Recommendations on

Growth of Telecom services in rural India

The Way Forward

October 3, 2005

Preface

The economic reforms of 1991 and of subsequent years have led to a paradigm shift in the Indian economy, particularly in the telecom sector – but rural areas continue to be neglected.

The Authority issued a Consultation Paper on "Growth of Telecom Services in Rural India" in October 27, 2004. The Consultation Paper highlighted that whereas urban tele-density increased from 5.8% to 21.3% between 1998 and 2004, the rural tele-density stagnated at much lower levels and increased from 0.4% to 1.7%. The problem is much more severe today. As this paper is being finalized, we find that the rural tele-density has only gone up to about 1.94% whereas urban tele-density today is 31%. In the metros the tele-density is at levels 40-50% (Delhi 42%, Mumbai 53%).

Since tele-density is inter-linked with the level of development, the large differential between rural and urban tele-density cannot be sustainable. Besides, there is need for a re-look at our traditional policies of looking after the communication needs of rural areas. A time has come that our policies of reaching telecom to villages are looked as "Universal Service Opportunity" rather than "Universal Service Obligation", and the time is ripe for such a change over. These recommendations highlight rationale of the proposed policy.

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List of Abbreviations Used

S.No.	Abbreviation	Full Form
1.	3G	3rd Generation
2.	ADC	Access Deficit Charge
3.	AGR	Adjusted Gross Revenue
4.	ARPU	Average Revenue Per User
5.	B2C	Business to Citizen
6.	BOOT	Build Operate Own Transfer
7.	BSC	Base Station Controller
8.	BSNL	Bharat Sanchar Nigam Limited
9.	BTS	Base Transceiver Station
10.	C2G	Citizen to Government
11.	CAPEX	Capital Expenditure
12.	CDMA	Code Division Multiple Access
13.	CMSPs	Cellular Mobile Service Providers
14.	DELs	Direct Exchange Lines
15.	DG	Diesel Generator
16.	FMCG	Fast Moving Consumer Goods
17.	G2B	Government to Business
18.	G2C	Government to Citizen
19.	Gbps	Gigabits per second
20.	GDP	Gross Domestic Product
21.	GHz	Giga Hertz
22.	GOI	Government of India
23.	GSM	Global System for Mobile
24.	GST	Gross Sales Tax
25.	HPTICs	High Speed Public Telecom and Information Centers
26.	HQ	Head Quarter
27.	ICTs	Information and Communication Technologies
28.	IEEE	Institute of Electrical and Electronics Engineers
29.	IP	Internet Protocol
30.	ITC	Indian Tobacco Company
31.	ITU	International Telecommunication Union
32.	LSPs	Local Service Providers
33.	MARR	Multi Access Radio Relay
34.	MHz	Mega Hertz
35.	NCAER	National Council of Applied Economic Research
36.	NGN	Next Generation Network
37.	NGOs	Non Governmental Organisations
38.	NIC	National Informatics Centre
39.	NTP'99	New Telecom Policy'99
40.	O&M	Operation and Maintenance
41.	OFC	Optical Fibre Cable
42.	OPEX	Operating Expenditure

43.	PC	Personal Computer
44.	PTICs	Public Telecom and Information Centers
45.	RCP	Rural Community Phones
46.	SACFA	Standing Advisory Committee on Radio Frequency Allocation
47.	SDCA	Short Distance Charging Area
48.	UASL	Unified Access Service Licence
49.	USF	Universal Service Fund
50.	USO	Universal Service Obligation
51.	USOF	Universal Service Obligation Fund
52.	VAT	Value Added Tax
53.	VoIP	Voice Over Internet Protocol
54.	VPTs	Village Public Telephones
55.	VSAT	Very Small Aperture Terminal
56.	WiFi	Wireless Fidelity
57.	WiMAX	Worldwide Interoperability for Microwave Access
58.	WLL	Wireless Local Loop
59.	WPC	Wireless and Planning Coordination
60.	WSIS	World Summit on the Information Society
61.	WTO	World Trade Organisation

Chapter 1. Introduction

Background

1.1 As per TRAI Act, TRAI shall make recommendations, either *suo motu* or on a request from the licensor, on

- need and timing for introduction of new service provider;
- terms and conditions of license to a service provider;
- measures to facilitate competition and promote efficiency in the operation of telecommunication services so as to facilitate growth in such services;
- measures for the development of telecommunication technology and any other matter relating to telecommunication industry in general;
- efficient management of available spectrum.

1.2 Keeping the objective of growth of telecom services in rural areas in mind, TRAI issued a consultation paper on Growth of telecom services in rural India on 27th October 2004. Comments from the stakeholders on various issues involved were invited by 30th November 2004. Subsequently, Open House discussions were held in Bangalore and Delhi on 15th and 16th December 2004. Based on the comments received in the consultation process and its own analysis TRAI has finalized its recommendations on growth of telecom services in rural areas.

Universal Access and Poverty Reduction

1.3 Access to telecom services is the key to development and growth. Information and communication technologies (ICTs) provide new and exciting opportunities to those who have access to them. However, existing economic imbalances and social inequalities will be deepened if access is unequally distributed. Thus, equal opportunities are necessary to avoid creating an even bigger gap between the digital “haves” and “have-nots”. Communication technologies affect poverty reduction in three ways, increasing the efficiency of

the economy, enabling better delivery of public services, such as health and education, and creating new sources of income, employment and training for the same, for poor population.

1.4 Unequal access to communications, leading to a huge digital divide between the rich and the poor, the urban and the rural populace only, increases the existing divide. Technological innovations, economic pressures and regulatory reforms are making access to information and communications technologies more affordable and are providing opportunities to close the digital divide. Technological innovations have decreased equipment prices and have led to convergence between telecommunications, computing and the media, and the explosion of Internet. Low cost wireless solutions are now available for rural areas at affordable prices. Business innovations such as pre-pay options have reduced the entry price at the lower end of the market and easy access is now available for multiple services in areas where fixed telephone infrastructure are poor. An important trend is the emergence of community access to both basic and value added services, while individuals in many poor locations may not be able to afford the upfront costs of owning telephones and internet enabled PC, a community as a whole may be able to afford the facility. But even this is changing fast with entry costs of mobile telephones and their recurrent costs coming down to very low and affordable levels particularly when seen by the user in the context of cost benefit ratios.

1.5 We have been enthusiastically talking about the new community telephone for the village in rural areas given under the USO Schemes, but owing to the community nature of the equipment, they often do not work or are not available. Besides the villager often asks “whom am I going to call? I don’t know anyone who owns a telephone”. At present, most of the rural phones being public call offices and community telephones, this problem is genuine. Telephone services, like other network services do not grow till they obtain a critical mass. After all, for the same reason, the fax machine or the Internet did not become popular for about 20-30 years after its discovery, because the service did not

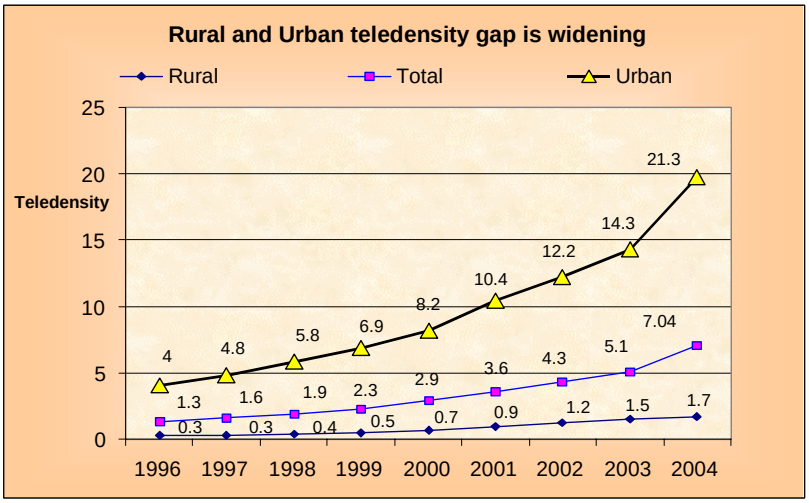
acquire a critical mass in the network and once it did, the growth was explosive. Due to technological and market developments, the USO policy, which presently provides rural telecommunication in a limited manner, may need some revision. The activities that the present USO policy supports are mentioned in Annexure 1.1. Universal Service Obligation Fund (USOF) covers both public access through Public or Community telephones, and provision of individual household telephones in identified Net High Cost rural/remote areas. New Telecom Policy 1999 envisaged that other service providers shall also be encouraged to participate in USO provision subject to technical feasibility and shall be reimbursed from the funds from the universal access levy. As of now only fixed wireless/wire line services are being supported by USO fund and mobile operators are not getting reimbursements from the USF. As the discussions in the following chapter would reveal, the rural markets have substantial purchasing potential and there is demand for all types of communications services in rural areas. Present policy should be modified keeping in mind potential demand for voice, data and video services in rural areas. Only then will rural tele-density increase, the same way it has done in urban areas.

Growth of Telecom Services in Rural India

1.6 Inadequate access in rural India, where over 70% of the population lives has caused further marginalization of the marginalized. Therefore, it is vital that an enabling environment through policy and regulatory measures is created for the transformation of the existing digital divide into digital opportunity, which also, as is well known, has been a key driver behind the World Summit on the Information Society (WSIS).

1.7 At the time of issuance of the Consultation Paper on growth of telecom services in rural India on October 27, 2004, we had emphasized on the widening gap between rural and urban tele-density and had stated that this was not sustainable. The graph shown in the consultation paper is repeated below:

Figure-1.1



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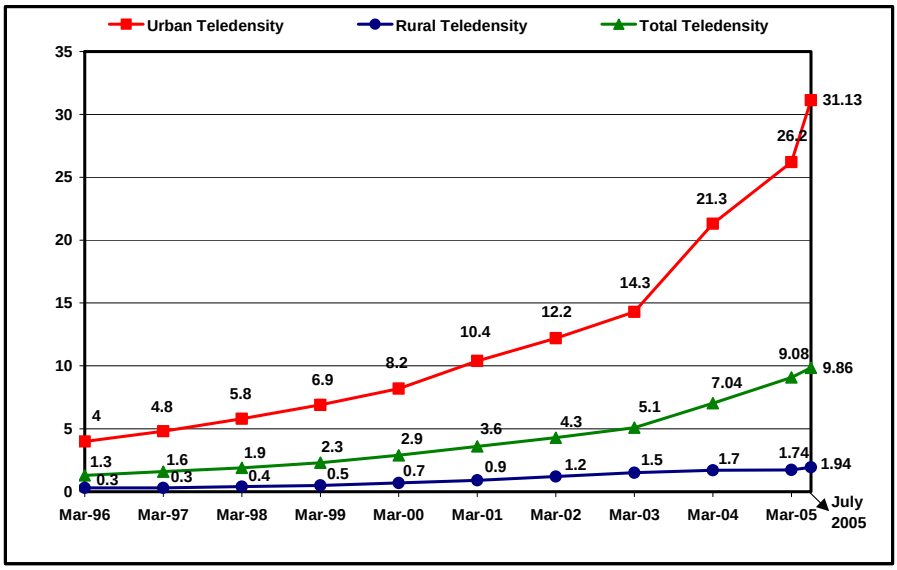
1.8 It has only been less than one year that we highlighted this difference. Today, as we write this report, the divergence has increased fast and is shown below:

Figure-1.2

Rural-Urban Tele-density – widening gap



These graphs clearly show the huge success in our policies towards urban telecommunications and perhaps a failure in replicating the same for rural areas. This needs further analysis and would be dealt with in the subsequent chapters.

Policy, Regulatory and Legal Framework

1.9 In 1999, the Government announced the New Telecom Policy i.e. NTP'99. Universal Service was one of the main objectives of NTP'99. Table 1.1 mentions the targets set by NTP'99 and the achievements till March 2005

Table 1.1: NTP'99 targets and the achievements (till March 2005)

Sr	NTP'99 targets	Whether eligible for USO Funding as per NTP'99	Achievement (March '05)
1	Provide voice and low speed data service to the balance 2.9 lakh uncovered villages in the country by the year 2002	Yes	5.31 out of 6.07 lakh villages have voice capability
2	Achieve Internet access to all district head quarters by the year 2000	No	Achieved
3	Achieve telephone on demand in urban and rural areas by 2002	No	Urban demand largely met, Rural unmet
4	Tele-density of 7 by the year 2005 and 15 by the year 2010	No	Tele-density 7 achieved in March 2004, 15 likely by 2006
5	Rural Tele-density from the current level of 0.4 to 4 by the year 2010	Partly	Rural Tele-density 1.74 in March'05
6	Reliable media to all exchanges by the year 2002	No	30000 out of 35000 exchanges on fibre and several on microwave and satellite
7	High-speed data and multimedia capability using technologies including ISDN to all towns with a population greater than 2 lakh by the year 2002.	No	-

While overall tele-density has far exceeded NTP'99 targets there are clear shortfalls in achieving rural telecom growth.

USO Fund and amendment in the Indian Telegraph Act 1885

1.10 The USO levy is at present 5% of AGR and comes out of the license fees paid to the government. However, the implementation of Universal Service Obligation is through a multi-layered bidding process. The Fund is being administered by the Department of Telecom through Universal Service Fund Administrator. On 9th January 2004, the Indian Telegraph Act 1885 was amended to provide the USO Fund a statutory non-lapsable status. The Act states that, "'Universal Service Obligation' means the obligation to provide access to basic telegraph services to people in rural and remote areas at affordable and reasonable prices."

1.11 So far 5.3 lakh villages have been provided access to telecommunication network through Village Public Telephones (VPTs) covering 87% of the villages. Most of the VPTs have been provided by BSNL. BSNL has provided 13.59 million (July 2005) rural DELs in the country.

1.12 It is expected that the pace would accelerate considerably with the implementation of non-lapsable Universal Service Obligation Fund (USOF) and entry of private operators into rural areas for providing individual rural phones. So far, Rs. 1814.58 Cr. had been made available to the operators for rural telephony of which Rs. 1314.58 Cr. was for the year 2004-05. For 2005-06, Rs. 1500 Cr. have been allocated. The rise in collections of USOF should allow leverage to Government to adopt more aggressive policies for rural coverage.

Table 1.2 : Collection and disbursement of USOF

Collection and Disbursement of USOF			
Financial Year	Collection	Disbursement	Balance
	(Rs in crore)		
2002-03	1653.61	300	1353.61
2003-04	2143.22	200	3296.83
2004-05	3457.73	1314.58	5439.98
Total	**7254.56**	**1814.58**	**5439.98**
2005-10	**37541**	**17936.80**	**25044.2**

Assumptions:

1) Figures for 2005-10 are based on projections
2) Growth in fixed service revenue - 10% p.a.
3) Mobile Growth to reach 20 crs by 31.3.2008. Therefore, mobile growth assessed at 10 crs by 31.3.2006 and 15 crs by 31.3.2007.
4) Projection for the year 2008-10 is 25% on absolute revenue of fixed and mobile services

Chapter 2

What has the present telecom policy / regulation achieved: particularly for urban areas, and how

2.1 Public private partnership in telecommunication infrastructure has brought great benefits to the Indian economy and the telecom subscribers. This growth has come in after the Government of India/TRAI made major changes in the policies, structure and the regulation in the telecommunication sector. All stakeholders also responded by making Herculean efforts. Let us look at the past growth and the future possibilities in the sector, the policy changes made by the Government to bring about public private partnership, and the major hurdles that had to be crossed by the Government and the regulator in enforcing its policies. Only this analysis can indicate a direction for the future.

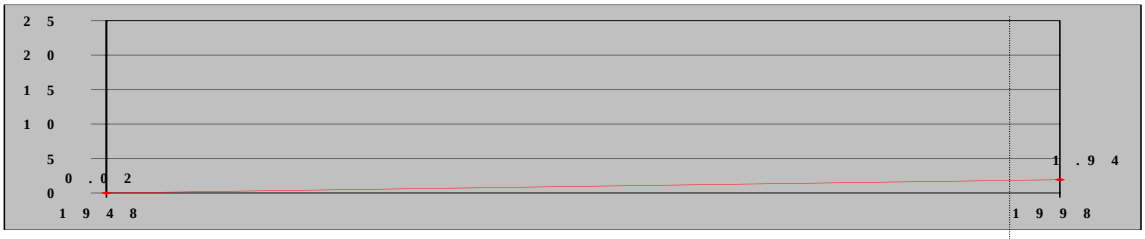
2.2 Prior to liberalization local calls, national long distance calls and international calls were either managed by Government or by Government companies and this network constituted a vertically integrated natural monopoly. Post liberalization led to many competing, public and private players, operating in the network in a competitive environment. Let us look at the performance of the sector and operators before and after liberalization/regulation.

2.3 Tele-density in 1948 i.e., just after independence was 0.02%. The Government and its monopolies made efforts to increase this tele-density and by 1998 i.e. after 50 years of independence the tele-density increased to 1.94% and the total growth in tele-density during this 50-year period was 1.92%.

