

Accelerating Indian Rural Telecom Services: Policy and Regulatory Approaches

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1.0 Introduction

Although the Indian telecom services have seen very rapid growth rates both in fixed and mobile services, these have largely been in urban areas. As of early January, 2006, while urban teledensity had reached nearly 30%, rural teledensity was barely 2%. The disparity is growing and is a cause of concern [TRAI, 2004]. Moreover, the poor availability of telecom infrastructure in rural areas has led to near exclusion from the Internet leading to growing social and economic inequities.

The challenges are due to the remoteness, difficult terrain, smaller population (a large number of villages have population of less than 500) and lower per capita income in relation to urban population, spread out nature of villages in India that causes the access or last mile costs to be very high. Recognizing these challenges, the Government of India accepted the provision of rural telecommunication services (RTS) as a policy objective since the 1970s. Despite these, the outcomes have not been as planned. After corporatization, the incumbent adopted a more commercial orientation, reducing its focus on RTS. Further, the changes in regulation and policy led to a situation where the private fixed line operators, who had rural roll out obligations, could migrate to a “unified access service license” (UASL) which did not have any such obligation, causing further harm to the objective of enhancing RTS.

The paper based on extensive field work and an in depth study of rural telecom services in India, covering several states, including the isolated North Eastern states, case studies of state wide initiatives in providing broadband services, and secondary research, critically assesses the effectiveness of the various policy and regulatory initiatives in accelerating provision of RTS. For example, the paper highlights the policy and organizational issues that reduce the effectiveness of the Universal Service Fund.

It recommends the policy and regulatory interventions that may be required to facilitate the involvement of public and private enterprise for RTS. It suggests the changes that would be required based on a comparative study of developments in other countries that have had more successful rural deployment policies in other countries¹.

¹ This paper is based on a Report on Accelerated Provision of Rural Telecom Services by Prof Rekha Jain and G. Raghuram, Indian Institute of Management, Ahmedabad, India, May 2005. This material has not been published before.

2.0 Background

The Indian Telecom Sector

The Department of Telecom (DoT) was the sole provider of all telecom services until 1984 when the deregulation in the sector started. Owing to initial problems, private operators started providing services only from 1994. Service areas for operators were designated as “circles”, geographic units that were usually co-terminus with state boundaries. Significant facilitators for private entry were provided by the National Telecom Policy (1999) that even now provides a blueprint for the ongoing reforms [<http://www.trai.gov.in/ntpt1999.htm>]. By 2003, six operators had pan Indian cellular footprint and four had pan Indian fixed service licenses.

There were two incumbent operators for domestic services -- MTNL, the service provider in Mumbai and New Delhi and BSNL, (erstwhile DoT) in the rest of the country -- providing local, long distance, and cellular services. International services are provided by VSNL, a state-owned enterprise until 2002, and partially privatized since then. International services are also provided by some private operators. In 1997, the government set up the Telecom Regulatory Authority of India (TRAI) [Jain, 2001].

The NTP 99 significantly relaxed conditions on private participation in telecom services by changing the then existing annual license fee to a one-time entry fee and an annual revenue share. It also provided for the entry of DoT and MTNL as the third operator for cellular services and increased the flexibility to private operators to carry their long distance traffic within a service area on their own networks. Private operators were slow to take off in providing basic services and none of them fulfilled the rural obligations associated with their licenses.

In 2003, TRAI moved towards a ‘unified access’ license, allowing for the existing licensees to provide either fixed or cellular services under the new regime, thus bringing similarity across the two licenses. Appendix 1 provides some parameters of growth in telecom sector in India. From a base of nearly 18 million subscribers in 1997, there were nearly 85 million subscribers in 2005. Significant growth came from mobile services, as is the global trend. Cellular services grew at an annual growth rate of nearly 66.6%. The cellular teledensity in December 2004 was 4.84 up from 2.7 in December 2003.

Rural telecom policies have been at the national level and focused on service provision, support for indigenous development, funding, and tariffs.

