheld mobile device. The cost of these should be reduced in India.

2) Low entry level tariff – Tariff at the entry level should be kept at affordable rate.

   Low entry level tariff – The entry level price per megabit in India, although has come down drastically from Rs 1500 in 2004 to Rs 200 (USD 4.16 approx) in 2007, is still higher than most countries. The figure below illustrates the entry level price and the price range in some countries.



3) Localized content – To ensure end to end local content delivery application as well as content need to be provisioned in local language.

4) Accessibility to applications like banking etc.

5) **Perceived Utility**: The popularity of broadband will be linked to its perceived utility. Today, the internet is utilized by a vast majority of users for e-mail and internet research, for which 256 Kbps is sufficient. Bandwidth-rich applications are yet to make way. Moving on, the key drivers of broadband will be in the areas of telephony, education, entertainment and the healthcare space.

In addition to the demand side parameters listed above, there is need for initiatives on the supply side as well. While government has taken some initiatives to promote the broadband infrastructure, the results have not been in line with the objectives. Thus, it is important that certain additional measures be taken. Some of the suggested measures are:

i) Support to service providers in laying infrastructure: Large number of service providers and government agencies like Powergrid, Railtel have deployed vast amount of fiber networks. The telecom service providers have also deployed extensive fiber networks. However, there are still large proportions of rural areas which are not covered by fiber. This is primarily because of the fact that it is economically unviable for the private service providers to reach

out to those areas. Government can support the private players by providing support in the form of subsidies for deployment of fiber in rural. This would ensure that hitherto, uncovered areas are also covered by fiber.

ii) Holistic technology neutral approach: It is important to take a holistic view and include wireless technologies in the broadband definition. By just focusing on wireline it would be difficult to realize broadband objectives as wireline technologies have several limitations like time consuming deployment, relatively expensive CPEs. Wireless technologies however do not suffer from these challenges and can be an important driver for growth in the access side.

iii) Spectrum: There is also a need to take some measures on the spectrum end as suggested above which can have a significant impact on the uptake of broadband. Also, it needs to be kept in view that with increasing uptake of broadband the spectrum requirement will also further increase.

5.2 What, according to you, will improve the perceived utility of broadband among the masses?

Applications with rich utility will enhance the perceived value of broadband in India. **Towards this, we recommend the consideration of utility applications in the following key areas to enhance the perception of broadband to Indian consumers.**

E-governance - For any technology to go main stream and find maximum applications and utility, one of the biggest customers is the government. Broadband can be an important lever in helping government realize its objectives laid out under "National E-governance Plan" With **e-governance** being the new mantra, it has significant potential to bring about convenience, transparency and efficacy in government functions. The various ministries and government departments must have a clearly specified timeline for providing these services as part of this Plan.

Education - In education, **virtual classrooms**, where students do not have to travel distances to schools and colleges, will be in demand. Online discourses, tutorials and examinations will be necessary for empowering universal education where broadband can be used to impart knowledge. Video conferencing is a very useful tool, however initial equipment cost is still viewed as prohibitively high. The "killer application" for deriving broadband is still at large. In keeping with the "Right to Education Act" of the Government of India that came into force on 1 April 2010, broadband can very easily help in bridging this scarcity of adequate schools and teachers to provide effective education at affordable cost

Ecommerce - Online shopping is fast picking up in India. As more and more people start shopping online, the momentum will have to be sustained. For this, it is essential to make the experience richer and more realistic with availability of sufficient bandwidth.

Utility - Remote management of security for homes and business premises over IP networks will drive demand for broadband. Surveillance, alarm and retardants will get enabled over broadband.

Healthcare - Telemedicine is a fairly new trend and an area of growing interest. It is a necessity especially in skill-short developing countries. It could be further enhanced and expanded only on the backbone of a reliable bandwidth service.

Digitalization of land records: This web enabled service would help by bringing in

- Ensuring efficient, accurate, transparent delivery mechanism and conflict resolution in ownership
- Providing electronic record of rights (ROR) to land owners at nominal rates
- Information empowerment of land owners
- Low cost and easily reproducible data for reliable and durable preservation
- Value addition and modernization in land administration

Hence, the scope of broadband can be enhanced from just e-mail to more value added applications. **Effective use of broadband in automation of operations and functions, innovative use of technology in imparting education and increasing literacy will drive the penetration of broadband in India**. Internet and broadband needs to go to every household in the country.

5.3 What measures should be taken to enhance the availability of useful applications for broadband?

In 2004, when initially broadband was defined, it was mainly used for various elementary applications like E-Mail, voice chatting and text information. The availability and type of popular contents have evolved with time. **We recommend the following measures to enhance the availability of useful applications.**

E-Governance - e-Governance in India has progressed towards the "transactional" stage and providing various services to citizens, business and government organization, offered by Central Government agencies and different State Government departments. National e-Governance Plan (NeGP), initiated in 2006, attempts to make all Government services accessible to the common man in his locality, through Common Service Centers (CSC) being set up across India. As on March 2010, about 76,000 CSCs are operational with different brand names and started delivering services to people. Rural landscape in India is set to take the advantage of the flourishing ICT initiatives, by various institutions, more specifically the CSCs.

Rural Broadband Scheme - E-services to the rural population, with access to locally relevant content including available content developed by NGOs, business and government agencies.
Initiatives - Setting up broadband kiosks in rural areas with suitable content is a lucrative option for many private entities. This is the business logic behind ITC's e-Choupal kiosks, which has brought many useful services to rural areas touching the lives of 3.5 million farmers and empowering nine states. Similarly, Aadhar a retail venture launched by Godrej Agrovet provides end-to-end solutions, soil testing facilities, fertilizers, seed recommendations and agri-inputs to the farming community

UID Project (Aadhaar) – UID project's utility can grow manifold if the necessary broadband infrastructure is in place. Broadband (especially wireless) will help UID in connecting with various service providers such as banks and financial institutions and help in solving the last mile connectivity issue

5.4 How can broadband be made more consumer friendly especially to those having limited knowledge of English and computer?

India poses a unique challenge in terms of diversity in languages spoken. Though Hindi is the official language, a large population of India is not well conversant in the same. There are 22

constitutionally approved languages spoken in India and over 1600 regional dialects. Most languages have their own script. Almost every state in India has more than one dialect. This diversity in languages spoken across the length and breadth of India indicates that Indian language content/technology is not synonymous with any one language. There is a need for promoting different languages across regions in order to reach out to the masses. Out of the total literate population in India, 37% are English literate in urban areas and 17% in rural. The remaining (i.e.63% in urban areas and 83% in rural) are not familiar with English. This population is spread across different socioeconomic classes and speaks and read different languages.

Their non familiarity with English has alienated them from using technology tools such as Internet. This opens an opportunity for vernacular content to increase and tap the non-English knowing literate people.

Languages	Million speakers
Chinese	1500
English	510
Hindi	490
Spanish	420
Russian	255
German	229
Arabic	230
Bengali	215
Portuguese	213
Japanese	127

Note: http://www.vistawide.com/languages

Languages	% of Internet Users	No of Users
English	30.50%	430.8
Chinese	20.40%	276.2
Spanish	6.80%	124.7
Japanese	1.90%	94
French	6.10%	68.2
German	1.40%	61.2
Arabic	5.40%	59.8
Portuguese	3.60%	58.1
Korean	1.10%	34.8
Italian	0.90%	34.7
Others	21.80%	220.9

Note: *http://www.vistawide.com/languages*

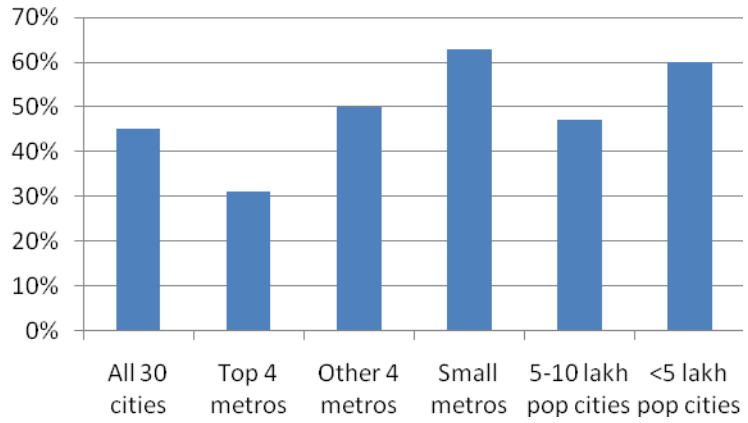
Traditional media have been successful in generating a mass appeal by offering content in Indian languages. Not only Hindi newspapers, but other regional language newspapers like Marathi, Tamil, Telegu, Bengali have surpassed English newspapers (as illustrated in the table below). The success of these newspapers has primarily been the huge vernacular user base and the need for content in regional languages.

Daily	Readership	Language
Dainik Jagran	16,313,000	Hindi
Dainik Bhaskar	13,329,000	Hindi
Hindustan	9,914,000	Hindi
Malayalam Manorama	9,583,000	Malayalam

Daily	Readership	Language
Amar Ujala	8,491,000	Hindi
Lokmat	7,361,000	Marathi
Daily Thanthi	7,353,000	Tamil
The Times of India	7,035,000	English
Ananda Bazar Patrika	6,532,000	Bengali
Source: IRS Figures 2010 Q1		

But the development of regional content for Internet has been very restrictive. Nevertheless, the non-metros and rural population have shown higher propensity to use regional language applications as depicted in the following chart.

Regional Content Usage



Source: **http://www.vistawide.com/languages**

Thus providing regional language content and applications coupled with access points and interfaces in regional languages is the key to widespread broadband internet adoption.

Access points and interfaces such as kiosks, public access, mobile phones and enabling devices such as keyboards and peripheral devices need to be in regional languages so that it is easier for the users to interact with the technology.

Typically to operate a PC/laptop, a user must have some basic knowledge of IT. On the other hand a mobile device with simple icon based interface will have mass appeal, as it would provide similar internet accessibility with no requirement of IT/English literacy. With high penetration level of

existing wireless mobile services, it is clear that it is not necessary for any individual to be literate to handle these simple mobile devices.

A Model for a Digital Literacy Corps

In 42 locations across the city of Chicago, a group of young people is helping others unlock the potential of information communication technology. These young volunteers, mostly in their 20s, are Cyber Navigators who, in conjunction with librarians in the Chicago Public Library system, help patrons with everything from basic computer instruction to advanced computer troubleshooting.

These young people teach classes aimed at the beginning computer user—Internet Basics, Mouse Skills and Introduction to e-mail—to support adults trying to enter the workforce after an extended absence. For example, Cyber Navigators work with job seekers to update their résumés, set up e-mail accounts, post résumés online and e-mail potential employers.

The Cyber Navigators provide one-on-one instruction, at times roaming the library to help users as necessary. Many speak a language other than English, enabling them to better assist a broader group of residents.

To ensure an end-to-end local language delivery, Applications (web browsers, messaging etc) as well as Content need to be provisioned in localized language. The content that is available today on the Internet is largely in English and is not customized to local needs. The task is to make this content available in the dialects spoken in India. However, given the diverse socio cultural background in India this is a complicated task. Mere literal translation of the content in local language might not ensure adoption. A context-aware translation, on the other hand, is needed to guarantee widespread acceptance of ICT. Once infrastructure, application and content is available in Indian language a bulk of the population which is not literate in English would be able to relish the benefits of technology.