Figure-2.1

Past Performance and Targets

Tele-density Growth – Pre-reform



50 years: Total growth 1.92%

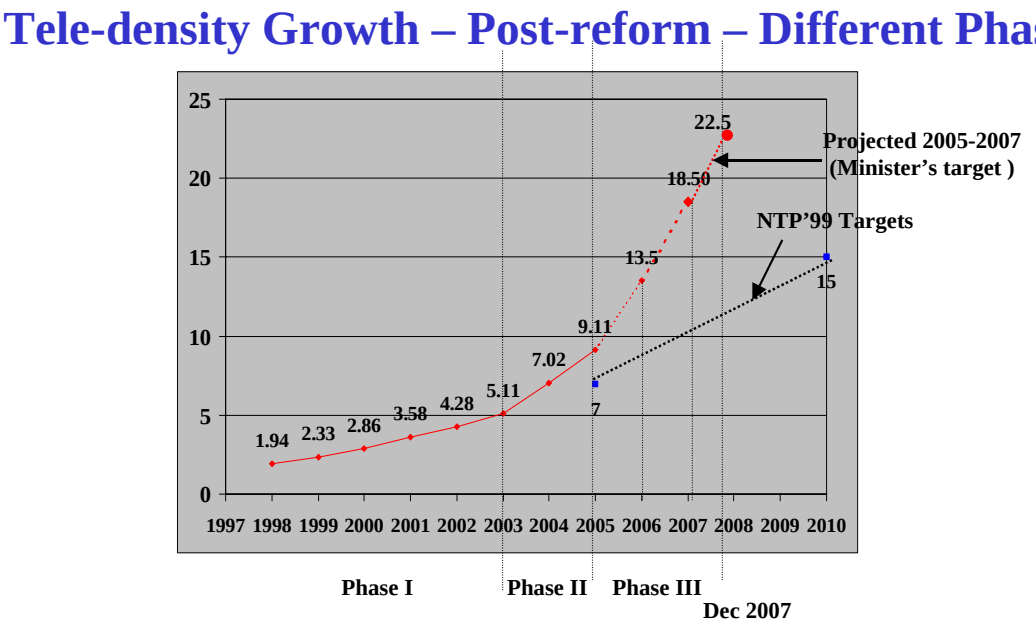
1994

2.4 Though manufacturing of telecom equipment by private sector was permitted in 1984 and some services like Radio paging, etc. were also opened for private sector in 1992, but the reform process only started after the issuance of National Telecom Policy, 1994, which called for bidding for private licenses and setting up an independent regulator. The independent regulator was set up in 1997 after the promulgation of TRAI Act, 1997. The Regulator issued the first tariff order in 1999 and thus the reform process really started during this year, 1999. Some problems were identified in NTP 94 and in the implementation of TRAI Act, 1997. This led to issuance of NTP 99 and amendments in TRAI Act in 2000.

2.5 Tele-density increased from 1.94% in 1998 to 5.11% in 2003 i.e. an incremental growth of 3.17% in five years (about 0.6% per annum). The growth substantially picked up after 2003 and during 2003-04 and 2004-05 it has been of

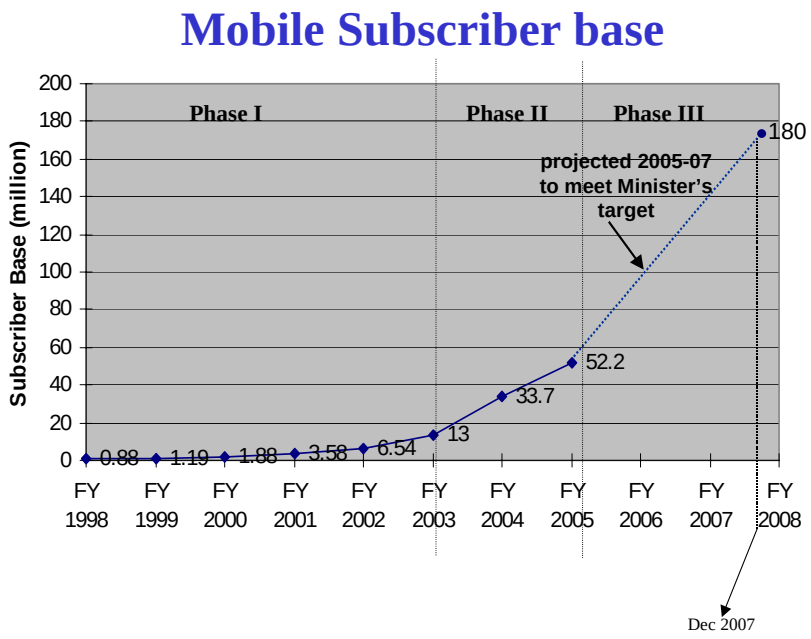
the order of 2% every year. During each year thus, the growth exceeded the first 50-year growth after independence. This would happen in 2005-06 also.

Figure-2.2



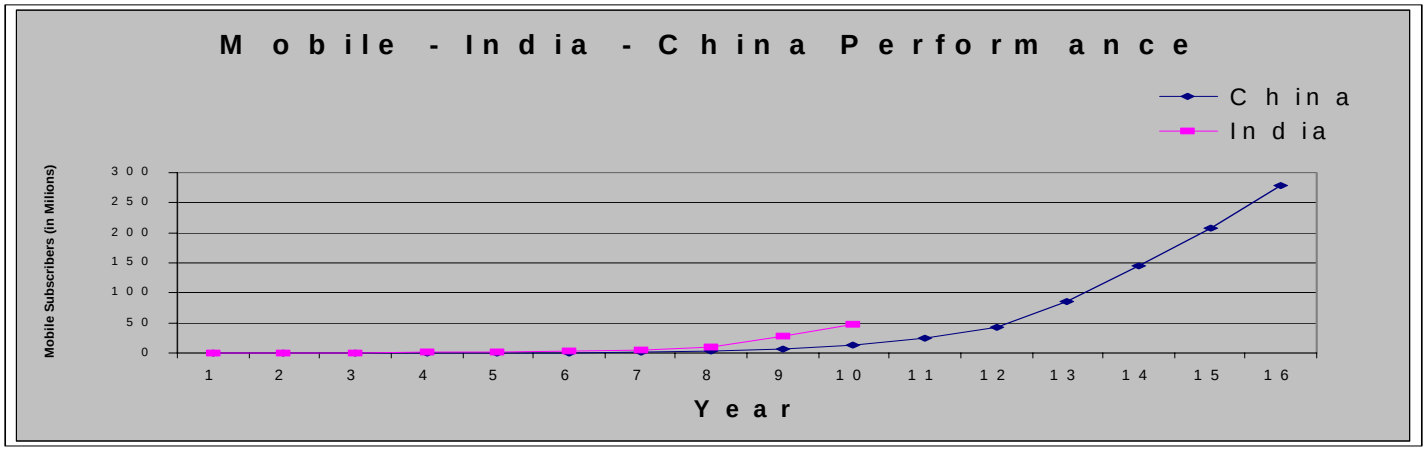
2.6 The growth between 1998 to 2005 was primarily public-private sector driven and also driven by the new technology i.e. mobile technology. During this period 51.3 mobile subscribers were added.

Figure-2.3



Most of the telecom services in India had a late start. Mobile started in 1980's in other countries. In China, they started in 1988. We debated whether mobiles are suitable technology and ultimately introduced them in 1995. The advantage of introducing mobile technology late was that we got mobile equipment at cheap rates and this coupled with other proper regulatory and policy measures brought down the subscriber rates to levels lowest in the world. Once this happened, rate of growth was very fast. If we assume year one for mobiles in China as 1988 and year one for India as 1995 – our growth has been consistently higher as the following table would indicate. However, on account of high tele-densities in large towns, this growth can be sustained only if we now accelerate growth in small towns and rural areas or we will soon fall behind China's growth.

Figure-2.4



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
China	0.003	0.01	0.02	0.1	0.2	0.6	1.6	3.6	6.8	13.2	24	43	85	145	207	279
India	0.03	0.22	0.8	1.1	1.6	3.1	5.5	10.5	28	48						

Introduction of Mobiles:

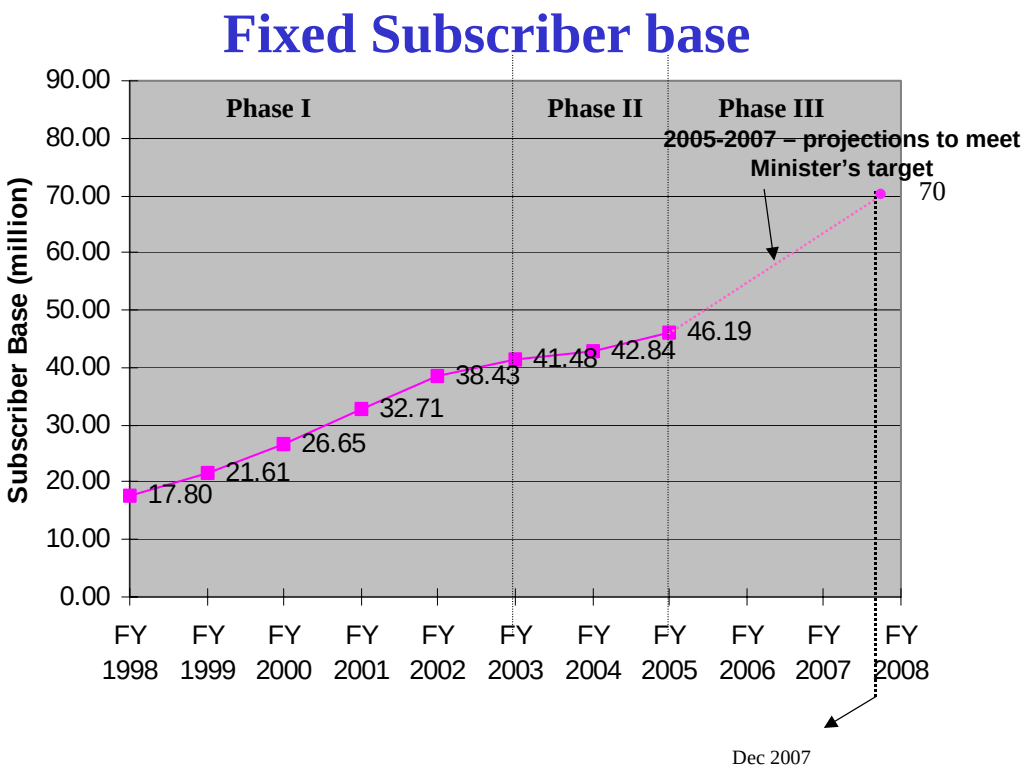
China year 1 : 1988 Year 17 : 2004

India year 1 : 1995 Year 10 : 2004

Note: Values are for end of year (December)

Fixed line growth, like in other countries, was marginal.

Figure-2.5



2.7 The growth of Internet & broadband in India has been tardy in comparison to some neighboring countries and like mobile telephony, Internet, broadband tariffs were very high in initial years, as the table shown in Annexure 2.1 would recall. Consequent to the Broadband Policy issued by the Government in 2004, Internet and broadband tariffs have been reduced and the services are now picking up as the following table would reveal. However, in the absence of competitive multi-operator environment, the growth has not picked up, as it should have.

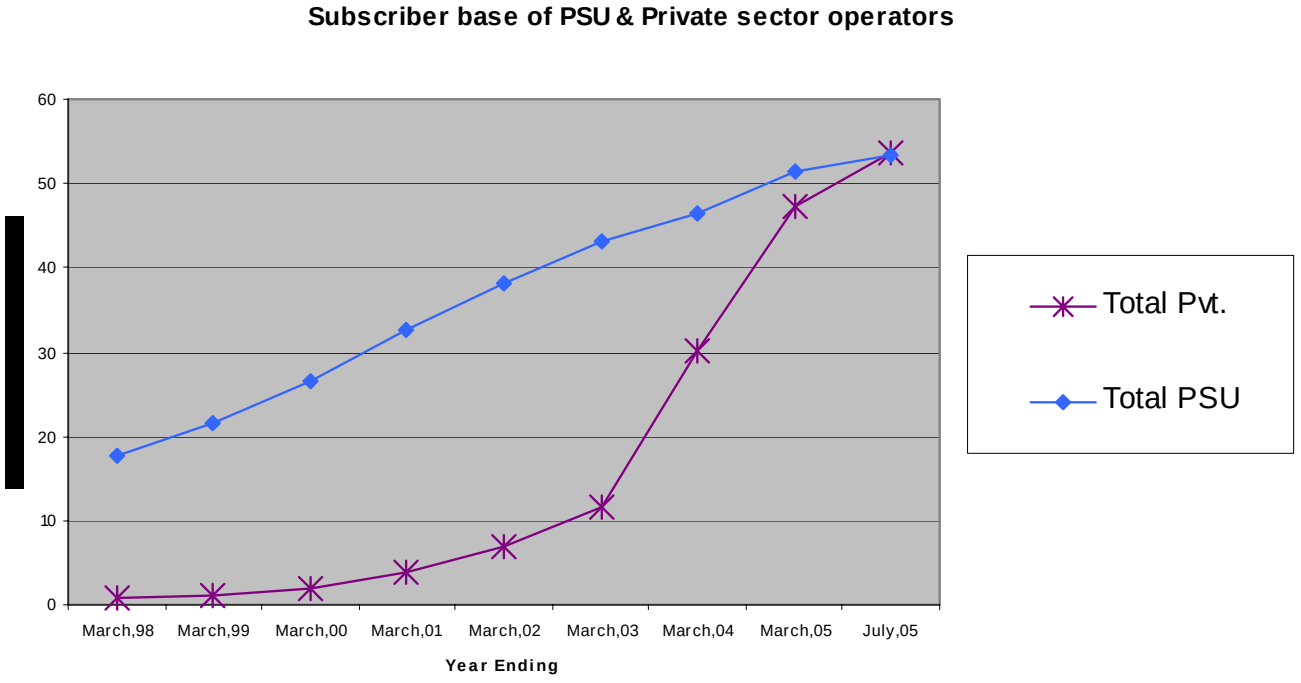
Table-2.1

Growth of Internet & Broadband and tariffs (2003-2005)

	Mar,2003	Mar,2004	Mar,2005	June,05
Internet Subscribers per hundred persons	0.4	0.45	0.51	0.53
Monthly Charges for average usage of internet (in $)	-	9.5	5.0	4.8
Broadband Subscribers per hundred persons	-	0.02	0.03	0.04
Monthly Charges for average usage of broadband (in $)	-	21	12	7

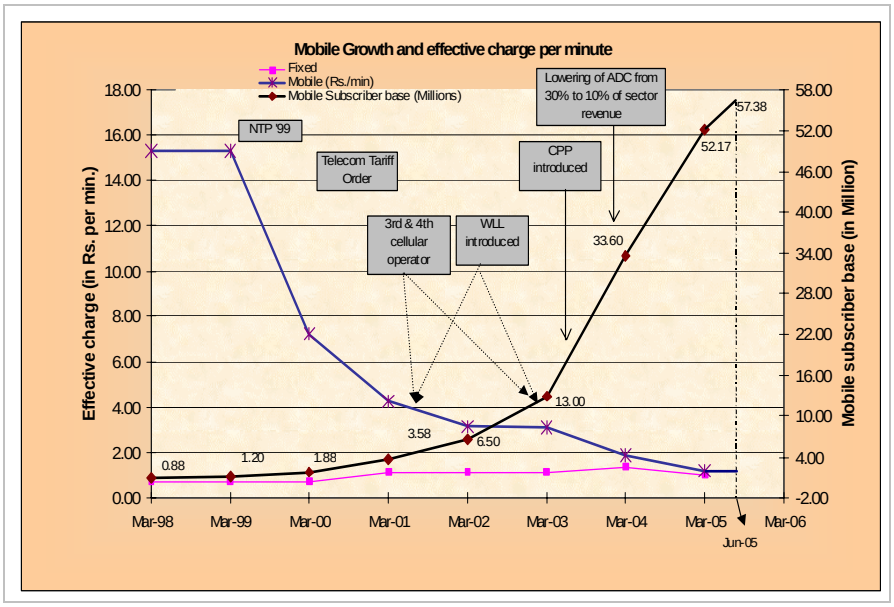
2.8 Private operators contributed very largely to post 1998 growth. The growth of PSU operators subscriber base during the seven-year period was 34.28 million subscribers, consisting of 23.28 million fixed and 11 million mobile subscribers. The growth of private sector during the period was 45.45 million subscribers consisting of 5.09 million fixed and 40.36 million mobile subscribers. It is also remarkable that public sector undertakings whose growth was very slow during the monopoly period of 1948 to 1998 i.e. about 0.3 million subscribers every year, increased it to about 5 million subscribers every year during the period 1998 to 2005. The public-private cooperation and competition led to immense improvement in the performance of both public and private sector. We can only infer from this that similar companies behave very differently in monopoly and competitive environments.

Figure-2.6



2.9 **The above charts show that the growth has been primarily mobile telephony oriented. The mobile growth chart below clearly shows that the growth picked up substantially after 2003 i.e. when the mobile tariffs started approaching fixed tariffs. It was only at this stage, when tariffs went down severely because of competition and the mobile telephone instrument became the instrument of working class, did the growth pick up**. The measures taken by TRAI to reduce tariffs i.e. through encouraging increased competition, introduction of Unified Access Licensing Regime, introduction of calling party pays regime, lowering of ADC from 30% to 10% of the sectoral revenue, allowing cheaper handsets being sold at the time of delivery (with rest of the money charged in installments), allowing cheaper intra-network calls giving consumer relief, etc., led to the phenomenal growth. The Government encouraged the process by changing high entry fee with revenue share and reducing the revenue share further in 2001 and 2003.