3.0 Policies for Rural Telecom Services (RTS)

The following have been the major policy/regulatory interventions:

- Rural service provision at village level
- Lower tariff policies for rural services (registration, rentals and per call charges)
- Rural funding policies mainly cover the following:

- Creation of Universal Service Obligation Fund (USOF)
- Provision of Access Deficit Charges (ADC)
- Support for development of indigenous technology for rural areas

Policies on RTS have relied on the concept of Rural Teledensity (RTD) and coverage to define targets and monitor targets. The issues with these measurement variables are elaborated below:

RTD

- There would be a need to define rural, not just as a single aggregate but with greater granularity, recognizing population densities, remoteness from urban centers and social contexts.
- We would need to review the concept of “teledensity” as a measure of access (availability of a telephone within a specified distance, largely for public use) and also include the concept of telecom service (availability of phone at home) to assess the policy implications of facilitating rural access. For example, access becomes an important parameter in the context of rural broadband provision (availability in a public place), while initially broadband service (availability at home) may not be that critical.
- Given the socio-economic context of phone ownership (economically more feasible to have it at a household or community level), and also due to the greater interaction amongst rural households (at least among similar social groups) as compared to urban households, from an access viewpoint, a household telephone in a village is accessible to a larger number of people than in urban areas. Thus, in rural areas, the concept of telecom service has relationship to access that may not be very strong in urban areas. Therefore, teledensity in rural areas also needs to reflect the number and percentages of households having access to telecom services as well as number of Public Call Offices (PCO).
- Rural teledensity needs to recognize both fixed line and wireless, and in the context of wireless, not just the subscriber base but also the coverage.

Coverage

The concept of “covered” village refers to a one time provision of service (measure that reflects RTD). However, the definition of covered villages should specify the level of connectivity (local, long distance), acceptable down time percentages and other Quality of Service (QOS) parameters. In the current context, mere provision of a Village Public Telephone (VPT) without reference to QOS qualifies for a village to be covered.

The current measures of telecom coverage refer to the population. In the context of increasing spread of wireless, it would be useful to gather information on the percentage of geographical (carpet) area covered by these networks. This would reflect the ability to provide DELs to the local population and connectivity for visitors. The carpet area information should further be examined for rural and urban areas and the population covered.

4.0 Review of Policy Initiatives

There have been varying levels of success with these policies. In the following, we review the impact of government programs.

4.1 Rural Service Provision at Village Level

Government policies started focusing on rural roll out largely during the Eighth Five Year Plan (1992-97). The plan aimed to provide 0.309 lakh (covering half of the total number of villages) Village Panchayat (administrative unit) Telephones (VPT) by 1997. However, this scheme was not very successful, as it did not allow access to a large number of rural people, who found it difficult to avail of service. This was due to the very rigid social interactions patterns in Indian villages that did not allow socially backward castes to use these phones as these were normally kept in the house of village head, who typically belonged to caste considered to be socially higher. Subsequently, the DoT decided to place such phones in more accessible places such as shops etc. Moreover, few of the village phones had long distance connectivity leading to low potential for revenue generation, several of the village administrators did not pay the bills, and maintenance of such phones was a technological and logistics issue.

Subsequent policies continued to focus on covering all villages with one VPT, on the assumption that the private sector would significantly contribute to the effort. The National Telecom Policy 1999 (NTP 99) set 2002 as the target year for “covering” all villages with not only voice but also low speed data services. It also specified increasing RTD from the current level of 0.4 to 4 by the year 2010 and to provide reliable transmission media in all rural areas. Besides providing specific targets for rural service provision, it recommended setting up the Universal Service Obligation Fund (USOF).

However, the participation by the private sector did not take off in any significant manner and DoT’s efforts were limited to the resources it had. The total number of villages left uncovered, as on 31st March 2006 are 58,648 and high speed and multimedia capability targets were not achieved. [TRAI Paper, “The Indian Telecom Services Performance Indicators Oct-Dec 2005, March 2006]

An examination of the year wise coverage of VPT targets (Table 1) shows that the average incremental addition of VPT per year (from 1995-2003) was nearly 48,800. However, during 2003-2006 on an average only 11,000 VPTs were added. This may be reflective of the fact that the remaining villages may be those that are more difficult to reach. Two factors that may have contributed to this could be that with the corporatization of BSNL in October 2000, it acquired a more commercial orientation, although there was a lag in reduced investments. The actual disbursements from USOF began in a small way only in July 2003 and subsequently as disbursements from the USOF increase, it is expected that the remaining VPT in uncovered villages would be provided in a phased manner by 2007 and a second VPT in villages above a population of 2000 and having a single VPT, would be provided.