As seen in various other countries including the USA, computer literacy programmes have been rolled out to promote digital literacy. **Digital literacy** is an evolving concept. Though there is no standard definition, digital literacy generally refers to a variety of skills associated with using ICT to find, evaluate, create and communicate information. It is the sum of the technical skills and cognitive skills people employ to use computers to retrieve information, interpret what they find and judge the quality of that information. It also includes the ability to communicate and collaborate using the Internet—through blogs, self-published documents and presentations and collaborative social networking platforms. Digital literacy has different meanings at different stages of a person's life. Digital literacy is a necessary life skill, much like the ability to read and write. **Government of India may launch a National Digital Literacy Program (under National Skills Development Corporation) that creates a Digital Literacy Corps, increases the capacity of digital literacy partners and creates an Online Digital Literacy Portal.**

5.5 Do you agree with projected broadband growth pattern and futuristic bandwidth requirements?

No Sir. The existing projections and targets have taken a limited view and there is a need to expand the scope of broadband to consider the potential of wireless technologies. The current targets of 48 Mn connections by 2012 and 100 Mn connections by 2014 are conservative and take into account only the growth of PCs. It needs to be noted that it would be economically prohibitive for every household to own a device with form factor of a desktop / laptop. However, owning a

device with form factor of a smartphone (a fraction of PC's cost) will be much higher This also becomes relevant from the perspective that smartphones would offer user the ability to interface with the device operating system through icon based touch screen based interfaces which do not require significant computer or English language understanding. It also needs to be noted that mobile handsets have wide software development ecosystem and the business models are mature which make the software management relatively easy and enable the OEMs to offer phones at costs which are significantly lower than that of a PC

A study done by BDA projects 62 Mn 3G subscribers by 2012. If we add other devices like set-top boxes, i-pads, PCs etc to this number the total target number can easily be revised in the range of 65-80 Mn.

We feel the scope and time period being envisaged in the consultation paper may need to be extended to envision a longer time period.

Drawing examples from other countries, the National Broadband plan should span around 10 to 15 years as has been done in other countries:

Country	Program Duration
Australia	>15 years
Japan	15 years
South Korea	10-15 years
UK	>15 years

Snapshots of the broadband plans of different countries are presented below:

National Broadband Network Implementation in Australia

2009 Build the NBN and transition the industry – Migration of customers to NBN; Suspension of further fixed line infrastructure-based competition to reshape industry and investment in future proofing for future competition

2018 To Complete Roll-out and Prepare for Privatisation – Adjustments post roll-out and privatization competition

2023 Sustain a world class competitive telecommunications industry – Regulation of monopoly to deliver fair prices and innovation

National ICT Strategy of Japan

The National ICT Strategy of Japan, had a time span starting from 2001 to 2015 built around 4 waves, viz. e-Japan Strategy (Jan2001), e-Japan Strategy II (July 2003), New IT Reform Strategy (Jan 2006) succeeded by an i-Japan Strategy 2015 (July 2009).

The first wave focused on establishment of broadband infrastructure.

The second wave promoted the effective use of IT in seven leading areas viz. medical services, food, lifestyle, SME financing, knowledge, employment and labor, public service.

The third wave brought structural reforms in additional 15 areas while the current wave targets an elimination of broadband zero area and make ultra high speed (100 Mbps for mobile, 1 Gbps for fixed) available to 90% households.

Source: National Broadband Policies (1999-2009), Counselor for Communications Policy, Embassy of Japan

Broadband Journey in South Korea

The decision to focus on broadband began in the mid-1990s and intensified after South Korea's economy was crippled by the collapse of the Asian financial markets in 1997, when policy makers targeted technology as a key sector for restoring the country's economic health. Korean regulators set a path for the industry with well-publicized national goals. All big office and apartment buildings would be given a fiber connection by 1997. By 2000, 30 percent of households would have broadband access through DSL or cable lines. By 2005, more than 80 percent of households would have access to fast connections of 20mbps or more—about the rate needed for high-definition television. Most of the country's consumers were already served by the dominant carrier Korea Telecom, but the government encouraged competitors with a low-interest loan program for companies that built their own broadband facilities. The program offered $77 million in two years alone, with a particular focus on rural areas.

In February 2009, the Korea Communications Commission (KCC) announced plans to upgrade the national network to offer 1 Gbps service by 2012. Currently, Koreans can get speeds up to 100 Mbps. The plan will cost 34.1 trillion won (USD $24.6 billion) over the next five years. The central government will put up 1.3 trillion won, with the remainder coming from private telecom operators. The project is also expected to create more than 120,000 jobs - a win for the Korean economy. In November 2006, the government had announced it would invest 26.6 trillion won (US$28.3 billion) to upgrade networks - including fiber-to-the-home (FTTH), optical LAN and hyper fiber co-axial cable - in the country over the next four years. The government aims to upgrade a total of 20 million subscriber lines - 10 million lines for fixed and wireless services each.

Source:

The UK government had published its Digital Britain Implementation Plan in August 2009

The journey towards Digital Government to date has been in two phases. The first phase, from the later 1990s to around 2004/05 was about driving Britain, private sector and public sector, from being a laggard, as in the mid-1990s, to a leading economy in terms of e-readiness

The second phase, since 2004-05 till today can best be described as 'Government on the web', characterized by the creation of the office of Chief Information Officer and the CIO Council across Whitehall and the institutional support for the Transformational Government programme in the Cabinet Office. Together these are driving towards more common procurement systems, smarter procurement, developing new ways of e-engagement with the citizen and effective savings, based on process re-engineering of online delivery of public services, particularly the large operational units.

The plan further extends till 2016 to complete digitization

The consultation paper envisions deployment of 11.46 lakh km OFC backbone in next 2-3 years; even if a target of 3 years is set, this would require laying 1046 km of fiber daily. This is an unrealistic target and highlights the need to have a long range plan. The National Plan must include proposals for providing Broadband for the time period uptil 2020. This may however, be sub-divided into three phases, in which there is rapid exploitation of available resources in the first phase, lay the groundwork for the infrastructure in the second phase and exploit the infrastructure made in Phase 1&2 in the Phase 3. :-

a) **Phase 1: For the period 2011 – 2012.** Early provision of Broadband services is the aim of this Phase. This phase should **exploit the already existing national broadband resources which are readily available and are underutilized**. The need is to connect maximum population with the available resources in the least possible time frame. This would include leveraging the existing assets of PSUs, the considerable landline and wireless network that is already available in the country. The target of 40 million broadband connections envisaged in the 11th FYP is conservative and as explained earlier can easily be revised to 65-80 Mn connections. Simultaneously the government may initiate steps and measures promoting deployment of OFC backbone by the service providers

b) **Phase 2: For the period 2013-2016.** In this Phase, the government should focus on measures promoting wide scale deployment of OFC backbone, and wireless access by service providers
The Authority should also try to dovetail into this Phase the Phase 2 of the USO Shared Tower Infrastructure Scheme which targets to cover 3.74 lakh villages with population > 500.The target for Phase 2 may be laid down at 200 Mn connections.

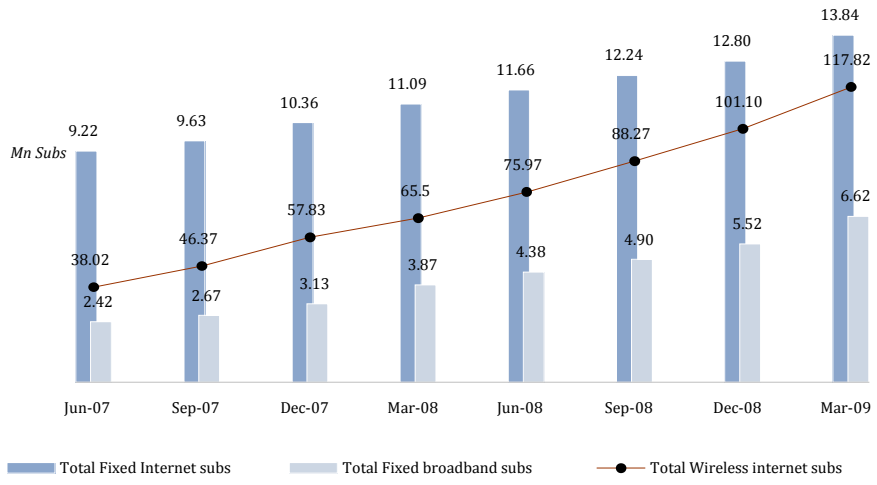
c) Phase 3: For the period 2017-2020. In this phase, the Authority should seek to extend the broadband access to all the balance villages (including those with population < 500), taking into account the infrastructure built and learning's of the Phase 1 and 2 and also keeping in mind the new technologies that would have evolved. The target of this phase should be 500 million additional connections, which would effectively cover all the households in the country.

World over, WIRELESS BROADBAND technologies have been identified as the media to overcome the scarcity. In India too, UAS Licensees, have established considerable wireless infrastructure in rural areas. Further, with the recent 3G and BWA auctions, there is a strong case of leveraging this wireless infrastructure for provisioning of national broadband services. Not only will this reduce roll-out time but will also rationalize the CAPEX requirement. **The current technology options have already been deployed successfully in metro cities in India and their rapid scale up for provision of broadband services in rural areas can be expeditiously achieved by adopting a suitable incentive-based approach.**

Broadband using wireline (fiber, copper, cable) access is constrained by right of way issues, weak per unit economics and high level of market fragmentation. Besides, being wire line has a significant physical infrastructure element. Wireless is expected to contribute significantly in increasing broadband penetration across residential and enterprise segments. Industry inputs suggest that consumer utility of broadband services has been a key constraint in its adoption, which in turn, remains low due to the limitations of current access infrastructure in providing an optimal user experience for consumption of content. This situation, coupled with high device and broadband prices, has resulted in a clear absence of an entertainment-led broadband penetration model. From a supplier perspective, right of way permissions make new fiber or copper based rollouts expensive and time consuming, resulting in a weak business case for network expansion by carriers. The cable market remains fragmented with issues such as under-declaration of subscribers by local cable operators, resulting in limited upgrade and digitization of cable networks to offer interactive cable broadband services. Given this scenario, wireless using 3G / BWA technologies is expected to drive adoption of broadband in residential and enterprise segments, complementing the limited wireline broadband access infrastructure.

5.6 Do you agree that existing telecom infrastructure is inadequate to support broadband demand? If so what actions has to be taken to create an infrastructure capable to support futuristic broadband?

Growth of internet and broadband users



Source: TRAI

Existing infrastructure need upgradation / expansion. The Government should continue to adopt pro-growth regulation which will encourage private and public investments in the telecom sector. Government should provide support to service providers to lay down broadband infrastructure in areas which are economically unviable.

Our analysis of the growth of wireline and wireless connections shows that wireless connections are overgrowing wireline connections for narrow band. Fixed broadband subscribers growing at an average of 15% over the last 7 quarters and is predominantly based on DSL technology. Wireless based connections currently contributing to ~1% of the installed base

Wireless is likely to have the most promising role in the provision of high-speed broadband. Over the last 10 years mobile networks have made substantial progress in the cost-effective delivery of data services. In particular, the advent of 3G and more recently the High Speed Packet Access (HSPA) standard, combined with the declining cost of powerful digital devices, has led to a rapid growth of mobile internet traffic. The speed and bandwidth that mobile networks offer today is similar to the performance of DSL (1st generation fixed network broadband) three to four years ago. Wireless technologies are evolving very rapidly and are expected to continue its progress and to deliver in three to five years speeds that can be materially higher than current access networks and, as such, can be regarded as integral part of the NGA infrastructure. Recent announcements regarding developments in new technologies such as Long Term Evolution (LTE) confirm that trend.

Chapter 3: National Broadband Network

5.7 What network topology do you perceive to support high speed broadband using evolving wireless technologies?

Mapping the digital divide presently existing between urban and rural India is a mammoth challenge owing to the setting up of infrastructure in remote or geographically challenged areas. The challenge is similar for densely populated urban areas. Emerging Wireless technologies should be seen as the potent solutions to these pertinent issues of the past because of its ease of installation, operation & maintenance, flexibility for the service providers and convenience to the end users. However, we must emphasis on leveraging and harnessing all available technologies i.e. by means of adopting a "Technology Neutral Approach" to achieve the national broadband objectives in the most expeditious and effective manner.