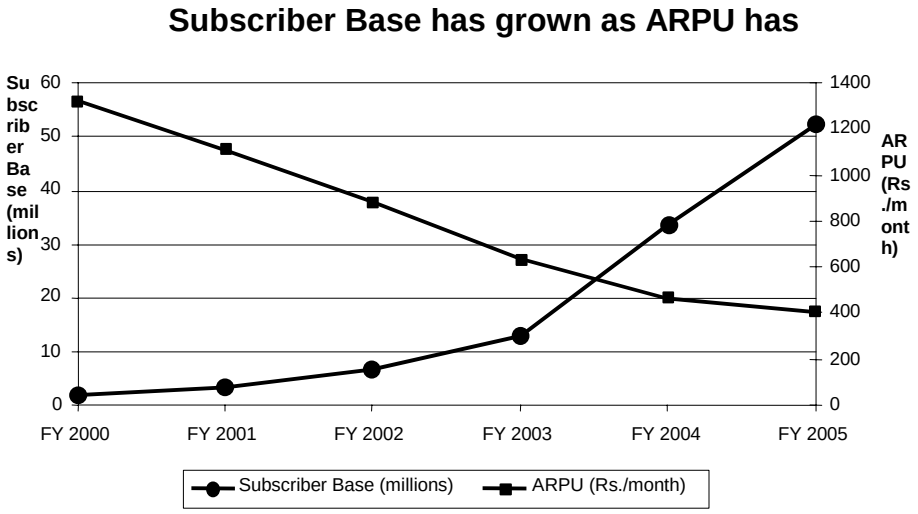
Figure-2.7



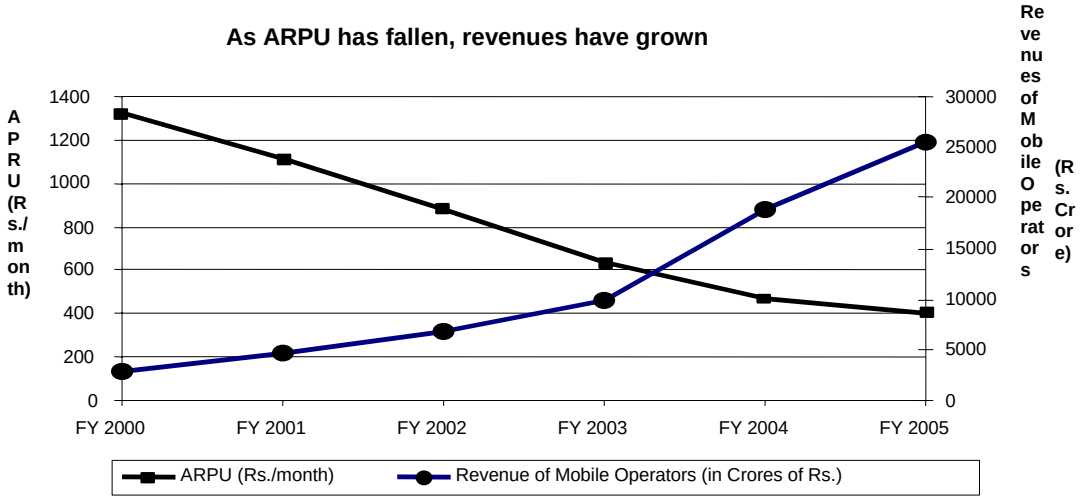
2.10 Despite a severe fall in tariffs, the income of telephone operators went up sharply due to the increase in number of subscribers, as the following graph would show:

Figure-2.8

(**ARPU: Average Revenue per User/month**)



2.11 One of the other reasons of tariffs coming down as explained in para 2.9 above was the abolition of the high entry fee regime and launching of lower



revenue share regime, by the Government in 1999 and reduction of revenue share in 2001 and again in 2003. It was thought initially that these reductions would lead to severe reduction in Government revenues. This did not happen. Service tax was introduced around 1999-2000, including on telecom services. The reduction in revenue share regime and the introduction of service tax on telecom services led to a substantial increase in Government revenues from mobile telephone despite severe reduction in tariffs as the following table would indicate:

Table-2.2

Government gains through reduced fees in the Mobile Sector

Statement of Revenues to be received by Central Government - mobiles							
	All circle and Metro License					(Rs.in Crore)	
		1	2	3	4	5	6
	YEAR	Licence fee old regime auctioned high entry fee paid	Licence fee new regime (post NTP 99) 15%	License Fee as per 2001 Regime 8-12%	License Fee as per 2003 Regime 6-8%	service tax(Estimated)* % share define	License Fee+Service Tax
1	1999-00	1603	275	209		110	319
2	2000-01	2270	619	468		248	716
3	2001-02	2734	793	602		317	919
4	2002-03	2455	872	657		349	1006
5	2003-04	2470	1727	1296		1105	2402
6	2004-05	2511	2698		1666	2158	3824
7	2005-06	2591	4586		2831	3669	6500
8	2006-07	2680	7796		4813	6237	11050
		19314	**19366**	**3234**	**9309**	**14193**	**26736**
				12543			

- Rate of Service Tax taken as 5% up to 13.5.2003, 8% up to 31st March 2004 and thereafter 10%
- Estimated Service Tax (based on estimated Gross Revenue)

2.12 If we look at the total revenues from all telecom services they also increased exponentially after 2002-2003 as the following table would indicate:

Table-2.3

Statement of Estimate of Government Levies from License Fee, Spectrum Fee and Service Tax on all Telecom Services

Rs Crs

1	2	3	4	5	6	7
Year	**Gross Revenue**	**Adjusted Gross Revenue**	**License Fee**	**Service Tax 5-10%**	**Spectrum Charge 2-4%**	**Total Govt. Levies**
2002-03	48000	40800	4080	2040	206	**6326**
2003-04	61000	51850	4770	4148	434	**9353**
2004-05	80000	68000	6256	6800	856	**13912**
2005-06	100000	85000	7820	8500	1530	**17850**
2006-07	139000	118150	10869.8	11815	2458	**25142**
2007-08	169000	143650	13215.8	14365	3275	**30856**

There could be no better example of growth in revenue from lower taxation/tariff. But even today, the taxes and duties on telecom services, a vehicle for economic growth are very high and need further reduction, particularly to universalize these services in real terms, which is now possible, and particularly in rural areas.

2.13 Despite very heavy taxation vis-à-vis other neighboring countries, as shown below, our tariffs are the least in the world, a tribute to the competition in the sector and our operators:

Table-2.4

SECTOR LEVIES

	Pakistan	Sri Lanka	China	India
Sector Charges	%age of revenue	%age	%age of revenue	%age of Revenue
Service Tax,GST	GST	VAT	3%	10% + GST
License Fee	0.5% + 0.5% R&D	0.3% TURNOVER (T.O.) + 1% of capital invested (inv)	NIL	5-10%
Spectrum Charges	Cost recovery	~1.1% of T.O.	~0.5%** (China Mobile)	2-6%*
USO	1.5%	Nil (only on ISD Calls)	Nil	Included in license fees
Total Sector Charges	**2.5% + GST+ cost recovery**	**=1.3% T.O. + 1% inv +VAT**	**~0.5% + 3% (Tax)**	**17%~26% +GST**

* Backbone spectrum charges extra

** Estimated from spectrum fees & revenue of China Mobile

Reducing levies is essential to drop cost to customer and hence increase in penetration in new markets particularly rural areas with lesser purchasing power, low density of population, leading to higher network costs. The ideal policy would be to charge license fee & spectrum charges only for USO and for covering administrative costs.

Table – 2.5

Call charges per Minute of Use, ARPU and Termination Rates per minute for mobile service in different countries (June 04)

Name of the country	Call charge per minute	Minutes of Use per subscriber per month	ARPU (Average Revenue Per User)	Termination rates per minute	
				Fixed	Mobile
	US$	Minutes	US$	US$	US$
Australia	0.24	159	43	0.016	0.152
Brazil	0.11	92	11	0.020	0.080
China	0.04	261	10	0.010	0.025
Switzerland	0.45	119	59	0.017	0.163
Japan	0.33	156	63	0.022	0.130
India	0.04*	309	11	0.007	0.007

*** Has come down to 0.03 in 2005 – lowest in the world –and going down further.**

Fixation of very low termination rates in India have led to aggressive competition in origination, leading to lowest call rates in the world.

2.14 The analysis above clearly reveals that the factors leading to high telecom growth have been:

(a) Introduction of mobile technology which allows telecom services to be given at lower costs,

(b) Severe competition between large number of public/private operators,

(c) The Government and the Regulator facilitating fall in tariffs by various measures including fall in taxation on the sector.

2.15 The reasons for failure of the telecom revolution in rural areas so far can now be analyzed.

2.16 While noting that mobile technology has been the key driver in boosting the urban tele-density, one also notes the low penetration of cellular mobile services in rural areas due to the inadequate BTS infrastructure (towers, power supply, etc.). This observation shows the non-connectivity and non-exposure of large percentage of our population (rural population) which translates into low rural tele-density.

Table-2.6

Coverage of Mobile Networks (2003 - 04)
(Population Coverage)

	By	***Population***
Town	**~1700 out of 5200**	**~200million**
Rural areas	**Negligible**	**Negligible**

Since the mobile tariffs have severely gone down, there is a huge demand for mobile telephones in rural areas but unless coverage of towers goes to rural areas this demand would not be met. We have had discussions with mobile operators and players and they have now launched a telecom expansion plan of the following order:

Table-2.7

Proposed Network Coverage by end 2006; operators plan
(Population Coverage 75%)

	By area	*Population Coverage*
Towns	~4900 out of 5200	~300 Million
Rural areas	~350,000 out of 607,000 villages	~450 Million

We have to facilitate and aid this expansion of coverage by public and private operators, particularly in rural areas.

2.17 Is this expansion possible or is it a pipe dream? We have to look at the mobile tower coverage in other similar countries to see whether such a coverage can become a reality. The following table shows that our targets of population coverage, for 2007, if at all, are conservative:

Table-2.8

MANY OTHER DEVELOPING COUNTRIES ALREADY HAVE MORE ADVANCED COVERAGE

Mobile coverage in selected countries, by region, 2002

Region	Country	Pop. Covered by mobile signal
Africa	**Cape Verde**	90%
	South Africa	93%
	Togo	90%
	Zambia	50%
Americas	**El Salvador**	85%
	Eucador	86%
	Gautemala	68%
	Mexico	90%
Arab States	**Jordan**	90%
	Morrocco	95%
Asia-Pacific	**Korea-Rep.**	99%
	Malaysia	95%
	Philippines	70%
Europe	**Azerbaijan**	94%
	Belarus	72%
	Czech Republic	99%
	Slovak Rep.	98%
	India	20%

Source: ITU World Telecommunication Indicators Database

2.18 It may be argued that the present ARPU in the telecom sector could go down further if the operators go to rural areas and such expansion therefore, may not be viable. As per Morgan Stanley report[1], Indian cellular operators can remain profitable even at an ARPU of US$4, if the incremental capex/sub is $50 or lower, and no handset subsidy is given. If handset subsidy is provided, minimum ARPU for a positive return on capital employed will increase to $6 *caritas paribus*. The present ARPU is around $9 per month and hence operators can profitably expand into non-covered and rural areas. In any case, operators are already offering tariff packages that assure ARPU of over $4/month. It is clear from above that telecom operators can go to the interiors, as they have done in other countries and still remain viable.

[1] Morgan Stanley, Micro-Prepaid comes to India, June 2005

2.19 The Authority has been reviewing the growth of mobile networks after 2003-2004. Though we have not received the entire data, it appears that the growth of network is adequate in the urban areas and we may soon cover all towns in the country but the growth has been slow and incidental in rural areas. These networks would obviously be not so viable as urban area's networks on account of comparatively lesser income levels and also lower density of population as we go into smaller towns and to the backward rural areas. The new USO policy must deal with this. Since our tariffs and entry price (price of handset) have both come down, we must plan for an explosive growth in coverage and also in subscriber numbers. The Minister C & IT's targets also indicated the necessity for such a policy. **But we cannot grow till our policies for rural areas are shaped drawing upon the successful experiences for urban areas.**

2.20 **We, therefore, also have to examine whether there is purchasing power in our villages to have a large number of telephones in each village and also whether we can introduce multi-operator competition in villages. It is clear that the urban telecom growth was driven by the presence of a large number of operators and also from aggressive competition between them. We will examine this in Chapter-3.**

2.21 The present rural telecom policy has been driven by public sector and Government supported USO schemes on individual telephones, VPTs, etc. The rural telecom policy thus replicates the overall telecom policy during the period 1948-98. Hence there is remarkable similarity in

the overall telecom growth graph of 1948-98 (Figure-2.1) and the present day rural telecom graph 1996-2005 (Figure-1.2).

2.22 As explained subsequently in Chapter-6 of these recommendations, **the present USOF support approach for VPTs, RCPs, MARR replacements, PTICs/HPTICs and rural DELs would lead us barely to achieve 4% rural tele-density target in 2010 after giving a huge subsidy of approximately Rs. 25,000 crores from USO. In addition rural DELs will get a further subsidy of around Rs.5000 Crores from USO funds beyond 2008, if the present approach of USOF subsidy to fixed line DELs continue. It needs also to be pointed out that rural DELs have been receiving support from ADC since 2003.** Neither such low tele-density in rural areas in 2010, nor such high subsidies, to achieve so little, can be acceptable. The achievement of 4% rural tele-density would not take the country to achieve the overall tele-density target fixed by the Hon'ble Minister of Communications & IT or even world average of 50% in the near future. This improvement in rural tele-density may not be achieved if we continue to follow the individualistic approach of USOF support. For better results, we will have to definitely adopt a network infrastructure expansion approach which has been discussed in detail in Chapter 6 & 7 of these recommendations.

2.23 It would be clear that for fast rural growth, the present policy must be supplemented and at a later stage after meeting the present contractual commitments, replaced by a policy for creating additional infrastructure for mobile rural connectivity – and in these policies the

Government must be very aggressive. After all, the huge success and almost hundred percent broadband coverage in South Korea was kick started by Government laying down the entire optical fibre network, at its own cost. We are lucky in India, that we have huge unspent balances in USO funds and huge accruals and they can be spent for facilitating infrastructural coverage. Even if the Government's expenditure on new rural telecom policies are more than USO accruals, they are advisable because the sector provides growth potential to the country and huge revenues to the Government and expansion in network will only supplement these revenues, as had happened in the past also and reflected in Tables 2.2 & 2.3.

2.24 In the subsequent chapters, we examine the economic indicators and the rural indicators of our country at present, to examine whether they can support an extensive telecom network, inclusive of rural and backward areas.

Chapter 3

Economic Indicators

3.1 The growth in the past few years has allowed us to dream for a higher growth in the future. Hon'ble Minister Telecom has recently set an ambitious target for the sector, 250 million telephones by the end of 2007 i.e. a tele-density of 22.98%. This would require an addition of more than 4 million mobile telephones per month against the growth rate of 2 million in the recent past and also a slight increase in the growth of fixed telephones. Can this happen?

3.2 Subscribers buy telephones when they can afford it. If we look at tele-density in India and in other countries with similar GNI per capita on a PPP basis, it appears that India also can increase its tele-density very fast only based on income indicators, as the following table would show:

Table-3.1

INDICATORS
International comparison:
India's per capita holds higher Teledensity potential

Country	GNI Per Capita PPP 2002, USD**	Teledensity* 2003
Bolivia	2300	23.81
Georgia	2210	23.98
Moldova	1560	23.76
Ecuador	3130	30.32
India	2570	6.7

Source: * ITU database

** World Development Indicators data, World Bank July 2003

Let us now look at the rural scenario and rural economic indicators to see whether such areas can sustain an explosive network expansion.

3.3 We discuss the rural scenarios in terms of the rural purchasing power, the pilot projects carried out in selected rural areas and their experiences, possible approaches, and the currently faced bottlenecks in the expansion of telecom network in the rural areas.

3.4 An idea of rural area purchasing power can be had from the following table, which gives both in absolute figures as well as in percentage term income-wise distribution of households in both rural and urban areas. It is interesting to note from this table that while in percentage terms, the middle to high income households in rural areas are nearly one-third of those of urban areas, in absolute terms these numbers are almost the same. Further, in lower middle-income group also, while the percentage of rural households is just a shade higher than the urban households, in absolute terms, these constitute nearly two and a half times the number in urban areas.

Table-3.2

Urban/Rural income-wise distribution of households

(In millions)

Income Group	Rural Households	Urban Households
Lower	58.87 (47.94%)	9.31 (18.96%)
Lower Middle	42.77 (34.83%)	16.58 (33.76%)
Middle to High	21.16 (17.23%)	23.22 (47.28%)
Total	122.81 (100%)	49.11(100%)

Data from 1998-99. Source: NCAER IMDR 2002

3.5 **The discussion given above clearly shows that there is substantial purchasing power in the rural areas – at least comparable to the urban areas**. This is a very significant conclusion while looking at the question of demand and provisioning of communication services in rural areas. **The cost-effectiveness of a given solution for providing communication service in rural areas because of their sparse and spread out nature is a different consideration and may require subsidization of the network in rural areas. Any subsidization of individual telephones may not be an appropriate**

policy, in view of the huge rural demand and inevitable problems in implementing micro-managed subsidization policies.

3.6 An estimate of the purchasing power and the nature of rural market requirements can be had by looking at the deepening penetration of Fast Moving Consumer Goods (FMCG). For the past few years, FMCG companies have been concentrating their efforts on increasing their coverage of rural areas. In the process, they have had to redesign their marketing strategy. The fact that they have achieved great success and over 50% of sales of most products take place in rural areas, is an indication both of the purchasing potential of rural areas as well as the desire in these areas to purchase goods which are common place in urban markets.

3.7 Of course, the focus on the rural market does not really come as a surprise. India's rural market has been growing steadily over the years and is now bigger than the urban market for FMCG (53% share of the total market)[2]. Rural India also accounts for a large pie of FMCG, consumer durables/white goods, automobile/two-wheeler/tractor sales among a host of other industry sectors in our country. Table below shows the number of households with key durables.

[2] Indian Brand Equity Foundation report

Table-3.3

Urban-rural markets

		Market Share %		Total numbers in millions	
	All India	Urban + Semi-urban	Rural	Urban + Semi-Urban	Rural
Total Households (Millions)	192	54	138		
Bicycle	44%	46%	43%	24.84	59.34
Radios	35%	44%	32%	23.76	44.16
Television	32%	64%	19%	34.56	26.22
Motor Cycles & Scooters	12%	25%	7%	13.5	9.66

3.8 According to the World Bank[3], "wherever they are given the choice, poor communities often spend on communications as much as urban communities, in terms of percentage of available income" and if this expenditure is made on availabilities and cheap communication services, the rural growth will pick up substantially and in a short time frame and this, gives us today a Universal Service Opportunity, both for the operators and subscribers.