Table 1: Year wise VPT Coverage

Status as on 31st March	Total VPTs (000s)	Percentage of Villages Covered	VPTs Added over Previous Year (000s)
1995	172.5	28.4	
1996	204.0	33.6	31.5
1997	260.7	42.9	56.7
1998	303.6	49.9	42.9
1999	340.6	56	37.1
2001	408.9	67.3	68.2
2002	468.9	77.1	59.9
2003	514.2	84.6	45.4
2004	522.3	85.9	8.1
2005 (as of Sep 30)	539.4	88.7	17.0
2006	548.8	90.2	9.5
Total Number of Villages			607.9

Another issue of importance in VPT coverage has been the quality of access. Several of these phones remained out of service for long periods of time [“Rural Telecommunication Services”, Jain and Sastry, 1997 and “Assessment of Socio-economic Impact of Rural Telecom Services: Implications for Policy”, Jain and Sastry, 1999]. If village telephones were not maintained well, then a vicious cycle of low revenues and hence lower profitability led to lower available funds for investment. However, with the operationalization of the USOF, where payments are linked to the period of availability should provide incentives to operators to focus on quality. This also has implications on whether to consider a particular village as “covered” if it does not have adequate quality of service.

State Wise Provision of VPTs

An analysis of the state level data of VPT coverage as of 31st March, 2004 (Table 2) would help in better targeting of coverage. Karnataka, Kerala and Tamil Nadu had 100% VPT coverage. Haryana and Punjab had low percentage of uncovered villages (0.57 and 0.88). North East had the lowest coverage at 52.8% followed by Rajasthan (32.0%), Jammu & Kashmir (29.2%), Madhya Pradesh (26.2%), Chhattisgarh (25.6%), Uttaranchal (24.9%), Assam (21.5%) and Maharashtra (19.5%). Other than Maharashtra, these are states with “low” (0.9% to 2.0%) RTD and “poor” (less than 0.9%) RTD. This indicates that both the provision and uptake of public and private telecom has been poor in these states. The relatively large numbers of uncovered villages in Maharashtra, despite its higher RTD, may indicate far flung villages that may not have been economically viable to connect. The low and poor RTD states, therefore, require a dedicated focus to achieve the objective of one phone per village and as identified before, enhancement of rural DEL penetration.

As can be seen from Table 2, the role of private sector in VPT provision has been insignificant (12,665 out of 5,22,347) provided until March, 2004. With the migration of the fixed service providers to the UASL, roll out obligations of fixed service operators were done away with.

Table 2: State wise Number of Villages with Direct Access to Telecom Facilities (As on 31.03.2004)

Circles/ States	Villages Covered with VPTs* (000s)			PCOs (Local +STD + Highway) (000s)	Villages Left Uncovered	% of Villages Left Uncovered	RTD ²
	Public	Private	Total VPTs				
	2004	2004	2004				
Karnataka	27.0	0	27.0	164.4	0	0	2.38
Kerala	1.5	0	1.4	74.5	0	0	8.45
Tamil Nadu	17.9	0	17.9	123.8	0	0	2.17
Haryana	6.8	0	6.8	31.7	39	0.6	2.43
Punjab	12.7	0.9	13.6	44.1	121	0.9	4.74
Andaman and Nicobar Islands	0.2	0	0.2	0.9	3	1.5	8.36
Himachal Pradesh	16.6	0	16.6	8.2	338	2	5.5
West Bengal	37.3	0	37.3	34.5	1031	2.7	0.95
Bihar	38.5	0	38.5	47.6	2602	6.3	0.51
Orissa	40.7	0	40.8	27.2	6236	13.3	0.94
Uttar Pradesh	97.3	0	97.3	136.7	6128	14.7	0.48
Jharkhand	26.9	0	26.9	13.1	4799	15.1	0.46
Gujarat	11.2	4.1	15.3	112.4	2797	15.4	2.53
Andhra Pradesh	23.4	1.4	24.8	177.4	4633	15.7	2.31
Maharashtra	31.5	2.6	34.2	223.2	8283	19.5	2.29
Assam	19.3	0	19.4	17.8	5306	21.5	0.56
Uttaranchal	11.7	0	11.7	10.6	3881	24.9	1.47
Chhattisgarh	14.7	0	14.7	7.5	5055	25.6	0.47
Madhya Pradesh	37.6	0.6	38.2	46.1	13594	26.2	0.69
Jammu and Kashmir	4.8	0	4.8	14.2	1978	29.2	0.63
Rajasthan	23.9	3.0	26.9	58.7	12615	32	1.36

² Categorization of States Based on their RTD – high (over 4.0%), medium (2.0% to 4.0%), low (0.9% to 2.0%), poor (below 0.9%)

North East	7.4	0	7.4	8.6	6705	47.2	1.08
India	509.7	12.7	522.3	1789.3	85144	14	1.58

Source: Annual Report 2003-04, Department of Telecommunications, Ministry of Communications & IT, Government of India.