Broadband Technologies like EV-DO, HSPDA, 3G, WiMAX and LTE would be able to offer higher data rates over existing wireless technologies. Wireless mesh networks (which is more reliable and supports redundancy) can be implemented with various wireless technology including 802.11, 802.16, cellular technologies or combinations of more than one type. WiMAX/LTE can be deployed by carriers for backhaul application for carrying high bandwidth traffic as one of the options. WiMAX/LTE provides non-line of site backhaul solution while conventional Microwave solutions are line of sight.

Considering the need for broadband technologies in backhaul and access areas, we recommend that the Indian government should make plans for release of additional spectrum especially in the 450MHz, 700 MHz, 1900 MHz, and 2.5 GHz to support the broadband growth. The 900 MHz band is very valuable for providing 3G and LTE services. The same should be refarmed for spectrum efficient and/or future technologies. Further spectrum in 2.1GHz should be released for commercial broadband applications. In addition, usage of guard band for provisioning of broadband can be explored

Network topology should be based on the principle of efficient utilization of various types of available infrastructure. This can be achieved by combining wireless technologies with the fiber based network. Fiber and Microwave can be used for the backhaul whereas wireless technologies can play a vital role in the access side of the network. This type of topology is being recommended keeping in view the success experienced by mobile phones in the country as against wireline phones. This also does not suffer from the long-delays, high costs and complicated RoW procedures involved in provisioning of services to consumers based purely on wireline technology.

5.8 What actions are required to ensure optimal utilization of existing copper network used to provide wire line telephone connections?

Broadband over copper network has been the front-runner with 86% of the countries' broadband connections being serviced through DSL technology. However, the DSL users' as a percentage of total Landline users' remain as low as 21%. As has been highlighted in the TRAI Consultation report that Top 10 cities account for 60% of the overall DSL subscribers, it is evident that the above ratio (DSL : Landline users) would portrait an even more abysmal picture for the rest of the country.

Going by the country's prior experience, it is to be noted that copper cannot serve as the key medium to realize broadband targets. The emphasis should be on combination of fiber and wireless technologies which have not been given requisite support till now. The service providers should be incentivized to roll out fiber and this can be done from the USOF; Also, further financial support for laying and maintenance of copper based networks may be withdrawn as it is not helping in proliferation of broadband and the same amount can be diverted towards supporting fiber based networks.

5.9 Do you see prominent role for fibre based technologies in access network in providing high speed broadband in next 5 years? What should be done to encourage such optical fibre to facilitate high speed broadband penetration?

Fiber based broadband services has the potential to provide maximum high speed Internet over all other available technologies. This technology has no limit as far as upstream and downstream bandwidths are concerned. However, the uptake in India has been low owing to issues relating to Right-of-Way (ROW) and higher capital expenditure commitments required. Fiber optic networks are typically laid down only in big cities with a high density of population and significant revenue-generating potential. Fiber to the Curb (FTTC) and Fiber to the House (FTTH) are being deployed at a limited level in the last mile. The uptake of FTTH in countries like Japan has been significant given the high population density, which makes it possible to connect many users in a small region, as also the widespread fascination for high technology.

The following table establishes the correlation between deployment of fiber based broadband (penetration and coverage) and the population density:

Country	Population-on Density (per sq. km)[1]	FTTH/B				GDP per capita (USD PPP, 2008)[4]
		Penetration (%age)[3]	Coverage[2]	Source Year[2]	FFTH/B to Total Broadband (%age)[3]	
Iceland	3	2.2%	4	Jan-09	7%	46,334
Norway	13	4.3%	8.3	End 08	13%	84,678
Finland	16	0.2%	14	Mar-09	0.9%	49,728
Sweden	21	7.4%	10	End 08	22.7%	50,431
United States	32	1.3%	13.1	Mar-09	4.9%	46,008
Ireland	63	0.1%	1.4	End 08	0.6%	62,806
Spain	91	0.1%	1.5	End 08	0.3%	33,955
Hungary	108	1.1%	1.3	Apr-09	6.2%	14,707
Slovakia	111	3.3%	20	End 08	28.3%	16,023
France	114	0.1%	11	Apr-09	0.4%	43,453
Denmark	128	4.2%	14	Mar-09	11.3%	60,390
Italy	200	0.6%	8.6	End 08	2.7%	37,936
Germany	229	0.2%	0.4	Apr-09	0.5%	43,484
Netherlands	248	0.8%	4.8	End 08	2.2%	50,868
Australia	253	N/A	N/A	N/A	4.0%	44,223

		FTTH/B				
Japan	**337**	**13.5%**	**86.5**	Mar-08	**54.4%**	39,081
Korea	**487**	**16.4%**	**67**	End 08	**48.8%**	18,202

Source:
[1] United Nations World Population Prospects (2004 revision)
[2] OECD (2010), Indicators of broadband coverage, OECD, Paris
[3] OECD Fixed broadband subscribers per 100 inhabitants, by technology, December 2009
[4] OECD, OECD broadband penetration and GDP per capita, 2008

Japan also has 5 cities falling within the Top 100 densely populated cities of the world. India too has a high population density (360 persons/square km); however the geography is spread out as compared to countries like Japan and Korea. **Therefore, deployment of Fiber based broadband would be beneficial given the revenue-generating potential of densely populated cities like Mumbai, Kolkata, Chennai, Delhi, Bangalore, Hyderabad, among others. Also, fiber based broadband would be required in areas with high concentration of enterprise customers (STPs, SEZz, etc).**

Few instances of FTTH deployments in India are highlighted below:

Location	Fibre Deployments
NCR (Noida)	Ericsson India has launched Fiber-to-the-Home (FTTH) technology to provide a host of broadband services in collaboration with property management services provider, Radius Synergies in December 2008. Ericsson India is the first company to introduce FTTH technology in the country, which aims to connect homes to a breadth of high-end data, TV and communications services. With the help of the new fiber technology, Ericsson India has connected about 3000 homes near New Delhi. The services are made available to the people by Ericsson's high-speed fiber access solution, Gigabit Passive Optical Network (GPON).
Jaipur	BSNL has launched FTTH Service in Jaipur with Aksh Optifiber on 13th March 13, 2010. With this technology BSNL now can offer high speed internet access up to 1000Mbps and plethora of services based on triple play (voice, video and data). Services like IPTV, HDTV, 3DTV, video on demand, bandwidth on demand, video conferencing, interactive gaming, and several other value added services will now be available through FTTH.

Source: CIOL

Since large part of the cost of deploying fiber networks is in form of RoW and exorbitant levies are being imposed by various municipalities, there is a need to have appropriate policies in place for ensuring access to right of way at reasonable prices, and preferably at no charge to facilitate broadband services to the public.

The Telecom Operators have been guaranteed the Right of Way (ROW) under Section 10 of the Indian Telegraph Act, 1885 but various municipalities and other State agencies have stipulated their own norms across the country for granting permission / access. As per the Act, the charges that can be levied for granting RoW shall be limited to the restoration charges or any other thing connected with or related to any work undertaken for lying of cable.

The following chart illustrates the fact that there is no rationality/ uniformity in charging as well as there is no uniformity across various states / municipalities. The amount being sought by the various authorities in the respective geographies is perhaps more than the actual restoration charges:

Circle	City	RoW Charges Demanded by Authorities (Rs. per km)			
		Concrete	BT Road	Soil	Paver Block
NCR	**Gurgaon**	4,00,000	4,00,000	4,00,000	4,00,000
NCR	**Delhi**	260 Rs per m^2	260 Rs.per m^2	260 Rs.per m^2	N/A
Karnataka	**Bangalore**	1,05,000	1,05,000	1,05,000	1,05,000
Maharashtra	**Pune**	19,00,000	19,00,000	19,00,000	19,00,000
Rajasthan	**Jaipur**	10,00,000	10,00,000	NIL	NA
Kolkata	**Kolkata**	10,50,000	25,00,000	NA	16,50,000

National Telecom Infrastructure Policy (NTIP)Local body approvals for the Telecom infrastructure build-out:

a) There is no uniform approval process across the States, for the telecom infrastructure construction in different states/local bodies in India and hence different agencies follow different approval procedures. A recent study by the Indian Council for Research on International Economic Relations (ICRIER) reveals that Indian states with higher mobile penetration are expected to grow faster, with the growth rate being 1.2% points higher for every 10% increase in mobile penetration.

b) The Telecom Infrastructure service provider needs to apply to the local Municipality/Panchayat bodies for permission to install Telecom infrastructure (UG cables, OFC, Microwave towers, Distributed Antenna Systems (DAS) mobile tower construction, power supply, land acquisition etc). But the lack of guidelines or standard procedures is resulting in enormous delays and cost implications. With ISO standard designs and structural safety will reduce the need of the local body approval process for telecom infrastructure rollout / construction.

c) On the lines similar to National Telecom Policy 1994 and New Telecom Policy 1999, government should announce National Telecom Infrastructure Policy (NTIP) elaborating uniform procedures for land/site acquisition, uniform taxation regime, extending applicable/suitable subsidies and other packages for creating conducive environment to boost national telecom infrastructure building and thereby ensure increased participation of all the stakeholders.

d) Department of Telecom, in consultation with state governments, will frame a National Telecom Infrastructure Policy which will speed up deployment of infrastructure in the

country by laying down guidelines for RoW, land acquisition, availability of power supply etc. This policy should make state governments and local self governments party to successful implementation and enabler for telecom infrastructure. Mere "policy guidelines" may not help and it is desirable to make this policy into **"National Telecom Infrastructure Act"** or appropriate changes in Indian Telegraph Act which will be binding on state governments.

Therefore, we recommend that DoT should take lead in ensuring that RoW procedures are in line with the Indian Telegraph Act. DoT should re-emphasize and re-state its RoW guidelines with few additional issues mentioned below and coordinate with various State governments for its uniform implementation:

- **Formulation of a National Telecom Infrastructure Policy is essential to enable steady growth in a national asset such as telecom infrastructure as part of this Plan.**
- **The RoW permission should be granted "ON PRIORITY". Any denial to RoW in exceptional circumstances be recorded in writing with reasons**
- **The local Authority should only levy restoration charges. No rental or any recurring charges may be levied in any form.**
- **Service providers may be directed to restore the dug up sections to its original state to the satisfaction of the local authorities.**
- **Broadband and In-building solutions installation can be included in the building laws**
- **Broadband should be made an integral part of Jawaharlal Nehru National Urban Renewal Mission with suitable inclusion of enabling regulatory provisions for broadband in the building codes.**

5.10 What changes do you perceive in existing licensing and regulatory framework to encourage Cable TV operators to upgrade their networks to provide broadband?

Digital transmission, offers a number of advantages over analogue broadcasting. These include better reception quality, increased channel carrying capacity, new features such as programme guides, multi view and interactive services, as well as potential to provide Triple play i.e. voice, video and data. Digitalization can lead to increase in ARPU, especially when bundled with other broadband services such as Internet access and telephony.

In order to ensure that the country realizes the wide benefits from digital transmission, It is recommended that TRAI should mandate the digitalization plan within next 2 years. Also, TRAI may go ahead with the recommendations of increasing the FDI cap to 74% for MSOs who are/would digitize their networks. MSOs should combine and cooperate to build tomorrow's digital India.

The cable TV rules are already defined and further changes in the licensing regime are not required. However, there is a need to expedite the digitization plan and this should be done within 2 years.

5.11 Is non-availability of optical fibre from districts/cities to villages one of the bottlenecks for effective backhaul connectivity and impacts roll out of broadband services in rural areas?

It is a well recognized fact that broadband penetration in rural areas is lagging behind. India's position on the global map in terms of broadband penetration is very dismal. Broadband will be the key to enable ICT applications in rural areas. There is an urgent need to develop specific schemes for improving broadband connectivity.