3.9 The demand of mobile telephones is increasing very fast today, even in small towns. . Category C States have, on average, 85% rural population, while Category A and B comprise of 67% and 75% rural population respectively[4]. Further, Category C States, which include Himachal Pradesh, Bihar & Jharkhand, Orissa, Assam, Sikkim, Tripura, Meghalaya, Manipur, Mizoram, Nagaland, Arunachal Pradesh, and Jammu & Kashmir, have average lower per-capita incomes than States in other Categories – approximately Rs. 8,000 as compared to Rs. 10,000 and Rs. 13,000 for B and A category States

[3] Telecommunication and Information Services for the poor, World Bank Discussion paper No. 432

[4] Census of India, 2001

respectively[5]. Yet, Category C Circles have outperformed the national and other Category averages for percentage growth over multiple quarters, in terms of both GSM and CDMA subscribers. Consequently, we can contest the claim that areas with higher rural populations or lower economic status are not attractive for investment in telecommunications infrastructure. A demand for telecommunications services exists in these regions along with the potential for growth in penetration, as the figure shown in **Annexure 3.1** would reveal.

3.10 Since the demand in rural areas has grown manifold in recent years, our policies should now concentrate on increasing the supply of telecommunication services to rural areas and substantially compensate such infrastructure from USO funds to accelerate telecom services supply and thereby facilitate explosive growth in rural areas and then schemes should be simple and free from bureaucratic intervention – to replicate the urban growth model, in a time bound manner.

3.11 While planning for growth in rural areas, we must look at another feature of the Indian telecom market. Unlike other countries, where fixed line telephones far outstrip cable TV connections, the growth of cable TV services in India has been remarkable:

[5] Per-capita-income data from Government of India, Minister of Statistics and Programme Implementation, Lok Sabha Questions, Unstarred Question No. 1971, Answered on July 21, 2004

Table-3.4

Number of cable homes and number of fixed line telephone subscribers

Figures in million – (Year 2003)			
S. No.	**Name of the country**	**No. of cable TV + DTH subscribers**	**No. of fixed line connections**
1	Australia	1.55	10.82
2	China	105.00	263.00
3	United Kingdom	10.50	34.90
4	Japan	8.10	71.15
5	Korea	11.94	22.88
6	Taiwan	5.30	13.36
7	Thailand	0.43	6.60
8	Unites States	94.97	181.6
9	India	61*	47*

Note : *Data for India is for 2005.

The remarkable growth in cable TV indicates the following:

(a) Whenever the Indian State allows the Indian entrepreneurs all choices and very light handed regulation, and allows him to grow his business in such environment, he does exceptionally well.

(b) The Indian consumers value multi sourced information (hears channels including Doordarshan) and entertainment (Star plus, Sony, Zee TV, etc.) much more than fixed line telephone services. This trend is not the same anywhere in the world.

3.12 The trend shown above clearly indicates the popularity of cable TV in India and this should be leveraged to increase the penetration of communication services in India, particularly in remote and rural areas. This can be incentivised by encouraging triple (or more) play networks in the country, particularly in remote and rural areas. Such IP based next generation networks in place of

present switch based networks are already being implemented in many countries. The operators can be allowed this choice if a converged network is brought in the Indian Telecom sector. Such an environment can be brought in if either the Convergence Bill is passed by the Parliament or Unified Licensing (Unified Access Licensing introduced already) is approved by the Government. When unified access license was introduced in India the Shostech Group, an American research group in its paper "The Indian Telecommunications Experience: Its Relevance for the World" said: "India's Unified (Access) License – with which any operator can offer any access technology, whether land line or wireless – has enabled more robust competition than otherwise would be possible. As an outcome, services are expanding more extensively, tariffs are falling more rapidly, and subscribers are adopting more quickly than the world has witnessed before".

3.13 It is necessary, for quicker growth of the sector, consistent with latest emerging technologies, to adopt the full 'Unified licensing' or 'convergence' approach. The presence of both public and private sector in all these sectors and a framework, which allows maximum competition would open up the next phase of telecom revolution, inclusive of broadband and TV services. Our recommendations in this regard were sent to the Government on 13th January 2005 wherein it was recommended that Unified licensing regime should be introduced for all telecom services to encourage free growth of new applications and services. It is necessary to implement such a regime because of the pace and pattern of technological developments. The regime would facilitate service providers to find new ways to reach customers for different services, create markets of the future and new revenue streams. Majority of such uncovered markets today are in rural areas, and the connectivity within easy reach for consumers exists. Unified Licensing will kick-start the growth process in such areas.

Chapter-4

Rural ICT Initiatives and Resulting Pointers

4.1 The Indian Corporates, State Governments and NGOs have launched several rural initiatives based on the latest ICTs and of different scales. As a consequence the results from these initiatives, throw a new light on the rural telecommunications scenario both in terms of demand for services and possible modes of supply. They also throw a new light on the financial picture of the Rural ICT initiatives.

Some pilot projects carried out in rural areas of India

4.2 To get an idea of the nature of requirement of telephone services in rural areas, it is instructive to study the types of services provided by the pilot projects through private initiative in rural areas of India and the response to those projects. These projects in India, as per our information, at present are:

(a) Profit Driven Projects:

- ITC e-chaupal
- N-Longue
- Drishtee (using existing telecom infra-structure)

(b) Grant/aid driven:

- MS Swaminathan Center (in Pondichery, focused on agriculture and fishing applications).
- Tara-haat (focus on rural enterprises)
- Akshaya (in Kerala with Government support).
- Gyandoot (in M.P. with focus on e-Governance)- operated by n-Logue.
- Rural E-Seva (in East Godavari District of AP with focus on e-governance)
- Warana Village (in Maharashtra by NIC) – operated by n-Logue

(c) Application Development initiatives:

- Bhoomi

(d) State Government driven:

- Andhra Pradesh Broadband Network – Broadband connectivity available across the state – for offices, institutions and homes – at affordable costs.

4.2.1 The list of such projects is expanding and we may not have captured all in the projects above. But there is a lesson in these projects for all of us that recognizing the benefits of rural connectivity, corporates, educational institutions, NGOs and State Governments have launched major projects which cover thousands of villages and if these efforts could be integrated in an appropriate policy framework, there would be an explosive increase in rural connectivity/communications, the kind of which has never been witnessed in India before.

4.3 We would have liked to give the details of efforts made by all the projects but for the sake of brevity, we have picked up only three, using different communication platforms, from the list for details below – to evolve proposed GOI's policy framework to consolidate these efforts. Some descriptions of the other projects are given in Annexure 4.2.

ITC e-Chaupal. (details in Annexure-4.1)

4.3.1 Based on V-SAT technology, ITC has covered over 25000 villages with e-chaupal at 4300 places in six States where following services are provided:-

- information about agricultural products
- market information
- weather information
- information about the fertilizers requirements and their variety.

These e-chaupals, besides providing connectivity and information, also serve as ITC ground level outlets for agricultural products. Products such as seeds, fertilizers etc. of guaranteed quality and reasonable rates are made available. These chaupals also carry out other commercial transactions with

farmers such as purchase of agricultural produce thereby eliminating the village middle men. The scheme has received very positive response from the villages since the villager is now able to get better price for his crops and in a transparent manner. He has the option of choosing the time of sale based on market information. The cost of providing the connectivity is, however, high and the scheme is cost effective only when combined with the agricultural products based business of ITC. Thus, it is evident from this pilot project that there is a demand for value added information in the villages although cost effectiveness of the provisioning arrangement used for information is a question mark.

n-Logue projects in Tamil Nadu & Andhra Pradesh (details in Annexure-4.1).

4.3.2 Based on the corDECT product developed by IIT Madras (The CorDECT technology has been awarded the best technology award by the Prime Minister this year at the Shanti Swarup Bhatnagar Awards Function on 28.9.2005) this project provides information kiosks, in over 2000 villages in the State of Tamil Nadu and to a lesser extent in Andhra Pradesh. The kiosk is connected to the terminal of an ISP through a 70 kbps wireless connection using corDECT technology which in turn provides internet based services. The services provided at the kiosks include e-education, e-medicine, video conferencing, cyber chatting, etc. as on-line products and computer training, photography (still photography) as off-line products. These kiosks are owned by a villager with investment partly by the villager and partly by n-Logue. The reported income per month varies between Rs. 3000 to 5000 and is, therefore, indicative of the nature of demand in services in rural areas. The cost of provisioning products is not very high but can be made more attractive for the products expansion to more rural areas, through certain regulatory interventions.

Andhra Pradesh Broadband Network (details in Annexure-4.1):

4.3.3 This is the most comprehensive and integrated effort so far in any of the States and proposes to make broadband connectivity available across the State

at an affordable cost at viable tariffs and plans to provide 10 Gbps upto each district H.Q., 1 Gbps upto each Mandal H.Q., and 100/50 Mbps upto each village using fibre/wireless.

Table-4.1

Capex/Opex of Broadband connectivity projects

	A.P. model		N-logue		E-chaupal	
	Per village	For 75000 villages	Per village	For 75000 villages	Per village	For 75000 villages
Capital Cost	0.93 lakhs	701 crore	0.5 lakhs	375 crore	1.2 lakhs	900 crore
Operational cost (Annual)	0.25 lakhs	188 crore	0.25 lakhs	188 crore	0.53 lakhs	398 crore
Delivered bandwidth at village level	100 Mbps		70 kbps		64 kbps	
Revenue	-		Income/year from year II Kiosks: Rs. 20,000 to Rs. 1 lack/year Profitability Project HQ: Rs. 30 lacs/year (To be shared by project HQ/company).		Breakeven happens after 4th-5th year of operations. Revenue HQ: 14.1 Crores approx. (With 30% Projects in their 1st year of operation and rest in their 2nd year of operation) Revenue Franchisee Total revenue = 1% of total transactions Approximately 4.5 crores, assuming 450 crores transactions made in one year. Approx. Rs.14063 per year per Franchisee Revenue Agent Approx. 1.25 crores, assuming 450 cores transactions made in one year. Approx. Rs.62500 per year per agent	

4.4 The outline of some of the other projects inclusive of efforts of the State Governments is given in Annexure-4.2.

4.5 From the above discussions and analysis of the pilot projects, it is evident that a market exists in rural areas which covers not only voice telephony but also a variety of other value added services which can be provided through data

circuits. The cost effectiveness of some of these projects for scaling up to cover very large number of villages or all the rural areas in the country is, however, not entirely proven at this stage. But these projects are being expanded and getting completed at a very fast pace and we will shortly have all the required experience to finalise the framework of entire country projects. However, India is a large and diverse country and what is successful in Tamil Nadu, Andhra Padesh, Madhya Pradesh and some identified areas may not be applicable elsewhere. However, policy direction can evolve from the experience of these projects. **At the same time, it is also clear that these schemes are found to be more successful in terms of their returns as well as the state of maintenance and upkeep compared to the present USO policy.** The main reason for better performance of these projects appears to be the greater stake of the entrepreneur in the schemes. The cost of implementing these schemes is also not much and major parts of the costs are recoverable in business, once the network stabilizes, particularly in high-density villages. If voice telephony is added to such networks, they may be more viable and it is suggested that Unified License Policy, proposed to the Government, may be considered for approval. It is quite possible that in spite of best efforts of cellular/ UASL operators, they may not be able to increase the penetration of telecom services in very backward areas from telecommunication point of view. In such situations, a bottom up approach by promoting small operators in partnership with local population may help in increasing the penetration of telecom services in such areas. **Keeping this aspect in mind, a concept of niche operator in SDCAs where tele-density is less than 1% is recommended by TRAI in its Unified Licensing Recommendations. It is suggested that Government should accept Unified Licensing Recommendations so that these niche operators may also contribute for growth of telecom services in rural/remote areas.**

4.5.1 The main conclusions to be drawn from the examples given above are:

(i) the rural market for communications is not entirely based on voice telephony nor is voice telephony service by itself remunerative enough due to high infrastructure cost.

(ii) There is a substantial demand for value added services to be provided on data circuits but such data circuits by themselves are not sufficiently remunerative to be scaleable to all parts of the country.

(iii) Innovative projects of a small entrepreneur working as franchisee of large service provider, have produced interesting results. Such entrepreneurs utilizing their own infrastructure of a specific nature, are often more successful than very large operators.

(iv) If these projects can give the entire range of triple play services (including TV), the demand in rural areas for such networks would be large, and they would be more viable than single play networks.

Possible Approaches to Rural Coverage

4.6 The above discussion has clearly brought out that there is a demand for both voice telephony services as also data communication services and an emerging demand for cable TV and other emerging services which could also be provided on such networks. The proportion of three or more types of services would vary substantially from one geographical area to another. Further, it has been argued that the impact of communication services on the economic growth of a given area is much more in a developing country as compared to a developed country. The need for communication services will depend upon the extent of economic development of the area. Therefore, as time progresses this need could change over from a simple voice communication to an elaborate data based and other value added services.

4.7 It has been established on the basis of some pilot projects such as Gyan Doot in Rajasthan and Andhra Pradesh Government project that providing a network which is IP based is far more cost-effective than the standard circuit switched network. When VoIP based voice telephony is also permitted on such networks, their cost-effectiveness improves substantially. Thus, conceptually IP networks appear to be very interesting solution for the coverage of rural areas. Considering the fact that the rural areas are sparse and remote and the

requirement of telecommunication facilities per habitation is much less than in urban areas, the infrastructure cost becomes a very critical parameter. Under certain circumstances such as those prevailing in India, these need not be very high. Specifically, the fact that there are over 30000 locations with fibre terminations implying an average of 15 kms distance from a wide band telecommunication infrastructure to a village, it may be possible to cover such distances by either optic fibre based networks in conjunction with WiFi or copper cables or by the evolving WiMAX based wireless communication.

4.8 **Earlier, we have seen in Chapter 2, that like urban areas, success in increasing tele-density in rural areas also can be achieved by ensuring roll out of cellular mobile services in these areas. The experiences of the pilot projects demonstrate that if broadband services are offered which are capable of offering voice, entertainment besides other e-services, the demand in rural areas could be quite substantial. If the experiences of pilot projects are extrapolated, it would appear that some policy and regulatory interventions would be necessary for making the business case based on broadband services more attractive. It is, thus, seen that the rural areas has to be built around both cellular mobile technology as also IT based broadband technologies. The policy and regulatory initiatives have to be defined for both these approaches.**

4.9 Before embarking on a discussion on the specific policy and regulatory steps for promoting these two approaches, we analyze the current barriers to the penetration of telecom in rural areas as they relate to the supply side as well as the demand side. These are discussed in the next chapter.

Chapter-5

Barriers to Penetration of Telecom in Rural Areas

5.1 From the discussions so far it is quite evident that an aggressive competitive market for telecom services based on either cellular mobile technology or IP based broadband technology or both has to be encouraged in the rural areas to be able to recreate the urban telecom revolution in the rural areas. There are, however, several hurdles faced in increasing the penetration of telecom services in rural areas. Based on comments received in response to the Consultation Paper and consequent open house discussions, TRAI has identified the following specific hurdles to the growth of rural telecommunication.

Supply Side

Backbone Infrastructure

5.2 Currently around 6.7 lakh route kilometers of optical fiber is present across India and out of 35000 exchanges in the country, 30000 exchanges of the incumbent have OFC connectivity (these include OFC connectivity of about 27000 exchanges in rural areas). In addition, satellite systems offer high bandwidth connectivity all across India through VSAT. In spite of the existence of this nation-wide fiber network adequate connectivity to villages is not available to an enterpreneur other than the facility owners. The cost of installing backbone infrastructure in semi-urban and rural areas for a new enterpreneur can be substantial, and it is in the interest of economic efficiency that the existing infrastructure is fully utilized. The problem lies in facilities owners not being willing to share their infrastructure commercially. The only additional capacity available is the capacities with infrastructure service providers (IP-1 & IP-2). The World Bank study in this regard has identified the capacities as quite substantial. In actual practice, last mile connectivity sometimes seems to be the limitation. In addition, there are no uniform, clear, applicable and enforceable guidelines for various procedures such as right of way, municipal & civic clearances etc. As a

result of this, different state governments adopt different rules, criteria, costs and time frames, which cause significant amount of effort and delays to the operators in getting the requisite clearances.

Infrastructure sharing

5.3 According to industry estimate, setting up a cellular tower (BTS) cost around Rs.50 lakhs inclusive of equipment, power plant, etc. Significant number of existing cell sites are already being shared by competing operators across the country mainly in urban areas. In rural areas, sharing infrastructure will reduce costs and the advantages may be quite substantial, depending on how the win-win situation is created by operators. The response of the stakeholders during the consultation process was on expected lines. The incumbent and the owner of majority of the rural infrastructure did not wish to give up its first mover advantage by sharing his own infrastructure. However, other operators having experienced the advantages of sharing of infrastructure in urban areas are quite keen for the same. The responses also ranged from voluntary sharing to Government/ TRAI mandated sharing of infrastructure.

Last mile connectivity

5.4 Last mile connectivity to sparsely distributed households is more costly than in densely populated areas. Wireless technologies overcome this hurdle and seem promising for the provision of multi-service broadband and voice connectivity. Making spectrum available for rural wireless deployments at reasonable costs either through special low rates or through financial support from USO Fund will help bring costs down and encourage the innovation and deployment of advanced wireless technologies. Providing support for last mile connectivity will help in rapid rural network deployment.

Power Supply

5.5 Unavailability of reliable power supply in semi-urban, rural and remote areas increases operational costs because they have to maintain sufficient

backup systems. Alternate energy sources could mitigate this problem, but might be costly to install and maintain.

Operation and Maintenance cost

5.6 Maintenance costs of the network in rural areas are higher as compared to urban areas because of several factors such as poor transportation systems, difficulty in supply of spare parts and non availability of skilled manpower, etc. in these areas. Operational cost for satellite technologies such as VSAT in rural areas is also higher because of additional cost of the bandwidth incurred by the operator and taxes.

Duties, Levies and Taxes

5.7 Currently, as shown earlier, duties, levies and taxes are very high. The net result is that the offered service cost becomes higher and unattractive to rural population and enough resources are not left with the operator for major rollout.

Licensing Framework

5.8 We have seen that technological developments especially built around IP networks have resulted in convergent networks in which one single network offers a variety of services. As has been pointed out in the TRAI Recommendations on Unified Licensing, the earlier service specific licensing is losing meaning owing to the fact that service providers of one type step into the services of another type of license using the same network. The increasing capability of wireless technologies and its use in the modern cellular mobile technologies irrespective of whether they are based on the so called 3G technologies or beyond 3G technologies has created a totally new situation. It is, therefore, anticipated that for the rural areas where the demand is clearly identified to be substantially multimedia type, a change in the licensing framework will be extremely beneficial.