Both, the President in her address to the parliament as well as the Prime Minister have stressed on the need for Broadband penetration to be increased in rural areas. In his address at India Telecom Exposition in December 2009, the PM emphasized the need to double the rural teledensity in the next three years to exploit the opportunities offered by mobile telephony for financial inclusion. He also remarked on the lack of broadband availability in the rural areas, and spoke about the initiatives taken by the government on that front. He said, "We have decided to implement a massive programme of broadband for all, under which all the 250,000 gram panchayats (government at the village level) in the country will be provided high speed broadband connectivity by 2012. Concluding that, "We cannot be satisfied with the status-quo".

This target (March 2012 i.e. 25 months from now) translates to adding more than 10,000 additional broadband connections each month from now till March 2012, only for panchayats. While the PMO has stressed the need to enhance broadband connectivity, it is the onus of the policy makers in the government and industry to put in synergized concerted efforts to meet this difficult target on priority.

The urgent need right now is to catalyze and accelerate the growth of Broadband in rural areas. The benefit of connecting the rural goes well beyond basic telecommunications. Greater broadband connectivity to the Internet promotes distance learning, E-Learning, E-Governance, E-Health applications – all of which prove to be significant economic multipliers in a spread out rural population. A study by GSM Association, based on a survey in 57 countries concluded that a 10 per cent increase in mobile phone penetration leads to a 1.2 per cent rise in annual GDP.

Realizing the above benefits, the Universal Service Obligation Fund Administrator brought out a scheme for subsidizing Wireline Broadband in designated rural areas in January 2009. This scheme envisioned up-gradation of 27,789 rural exchanges for provisioning 1,778,496 wireline broadband connections. Even after commencement of such subsidy schemes, India with over 600,000 villages still has to provide enabling schemes to cover adequate broadband coverage in rural areas. Deployment of last mile wireline infrastructure is deemed to be an arduous process where the following factors pose significant challenges to the rural broadband penetration time:

- Acquisition of land
- Right of Way
- Backhaul connectivity
- Lack of infrastructure sharing
- Power supply
- Higher operation and maintenance cost
- Lower Average Revenue Per User (ARPU) & hence reluctance to commit large investment;
- Affordability of Services
- Low level of Literacy and Awareness
- Unavailability of locally relevant applications in local language

World over, Wireless Broadband technologies have been identified to overcome aforementioned hurdles. In India too, UAS Licensees have established considerable wireless infrastructure in rural areas. There is a strong case of leveraging this infrastructure for provisioning of rural broadband. Not only will this reduce roll-out time but will also rationalize the Capex requirement. Since services already exist in urban areas it is only a matter of extending these to rural areas with suitable support for the upgrade of existing rural telecom infrastructure.

Taking the above into consideration it is evident that a combination of existing fiber optic network and emerging wireless technologies would be adequate to handle the challenges in the core, backhaul, access areas of the network (as also CPE):

- Existing infrastructure: The regulator should encourage all the operators to light up their dark fiber especially in the rural areas. Existing infrastructure is utilized, thereby overcoming challenges faced so far for ROW, power supply, supply, retail distributor chains etc.
- Trials: Tried and tested deployment in the urban areas in India, which can be rapidly scaled up in rural areas. Thereby being in line with the government's objective of inclusive growth with PURA – Providing Urban amenities in Rural Areas.
- Plug and play: Thereby extremely customer friendly, easy to adapt by rural consumers, for individual as well as usage in cottage industry/SME applications
- Ease of Use: Minimal after sales maintenance and support needs.
- Flexibility: Usage as standalone device through USBs, as well as embedded in PC/Laptops, Cell phones.

We recommend that:

There is a need to revise the current definition of Broadband to accommodate the provision of services on a wireless platform.

1 **USOF should devise attractive schemes for rural broadband to enable broadband connectivity in rural areas. The details of the schemes could be worked out by USOF and UAS Licensees.**

2 **There is an immense potential for providing broadband over wireless in rural areas using different wireless technologies. While there have been many schemes for wireline, the focus on wireless has been limited. USOF should immediately devise a scheme for subsidizing infrastructure for wireless broadband.**

5.12 If so, is there a need to create national optical fibre network extending upto villages?

We recommend the use of existing infrastructure to support deployment and uptake of rural broadband. Optical Fiber Network to the extent of 7,50,000 kms is available in the country. Approximately, 85% of India's villages are located within a radius of 15-20 kms of a fiber drop point. Therefore, it would be inappropriate to conclude that the non-availability of optical fiber network in the backhaul is resulting into the low proliferation of rural broadband. Many telecom operators and government agencies (Railtel / Power Grid Corporation of India Ltd/GAIL) have already deployed vast network of fiber and appointing an agency would tantamount to duplication of infrastructure. In fact, Pan India Optical Fiber Network should be mapped across all public and private operators and the same should be used with wireless technologies, to increase the broadband penetration in India. BSNL, for example, has more than 5,00,000 km optical fiber

network in India. The reasons for its low utilization need to be taken into account while formulating this current proposal.

In addition, the topology should include wireless technologies so that broadband proliferation does not suffer from limitations of complicated RoW procedures, time consuming infrastructure laying process and high costs. Wireless also offers the advantages over wireline in terms of being immune to damages like 'fiber cut' which may be caused by natural disasters / negligence etc. However, very high ROW charges at present are causing a major hindrance for fibre roll out. On the other hand, wireless broadband technologies will be in a better footing in rural areas both from a cost as well as a maintenance perspective. The urgent need right now is to catalyze and accelerate the growth of Broadband in rural areas. The benefit of connecting the rural goes well beyond basic telecommunications. In the short term, it is quite evident that wireless connectivity is likely to be much more cost effective to provide wireless connectivity to villages, than OFC.

Thus, we recommend the use of existing and proposed new infrastructure of public and private operators to support deployment and penetration broadband upto villages in the country. While there is no denying that considerable new infrastructure is required to be provided in the fastest possible manner a more realistic estimate of the targets , resources and timelines for execution of this national optical fibre core network layout needs to be done, than that which has been indicated in the Consultation.

5.13 In order to create National optical fibre core network extending upto villages, do you think a specialized agency can leverage on various government schemes as discussed in para B?

&

5.14 Among the various options discussed in Para 3.35 to 3.37, what framework do you suggest for National Fibre Agency for creating optical fibre network extending upto village level and why?

&

5.15 What precautions should be taken while planning and executing such optical fibre network extending upto villages so that such networks can be used as national resource in future? What is suitable time frame to rollout such project?

Members will reply

Chapter 4: Regulatory Challenges and Future Approach

5.16 Is there a need to define fixed and mobile broadband separately? If yes, what should be important considerations for finalizing new definitions?

With the introduction of the Broadband Policy of 2004 which became effective as of 14th October 2004, the Government formally recognized the need and the potential of Broadband in improving the quality of life of citizens through a variety of applications such as telemedicine, distance education, e-governance etc. However, six years hence, broadband penetration still remains significantly lower (with just 8.75 million connections as of March 2010) than the target of 20 million connections at the end of 2010. Demand for Broadband is contingent upon the penetration of the internet and PCs. While low penetration is one concern, the definition of Broadband itself is a matter of contention. The Broadband Policy of 2004 defines broadband as:

> *"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."*

In this perspective, the words "Always on" could restrict wireless based high speed internet connections from being classified as Broadband. In this age of information technology where growth of the internet is anticipated to be driven mainly by wireless access such as 3G and BWA technologies, the current definition may be highly restrictive.

Internationally too, the definition of broadband is relatively less restrictive. Several advanced and developing countries have not set a minimum speed for broadband connections thus driving competition and getting players to provide higher speeds to customers. In some countries who have defined speeds, there are separate definitions for wired and wireline connections in order to protect the interests of both technologies.

Country	Comment
Japan	• No defined minimum download speed
Korea	• For its 'Broadband Convergence Network', Korea has a planned speed between 50-100 Mbps per household for wireline network and 1 Mbps for wireless network
China	• No defined minimum download speed
Canada	• No defined minimum download speed • The Canadian National Broadband Task Force (CNBTF) defined broadband as "a high capacity, two-way link between end users and access network suppliers capable of supporting full-motion interactive video applications to all Canadians on terms comparable to those available in urban markets."[2]
Australia	• No defined minimum download speed

[2] *TRAI, Status Paper on Broadband Speeds, January 2008*

However, even where minimum download speeds are specified, advertised speeds in all these economies is market driven and hence much higher. In Japan and Korea for instance, the advertised rates are of the order of 80 – 100 Mbps[1]. In Singapore, starting plans have a minimum speed of 512 kbps. Even France which has a minimum speed of 512 kbps has advertised speeds of ~50 Mbps.

As mentioned in the current TRAI Consultation paper, though the current penetration of wireless in India is at a very nascent stage with just around 1% of broadband users using wireless connections, recent technological innovations in mobile telephony are capable of generating high speed internet access through mobile phones. The wireless telephone subscriber base in India increased to 617.53 Mn at the end of April 2010 thus bringing wireless teledensity to 52.3%, while wireline subscriber base declined from 36.83 million in April 2010 to 36.39 million at the end of May 2010 bringing wireline teledensity to 3.08%[2].

Wireless as a technology has immense potential and high uptake and wireless broadband is likely to have similar uptake and can be an important lever in realization of government's objective of providing internet connectivity to large number of subscribers. It is also important to do a quick comparison of the wireline and wireless technologies:

- **Shared Access.** The core networks for wireless and wireline networks are not substantially different but the "last mile" distribution/access system is entirely different. The mobile networks are shared bandwidth systems as the "last mile" for wireless is the shared radio link. All subscribers on a wireless network in the same area share that same capacity. The bandwidth that can be delivered in broadband wireless access is spread across all the active customers on the same base station antenna. Resource-intensive use by one wireless broadband customer impacts the speeds at which others can communicate. This is unlike the dedicated user access technology used in wireline broadband systems, where sharing of capacity occurs only at more central points in the network and not at the access level. Wireless connections cannot guarantee a minimum speed, they are extremely important in spreading internet access, and subsequently increasing the economic level and the quality of life of India's citizens. The actual access speed offered by a service provider is also a function of the demand and competitive factors. With evolution in technology the actual offered speeds can go much higher than the current limit of 256; thus making it lose significance.

- **Mobility.** Mobile wireless networks, unlike fixed networks, enable customers to change locations and still gain access, or even to communicate while traveling. The wireless network has to be built to accommodate mobile subscribers, rather than subscribers sitting in one place. The cell sites for mobile networks have constantly changing mix and volume of voice and data uses, which put varying strains on the available spectrum resources. This limits the spectrum resource that can be allocated to any one user and to all users within the area served by a certain cell.

- **Bandwidth Availability.** Wireless networks have limited capacity compared to a broadband system such as fiber. Although new wireless technologies, such as LTE and Wi-MAX, will substantially improve wireless system speeds but will still lag behind the speeds available using wireline networks.

[1] Reuters, News Article
[2] IT News Online, News Article

The above mentioned differences between wireless and wireline broadband networks translate to differences in the way these networks can be managed. The goals of wireless network management practices are to maintain equitable access to the network resource for the most users and to ensure that maximum users have access to the bandwidth expected at any given time. Therefore, wireless internet operator may have to restrict connection alive for more than it is needed. The customer experience improves when the wireless network operator optimizes performance and efficiency by managing the shared air interface between users and the base station. The internet sessions can be terminated for inactivity for reasonably longer period of time as without this feature a cell site is unnecessarily overwhelmed without achieving any benefit to the user.

Therefore, it is recommended in view of the above, there is a need to define wireline and wireless broadband separately so as to avoid inclusion of clauses which favor wireline over wireless. The wireless would include both fixed and mobile wireless. It is recommended that clauses "Always-on" and minimum download speed guarantees as mentioned in the current definition should be taken out from the definition. This would help in ensuring technological neutrality and also help improve internet penetration in the country.

5.17 Is present broadband definition too conservative to support bandwidth intensive applications? If so, what should be the minimum speed of broadband connection?