Demand Side

Cost of Handsets and Access Devices

5.9 Lower income rural households may perceive mobile handsets or access devices as expensive. The cost of handset constitutes an entry cost and is, therefore, an important barrier for growth of mobile services. Recently single chip cell phone solution was launched in India that will bring down the cost of handsets, making the Rs. 1000 mobile a reality. Such single chip solutions are expected to reduce power consumption by 50 per cent.

Unavailability of locally relevant applications

5.10 Physical and financial access to telecommunications services are only two dimensions of the rural-urban divide. It is also important to increase content access – that is, create applications and services which are useful to local population. These could include e-governance, e-health, e-education and commercial applications in local languages. With proper communication infrastructure it may be possible to move business processes to rural regions. This should open up the growth potential of rural Indian economy.

Affordability of Services

5.11 There is evidence to suggest that people will spend up to 2% of their income on phone calls if a phone is available to them, even in rural communities[6]. The number of cable TV homes in India is more than fixed line phones. This indicates even lower income population has a demand for entertainment and information services. Cellular service providers have already begun to introduce innovative schemes in urban markets to increase affordability of services. For example, operators like Reliance, Bharti and Hutch have introduced micro prepaid cards that accelerate growth and increase operator margins. Similar schemes in rural areas will only serve to increase their market share and service penetration.

[6] Telecommunication and Information Services for the Poor, World Bank Discussion Paper No. 432; Wellenius, B., Extending Telecommunications beyond the Market, Public Policy for the Private Sector, Note No. 206, March 2000

CHAPTER-6

Accelerating growth of telecom services in rural areas

6.0 Present approach to increasing penetration of telecom services in rural areas

6.1 The Universal Service Support Policy came into effect from 1.4.2002. The Indian Telegraph (Amendment) Act 2003 giving statutory status to the Universal Service Obligation Fund (USOF) was passed by both Houses of Parliament in December 2003. The approach at the time of formulation of Universal Service Obligation Fund was to promote increased accessibility to the telecommunications facilities. Accordingly, the USO Fund is meant to support primarily the provisioning of Public Telecom and Information Services through operational and maintenance support to Village Public Telephones, provision of additional Rural Community Phones, replacement of Multi Access Radio Relay based VPTs, up gradation of Public Telephones to Public Telecom and Information Centres (PTICs) of low and high speed categories. In addition, remainder funds are meant to be utilized for the provision of household telephones in rural and remote areas.

6.2 A review of disbursements carried out so far (Table 6.3) and the likely requirements of funds in the future brings out the following position.

6.2.1 The amount of support from USOF for the above mentioned activities excluding rural DELs will be around Rs.3300 crores (Annexure 6.1) for the commitment period ranging from five years for Rural Community Phones and VPTs in uncovered villages to 7 years for existing VPTs including MARR replacements. The present commitments would end in 2010–11. In addition, currently the USOF provides support for rural DELs in 1685 net high cost SDCAs. USOF Administrator has estimated that an additional 6.6 million rural DELs will be installed in these 1685 SDCAs till the year 2007, which will be

eligible for support from the USOF. As per the present agreement, the amount of support from USOF for the new rural DELs beyond 31.3.2005 will be around Rs.11,000 crores (Annexure 6.2) for the period of commitment.. An additional amount of around Rs.2600 crores is likely to be required for the additional DELs which were installed in these SDCAs from April 2002 to March 2005 (details at Annex 6.2). Besides these 6.6 million DELs in 1685 SDCAs, some additional rural DELs will also get installed in the remaining SDCAs (which presently do not qualify for USOF support but will be eligible at the time of merger of ADC & USO regime) by the year 2008. Thus, including the existing 13.6 million rural DELs we may not even reach the 4% rural tele-density target by the year 2010, after providing a subsidy (including VPTs) of around Rs.17000 crores (Annexure 6.2) . In fact, if all rural DELs installed after 31.3.2002 are provided USOF support so as to reach a target of 4% rural tele-density by 2010, then the total support amount including support for VPTs, etc. will be around Rs.25000 crores (Annexure 6.3). **It need also to be pointed out that rural DELs have been receiving support from ADC since 2003 which will conclude and merge with USOF in 2008. The rural DELs will get a further subsidy of around Rs.5000 Crores from USO funds beyond 2008, if the present approach of USOF subsidy to fixed line DELs continue. Rural areas cannot be expected to live with such low tele-densities and that too, at such high subsidy cost particularly when it is possible to substantially increase tele-densities in rural areas with the help of new technologies and regime on lines similar to urban areas.**

An Alternative Approach

6.3 It is quite evident from the discussions, experiences of the pilot projects, etc. that without some form of initial subsidy the business case for the rural areas remains inadequate. **An alternative approach to the growth of telecommunication services in rural areas is to emphasize assistance in provisioning of the infrastructure. The key features of the rural network are**

the access to the population through largely wireless means and the connectivity of these wireless base stations to the main network. It has been estimated that to cover around 80 to 90% rural population, about 20000 base stations will be required. The detailed calculations are given in the enclosed Annex.6.4. These calculations are based on the realization that the population distribution is not uniform and that the initial installations in relatively densely populated areas would cover a large segment of the rural population. In fact, covering 200,000 larger villages (1/3rd of total villages) would provide mobile signals to around 75% of rural population.

6.4 The total cost of setting up these 20000 BTSs by each operator can be estimated if we make appropriate assumptions about the configuration of the BTS, the height of the tower, the size of the power plant, the size and type of the backup power plant, etc. Our purpose will be served if we estimate costs on the basis of average configurations. Such a configuration will imply a 40 metre tower with suitable power plant, etc. The cost of one such BTS (including electronic equipment) based on estimates obtained from various operators, works out to around 50 lakhs. In case three operators share the tower the cost of tower + electronic equipment (Rs.10 lakhs for each operator) for three would be around Rs.70 lakhs and the cost for 20000 operating BTSs would be about Rs.14,000 crores.

6.5 USO funds could be used to incentivise the roll out by encouraging, but not fully supporting it. This could be done through a support to cover part of the capex as well as part of the recurring operating costs for a limited period of time. However, to keep the process of support through USOF simple and practical to implement, the CAPEX and recurring operating expenditure support could be limited to a payment of Rs.12 lakhs to each operator for infrastructure purposes, the total support from the USO Fund being Rs.7200 crores.

6.6 In addition, another important hurdle for the expansion of network in rural areas, is the high cost and time consuming process of setting up backhaul

connectivity of these BTSs to the BSCs and the main telecommunication network. With the existing over 600000 route-kms of optic fibre cable network, each base station should, on an average, be within 15 kms or so of optic fibre reach. However, this fibre is largely with a single service provider – the incumbent. The Access Service Provider and UASL licenses provide for these licensees to develop their own infrastructure for rolling out their networks. Thus, unless there is substantial motivation and a win-win situation for all, mandating the provisioning of leased lines even in rural areas, could create disputes. At the same time utilizing this infrastructure rather than waiting for new one to be laid, has to be a national priority subject to adequate compensatory commercial terms being offered. It may be recalled that in its Tariff Order dated 21st April, 2005 on Domestic Leased Circuits, it has been mentioned that the Authority would consider making recommendations to the Government on the issue of providing direct support from USO fund to bandwidth providers in rural/remote areas. Quite evidently, the extent of such support would depend upon the price at which bandwidth services are to be made available to the service providers in such areas within the ceiling tariff specified in this Order. Thus, if it is mandated that those who own optic fibre connectivity in a given rural/remote area, must provide leased lines, these facility owners/service providers could be provided subsidy through the USO fund, possibly to the extent of covering 30% discount on specified ceiling. Thus bandwidth users shall get a discount of 30% on the ceiling specified by TRAI. Bandwidth owners should also get an incentive of 10% on the ceiling tariffs specified by TRAI from USOF as an incentive for necessarily providing leased line. Thus the bandwidth owner will not only get the reimbursement of 30% discount which is being offered to the operator in rural areas but also 10% incentive will be on top of specified ceiling tariff. Once the Government accepts these recommendations, then necessary amendment in Domestic Lease Line Tariff Order of TRAI will be issued separately. Assuming that fibre connectivity is already available to each new tower installation within 15 to 20 kilometers of the nearest optic fibre connectivity and the average distance between BTS and BSC is around 170 kms then an additional burden on USOF for 20000 BTSs for 5 years would be about Rs.1040 crores. This amount is

based on the assumption that each BTS will be connected with its BSC with one E1 only through leased circuits. Even if we assume that a minimum of two E1s will be required to connect each BTS, this amount works out to Rs.2080 crores over a period of five years. It is also quite likely that since lease line connectivity between BSC and BTSs is in a point to multi-point configuration, because of usage of common optical fibre cable and other equipment this burden on USOF may be reduced. This is an indicative figure. If an operator chooses to use a different media such as microwave link between BTS and BSC, the compensation provided could be based on actual costs, which may be less than this estimate. In any case, the spectrum charges for such microwave links/any other wireless connectivity should be 'nil'.

6.7 This methodology of one time support (in two installments) has been considered to simplify the basis for calculating the amount of support. This support could also be given for existing BTSs which are installed outside the census listed 5161 cities/towns provided the service providers give wireless based telecommunication facilities from these BTSs in their coverage area.

6.8 Thus, it is seen that through a support from USOF of about Rs.9000 crores it will be possible to install 20000 base stations in rural areas with two E1 connectivity to the main network to cover about 80 to 90% of the villages. This implies that a subsidy support of about Rs.8000 crores would be adequate to create the following:

i) The necessary infrastructure for exposure of 80 to 90% of the rural population to wireless signals of appropriate bandwidth.

ii) A business case in which while making a reasonable profit, the operators will be able to offer telecom services of the type required by rural population at price levels where the cost-benefit ratio will clearly suit large masses.

If the proposed scheme is implemented early, the result of this approach could , on the basis of our experience for urban areas and C-circles, be estimated to take the rural tele-density to about 15% by December, 2007.

This combined with the expected boost to 43% urban tele-density will take the overall tele-density to 22.98% by December, 2007 easily meeting the target of 250 million subscribers set out by the Hon'ble Minister of Communications & IT. To achieve the target of 250 million subscribers by December, 2007 and also to achieve 15% rural tele-density in this period the likely urban – rural subscriber distribution is given in Table 6.1 below.

Table 6.1 : Rural and urban tele-density with the proposed incentivisation scheme for infrastructure development

Year ending	Subscriber base	Rural Subscriber base	Urban subscriber base	Rural Tele-density	Urban Tele-density
	(in million)				
Aug-05	110.01	13.63	96.38	1.8	29.6
Dec.2005	125.00	15.5	109.5	2.03	33.6
Dec. 2006	175.00	53.5	121.5	7.02	37.27
Dec. 2007	250.00	110.5	139.5	14.5	42.8

If the present USO policy continues then it is expected that we would be able to achieve a rural tele-density of only around 3% and accordingly in order to achieve subscriber base target of 250 million subscribers by 2007 we would require an urban tele-density of 70% by Dec. 2007, which is too ambitious a target for urban areas and even if achieved would create a much larger rural-urban divide. The likely subscriber distribution with this approach so as to achieve a target of 250 million subscribers is given in Table 6.2 . Besides, the cost of rural network, in terms of subsidy implications would be too high, as explained in para 6.2.

Table 6.2: Rural and urban tele-density to meet the Minister's 250 million target- with current USO approach

Year ending	Subscriber base	Rural Subscriber base	Urban subscriber base	Rural Tele-density	Urban Tele-density
	(in million)				
Aug-05	110.01	13.6	96.38	1.8	29.6
Dec.2005	125.00	15.5	109.5	2.03	33.6
Dec. 2006	175.00	18.44	156.56	2.42	48.02
Dec. 2007	250.00	22.86	227.14	3.0	69.7

6.9 The contribution by various operators to USOF and its disbursement are reproduced below as Table 6.3.

Table 6.3 : Collection and disbursement of USOF

Collection and Disbursement of USOF			
Financial Year	Collection	Disbursement	Balance
	(Rs in crore)		
2002-03	1653.61	300	1353.61
2003-04	2143.22	200	3296.83
2004-05	3457.73	1314.58	5439.98
Total	**7254.56**	**1814.58**	**5439.98**
2005-10	**37541**	**17936.80**	**25044.2**

Assumptions:

1) Growth in fixed service revenue - 10% p.a.
2) Mobile Growth to reach 20 crs by 31.3.2008. Therefore, mobile growth assessed at 10 crs by 31.3.2006 and 15 crs by 31.3.2007.
3) Projection for the year 2008-10 is 25% on absolute revenue of fixed and mobile services

Since there is a balance amount in USOF which will remain available even after meeting all the contractual commitments of USOF for VPTs, RCPs, MARR replacements and rural DELs, therefore, it would be possible to provide the support for the network infrastructure expansion approach as discussed above from the existing level of contribution to USOF and it may not be necessary to increase the contribution from existing level of 5% of AGR of the contributing operators. Authority has considered that since there are already contractual commitments for the existing VPTs, RCPs, MARR replacements and rural DELs, therefore, during the validity of these agreements both the schemes may work in parallel but ultimately only the network infrastructure expansion approach should be followed for providing the support from USOF. Since the amount of support in this network expansion approach will be less and ultimately the growth of telecom services in rural areas shall pick up, therefore, in future the reduction in USO level from existing level of 5% of AGR may also be considered. However, since ADC Regime has to come to an end in the year 2008 and it has to merge in USO Regime, the contribution towards USO may be suitably adjusted keeping in mind the merger of ADC Regime and also the objectives of USO policy at that point of time.

6.10 The net result would, therefore be that the emphasis will shift from the marginal increase in tele-density to accessibility and affordability of telecommunication services in rural areas. The approach of improving the business case will lead to tariffs which will be attractive and affordable for a large number of rural population, thereby substantially boosting the rural tele-density. Judging by the past experience in the urban areas and the response received in the pilot trials, a rural tele-density figure of about 15% should be entirely feasible with this proposed “enabling” approach of infrastructure creation, in the next few years.

CHAPTER 7

RECOMMENDATIONS

7.1 We have so far established that rapid increase in urban tele-density was the result of creation of a market for telecom services in urban areas. Such a market was created from the users' point of view by appropriate policy and regulatory measures which led to reaching price levels where the cost-benefit ratio clearly suited large masses of urban population. On the supply side, the rapid growth of the network ensured capability to handle a huge increase in the subscribers' numbers so that a clear business case was established for the operators. It has also been established that to bridge the growing gap between the urban and rural areas telecom services, it is necessary that a similar win-win situation is created for the user and the operator. The difference here, however, is that while the rural user has substantial requirement of data based value added services besides voice services, the relatively larger investment required to cover large number of rural subscribers due to poor density, requires policy and regulatory intervention to make the cost-benefit ratio attractive for the user while allowing the operators to make reasonable profits. It has further been established that at least two possible technology approaches exist – one depends entirely on the spread of cellular mobile and wireless service in the rural areas and the other relies upon the Next Generation networks based on IP technology. Notwithstanding which technology is chosen by the operators, it is evident that the hurdles/barriers discussed in Chapter 5 must be overcome through policy and regulatory intervention before the telecom revolution we are seeking in rural areas, can materialize.

7.2 A key consideration in evolving these policy and regulatory interventions is that market forces must be allowed to ultimately determine the conditions for rural area telecom services also. For that to happen an appropriate form of subsidy in the short run would be necessary to incentivize the creation of infrastructure. This subsidy has to be in the

form where the emphasis shifts from the present VPT and individual DEL based subsidy to infrastructure growth empowering subsidy. Further, these steps should lower the input cost for the markets to flourish and the revenues to the Government to increase from taxes on the output. Our earlier experience of rising revenues from expansion of telecom services with much lower taxes is shown in Tables 2.2 & 2.3. The possible financial initiatives have been discussed in detail in Chapter-6.

7.3 So far as the demand side is concerned, once again the creation of necessary infrastructure will bring in the market forces into play to create the needed applications at an acceptable cost. However, such a process is often slow and will vary from area to area and will depend upon the state of economic development of the given area as also the extent of awareness generated about ICT in these areas. Thus, a Government policy and regulatory intervention would have to be in the form of making available the initial seed application and towards this, e-Governance and e-health would play a major role.

7.4 Based on the above approach and conclusions from the consultation process, the Authority has formulated its Recommendations which may be divided into the following categories:

7.4.1 Reduction in BTS cost and creating competitive environment in rural areas by sharing the passive infrastructure like tower, building etc and power supply systems and to provide the incentive from USOF to install BTSs in rural areas.

7.4.2 To provide connectivity of BTSs with the rest of the network in the most optimum manner and also provide support for this connectivity from USOF.

7.4.3 Offering a discount on regulatory costs like annual license fee and spectrum charges linked with the coverage of rural areas.

7.4.4 The development of suitable applications for rural population so as to develop the local entrepreneurship programs by mobile operators and other stakeholders, increase ARPU and create demand due to deployment of various Value Added Services.

7.4.5 VSAT related recommendations.

7.4.6 Support from State governments and local authorities.

7.4.7 Niche operators.

7.4.8 Spectrum related issues & SACFA clearance

7.4.9 Licensing framework

7.4.10 Disbursement of funds

7.4.11 While finalizing these recommendations the other means like higher termination charges for subscribers in rural areas, white zone concept of France etc. have also been examined and due to their practical limitations have not been finally recommended.

These recommendations are discussed in detail in subsequent paragraphs.

Sharing of Infrastructure and support from USF

7.5. Authority, based on the discussions with various service providers, is of the opinion that operators would provide the coverage in 5161 towns / cities on their own. The objective of these recommendations is to increase the coverage in rural areas beyond the 5161 towns / cities. To achieve it, the operators would have to install BTSs in rural areas beyond these 5161 cities/towns. To reduce

the cost of BTSs the operators would have to share the passive infrastructure like towers, buildings and power supply etc.