The need of the hour is to first enable the vast majority to experience the internet as the first priority. The focus should be on this aspect, the provision of which will automatically lead and encourage the growth towards higher broadband penetration. We believe that the definition of broadband in any country has not been an impediment to for supporting high bandwidth applications. The definition specially for a county like India, with a low penetration of internet users must be an enabling definition rather than an excluding one, such as to enable the masses to experience the internet, and online utilities to their benefit. Broadband providers have been known to provide much higher speeds where ever the demand has arisen.

Though organizations such as OECD and ITU have fixed international standards on the minimum defined speed for broadband, countries use different speeds which are mainly driven the applications primarily used and the bandwidth required to support them. In France for instance, though the minimum defined speed is 512kbps, advertised broadband speeds are of the order of 50 Mbps which is required to support bandwidth hungry applications like video streaming and high definition video.

The current TRAI Broadband Consultation Paper also documents the bandwidth requirements for several applications as shown in the table below:

Application	Minimum Bandwidth Required	Current Usage/Popularity in the country
Internet Surfing	Upto 256 kbps	High uptake
Email	64 kbps	High uptake
Voice Chatting	64 kbps	Moderate uptake
Voice and Video Chatting	256 – 512 kbps	Low uptake

Application	Minimum Bandwidth Required	Current Usage/Popularity in the country
Video Clips	256 – 512 kbps	Moderate uptake
Tele-education	256 – 512 kbps	Low uptake
Telemedicine	256 kbps	Low uptake
Video Streaming	2 Mbps (approx)	Low to moderate uptake (restricted to urban populace)
Video Gaming	256 – 512 kbps (higher precision games may require higher bandwidth	Low to moderate uptake (Restricted to urban populace)
High Definition Video	4 – 8 Mbps	Low uptake
Source: TRAI Broadband Consultation Paper, Analysts' views		

The present Consultation Paper also outlines some of the usage patterns of the Indian internet users. Facebook, Wikipedia, Twitter and LinkedIn are some of the high usage sites in addition to mail on Yahoo!, Hotmail and Gmail. However, these sites may not have high bandwidth requirements. Video streaming applications like video uploads on Facebook, Youtube and similar applications would have higher bandwidth requirements but the current uptake for these applications in India is low. However, usage of broadband intensive applications is increasing by the day.

Also, several analysts predict that the profile of broadband customers is likely to change with more and more households opting for broadband connections. This trend is in keeping with the desirable targets set in accordance with the Hon'ble President of India's vision.

Year	No. of households	% of households to be covered for Broadband	Number of Broadband Connections
2010	236 Mn	5%	11.5 Mn
2012	241 Mn	20%	48 Mn
2014	250 Mn	40%	100 Mn
Source: TRAI Broadband Consultation Paper			

Several players are offering better plans with higher bandwidth and speed to customers. Private players are looking to position broadband as triple play – voice, video and data – as a means of offering a higher value proposition to the end customer.

For bandwidth intensive applications, several players are offering high speed plans (as per bandwidth requirements), with high download limits to customers as outlined in the table below:

Player	Plan Type	Monthly Charges (INR)	Download/Upload Limit
BSNL	Upto 2 Mbps	125	150 MB
	Upto 2 Mbps	250	1 GB
MTNL	Upto 2 Mbps	399	1 GB
	Upto 2 Mbps	750	5 GB
Reliance	2 Mbps	550	2.5 GB
TTSL	100 Mbps download; 5 Mbps	3,500	10 GB
Tikona	2 Mbps	599	4 GB
Sify (night plan)	512 Kbps	575	Unlimited for night
Airtel	2 Mbps	999	2.5 GB

Source: Broadband Provider Websites

Thus, as can be seen, the minimum defined speed does not deter the delivered speed and as proven internationally, players will offer speeds based on demand requirements and competition. Thus, there is no need to define a minimum speed criterion.

5.18 What specific steps do you feel will ease grant of speedy ROW permission and ensure availability of ROW at affordable cost?

As mentioned in the TRAI Consultation Paper the Right of Way (ROW) procedures are complicated and charges are extremely high thus deterring telecom players from setting up adequate infrastructure and building networks. However, telecom networks are key infrastructure, which provide support to various economic sector activities and essential services thus playing an important role in economic growth, improving the general standard of living and connecting the entire nation. The private sector players in particular have played an important role in increasing teledensity (from 1.9% in 1998 to 32% in 2008 mainly driven by mobile networks) and increasing GDP growth by providing telecom services throughout the country through huge infrastructural outlays of over Rs. 115,000 cr. Thus telecom providers are providing an essential public utility service.

Though the Indian Telegraph Act of 1985 has guaranteed right of way to telecom operators, multiple agencies such as the local governments, municipalities and the State Governments have developed their own norms for providing ROW and are levying exorbitant and erratic charges which range between few thousands to Rs. 26 lakhs per km for laying cable. These vary across states, across different levels of governance and sometimes within the state too. These high charges are thus affecting business and expansion plans of various players. In addition, some states are levying recurrent charges for every km.

The DoT has circulated draft model guidelines for ROW in 2005, clearly stating that that all State governments should extend the facility of rights of way for laying underground Telecom cables to all licensees without levying any compensatory charges / levy /lease rentals /license fee or imposing free bandwidth requirements or asking for revenue share/ cashless equity etc. There is also a clear statement that the only admissible charges are reinstatement charges or charges directly linked to the restoration work. However, State Governments and local municipalities still continue to levy recurring ROW charges and demand rental, failure of provision of which would lead to denial of ROW. As stated earlier it is essential to have a National Telecom Infrastructure

Policy (NTIP) in place simultaneously with this National Broadband Plan to be effectively implemented in the timelines stated. Thus, specific steps to ensure speedy RoW provision would include:

- Re-emphasize and reiterate the RoW guidelines and coordinate with various State Governments for its uniform implementation to facilitate Telecom growth at affordable tariffs. This would ensure that discrepancies in costs incurred and tariffs levied by various state governments are eliminated.

- The RoW permission should be granted "ON PRIORITY". Any denial to RoW in exceptional circumstances should be recorded in writing with reasons

- The local Authority should only levy restoration charges. There should be no rental or any recurring charges leviable in any form.

- Service providers should only be directed to restore the dug up portion to its original state to the satisfaction of the local authorities.

- Avoid various civic authorities from taking arbitrary and sudden decisions asking telecom companies to remove tower installations. Even where it is necessitated such action be taken giving due notice with reasonable time to shift.

- The cable laying process should be made an integral part of the Jawaharlal Nehru Urban Renewal Mission and other road infrastructure / NHAI projects; this would ensure a permanent RoW removing multiple levels of erratic levies, better infrastructure planning and also establish the position of Telecom as an essential public utility service.

- **Broadband and In-building solutions installation can be included in the building laws.**

5.19 Does the broadband sector lack competition? If so, how can competition be enhanced in broadband sector?

As outlined in the TRAI Broadband Consultation Paper, there are 104 service providers providing broadband services in India with the top ten players collectively holding approximately 95% of the market. Also, >89% of the market is held by the top 5 service providers alone. This shows the market is highly clustered and has a low level of competition. The market shares of the various wire line players in the industry are as listed in the table below.

Company	Market Share (%)
BSNL	61.45
Bharti Airtel	12.49
MTNL	9.5
Hathway Cable	3.54
You Telecom	2.27
TATA	2.01
Reliance	1.53
HFCL	0.89
Asianet	0.8
Sify	0.75
Others	4.77

Calculating the HHI for the industry (assuming the remaining 94 players each have an equal share of the 4.77%), yields a value of 0.405. (The Herfindahl index, also known as Herfindahl-Hirschman Index or HHI, is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them.) However, broadband is also available through wireless medium and in that case market concentration would be very different. There is fierce competition between wire line operators dominated by BSNL and wireless operators like Tata Teleservices and Reliance Communications.

Of these various players, three main clusters emerge:

i) **Government owned companies:** BSNL and MTNL which together hold more than 70% of the market. The two state owned operators have benefited due to the erstwhile monopolistic regime and also the infrastructure which they have been able to create due to various government incentives.

ii) **UAS Licensees** These players hold telecom licenses (UASLs) and have made significant investments in setting up their own nationwide fiber network.

iii) **Internet Service Providers (ISPs):** These include large number of players who provide internet services only. These players are territorial in nature and have a limited market share. Large number of players has been made feasible due to relatively relaxed regulations and license costs.

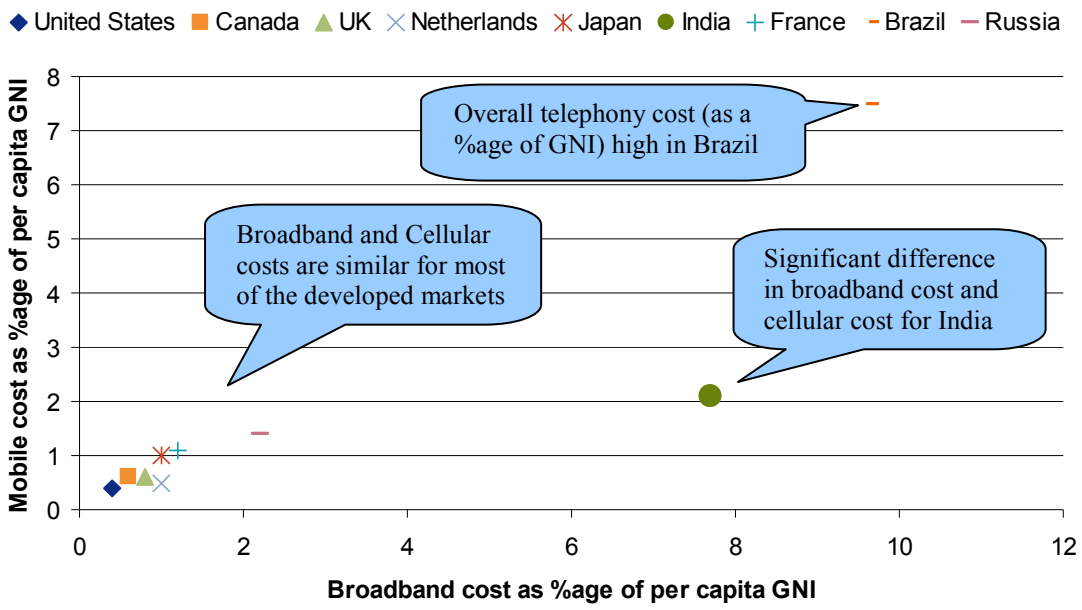
The recent 3G and BWA auctions would increase competition and soon customers will have choice of atleast 6 new networks for accessing broadband services. Competition can be further enhanced by releasing more spectrum for broadband commercial applications.

As proved internationally, higher penetration is a result of high competition there should be measures like releasing spectrum to introduce more players and thereby increase the competition in the sector

5.20 Do you think high broadband usage charge is hindrance in growth of broadband? If yes, what steps do you suggest in making it more affordable?

As outlined in the ICT Development Index report and also in the TRAI Broadband Consultation paper, broadband rates are higher at 7.7% of GNI as compared to the price basket for mobile telephony which stands at 2.2%. The following table lists down the price baskets for broadband, fixed telephone and mobile telephony for a few advanced and developing economies.

Country-wise comparison of broadband cost vs. cellular mobile as a %age of per capita GNI



Source: ITU, ICT Development Index Report, 2009

As can be seen for most of the advanced economies, broadband cost is almost the same or slightly more expensive than that of the cellular mobile, whereas India's broadband cost is ~3.7 times more expensive. These high charges are primarily due to the higher operational and service provisioning costs.

Broadband market (especially wireless) has a large number of players and with 3G / BWA licenses the number of service providers is likely to further increase. Given the large number of players and competitiveness, there is no need for any price regulations as this would curb innovation in tariff plans and may prove to be a hindrance in the growth of broadband. At this juncture, it is important to look at some of the innovative price offerings in the mobile telephony segment:

- Reliance monsoon hungama in 2004 provided subscribers handset and sim card for a very low cost of Rs. 501
- Lifetime validity plans introduced towards end of 2005 and had a very high uptake; In just 6 months of launch, approx. 16 Mn subscribers were in the lifetime validity tariff schemes. Out of these roughly 8 Mn were new subscribers. In first half of 2006, India added 30 Mn subscribers which is significantly more than 9.4 Mn and 18.6 Mn subscribers added in H1'05 and H2'05 respectively

Recently too, mobile sector has seen many pricing innovations. For instance,

- TATA DoCoMo launched their services with introduction of a per second calling plan; The success of this scheme is highlighted by the fact that Tata Docomo (a late entrant) had highest monthly net adds in the country continuously for 5 months.
- Uninor has introduced a dynamic discounting plan where one is charged different call rates for calls from different parts of the city

Thus, despite widespread pervasiveness of cellular connections in India, the operators are coming up with newer pricing innovations in order to cater to different customer segments. The benefits which mobile segment has drawn out of pricing innovations cannot be disputed and the same learning should be adopted for broadband

The issues highlighted in the consultation paper about high per Mb charges and lack of consumer awareness about usage rates and the resultant low usage can be taken care of through customer education and service support.

The Government should play the role of an anchor customer and increase demand of broadband services by ensuring that all schools-from primary to higher secondary, public health centers, police stations and post offices and branches of all rural banks are provided with broadband connections. This would serve three main purposes:

- It is in line with e-governance objectives
- As each of these institutions touch the life of a villager in some way or the other, it shall also serve as a catalyst for the rural masses to opt for individual broadband connections in the future.
- Also, this would provide a guaranteed market for the service providers and would bring down overall operating costs, thus having a resultant downward impact on the broadband prices.

A rough estimate (TRAI, "Measures to Improve Telecom Penetration in Rural India", Dec 2008) of the number of all these institutions translates into 1,706,208 broadband connections. Adoption of broadband by these institutions would definitely help in uptake of the broadband in rural areas. Further, competition in the broadband market will increase and services are likely to be available at more affordable rates.

5.21 Do you think simple and flat monthly broadband tariff plans will enhance broadband acceptability and usage?

The consultation paper illustrates the need for fixed and monthly tariff plans mainly because customers are not aware of their usage and thus are wary of being 'exploited'. Also, since per Mb charges are relatively high and customers are unable to monitor their usage, the usage tends to be low and thus, subsequently the penetration. As already stated, these issues could be taken care of

easily through customer education and provision of effective customer service portals. Also, the market should determine the internet plans.

Currently, operators offer a wide variety of plans and customers have the choice to choose the plan as per their own requirement.

Provider	Sample Plans
Reliance – Wireline Plans	• Simply 49: 2 Mbps bandwidth at monthly rental of INR 49 and usage charge based on time • Plan 299: 2 Mbps speed at monthly rental of INR 299 and usage charge based on data download • Surf addiction 300: 300 kbps download speed at monthly rental of INR 450 and unlimited usage • Night booster Zoom1: 1Mbps download speed during day which increases to 2Mbps at night time; monthly rental of INR 1499 and unlimited usage
Reliance – Wireless Plans	• Hi Speed 1x 25 hour pack: Prepaid voucher of INR 404 with 30 day validity and usage varying from 1500 – 3000 hours (based on time of the day) • Hi Speed 1x unlimited: Prepaid voucher of INR 801 with 30 day validity and unlimited usage
TTSL	• Lightning 20 Mbps: Download limit 10GB; download speed 20Mbps –monthly charges of INR 2500 • Infinity 384: Fair usage policy; download speed 384 Kbps – minimum monthly charges of INR 1,000
Sify	• 384 Kbps; unlimited download; INR 999 • 384 Kbps day speed / 512 Kbps night speed; unlimited download; price for 90 days- INR 2990 / price for 180 days – 5875 / price for 360 days – 10580
Tikona	• FMC799: Download limit 8 GB; download speed 2 Mbps –monthly rental INR 799 • CB299: Max rental of INR 599 and min rental of INR 299; free download 1 GB; download speed 2048 Kbps
BSNL	• BB Home UL750: Unlimited download at 512 Mbps for monthly rental of INR 750 • BB Home UL1100: Unlimited download; speed 2Mbps for first 20GB and 256 kbps beyond that – monthly rental of INR 1100
Source: Service Provider websites	

India has a wide variety of customer segments (office goers / students / housewives / retail shop owners / small and medium businesses etc) with each having a different need with respect to broadband. The different plans cater to the diverse needs of customers and are important from the perspective of increased broadband penetration. Restrictions on the nature and number of plans would be counterproductive to the government objectives and would also curb further innovation in the tariff plans.

Also, as mentioned before, even in the cellular space, innovations in tariffs such as per second calling, different rates for different points in the city, bundling with handsets and lifetime plans are resulting in the uptake of mobile phones and contributing to increased teledensity. The same is likely to happen in the broadband space with increase in competition and higher awareness.

Thus, restricting the nature of plans would not serve the desired objectives and may actually pose a hindrance in realization of the same

5.22 Should broadband tariff be regulated in view of low competition in this sector as present?

As mentioned in the responses to earlier questions, there is no need to regulate usage tariffs and prices would be more competitive if they are market driven. This would also result in greater uptake of broadband services. Soon broadband service will be available on 6 new 3G and BWA networks and regulating broadband prices at this stage would send a negative signal and may impact investment sentiments in this sector.

To further aid service providers in maintaining low tariff costs, the Government can implement some measures to bring down the operator cost through certain investments:

- Subsidies may be provided to service providers who apply for provision of wireline broadband connections through Universal Service Obligation Fund (USOF).
- Financial incentives in the form of lower ROW charges
- Lower AGR based license fees
- Government should serve as an anchor customer in driving penetration.

All these measure would lower operational costs and hence lower tariffs.

In conclusion, broadband tariffs should not be regulated and the Government should let the prices be decided by competitive forces. Also higher competition and better quality of service can be ensured by the Government through provisioning of financial incentives to players who expand in rural areas

5.23 What should be the basis for calculation of tariff for broadband, if it is to be regulated?

Market and competitive forces should be allowed to drive innovation and prices in the market. As illustrated above, this helps improve penetration and provides a wide variety of choice to customers.

5.24 How can utilization of International Internet bandwidth be made more efficient in present situation?

Use of international internet bandwidth can be optimized as and when the domestic hosting market picks up. Also, there hasn't been much uptake in site hosting/mirroring in India owing to availability of economical and reliable data centers and therefore government must provide additional incentives to encourage local hoisting. International social networking sites like Facebook, Orkut, Tweeter etc should be encouraged to be set-up local servers in India

It is also evident from the success of National Internet Exchange of India (NIXI) setup in 2003 through government funding for the purpose of routing the domestic Internet traffic between the peering ISP members in the country. It also improves the Quality of Services for the customers of member ISPs, by avoiding multiple international hops and thus reducing latency. Four nodes of National Internet Exchange of India have already become operational one each at Delhi (NOIDA), Mumbai, Chennai, Kolkata, Bangalore, Hyderabad, Ahmedabad respectively. In a country with 100+ ISPs the number of registered ISPs on NIXI for the respective locations are as follows: 24 (Mumbai), 24 (Noida), 15 (Chennai), 7 (Kolkata), 5 (Bangalore), 5 (Hyderabad), 3 (Ahmedabad). NIXI should also try to subsidize transit by means of the bulk bandwidth deal with government/BSNL.

The concept of local peering is also not known by the corporate users and hence the demand for the same to the respective ISPs is a miss. However, with the advent and popularity of innovative and present world real-time applications using high-bandwidth content, latency would be one of the prime factors to look out for. **Therefore, we recommend that the regulator should encourage domestic hosting/mirroring of sites & domestic routing of traffic by creating an economically viable model through effective data centers and NIXIs.**

5.25 How can use of domestic and international internet bandwidth be segregated? Will it have direct impact on broadband affordability? If so, quantify the likely impact.

As discussed in response to Question no. 5.24, the need of the hour is to create an economically viable model of effective data centers and increasing efficacy of peering bandwidth exchanges like NIXIs. The Domestic Internet Scenario in India is unique with several large and small ISPs spread across a large geographical area. Peering exchanges are designed to address the concerns of the large as well as the small ISPs at the same time keeping the larger national interest in mind by promoting domestic hosting of content as well as saving foreign exchange by keeping domestic traffic within India. Efficacy of peering exchange will determine the segregation of domestic and international internet bandwidth.

Most of the ISPs and all major ISP are already connected in all 4 major NIXI nodes and exchanging all the domestic traffic domestically. Also these ISPs are also doing Private Peering among themselves. Hence there is no question of routing the domestic traffic through international routes. Since this exchange of traffic is already being done at NIXI and hence this will not have any further affect on reducing the Broadband prices further. Also the major cost for providing the broadband connection to consumers is the cost of rolling out last mile infrastructure. A key example in this case is Pakistan's 2004 broadband policy, which encourages national and regional peering among local Internet Service Providers (ISPs). This helped reduce the reliance on the costly international IP backhaul. The policy goes even further by promoting the creation of a national Intranet to provide domestic IP services. It is expected that this also spurs the creation of locally hosted content and services.

If ISPs/Broadband providers are able to segregate their national and international traffic, then this will result in better traffic management and help isolate their international requirements. All the

ISPs who are providing International Internet IP port in India shall be permitted to have peering for exchange of domestic traffic with other ISPs provided such integrated ISPs segregate domestic and International traffic using any technique/ technology suitable to them. This will help in:

- Creation of alternate domestic peering points
- Reduce reliance on international bandwidth
- Reduction in bandwidth costs for ISPs and hence make business model more sustainable

Also this will result in enhanced competition in the space which in turn will help increase the penetration and benefit end users both from better price and better service.

Domestic traffic still continues to be less than 10% of overall traffic for most of ISPs. Higher domestic peering will reduce international bandwidth outflow which is at significantly higher price than domestic bandwidth. Therefore reduction of the International Internet traffic will have direct impact on the bandwidth prices of various ISPs

5.26 What steps should be taken to bring down the cost of international internet bandwidth in India?

As per the data compiled by TRAI, there is no shortage of submarine bandwidth in India, showing a total capacity of 18.6 Tbps across all existing submarine cables reaching India. With government deregulation that opens up the international gateway market and also Reference Interconnect Offer (RIO) is available for ILDO to access international bandwidth. This development has had a positive impact with enough competition in this space and leading to reduction in international bandwidth prices. A case in point is the International bandwidth rate that was quoted by L1 towards the recent BSNL Tender which was Rs. 900/- per Mbps. Besides there are close to 100-150 businesses that provide Internet-based services to Indian businesses and consumers. They buy their international bandwidth at wholesale prices. There is potential for these players to organize themselves and put further pressure on the suppliers. Therefore, further cost reduction in international internet bandwidth front should be left to competitive forces.

Price of Internet BW in India have fallen drastically over the past 3-4 years due to intense competition. Also many ISPs and other application providers have now started providing hosting services and content delivery services with in India. Due to this many of the popular content sites are already being hosted/cached/mirrored in India in various ISPs / other application providers network. This has reduced the percentage of international traffic for the past 2-3 years. However even though the prices for internet BW have fallen drastically, there has been increase in Internet Data Centre Costs due to increase in real estate costs and power costs. Govt. may consider to give "Power" subsidies to Internet Data centers to reduce the domestic hosting cost further. The real push for domestic traffic will come due to growth in domestic content and applications like e-governance or other BW hungry applications like video traffic etc. This can be achieved only once we have deep high speed Broadband penetration.