7.5.1 As discussed in Chapter-6, **Authority recommends that the operator who installs BTSs in rural/remote areas (outside 5,161 towns/cities as per Census of 2001) should be given one time support (in two installments) of Rs.12 lakhs per BTS from USOF, provided the installed infrastructure is shared with at least one other operator. The Authority considered that looking at the size and nature of Indian rural market and the number of operators in different areas, sharing of towers in rural areas between three operators would be the ideal solution. The other two operators who rollout their services in rural/remote areas and share the infrastructure like tower/shelter and power supply with the already existing operator in that area will also be given a support of Rs.12 lakhs per BTS from USOF.** Since almost all the towers in rural areas would be ground based this support will be given for such towers. In case roof-top/pole mounted towers are used, the support and distance criteria can be suitably scaled down. This support would also be given for existing BTSs, which start sharing and are installed outside 5161 cities/towns and the service providers give the mobile connections in their coverage areas. In order to avail the abovementioned support the two ground based towers installed in rural areas must be empirically 15 kms. apart. However, looking at different terrains, the distance might vary and therefore, it may be prescribed that for eligibility under the scheme, the minimum distance should be 12 kms. It is also possible that the passive infrastructure like tower, shelter and back up power supply may be installed by infrastructure provider. It is clarified that support from USOF will be provided only to the access providers who offer the telecom services in rural/remote areas and share it with at least with one other operator and this infrastructure provider will have to settle their commercial arrangement with these access providers.

7.5.2 **It is proposed that 50% of the payment i.e. Rs.6 lakhs for ground based towers, should be made to the operators, immediately on production**

of bill and self-certification by the operator covering the facts that he has set up a tower and started giving service, that his tower is not within 12 kms. of another tower and that the tower is being shared by at least two service providers. Rest 50% should be paid after the Government gets the physical working of the tower on all the above points duly verified. This would ensure that rental offered by owner of the tower, shelter and power supply system is reasonable and the BTSs actually work in a shared manner before the second installment is released. Authority is considering the support from USOF only for 3 operators and if additional operator come in that area then he will not get a support from USOF but the operators in that area may negotiate the inter operator settlement. If only two operators offer services in a particular area there would not be sufficient competition in the area and in such a case the support from USOF will come down from Rs.36 lakhs per BTS to Rs.24 lakhs.

7.5.3 Since the release of USOF support is linked to mandatory sharing of infrastructure, this will facilitate mutual negotiation among the sharing operators. Authority at this stage does not consider that the rentals for sharing the infrastructure should be regulated and operators should be encouraged to decide the rentals through mutual discussions.

7.5.4 Another factor due to which the running cost of BTSs in rural area increases is the unavailability of reliable power supply. To over come this problem, the alternate source of power supply like DG set etc. is to be installed. Since DG set will have to run for longer hours than in urban areas, therefore the O&M charges in rural areas are more. Authority considered whether a separate support on recurring basis to meet this additional O&M charges should be provided or to simplify the implementation process, this amount also should be built in one time support (in two installments) as discussed above. Authority recommends that instead of making a recurring support each year based on the number of BTSs installed in rural/remote areas, it will be better that this part of

support is also included in one-time support (in two installments) and accordingly the amount of Rs. 12 lakhs per BTS is proposed.

7.5.5 In this recommendation, the Authority's main consideration is encouraging infrastructure build up, for provisioning of access services, in rural areas. As the growth is mainly happening in wireless services, for the purpose of giving subsidy the installation of BTSs are considered. One may argue that service providers who provide voice and/or data services in rural areas using any other technology including Wi-Fi, Cor-DECT, fibre, etc. should get subsidy from USOF, just like cellular/UASL operators. The Authority is of the view that only those access service providers who contribute towards USO should get support at this stage. Service providers viz. ISPs or franchisee shall not be eligible to get support from USOF. Access Service providers, who provide telecom services in rural areas, using any technology, shall also be given incentives depending upon rollout of infrastructure in rural areas. Authority recognizes that due to cost reduction in optical fibre technology and its capability of providing very high band width in last mile connectivity the operator may use this technology in rural/remote areas. Authority would encourage the rollout of network in rural/remote areas by using any wireline or wireless technology and would like to provide support from USOF for shared media. Currently, the amount of support has been quantified for usage of wireless technology depending upon the number of BTSs but Authority would like to quantify the support for other technologies in consultation with operators after these recommendations are accepted in principle by Government. Other technologies may get incentive of the order of around 50% of the total infrastructure costs. As mentioned earlier, exact percentage shall be worked out in consultation with operators after these recommendations are accepted in principle by Government..

7.5.6 Authority has also noted that presently, necessary clearances including SACFA clearance , are required to be taken in advance for installing the tower. Even if post facto approval is permitted as proposed later by us, for installing towers, then also WPC will have a centralized data base of all towers installed by

operators. This may help in verifying the location of towers and thus makes the scheme simpler from implementation point of view.

7.5.7 Authority considers that the proposed network infrastructure expansion approach in rural areas will be simpler to implement and monitor. The operators will have to operate their services in a more efficient manner. This will also encourage development of local entrepreneurship in rural areas and ultimately this will lead to growth of telecom services in rural areas.

7.5.8 Authority has considered that there are already contractual commitments for the existing VPTs, RCPs, MARR replacements and rural DELs. Keeping in view the fact that with a lesser support from USOF the rollout of networks in rural areas can be increased if the network infrastructure expansion approach as proposed earlier in these recommendations is followed, therefore, Authority recommends that even during the validity of existing agreements both the existing and proposed network infrastructure expansion approach should be followed in parallel. However, ultimately, Authority recommends only the network infrastructure expansion approach should be followed for providing the support from USOF. Since the amount of support in this network infrastructure expansion approach will be much less and ultimately the growth of telecom services in rural areas shall pick up, therefore, in future the reduction in USO levy from existing level of 5% of AGR may also be considered. However, it may be considered for increase, if the requirements increase due to the merger of USO/ADC Regimes or if the policy for USO changes.

7.5.9 Based on the definition of Universal Service Obligation given in Clause 3(1A) of Indian Telegraph Act (as amended up-to-date) it is often argued that as per this definition only basic services are eligible to get support from USOF and if support is to be given to mobile services then Telegraph Act has to be amended by Parliament. Authority analysed Telegraph Act, different license conditions of cellular and UASL license agreements and WTO definition of Basic and Value Added Services. The detailed analysis is given in enclosed Annexure 7.1.

Based on this analysis, **the Authority is of the opinion that to cover mobile services under the ambit of USOF support, the amendment of Telegraph Act is not necessary and the objective could be achieved by defining basic services in UASL and cellular license agreements in accordance with WTO definitions.**

7.5.10 Some Government networks for e-governance have been envisaged where expensive infrastructure is being created. **The Authority proposes that this infrastructure, like all other telecommunication infrastructure, should be shared and Government requirement of the network could be provided through a security protected Closed User Group (CUG). The shared network will reduce the costs of rural connectivity.**

BACKBONE INFRASTRUCTURE

7.6 Based on the discussions in Chapter-6, Authority recommends that all the operators who have optical fibre connectivity in rural areas should be mandated to provide leased lines to other operators who are rolling out their networks in rural areas and such bandwidth owners shall get an incentive of 10% on the ceiling tariffs specified by TRAI from USOF for facilitating mandatory sharing. This connectivity should be provided with a discounted price at the rate of at least 30% and difference between ceiling specified by TRAI and the discounted price should be supported from Universal Service Obligation Fund (USOF). Thus bandwidth users shall get a discount of 30% on the ceiling specified by TRAI. Bandwidth owners should also get an incentive of 10% on the ceiling tariffs specified by TRAI from USOF as an incentive for necessarily providing leased line. Thus the bandwidth owner will not only get the reimbursement of 30% discount which is being offered to the operator in rural areas but also 10% incentive will be on top of specified ceiling tariff. Once the Government accepts these recommendations, then necessary amendment in Domestic Lease

Line Tariff Order of TRAI will be issued separately. The necessary amendment in the License Agreement should be incorporated to this effect.

Discount in Annual License Fee and Spectrum Charges linked with Rural Coverage.

7.7 It is to be noted that in rural and remote areas with low requirement of spectrum, it is not a scarce commodity and therefore, need not be taxed heavily. Thus, depending upon the number of BTSs located in rural areas, the service providers should be given a discount in Annual License Fee and Spectrum Charges, which are charged in terms of percentage of Adjusted Gross Revenue (AGR). Authority recommends that this reduction in Annual License Fee and Spectrum Charges could be worked out in consultation with Operators once this recommendation is accepted in principle. The Authority recommends that this discount in Annual License fee and Spectrum Charges could be linked to the rolling out of infrastructure in rural/remote areas, e.g., if 5,000 BTSs are installed in rural/remote areas then say 10% discount may be given in the License Fee and Spectrum Charges which are payable by the operator and like this percentage of discount may increase further if the number of BTSs installed are more. Similar arrangement will have to be considered for rolling out the infrastructure using other wireless technologies like Wi Fi / Wi Max, CorDECT and also the wireline technologies like copper or optical fibre system by the access providers. Ultimately, there will be an increase in the revenue base and therefore, even a lower percentage of spectrum charges could get substantial revenue to the Government which should be sufficient to meet the Administrative cost of management of spectrum.

Development of suitable applications

7.8 Based on the comments received about the development of locally relevant software, various reports and case studies about different projects in

India, it seems that both government & private services along with locally relevant content should be made available to the rural population in order to help them derive the maximum benefit of access to ICTs. Various projects initiated by corporates (e-Chaupal), State Governments and NGOs are proving to be very useful in rural areas. Some of these projects are Gyandoot in Madhya Pradesh, Bhoomi in Karnataka, Akshaya in Kerala, and n-Logue in Tamil Nadu. Details of some projects, which show the efforts made by Governments and Private participation, are enclosed at Annexure 4.2. These projects have been attempted at a smaller scale and these projects could be the role model for the growth and sustainability of telecom services in rural/remote areas. **Thus, TRAI believes that a balance between Government and private applications will be the most beneficial for rural communities. It will be necessary to have the support of the private sector in the development of local language software. Both the Government and the private sector should participate in the larger project of bringing useful services and applications like e-governance, tele-medicine and tele-education, etc. to rural India.**

VSAT Related Recommendations

7.9 VSAT WPC spectrum charges vary from 3 – 4% depending upon the data rate. The highest data rate of any VSAT in the network is the deciding factor for the percentage revenue share towards the spectrum charges[7]. VSAT services association have represented to TRAI that irrespective of the fact that there may be thousands of VSATs operating at lower rates, the WPC fee for the highest rate is chargeable to all sites in the network. VSAT service providers have requested for single and lower WPC charges.

TRAI's recommendations on VSAT WPC spectrum charges

[7] WPC order no. R-11014/9/2001-LR, 16.04.2003

7.9.1 TRAI is of the view that in the interest of growth of such services, WPC spectrum charges on VSAT should be lowered. **It is therefore, recommended that there should be a single rate of WPC fee and the present ceiling of 4% should be lowered to 1% to cover administrative charges only.**

7.9.2 VSAT is one of the effective means of telecommunication in rural and remote areas. **Therefore, it is recommended that concession in Annual License Fee to VSAT services linking it with the number of VSAT terminals installed in rural/remote areas should be provided to VSAT operators. The location of VSAT terminals is already available with WPC as well as with NOCC (Network Operation Control Center) and therefore, there will be no problem in verification of VSAT terminals installed in rural/remote areas. This concession could also be like the earlier concession suggested in access provider license fee, depending upon number of VSAT locations in rural/remote areas. However, the details could be worked out in consultation with VSAT operators once these recommendations are accepted in principle by the Government.**

7.9.3 As per the information received from VSAT services association of India, major input cost is on account of the cost of satellite bandwidth, which is in the range of 35-60% of the total input costs. Thus, substantial input cost is contributed by transponder charges. It is recommended that the Government should coordinate with Department of Space to make satellite transponders available for rural telecommunication at a nominal rate as has been done for EDUSAT[8]. It is recommended that DOT should work out the discounted transponder charges in consultation with the Department of Space. Alternatively the DOT may offer the discount linked with rollout of VSAT in rural/remote areas, which may be financed from USOF.

[8] EDUSAT is the first Indian satellite designed and developed exclusively for serving the educational sector.

Support from State Governments and Local Authorities

7.10 State Governments and local authorities should also facilitate deployment of telecommunication networks in rural areas by not levying Right of Way charges for deployment of wired cable or optical fiber networks in rural areas, etc. on restoration basis.

Niche Operators

7.11. As recommended in TRAI's recommendations on Unified Licensing Regime dated 13.1.05, **Niche Operators should be permitted to operate in SDCAs (Para 5 of TRAI's Recommendations on Unified Licensing Regime) where rural tele-density (based on fixed subscribers) is below 1%.** The basic idea is to promote such niche operators in the market to improve penetration and have competition even in the backward areas. To increase penetration of telecom services in rural / remote / backward areas from telecom point of view, Authority is considering a two fold approach. One is that existing operators should increase their geographical and population coverage. This approach could be termed as "Top Down Approach" i.e. the licensee will gradually go down from high density to low density areas. The second approach is termed as "Bottom Up Approach". Here the small operators who could work as Niche operators would offer telecom services in rural / remote / backward areas from telecom point of view. This will help in developing the partnership between local population and the niche operators.

7.11.1 **Niche Operators should be eligible for subsidies from the Universal Service Fund on the same lines as that available to the other access providers. Scope of the Universal Service Fund should be expanded to include Niche Operators.**

7.11.2 It is recommended that Niche Operators should not be levied any spectrum charges.

Spectrum Related Issues

7.12 **Delicensing of Spectrum for Wi-Fi and WiMax**:-From the discussion about spectrum related issues earlier, it is clear that creating unlicensed spectrum bands will encourage innovation and deployment of advanced wireless communication technologies all across the country. Rural areas will benefit from the lower costs of using this spectrum, and the nation will benefit from research and development efforts. **To provide connectivity at affordable prices and to encourage use of advanced wireless technologies such as Wi-Max, spectrum in 5.7 GHz, 3.5 GHz and 700 MHz frequency range should be de-licensed or made available at nominal charges. Government's broadband policy mentions that alternative spectrum bands, which are not in high usage and could be deployed for Broadband services shall also be explored and identified. It is recommended that further spectrum should be identified for allocation as de-licensed bands. De-licensed bands should be technologically neutral. This is in keeping with current trends in international spectrum policy.**

7.12.1 To promote the use of other wireless technologies like CorDECT, TRAI Recommendations on Spectrum related issues pertaining to spectrum charges for point-to-point and point-to-multi-point systems and allocation of CorDECT frequencies should be accepted and implemented. (Para 5.3 and 5.5 of TRAI's recommendations on Spectrum related issues). To promote the growth of telecom services in rural areas the Authority is of the view that the usage of low cost technologies e.g., CorDECT should be encouraged. **In view of above, it is recommended that no spectrum fee shall be levied on the usage of CorDECT and similar other technologies in rural/remote areas. Microwave links/any other wireless connectivity in rural area should not be charged any spectrum fee.**

7.12.2 The Authority has recommended the allocation of 450 MHz band in its recommendations on Spectrum Related Issues. The usage of 450 MHz equipment especially in semi-urban and rural areas would be advantageous from coverage point of view because of propagation characteristics at such frequencies. It is a well-known fact that lower frequencies like 450 MHz are useful to provide larger coverage in semi-urban and rural areas due to their higher coverage range. **Considering the benefits of deployment of 450 MHz frequencies especially to cover these uncovered areas the Authority considers that their allocation and usage should be promoted.** Though there will be no restriction on the usage of 450 MHz frequency even in urban areas but as mentioned above it will offer benefits not only to increase the coverage in semi urban and rural areas but also lessen the burden on other bands in urban areas. **It is recommended that for 450 MHz spectrum usage the spectrum charges (% revenue share) level should not be increased.** For example, before usage of 450 MHz spectrum if the operator was paying X% of AGR as spectrum charges then even after allocation of 450 MHz spectrum the operator should continue to pay same percentage of AGR as spectrum charges. Due to increased revenue base the spectrum charges will be more in absolute terms and this will help in penetration of telecom services deeper into rural areas.

SACFA clearance

7.12.3 Generally SACFA clearance takes long time due to co-ordination with multiple organizations. Though WPC is making efforts to streamline the whole procedure, in rural areas the operators may be permitted to install towers upto say 40 m height without prior SACFA clearance.

It is recommended that no prior SACFA clearance should be required for deployment of up to 40 meters towers in rural areas. The service providers may be permitted to install and operate the BTSs on submission of an affidavit that they would comply with necessary WPC's guidelines/orders issued from time to time.

Licensing framework:-

7.13 Traditionally, each service had been tightly linked to a specific form of infrastructure and end-user equipment. Owing to technological developments ,same network is being used to offer different services. Such technological developments have rendered traditional approach of service specific licensing redundant and have necessitated a converged regime which would efficiently deal with such technological evolutions.

7.13.1 The use of digital communications technology, and now the use of common IP-based platforms has opened new possibilities for the future development of communications systems, for example, IP-based video, telephony, and triple-play services. IP based services have already become popular in countries like Japan, France, Hong Kong, Korea, Austria, UK, Taiwan, Venezuela, Italy, Netherlands, Australia and Malaysia. To facilitate the ongoing convergence, several countries have already adopted some form of Unified Licensing regime. Such networks would reduce costs to the service providers and thus facilitate growth of telecom services. IP networks appear to be more promising and cost effective for meeting rural needs and would facilitate provision of cheaper services in such areas. Efforts should be made to facilitate penetration of cheaper new /better technologies such as CorDECT by imposing less restrictions on such technologies. Choice of technology in any case should be left to the service provider.

7.13.2 With extensive optical fibre network, but low penetration of telecom services in the country, India is in an advantageous position to leap frog to NGN and offer a converged services platform to the customers.

7.13.3 To get full advantage and to extend the scope of this convergence, policy framework should encourage the technological developments such as NGN. NGNs would reduce costs. NGN allows triple play services. Implementation requires replacing service specific licensing by Unified License.

NGN would help to deliver telecom services along with entertainment services at an affordable price particularly in rural areas.

7.13.4 It is, therefore, reiterated that Unified Licensing recommendations of TRAI may be implemented.

Disbursement of funds:-

7.14 The pace of release of funds has not kept up with the speed of implementation of Universal Services undertaken by the Universal Services Fund Administrator. There are substantial amounts of outstanding claims. In fact one of the objectives of giving statutory status to the Universal Service Fund was to ensure that the funds collected as Universal Service levy are automatically made available to the Universal Service Fund which has not happened so far.

7.14.1 **Since the Industry is contributing towards Universal Service Obligation and Access Deficit Charge, it is recommended that to facilitate growth of telecom services in rural areas the funds collected as Universal Access levy should be made available to USOF.**

Interconnection:-

7.15 Some private UASL operators have raised the issue of interconnection as a hindrance for roll out of their networks in rural areas. Authority in general agrees with the interconnection problem being faced by operators but Authority is not able to appreciate the linkage between expansion of network in rural areas with the interconnection. Most of UASLs are expanding their network coverage based on GSM or CDMA technologies. The others are also using Cor-DECT and wireline technologies but to a comparatively lesser extent. The operators like HFCL are expanding their network mostly on wireline technologies.

7.15.1 When an operator installs a BTS in rural area to increase his coverage, the interconnection for these rural subscribers is always through MSC

like for urban subscribers. The interconnection with other networks including its augmentation is equally important for urban and rural subscribers. Authority is of the view that issue pertaining to interconnection is not a bottleneck in penetration of telecom services in rural areas especially when growth is mainly happening in wireless services.

Annexure-1.1

As per the Rules, the following activities are to be supported by the USOF, namely:-

Stream I: Provision of Public Telecom and Information Services –

a) Operation and Maintenance of Village Public Telephones (VPTs) in the villages identified as per Census 1991 and installation of VPTs in the additional revenue villages as per Census 2001.

b) Provision of additional rural community phones (RCPs) in villages with population more than 2000, after achieving the target of one VPT in every village.

c) Replacement of Multi Access Radio Relay (MARR) based VPTs installed before 1.4.2002.

d) Up-gradation of a Public Telephone to Public Telecom and Information Centers (PTICs) in villages with population more than 2000, for providing data applications including FAX, e-mail, internet besides voice-telephony.

e) Installation of High Speed PTICs (HPTICs) for providing additional facilities including tele-education and tele-medicine at Block Headquarters and in villages with a population exceeding 2000.

Note: Unless otherwise specified by the Central Government, the Secondary Switching Area (SDCA) shall be taken as a unit for the purpose of arriving at the Net Cost for activities specified in items (a) to (e) of stream I.

Stream-II: Provision of household telephones in rural and remote areas.

For household DELs installed prior to 1st day of April, 2002, the difference in rental actually charged from rural subscribers and rent prescribed by TRAI of India for such subscribers shall be reimbursed until such time the Access Deficit Charges prescribed by TRAI from time to time take into account such difference.

For household DELs installed after 1st day of April, 2002, Capital Recovery, Operational Expenses and Revenue shall be taken into account to determine the Net Cost.

Note: Unless otherwise specified by the Central Government, the Short Distance Charging Area shall be taken as a unit for the purpose of arriving at the Net Cost for activities specified in item (b) of stream II

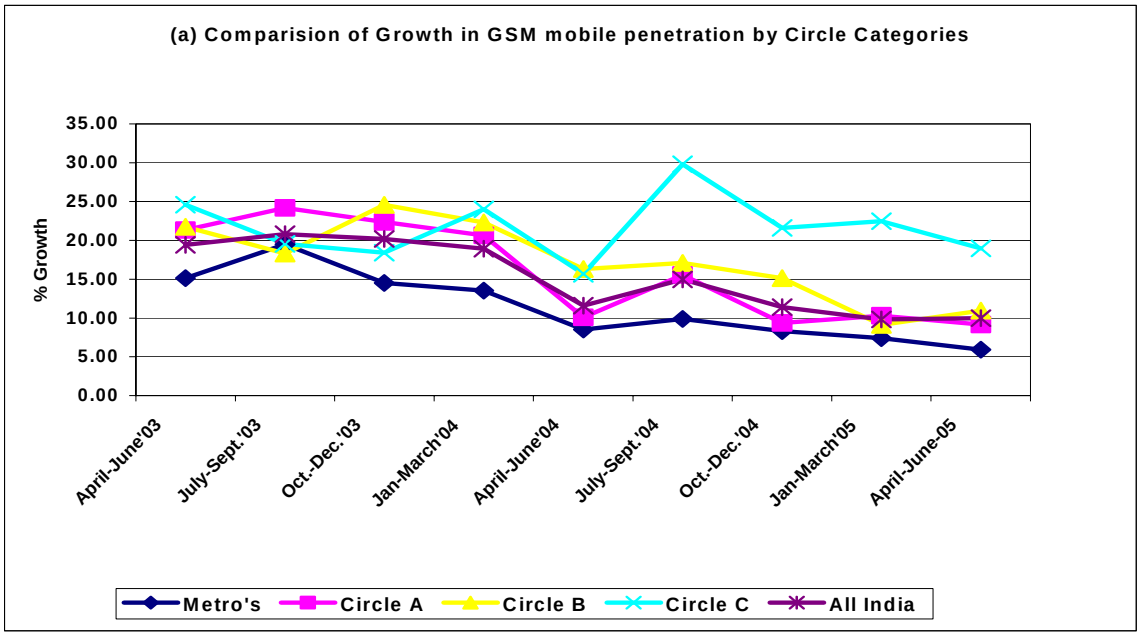
Annexure-2.1

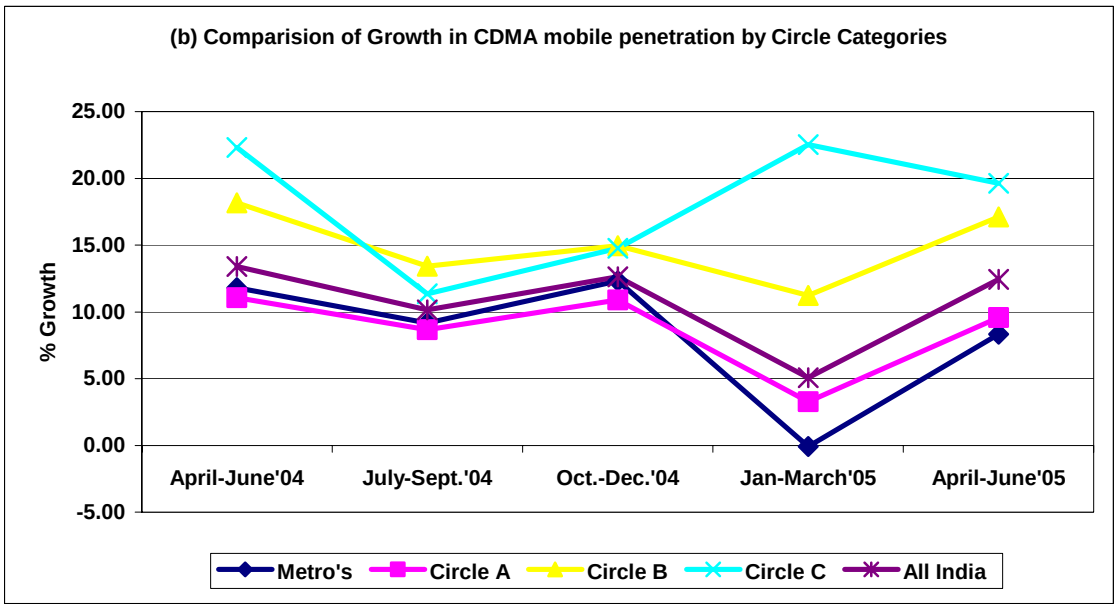
Status of internet, broadband, fixed and mobile telephones services

				End of year 2003
Parameters	Korea	Malaysia	China	India
No. of fixed telephone lines per 100 persons	51	18.5	18.0	3.9
No. of mobile phones per 100 persons	75	43.9	18.3	2.6
No. of internet connections per 100 persons	26	12	2.5	0.4
No. of broadband connections per 100 persons	25	0.4	1.4	0.019
Charges per 100 kbps per month (US$)	0.25	7.61	3.07	15.63

Annexue3.1

A higher growth rate in Category C Circles.





Annexure-4.1

ITC e-Choupal[9]

ITC has initiated an e-Choupal effort that places computers with Internet access in rural farming villages; the e-Choupals serve as both a social gathering place for exchange of information and an e-commerce hub. What began as an effort to re-engineer the procurement process for tobacco, wheat, shrimp, and other cropping systems in rural India has also created a highly profitable distribution and product design channel for the company—an e-commerce platform that is also a low-cost population system focused on the needs of rural India. The e-Choupal system has also catalyzed rural transformation that is helping to alleviate rural isolation, create more transparency for farmers, and improve their productivity and incomes.

Salient features of the project:

- Presently running 4300 rural projects covering 25,000 villages
- Latent value extracted from main economic activity in the village.
- Entire Capital and operating expenses borne by HQ.
    - Franchises and other agents in the chain do not bear any capital or operating expenditures
- Total number of franchise presently - 3200
- Other agents presently - 200
- Capital expenses: Rs.1.2 lakhs per project.
- Operating expenses: Rs. 0.53 lakhs per year per project.
- Total CAPEX: Rs. 52 crores approx.
- Total OPEX: Rs. 23 crores per year approx.
- Breakeven happens after 4^{th} – 5^{th} year of operations

- Revenue HQ: 14.1 Crores approx.
    - With 30% Projects in their 1^{st} year of operation and rest in their 2^{nd} year of operation
- Revenue Franchisee
    - Total revenue = 1% of total transactions
    - Approximately 4.5 crores, assuming 450 crores transactions made in one year.
    - Approximately Rs.14063 per year per Franchisee
    - Revenue Agent
    - Approx. 1.25 crores, assuming 450 cores transactions made in one year
    - Approx. Rs.62500 per year per agent

- Project involves massive upfront costs. Breakeven happens after 4-5 years of operation. Therefore, during first few years at least, favorable policy initiatives required to hasten recovery and attract investments in such projects.

[9] Based on World Resources Institute, What Works Case Study: ITC e-Choupal, August 2003 and other information available with TRAI.

The e-Choupal model demonstrates that a large corporation can play a major role in recognizing markets and increasing the efficiency of an agricultural system, while doing so in ways that benefit farmers and rural communities as well as shareholders. Critical factors in the apparent success of the venture are ITC's extensive knowledge of agriculture, the effort ITC has made to retain many aspects of the existing production system, including maintenance of local partners, the company's commitment to transparency, and the respect and fairness with which both farmers and local partners are treated.

n-Logue[10]

n-Logue currently relies on corDECT, a fixed Wireless Local Loop (WLL) technology, to provide the backbone of its IP network. Developed by the TeNeT Group, corDECT provides the most cost effective per-line cost available to n-Logue's networks. The point-to-multipoint wireless radio frequency technology supports simultaneous voice and data channels of 35-70 kbps to subscribers within a 10 km radius of its broadcast location. Coverage is extendable up to 25 km through the use of a repeater. Its low costs, ease of deployment, and minimal maintenance requirements make corDECT ideally suited for rural use.

To enable its rapid expansion, n-Logue has employed a three-tier franchise business model that pushes the delivery and management of Internet services closer to the end user. Each tier consists of independent, financially self-sustaining entrepreneurs operating interdependently with one another.
At the top level is n-Logue, responsible for overall management of the network. On the second tier are the Local Service Providers (LSPs), responsible for managing the project at the local level. On the bottom tier of n-Logue's business model are the local entrepreneurs that are recruited by the LSP to invest in and set up Internet kiosks in their villages.

Demand for kiosk services are driven by their usefulness in a rural context. Literacy rates, language barriers, and income levels all affect the types of IT-enabled services that kiosks can offer. To overcome these obstacles, n-Logue and its partners have developed relevant local language content and services aimed at all sectors of rural society. Particularly entrepreneurial kiosk owners have launched their own services as well.

[10] World Resources Institute, What Works Case Study: n-Logue, December 2004 and other information available with TRAI

Salient features of the project:

- Presently implementing 40 rural projects. 1 project designed to connect 300 villages. As on date there are 30 functional projects - each presently connecting 70 villages. These 40 projects can connect 300 villages each within one/two years. Total 12,000 Villages can be connected. Project runs 300 Kiosks in villages.
- Each district has 1000 villages. Each district needs 3 projects to cover accessible villages – about 900 villages.
- CAPEX and OPEX
    - 1 project can be completed in two years. **Two years capitalized cost = Rs. 50 lakhs which includes bandwidth cost, spectrum cost, leased line cost, tower's cost, equipment cost, training cost, staff cost etc. Thereafter, recurring cost for each project = Rs. 15 lakhs per year which includes spectrum, leased line, bandwidth cost plus staff and recurring costs**
    - Each Kiosk's
        - Capital cost = Rs. 50,000.
        - Recurring cost = **Rs. 25,000/year including connectivity charges and bank repayment of loans.**
        - Total capital cost of 1 project + 300 Kiosks, including capitalized cost of project HQ for two years = Rs. 200 lakhs (appox).
        - **Kiosks**
            - **Income/year from year II = Rs. 20,000 to Rs. 1 lakh/year.**
            - Expenditure: 32,000/year (payment to bank against loan, connectivity charges, recurring charges)
        - Profitability Project Head quarter: Income 10,000 X 300 = Rs. 30 lakhs/year (To be shared by project HQ/company).
        - Projects start breaking even after 3-4 years but not replicable in large areas due to negative/unattractive returns.

Andhra Pradesh Broadband Network Project

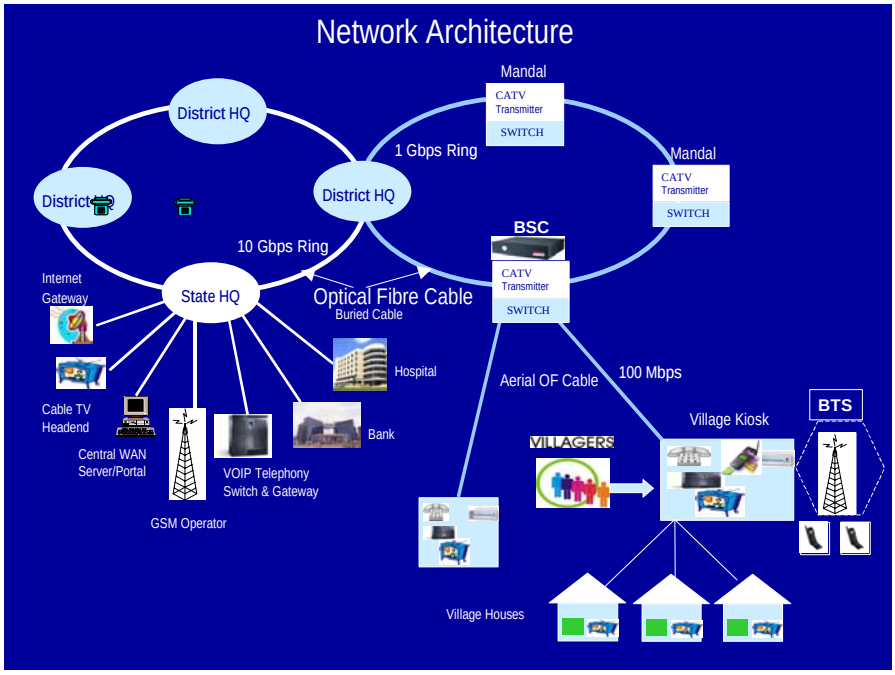
APSWAN (2 Mbps to each district hq) since 1999 under a BOO model, was to be replaced by new network in 2004. Initial plan was for fibre to mandal and wireless in the last mile and budgetary prices were obtained for entire bill of materials. The planned network is as follows:-

•10 Gbps at the district level (23 districts)
•1 Gbps at the mandal level (1127 mandals)
•100/50 Mbps at the village level (22,000 villages)
•Broadband connectivity to 40,000 government offices for a fixed annual fee
•Triple play for voice, video and data

Total Project cost was estimated to be Rs.562 crores.

The objective of AP Broadband is to make broadband (always on 512 kbps or more speeds) connectivity available across the state at an affordable cost to cover offices, institutions and homes. Indicative tariffs are @ Rs.75 to Rs.100 per month.

Options for implementations included backbone and co-networks funded by Government, catalyze private investment or some hybrid model.



The project is being implemented as a Government Private Sector particpation as a joint venture. In order to attract private investment free right of way along roads and Government properties, and option of limited participation in equity have been offered.

Proposed plan and outlay:

Optical Fibre Network

- 2,800 kms (24 fibre) underground upto all district headquarters; initially 10 Gb lit up for each dist.
- 18,000 kms (12 fibre) underground upto all mandal headquarters; initially 1 Gb for each mdl.
- 70,000 kms (6 fibre) along electric poles
- 10,000 kms (4 fibre) along electric poles

Implementation status – Joint Venture has been formed (Equity participation by Aksh, Incable, APTS). IP 1 Licence has been obtained and laying of fibre is in progress in 2 districts. The project is proposed to be completed in 5 phases covering full AP each phase of 187 days to cover 3 to 5 districts up to each village. The last phase is expected to be completed by June, 2006 which is expected to give broadband connections in all villages in AP by September, 2006.

The project intends to deliver broadband services of minimum 2 mbps in every village at a tariff that can be afforded by rural citizens and powerful intranets for Government departments, competing chains of citizen service centers and Education, health, agriculture, self-help groups, animal husbandry, rural eCommerce, etc. 1Gbps broadband service will also be available on demand.

Annexure-4.2

Some Ongoing Initiatives

Private Participation in ICT Services

DakNet11

DakNet, an ad hoc network that uses wireless technology to provide asynchronous digital connectivity, is evidence that the marriage of wireless and asynchronous service may indeed be that kernel—the beginning of a road to universal broadband connectivity. Developed by MIT Media Lab researchers, DakNet has been successfully deployed in remote parts of both India and Cambodia at a cost two orders of magnitude less than that of traditional landline solutions. Villagers now get affordable Internet services—and are using them.