5.27 How can competition be enhanced in the International bandwidth sector?

Competition in international connectivity (i.e., sub-marine cables) and access to services such as cable landing station is key to lowering the cost of bandwidth and broadband prices for consumers. Effective interconnection and gateway regulatory frameworks that introduce new

models of sharing and collocation, and reduce barriers to existing private, government and international networks is important in encouraging existing and new market entrants to expand into broadband and other services. An example of the process to liberalize the international gateway and secure bandwidth capacity at lower prices is of Singapore's Infocomm Development Authority (IDA). IDA required the dominant licence holder to provide a reference interconnection offer (RIO), mandated co-location at the submarine cable landing station, mandated connection services and regulated prices, and coordinate the submarine cable landing process, offering a one-stop-shop. This helped drop IDD tariffs by 90% which helped increase broadband penetration from 5% to 77% (Source: ITU)

India's regulator, TRAI, has adopted a similar regulation. The government announced further deregulation to open up the international gateway market. This development has had a positive impact, providing speedier and faster pipes at lower costs. An IDC India report shows that Internet access rates came down by about 70% in leased line and 60% in dial up connections—a spin-off of the 70% fall in international bandwidth rates and heightening competition after the entry of private ISPs. As a result of this policy, all international operators have been able to access bandwidth on alternate viable systems and provide more reliable products to their customers. There are a large number of international players like BT / Cable & Wireless / AT&T /Singtel/Telecom Italia which can/are accessing international bandwidth through cable landing stations. In additional Sify is also establishing cable landing station for international bandwidth cable. There are no bottlenecks with respect to gaining access to international bandwidth and the desired competition is there in the industry

Reference Interconnect Offer (RIO) is available for ILDO to access international bandwidth and therefore there is sufficient competition in the international bandwidth segment.

5.28 QoS of broadband, availability of bandwidth, adherence to given contention ratio, affordability, availability and spread are some intricately linked parameters. In our opinion what should be done to ensure good quality broadband to subscribers?

&

5.29 Do you think that bad quality of broadband connection is impacting the performance of bandwidth hungry applications and hence crippling the broadband growth? If so, please suggest remedial actions.

&

5.30 Is there a need to define new/redefine existing quality of service parameters considering future bandwidth hungry applications, time sensitivity of applications and user expectation? What should be such parameters including their suggestive value and should such parameters be mandated?

The current service quality parameters laid down by TRAI are stringent enough. These parameters have been recently defined and there is no need for any changes in this. Government's focus should be on increasing competition which will automatically ensure that subscribers benefit from improvements in customer service / innovations in tariff / better connectivity etc. In order to increase competition government should ensure speedy allocation of spectrum to 3G / BWA auction winners which will lead to early launch of services. Also, as discussed earlier, further spectrum across frequency bands should be made available for commercial broadband applications. With the resultant increase in competition, market forces would drive up the quality of service.

We recommend that there is no need to define new/redefine existing quality of service parameters and focus should be on increasing competition in the sector which would have a positive impact on the service quality offered to the subscribers.

5.31 What measures do you propose to make Customer Premises Equipment affordable for common masses? Elaborate your reply giving various options.

We recommend the following measure to be adopted to increase the affordability of Broadband CPE:

- Consideration should be given by the Government to encourage local manufacturers to ensure better availability and lower price of CPEs to common masses. This should include promoting manufacturing of high end handsets. India is already a big manufacturing base for large scale handset manufactures and government can give them (as well as handset component makers) incentives to promote manufacturing of smart phones in India.

- CPE consideration should take into account the potential of mobile devices like smartphones which offer significant advantages over PCs like lower costs (Fraction of PC cost); icon based touch interfaces which can be used by computer / English illiterates; potential for much wider penetration. Keeping this in view there should be subsidies for the broadband mobile devices.

- Consideration should be given to allow 100% depreciation in first year for PC's and broadband Customer Premise Equipment (CPE) including modems and routers. This would lead to greater uptake by small and medium enterprises.

- Consideration should also be given for tax benefits to organizations on the value of PC's, as defined by the Government through a value schedule, that they donate to schools run by the government / local bodies, and charitable organizations.

- Duties levied on inputs (parts, components and spares) and finished products used in providing broadband and internet services should be reduced to levels equivalent to that for mobile phones.

- Additionally, the central excise duty levied on these items should be reduced to the extent the customs duties are proposed to be reduced on a pro-rata basis, and in line with duties on imported finished goods.

- Consideration should be given to encourage local/foreign manufacturers to build small, mobile, energy efficient & economical Laptops/PCs/Mobile devices (like Simputer, Tablet PCs).

5.32 What measures are required to encourage development of content in Indian vernacular languages?

Please refer our response to question 5.3

5.33 Do you perceive need for any regulatory or licensing change to boost broadband penetration?

There are several regulatory and licensing change measures which need to be taken to realize the government objectives of broadband penetration and the resultant economic growth. These

measures should be based on the principle of 'level playing field', 'technology neutrality', 'incentives for reaching out to far-flung areas' and 'acknowledging that broadband is a necessary public utility'. Some of these measures have already been discussed as part of responses to the previous questions and are being reiterated here:

- National Telecom Infrastructure Policy to be brought out with **simplified Right-of-Way (ROW) procedures:** ROW procedures need to be simplified and the recommendations for the same are

    - Re-emphasize and reiterate the ROW guidelines and coordinate with various State Governments for its uniform implementation to facilitate Telecom growth at affordable tariffs. This would ensure that discrepancies in costs incurred and tariffs levied by various state governments are eliminated.

    - The ROW permission should be granted "ON PRIORITY". Any denial to ROW in exceptional circumstances should be recorded in writing with reasons

    - The local Authority should levy only restoration charges. There should be no rental or any recurring charges leviable in any form.

    - Service providers should only be directed to restore the dug up portion to its original state to the satisfaction of the local authorities.

    - Desist various civic authorities from taking arbitrary and sudden decisions asking telecom companies to remove tower installations. Even where it is necessitated such action be taken giving due notice with reasonable time to shift.

    - The cable laying process should be made an integral part of the Jawaharlal Nehru Urban Renewal Mission and other road infrastructure / NHAI projects; this would ensure a permanent RoW removing multiple levels of erratic levies, better infrastructure planning and also establish the position of Telecom as an essential public utility service. Bring into effect a " Dig once " policy for ducting along any road construction undertaken from now onwards.

    - **Broadband and In-building solutions installation can be included in the building laws**

- **In order to ensure that the country realizes the wide benefits from digital transmission, It is recommended that TRAI should mandate the digitalization plan within next 2 years**.

- **Changes in spectrum policy:**

    - BWA Technologies like EV-DO, HSPDA, 3G, WiMAX and LTE would be able to offer higher data rates over existing wireless technologies and help realize the broadband objectives. Considering the need for BWA technologies in backhaul and access areas, we recommend that the Indian government should make plans for release of additional spectrum especially in the 2.5-2.69 GHz to support the broadband growth. It is important to note that this band has a good ecosystem of broadband. Also, 2.5-2.69 GHz is currently with ISRO where it is underutilized and

is being sublet to private sector companies. The same should be refarmed from ISRO and should be utilized for broadband services

- Usage of guard band for provisioning of broadband. This is already being done in several countries

- Usage of 450 MHz and1900 MHz bands for broadband by CDMA operators.

- Currently the spectrum allocation in 2.1GHz band is insufficient. Additional 40MHz of 2.1GHz should be freed up for commercial usage. This would help in increasing the number of players in the sector

- The 900 MHz band is very valuable for providing 3G and LTE services. The same should be immediately refarmed for spectrum efficient and/or future technologies.

- 700 MHz band (698-806 MHz) should be harmonized on priority for LTE services as being at lower frequency band, it is most suited for rural broadband coverage.

- **Redefinition of broadband:** Definition of broadband should keep in view the potential of wireless and should not include clauses which favor wireline over wireless. It is recommended that clauses "Always-on" and a minimum speed as mentioned in the current definition should be taken out from the definition. This would help in ensuring technological neutrality and also help improve internet penetration in the country.

- **Changes in the license fee**

    - There is a need to reduce the AGR based license fees and thus increase viability of operators particularly in the rural areas. Also, the license fee should be based on the principle of level playing field and should not favor ISP (currently paying a fee of only Re.1 for pure internet services; 6% for internet telephony) over UAS Licensees (pay 6-10% of AGR based on circle category). This disparity should be removed as early as possible and for the growth of internet services the license fee should be kept low

- **Changes in the spectrum fee. Review of spectrum charges should be done taking into account the technology considerations as follows:**

    - The spectrum in 3.3 and 3.4 GHz band is used for provisioning of broadband services and the annual spectrum charges are computed as

    - Charges = M*W*C; Where C = Number of carriers; M = 2400 for distance between 5 Km to 25 Km and W = 60 for bandwidth greater than 2 MHz to 7 MHz

    - The calculations assume that the distance upto which the services are being provided is more than 5 kms and all the way upto 25 kms. However, the field experience indicates that the distance upto which the services can be provided is remaining limited to around 2 kms due to following reasons:

        - 3.3 GHz is on higher end of spectrum and suffers from higher attenuation (free space loss, building wall attenuation etc)

- Since the system is meant for mass broadband deployment, the customer prefers indoor installation of CPE. This requires that the wall attenuation be budgeted for in the RF design, requiring the distance from the base station to be kept much lower than the outdoor deployment.

- Available spectrum per MHz is limited (3MHz per sector) and hence capacity available per sector is quite limited.(At 1.7bits/Hz spectral efficiency, total capacity of only 5.1 mbps (uplink + downlink) is available

- Requirement from the broadband customers limits the number of concurrent customers that can be served per sector.

- Due to above observations on RF propagation and system capacity perspective, the 3.3 GHz system requires to be designed and operated with limited radius of operation, with maximum being 2 km.

- Current calculations are leading to annual license (annual royalty) payment of Rs. 2.89 lakh per BTS, which makes the entire operation unviable due to limitations as described above.

- As the coverage that the operators are getting is only upto 2 kms, the factor used for arriving at annual royalty (M) be changed to 1200, correctly reflecting the actual field situation.

- **Simplification of approvals for RRU (customer unit):**

  - Current procedure of obtaining frequency allocation approvals for each and every customer site is voluminous and time consuming and is a hindrance in achieving the broadband targets. WPC should waive off this process

- Current procedures require obtaining SACFA clearance for each RRU which can be taken only by confirmation of order from customer. This would require customer to wait for at least 2 months before services commencement. Given the fact that power transmit ted by a customer unit is not high enough to cause any interference with other operational wireless systems the SACFA clearance should be done away with.

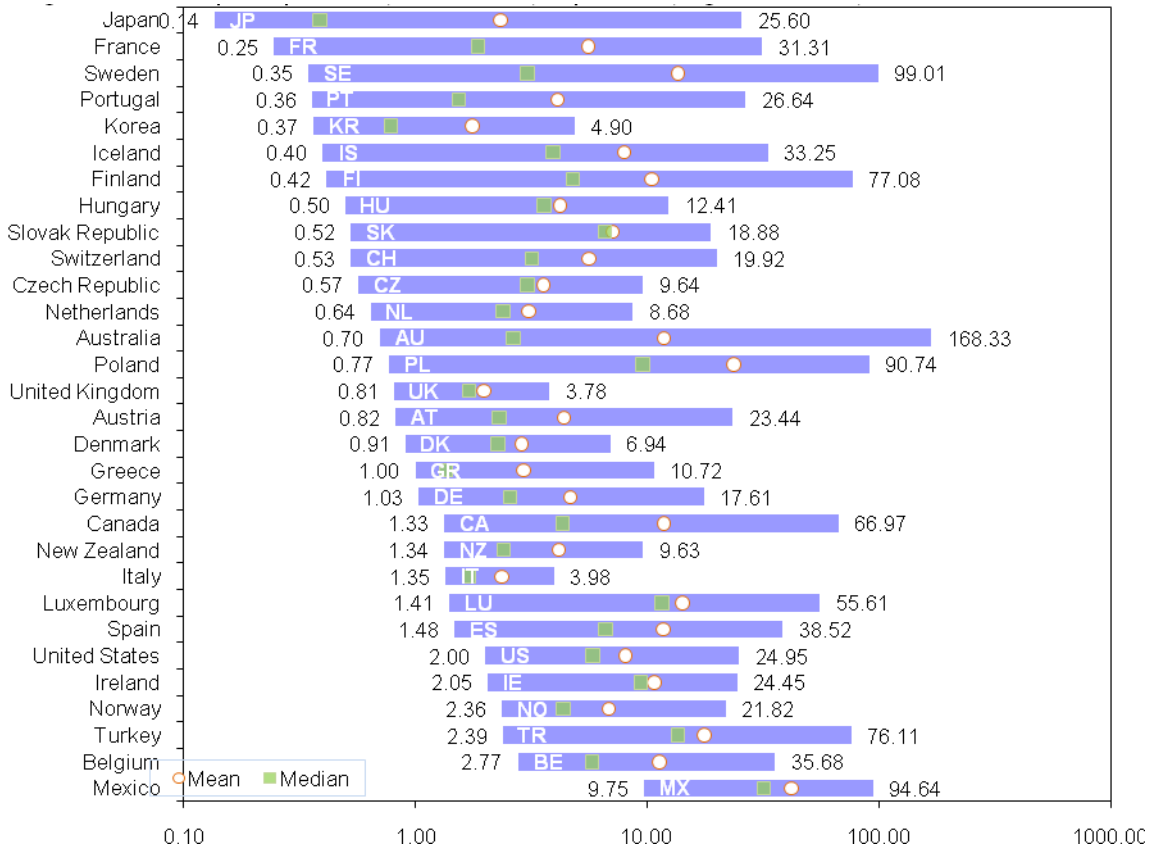
5.34 Are there any specific competition and market related issues that are hindering growth of broadband?

Low Market Demand and low competition is hindering the growth of broadband in India.

The low demand may be primarily attributed to the following:

High entry level tariff – The entry level price per megabit in India, although has come down drastically from Rs 1500 in 2004 to Rs 200 (USD 4.16 approx) in 2007, is still higher than most countries. The figure below illustrates the entry level price and the price range in some countries.

Range of Broadband Prices per Mbit/s (USD PPP)



Note: The data is as per October 2009 for all platforms in logarithmic scale

Source: OCED

High CPE Cost – The cost of CPE in India is too high as compared to other countries. This proves as a major hindrance towards broadband penetration. There is a clear need to reduce the costs of CPEs, with suitable subsidies and tax incentives to make these affordable and popular. It is clearly evident that most future users for the internet would have their first experience of the internet on handheld mobile devices. The costs of these should thereby be reduced in India.

Minimal Localized content - India poses a unique challenge in terms of diversity in languages spoken. There are 22 constitutionally approved languages spoken in India and over 1600 regional dialects. Even though Hindi is the official language, many people in India do not speak it at all. Almost every state in India has more than one dialect. Most languages have their own script. To ensure an end-to-end local language delivery, Applications as well as Content need to be provisioned in localized language. Exemplar applications in ICT include facilities such as messaging, web browsing and the like. Content are sets of information that could be exchanged and accessed through these applications. The content that is available today on the Internet is largely in English and is location independent. The task is to make this content available in the dialects spoken in India. However, given the diverse socio cultural background in India this is a complicated task. Mere literal translation of the content in local language might not ensure adoption. A context-aware translation, on the other hand, is needed to guarantee widespread

acceptance of ICT. Once infrastructure, application and content is available in Indian language a bulk of the population which is not literate in English would be able to relish the benefits of technology.

Lack of Accessibility to applications like banking, etc that otherwise are not available to the masses - It is time we start increasing the scope of broadband from just e-mail to more value added applications. Effective use of broadband in automation of operations and functions, innovative use of technology in imparting education and increasing literacy will drive the penetration of broadband in India. Internet and broadband needs to go to every household in the country. A Mckinsey study shows Financial services for the unbanked are among the most promising opportunities for mobile-telecom operators (through wireless broadband) hoping to counter slowing subscription growth with auxiliary offerings, such as banking, health care, and education services. In emerging markets, formal banking reaches about 37 percent of the population, compared with a 50 percent penetration rate for mobile phones. For every 10,000 people, these countries have one bank branch and one ATM—but 5,100 mobile phones.

Low Perceived utility

The popularity of broadband will be linked to its perceived utility. Today, the internet is utilized by a vast majority of users for e-mail and internet research, for which 256 Kbps is actually far too much. Bandwidth-rich applications are yet to make way. Moving on, the key drivers of broadband will be in the areas of telephony, education, entertainment and the healthcare space.

Increased competition: As proved internationally, higher penetration is a result of high competition there should be measures like releasing spectrum to introduce more players and thereby increase the competition in the sector

5.35 What other fiscal/non-fiscal measures should be considered to boost broadband penetration?

The fiscal incentives would be a means of bringing down the cost to provide service and make them affordable to a number of potential users. The same would also encourage various players whose contribution is required in the Broadband Value Chain – Service Providers, Equipment Manufacturers, Content / application developers, other professional or social organizations amongst others. The following fiscal incentives shall make broadband services more affordable:

- **Promote Proliferation of National (with increased focus on Rural) Broadband – Core, Backhaul, Access, Devices and Content development areas:**

- **National Broadband Fund -** Government has been able to collect sizeable money through proceeds of the recently concluded 3G / BWA proceeds. Some proportion of this amount should be invested back in the telecom sector with special focus on broadband. In this context, it is to suggest that a percentage of the proceeds of say 20-30% from the recent 3G and BWA auctions may be earmarked for the National Broadband Fund.

- Incentives from USOF: **The overall policy for USOF usage needs to be re aligned to lay more emphasis on broadband than on voice given the rapid enhancement already done in voice and the poor performance on broadband.** USOF should devise attractive schemes for rural broadband to enable broadband connectivity in rural areas. Amongst other things this may include subsidy to service providers who deploy alternate energy sources in rural network.

- Devise special subsidy schemes for wireless broadband, fibre based backhaul, use of alternate energy sources, broadband applications & services, technology development, etc

- Grant substantial incentives to operators who roll out network faster than specified timelines

- Devise scheme for providing subsidy for laying OFC network to all Village Panchayats to be shared by various operators for backhaul purposes.

- Subsidize microwave/wireless/VSAT based backhaul wherever feasible, for effective and quick roll out of services.

- Provide funding support for micro financing of access devices like low cost PC/CPE through various state government agencies/ micro finance credit institutions.

- Impetus towards provisioning of power supply to rural areas; this is important as lack of adequate power for network as well as the end-users results in under-utilization of the telecom infrastructure

- Keeping in mind that several Micro, Small and (even) Medium enterprises may not be having their own broadband and related infrastructure, The Government must invest and promotes public access kiosks (including but not limited to the Common Service Centers under the National e-Governance Plan) both in the public sector as well as in the private sector that specifically assist in such transactions till such time that these units acquire in-house infrastructure and expertise

Tax incentives for Broadband Proliferation:

- ISP's should be exempted from the payment of service tax for the next 5 years or post launch of services (especially in the rural areas). This exemption will reduce immediately the cost of providing such services to the customer.

- Rather than imposing any additional fees for e-transactions, it would be more useful to provide incentives for e-transactions to encourage take up and adoption; for example, for railway's e-tickets one has to pay more than what one pays at the counter whereas the cost is lower for the railways in case of e-tickets. The Government should recommend to all State Governments to waive sales tax on goods and services that are transacted through electronic/mobile mode (m-commerce or e-commerce) for next 5 years. This recommendation should be then followed with legislation to ensure execution by the State Governments.

- The State Government should waive off the Entertainment Tax for content through internet. Currently approximately 30% is charges as Entertainment tax in certain state viz. levied on broadband subscriptions and entertainment services, if they are provided through a broadband or internet platform. This recommendation should be followed with legislation to ensure execution by the State Governments

- All corporations, whether public or private, should be allowed to give a minimum per annum allowance to employees for broadband services access at home. This allowance should be removed from taxable income for the corporation. The same facility should be extended to self-employed professionals so that they may also reap the benefits of

broadband services. Government should play the role of anchor tenant and adopt broadband for public institutions like police stations, hospitals, schools, community centers etc

- Tax status for expenditure on connectivity / usage (similar to policies for other public welfare services such as education allowance, medical allowance etc)

- Provide seed funding or USOF support to select companies focused on developing rural specific and local language contents and/or applications.

- Product Development, Bandwidth Charges and Software License Expenses to be treated as Revenue Expenditure: A separate guideline for 100% deduction on expenses related to product development, bandwidth and software licenses.

Incentives for Access Device Penetration:

- Capital subsidy on plant and machinery for manufacturing next generation technology enabled (3G/WiMax etc.) handsets (like smart phones) and devices. Refund of central and state taxes for manufacturing in SEZ/Export Oriented Unit /Domestic Tariff Area

- Smart phones and other devices should be given focus. VAT on handsets is levied at IT products rates (4%). However, VAT on accessories and parts of cell phones are levied at residuary rate 12.5% (or higher rate) by some state governments. This has significant impact particularly in smart phones. Parts and accessories which are used along with cell phones should attract same VAT as handset. This will enable better ASC infrastructure and increase usability of handsets particularly smart phones

- Consideration should be given to allow 100% depreciation in first year for PC's and broadband Customer Premise Equipment (CPE) including modems and routers. This would lead to greater uptake by small and medium enterprises

- Consideration should also be given for tax benefits to organizations on the value of PC's, as defined by the Government through a value schedule, that they donate to schools run by the government / local bodies, and charitable organizations.

- Duties levied on inputs (parts, components and spares) and finished products used in providing broadband and internet services should be reduced to levels equivalent to that for mobile phones. All this should take into account the GST regime to be applicable in near future

- Additionally, the central excise duty levied on these items should be reduced to the extent the customs duties are proposed to be reduced on a pro-rata basis, and in line with duties on imported finished goods.

- Consideration should be given to encourage local/foreign manufacturers to build small, mobile, energy efficient & economical Laptops/PCs/Mobile devices (like Simputer, Tablet PCs).

While framing the fiscal / non-fiscal measures, government can take cue from other developed broadband markets. For example Korean government has taken a holistic view for the growth of

broadband. Following are some of the measures (Source: Information Technology & Innovation Foundation) undertaken by South Korean government:

- Low entry barriers and facilities based competition
- Focused on promoting e-governance measures
- Government established several agencies to promote broadband access in both the public and private sector including the South Korean agency South Korean agency for Digital Opportunity (KADO), which ensures that all South Korean citizens have the ability to access the Internet, including the elderly and those with disabilities through targeted training programs
- Government also created other agencies to spur demand for broadband access by ensuring that consumers know how to access the Internet (digital literacy), and that they feel secure while using it (Internet security and privacy). Accordingly, it created the Korea Information Security Agency (KISA) and the Korea Internet Safety Commission to oversee Internet security and consumer protection, as well as the National Internet Development Agency (NIDA) to promote the Internet society through education and promotional programs.
- The government's digital literacy programs also target groups that otherwise would be less likely to use the Internet. For example, the "Ten Million People Internet Education Project (2000-2002)" worked to provide Internet education to approximately a fourth of South Korea's citizens. Similarly, the government provided subsidies to around 1,000 private training institutes over the nation for the purpose of educating housewives, in order to create demand in households
- Government's national broadband strategy includes direct and indirect support for broadband infrastructure development, including loans and other incentives. The KII consisted of three sectors and three phases: KII-Government, KII-Private, and KII-Testbed called KOREN (Korea Advanced Research Network). KII-Government spent $24 billion to construct a national high-speed public backbone network, which service providers could use to deploy broadband services to about 30,000 government and research institutes and around 10,000 schools.17 The KOREN initiative also provided government test beds for companies to use for research and development.18 Meanwhile, KII-Private worked to spur private funding to construct an access network for homes and businesses, aiming to stimulate broadband deployment in the "last mile."
- Financial Investments: Government focused on making its own advance investments and investment in initiation of trial projects
- R&D Focus: Government gave special impetus to R&D activities and invested in development of core technologies and setting up of its own R&D centers. In addition, it strengthened global competitiveness through attracting foreign R&D centers

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