Researchers from the Indian Institute of Technology at Kanpur, working with Media Lab Asia, have used Wi-Fi to connect a 100-sq km area of the Gangetic Plain in central India. This project provides broadband connectivity along a corridor with almost one million residents, at a projected one-time cost of under $40 per subscriber. Other experiments have shown the practicality of the technology in mountainous terrain and in city centers. Indeed, several cities in the US have begun to deploy free Internet connectivity using IEEE 802.11b.

Villages in India and northern Cambodia are actively using DakNet with good results. Local entrepreneurs currently are using DakNet connections to make e-services like e-mail and voice mail available to residents in rural villages. The larger goal is to shift the policy focus of the government's universal-service-obligation funds from wireline village telephones to wireless ad hoc networking. The shift will probably require formal assessment of user satisfaction, resulting economic growth, and of course system reliability.

Government Efforts in India

Karnataka

The Bhoomi project has revolutionized the way people access information of land records. Several of the 7,00,000 land records will be available online within two months for banks, judicial courts and hundreds of village kiosks all across the State. Bhoomi, a successful project, is the only one and premier e-governance project in India that has recovered 70 percent of revenues of the total investment in the project, and is expected to generate more than Rs 10 crore every year.[12]

[11] Pentland, Fletcher, & Hasson, DakNet: Rethinking Connectivity in Developing Nations, IEEE Computer Magazine, January 2004

[12] Convincing people about e-governance was tough, 19 June , 2003, Sify News

Tamil Nadu

So far 26 software and hardware offerings have been certified which conform to the standards and have been authorized for use in Tamil Nadu Government and its institutions. A "Tamil Software Development Fund" with a corpus of Rs.5 crores has been set up to encourage the development of innovative Tamil software – the fund has supported seven projects till date. A "Center for Research and Applications of Tamil in Internet" has been set up and is supporting research projects in cutting edge areas of Tamil in IT. The State Government web site, www.tn.gov.in provides information of relevance to the citizens, and has more than 200 application forms in English and Tamil for use by citizens. A comprehensive database of all land records throughout the State was created. A set of application software for use at Taluk (Sub-District) and District level has been created, tested, finalized and has already been installed in all 206 Taluk offices. A pilot project for Tele-medicine between a State level tertiary hospital – Govt. General Hospital, Chennai – and a rural hospital – Walajah Taluk Hospital – has become operational.[13]

Gyandoot in Madhya Pradesh

The Gyandoot project was launched on January 1, 2000 with the installation of a low cost rural Intranet covering 20 village information kiosks in five Blocks of the district. Later, 11 more kiosks were set up. Villages that function as Block headquarters or hold the weekly markets in tribal areas or are located on major roads (e.g., bus stops) were chosen for establishing the kiosks. Seven centers are located in towns (urban areas), 8 in large villages with a population of 5,000-6,000, another 7 in medium sized villages with a population of 1,000-4,000, and the rest are in small villages with population less than 500. Each kiosk caters to about 25 to 30 villages. The entire network of 31 kiosks covers 311 Panchayats (village committees), over 600 villages and a population of around half a million (nearly 50% of the entire district). Each kiosk was expected to earn a gross income of Rs. 4,000 per month (50% from Gyandoot services, 25% from training, and the remainder from job work like typing). The operational costs are Rs 1,000 per month. Net income of Rs 3,000 must cover investments and provide a profit to the entrepreneur. In practice, the gross income has ranged between Rs. 1,000-5,000 per month; depending upon the skill and zeal of the manager.
In January 2000, the first month of operation, the kiosk network was accessed 1,200 times for a variety of services. That number reached nearly 9,000 in July. During the first 11 months, the 31 Gyandoot kiosks were used nearly 55,000 times.[14]

[13] http://www.tn.gov.in/misc/it-initiatives.htm

[14] http://www1.worldbank.org/publicsector/egov/gyandootcs.htm

Rural "e-Seva" (in east Godavari District of A.P.)

9,000 panchayats in Andhra Pradesh have access to a gamut of services offered under the Government to Citizen (G2C), Government to Business (G2B) and Business to Citizen (B2C) charters through 'e-Seva', a pioneering e-governance initiative. Encouraged by the success of 'e-Seva' services in Hyderabad coupled with its decision to bridge the digital divide across the state, the Andhra Pradesh government has geared up to set up 9,000 'mini e-Seva' centres across 23 districts in the first phase to offer over 35 services in a big way. The same will be extended to the remaining 13,000 panchayats once the first phase is completed in the next six months. Expected to generate around 9,000 jobs initially in the first phase, the proposed 'mini e-Sevas' will be manned by a person with access to all the information and data on the relevant services to be offered through internet with a common data centre. The centres, to come up in the rural, semi-urban areas and small towns with a population of over 2,000, will offer around 35 services under service module such as public grievance; market information (land); application and issue of certificate & registration; social, economic and agricultural services; educational services; messaging & information; police & security; financial services; utilities; health care; consumer and travel & pilgrimage.[15]

The project eSeva was launched on the 25th of August 2001 in the district West Godavari of Andhra Pradesh in India. The project is a tool to bridge the digital divide in the rural areas and has used Information Technology for providing access to various B2C and C2G services to the people living in rural areas. Under this project web enabled rural kiosks termed eSeva centres have been established at the mandal (a sub district unit of administration) level. The unique thing about these centres is that they are run and managed by the women self help groups and have been able to position the rural women as information leaders to help bridge the gender divide. This is an attempt to replace the traditional form of governance and its accompanying deficiencies with a modern, more open, transparent and responsive service delivery system. The project is based on BOOT (Build Operate Own Transfer) Model.[16]

[15] The Financial Express, Now, mini e-Seva centers planned for rural Andhra Pradesh, Monday 16 May, 2005

[16] The State Government of Andhra Pradesh – The Vision, The origin of eSeva, http://www.tvs-e.com/esevafinal.pdf

Warana, Maharashtra

The Warana Project is jointly carried out by the National Informatics Centre (NIC) (on behalf of the Central Government), the Government of Maharashtra and the Warana Vibhag Shikshan Mandal (Education Department). The estimated cost of the project is around $600,000 (Rs 2.6 crores). Of the total cost of the project 50 percent is being borne by the Central Government, 40 percent by the Government of Maharashtra and the remaining 10 percent by the Warana Vibhag Shikshan Mandal. The responsibilities of NIC are to: (1) supply the hardware, networking subsystems and associated software; (2) design, supply and establish the communication infrastructure with Internet access; (3) install and configure and Intranet; (4) provide site preparation guidelines; (5) design, develop and implement the application software; and (6) provide training on application software. The responsibilities of the Government of Maharashtra are to: (1) bar code product/items at Warana Bazar; (2) design and prepare the multipurpose identification number card with hologram and bar code for a villager's database; and (3) purchase the GIS. The responsibilities of the Warana Vighag Shikshan Mandal are to: (1) provide sites and site preparation; (2) provide 10 telephone lines at Sugar Administrative Building, and one at each IT Centre and Facilitation Booth; (3) enter and validate all data; (4) recruit technical manpower for managing the centers; and (5) provide necessary infrastructure support to the staff of NIC on tour to the sites.

Assam, ranked as a 'laggard' in e-readiness by the Financial Express in 2003, is currently planning its e-Governance system with the NIC Assam State Center.[17]

[17] http://informatics.nic.in/try_dispnews.asp?newsid=304&module_number=apr_5

Annexure 6.1

Computation of committed Subsidy towards VPT, MARR and RCP (Public access Facility)			
	Particulars		
1	**VPT Subsidy**		
	Number of VPT (in lakhs)		3.2
	OPEX subsidy per VPT per year average (in Rs)		5357
	Total VPT subsidy per year (in Cr.)		171.4
	Total VPT subsidy for 7 years (in Cr.)		**1200**
2	**MARR replacement**		
	Number of VPTs (in lakhs)		1.86
	CAPEX per year Average (in Rs)		11518
	Total MARR subsidy per year (in Cr.)		214
	Total MARR subsidy for 7 years (in Cr.)		**1500**
3	**Uncovered Villages**		
	Villages covered through satellite		14000
	Upfront per satellite (In Lakh)		1
	Total upfront cost- Capex (in Cr.)		**140**
	OPEX per year (in Rs)- average		11739
	OPEX per year (in Cr.)		16
	OPEX per year for 5 year (in Cr.)		**82**
	Non-satellite Villages		46000
	Upfront per village		25000
	Total upfront cost (in Cr.) - one time		**115**
	OPEX per year Average (in Rs)		4295
	OPEX per year (in Cr.)		19.757
	OPEX per year for 5 year (in Cr.)		**99**
	Total subsidy for uncovered Villages		**436**
4	**RCP**		
	Total Number of RCP		46253
	Upfront per RCP (Average)		23200
	Total upfront cost (in Cr.)		**107**
	OPEX per year Average (in Rs)		2000
	OPEX per year (in Cr.)		9
	OPEX per year for 5 year (in Cr.)		**46**
5	**HPTIC**		
	Total no of HPTIC		2000
	Upfront per HPTIC (Rs in lakh)		1.5
	Total upfront cost (in Cr.)		**30**
	OPEX per year per HPTIC (in Rs)		25000
	OPEX per year (in Cr.)		5
	OPEX per year for 5 year (in Cr.)		**25**
	Total Comittments (Rs in Cr.)		**3344**

Annexure-6.2

Total DEL Subsidy required to achieve additional 66 lakhs rural DELs by 2007(estimation by USOF)

DELS subsidy											
		subscriber base			DEL (From 1/4/2005 to 31/3/2010)				DEL (From 1/4/2002 to 31/3/2005)		
Sl.no	Year	subscriber base as 1st April (In Crore)	additional Subscriber during the year (In Crore)	subscriber base as on 31st March (in Crore)	Estimated Capex (in crore)	Estimated Capex to be r Disbursed (in crore)	Estimated Opex (in crore)	Estimated Opex to be Disbursed (in crore)	Capex Disbursements (in crore)	Opex Disbursements (in crore)	Total Amount Disbursements (In Crore)
1	1/4/2002-2005	-	0.15000	-		-		-	-	-	-
2	2006	1.3456	0.2600	1.6056	2,600.00	1,950	390.00	292.5	1500.00	225	3,967.50
3	2007	1.6056	0.4000	2.0056	4,000.00	3,650	990.00	840	0	225	4,715.00
4	2008	2.0056	0.00	2.0056		1,000	990.00	990	0	225	2,215.00
5	2009	2.0056	0.00	2.0056			990.00	990	0	225	1,215.00
6	2010	2.0056	0.00	2.0056		-	990.00	990	0	225	1,215.00
7	2011							248	0		247.50
		Total	0.6600		6,600.00	6,600.00	4,350.00	4,350.00	1,500.00	1,125.00	**13,575**
								10,950.00		**2,625.00**	
Allowed disbursement								**appox.11000**		**appox. 2600**	
Total Disbursement required											**13,575**

Total subsidy required for meeting present commitments (VPT, MARR, RCPs & DELs) = 3344 Cr. (VPT, MARR, RCP – Annex6.1) + 13575 Cr. (DELs) ≈ 17,000 Cr.

Annexure 6.3

Total DEL Subsidy required for achieving 4% rural tele-density by 2010

DELs subsidy with 4% Rural teledensity												
		subscriber base			DEL (From 1/4/2005 to 31/3/2010)			DEL (From 1/4/2002 to 31/3/2005)				
Sl.no	Year Ending	Subscriber base Opening for Fincial year(In Crore)	Additional Subscriber during the year (In Crore)	Subscriber base at Closing of Financial year (in Crore)	Capex due (in crore)	Capex Disbursed (in crore) _ Note 1	Opex Disbursements (in crore)	Capex Disbursements (in crore)	Opex Disbursements (in crore)	Total Amount Disbursements (In Crore)	ADC For lines not covered by the USO Funds (Estimation)	Total USO
1	31.3.2006	1.3456	0.2600	1.6056	2,600.00	2,600.00	390.00	1500.00	225	4,715	0	4,715
2	31.3.2007	1.6056	0.4000	2.0056	4,000.00	4,000.00	990.00	-	225	5,215	0	5,215
3	31.3.2008	2.0056	0.2407	2.2462	2,406.68	1,805.01	1351.00	-	225	3,381	0	3,381
4	31.3.2009	2.2462	0.2695	2.5158	2,695.48	2,021.61	1755.32	-	225	4,002	2774	6,776
5	31.3.2010	2.5158	0.3019	2.8177	3,018.94	2,264.21	2208.17	-	225	4,697	2329	7,026
		Total	1.4721		**14,721**	**12,691**	**6,694**	**1,500**	**1,125**	**22,010**	**5103**	**27,113**
											Note: It is assumed that ADC regime gets concluded in year 2008. ADC calculated for 11.96 Crores Rural DELs not covered in USO	

Total subsidy required for meeting present commitments (VPT, MARR, RCPs & DELs) = 3344 (VPTs, MARR, RCP-Annex. 6.1) + 22,010 Cr. (DELs) + 5103 Crores ADC for rural lines not covered by USO ≈ 30457 Cr.

Note1 – It is anticipated that by the year 2007, substantial infrastructure would have been put in place by the fixed line service providers and therefore the capital cost of providing new DELs will be lower by a factor of 25% and accordingly Capex disbursed from 31.3.2008 onwards in Table above has been reduced by the same percentage. So far as Opex is concerned no major change is expected.

Annexure 6.4

FUNDS REQUIRED FROM USOF FOR INCENTIVISING MOBILE TOWERS

Mobile Towers	
Total geographical area of India (Sq. Km)	3287263
Total covered rural area (Sq Km)	2761300
Average radius covered per site (Km)	7.5
Area under one site(sq. Km)	177
Total sites required	15634
Inter-site distance (Km)	15

Total sites required = 15,000 when circular sites are considered

Mobile Towers	
Total geographical area of India (Sq. Km)	3287263
Total covered rural area (Sq Km)	2761300
Average radius covered per site (Km)	7.5
Area under one site(sq. Km)	146
Total sites required	18917
Inter-site distance (Km)	15

Total sites required ≈ 20,000 when hexagonal sites are considered

Incentive per site for 3 operators (lakhs.) = 36

Total incentive for 20000 sites(in Cr.) = 7200

Annexure-7.1

Sub : No amendment of the Telegraph Act is necessary to cover Cellular Mobile Services under USO.

The Indian Telegraph Act, 1885 (as amended up-to-date) in Section 3(1A) & 3(1AA) has defined Universal Service Obligations and "Telegraph" respectively as follows :-

(1A) " Universal Service Obligation" means the obligation to provide access to basic telegraph services to people in the rural and remote areas at affordable and reasonable prices

(1AA) "Telegraph" means any appliance, instrument, material or apparatus used or capable of use of transmission or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, visual or other electro-magnetic emissions, Radio waves or Hertizian waves, galvanic, electric or magnetic means;"

2. From the above definition of Universal Service Obligation, it is clear that Universal Service Obligation includes provision of access to remote areas by any means wire or wireless.

3. Clause 6 of NTP' 99 dealing with Universal Service Obligation also say that the Government is committed to provide access to all people for basic telecom services at affordable and reasonable price. But, NTP' 99 further says that in addition to fixed service providers other service providers shall also be encouraged to participate in USO provisions subject to technical feasibility and shall be reimbursed from the funds of Universal Access Levy.

4. The Basic Service Licence issued in 1995-96 and 2001 has also covered Cellular Mobile Telecom Services under Value Added Services and one could interpret it as if cellular mobile services are not part of basic services and hence are not eligible to participate in Universal Service Programme.

5. In Unified Access Service Licence issued in 2004 the Cellular Mobile Telecom Services has been removed from the list of Value Added Services and on this basis even the License condition for Access Service does not indicate that cellular mobile services is not part of basic service but part of value added services.

6. WTO has defined Basic Telecom Services, which include all telecom service both public and private that involved end-to-end transmission of customer supplier information. WTO definition of Basic Telecom Services (Table 1)include explicitly cellular/mobile telecom services. The cellular mobile telecom services is not part of value added telecom services as defined by WTO.

Table 1: WTO's Basic services definition

Basic telecommunications

Basic telecommunications include all telecommunication services, both public and private that involve end-to-end transmission of customer supplier information.

Basic telecommunication services are provided:

- through cross-border supply

- AND through the establishment of foreign firms or commercial presence, including the ability own and operate independent telecom network infrastructure

Examples of basic telecommunication services:

(a) Voice telephone services
(b) Packet-switched data transmission services
(c) Circuit-switched data transmission services
(d) Telex services
(e) Telegraph services
(f) Facsimile services
(g) Private leased circuit services
(o) Other

- Analog/digital cellular/mobile telephone services
- Mobile data services
- Paging
- Personal communications services
- Satellite-based mobile services (incl. e.g. telephony, data, paging, and/or PCS)
- Fixed satellite services
- VSAT services
- Gateway earth station services
- Teleconferencing
- Video transport
- Trunked radio system services

Categories covered by basic telecommunication commitments, unless otherwise specified :
- local
- long distance
- international
- wire-based (including, e.g. all types of cables and, usually, radio portions of fixed infrastructure)
- radio-based (all forms of wireless, including satellite)
- on a resale basis (non-facilities based supply)
- facilities-based supply
- for public use (i.e., services that must be made available to the public generally)
- for non-public use (e.g. services provided for sale to closed user groups)

Value-added telecommunication services

Value-added telecommunication services are telecommunications for which suppliers "add value" to the customer's information by enhancing its form or content or by providing for its storage and retrieval.

Examples:
- on-line data processing
- on-line database storage and retrieval
- electronic data interchange
- email
- voice mail

15. In the background of above, it is clear that mobile services in rural areas can be subsidized by USO Fund. However, as an abundant caution, it might be advisable to amend the definition of basic service in license agreement. The amendment, if at all considered necessary may include the definition of basic telephone services as per WTO definition in the UASL and cellular License agreement.