- The analysis above shows the need for policies that are state specific, rather than at the national level as is the current practice.
- The earlier approach of DoT/BSNL to VPT provision was to have only local call facility enabled. This allowed calls to be made within a distance of up to 50 km. The issue was whether these villages could be considered as “covered”. The approach of limiting Subscriber Trunk Dialing (STD) facility may have been adopted since all call charges of a VPT were prescribed as Rs 0.50 per metered call unit and BSNL may have felt that it would lose revenues if STD calls were made at this rate rather than at commercial rates. However, the VPT operator had the option of having the STD facility enabled, if it was technically feasible (dependent on the quality of the transmission media and the capacity of the exchange) and a deposit was provided to BSNL. This approach did not take into account that non-availability of STD facility in the long run led to commercial non viability. However, in its publication on Business Plans and Annual Action Plans, March 2003 Supplement, BSNL recognized this and provided guidelines to “encourage the custodian to avail STD facility”, BSNL also provided for conversion of VPT without STD facilities to ones that with this facility.
- Other problems related to the absence of a proper monitoring system and difficulties in managing billing and collection. These could lead to non payment of bills and consequent disconnections. Sometimes, the lack of personnel to deal with rural systems left many phones in non functional state for long periods of time. Alternative management mechanisms (franchise system or as exemplified by the GRASSO initiative discussed later in the paper need to be adopted/reviewed.

4.2 Lower Tariff Policy

TRAI had mandated lower rentals and call charges for rural areas. Table 3 provides these and comparison with corresponding urban charges. The lower rentals and call charges were expected to prompt greater usage and incorporated an “affordability’ perspective [Jain, 2004]. However, a negative outcome of this approach had been that BSNL was reluctant to provide STD connectivity to VPTs at its own initiative.

Table 3: Telephone Call Charges and Registration Charges for Rural and Urban Areas
(Rs)

Capacity of the Exchange System (DELS)	Bi-monthly Rental*	No. of Call Units Allowed Free Per Month	Fee Per Call Unit In Excess of Those Allowed Free of Charge			
			126-225	226-250	251-500	Above 500
Less than 1000	100	125	0.60	0.80	1.00	1.20
1000 lines and above but below 30,000 lines	220	125	0.60	0.80	1.00	1.20
30,000 lines and above but below 1,00,000 lines	300	125	0.60	0.80	1.00	1.20
1,00,000 lines and above	420	125	0.60	0.80	1.00	1.20
Registration Charges**	500					

Urban Areas : Call Charges and Registration Charges (Rs)

Capacity of the Exchange System	Bi-monthly Rental*	No. of Call Units Allowed Free Per Month	Fee Per Call Unit In Excess of Those Allowed Free of Charge		
			From 76-200	From 201-500	More than 500
Below 30,000 lines	240	75	0.80	1.0	1.20
30,000 lines and above but below 1,00,000 lines	360	75	0.80	1.0	1.20
1,00,000 lines and above	500	75	0.8	1.0	1.20
Registration Charges**	500				

Source: www.bsnl.co.in

* The above rentals are applicable to telephone connections falling within local area of 5 Km radial distance

** Revised as applicable from 1.12.2004

The registration charges for rural telecom had also been traditionally below those in urban areas. Over the years, DoT has taken the initiative to bring about drastic downward revision in both rural and urban registration charges. With the latest change in registration charges, however, there was no disparity between urban and rural registration charges. Despite the lower charges, rural telecom services did not generate adequate revenue to cover their costs.

4.3 Rural Telecom Funding Policies

Universal Service Obligations Fund

As an outcome of the NTP 99, The USOF administered by the USOF Administrator, DoT was set up in 2002. The Indian Telegraph Amendment Act, 2003, the USOF became a non-lapsable fund. All telecom service providers other than pure value added service providers are required to contribute 5% of Aggregate Gross Revenue (AGR) towards the USOF.

The Act provides for Universal Service Obligations “to provide access to basic telegraph services to people in the remote areas at affordable prices”. Since basic telegraph license covers services provided through fixed and fixed wireless, USOF currently funds services provided through fixed and fixed wireless systems. Operators could choose any technology for providing fixed/fixed wireless services to be eligible for USOF.

The decision to allow funding for fixed and fixed wireless systems under USO was possibly driven by the “affordability” concern for the rural subscriber, as the tariffs for these in rural areas were regulated by TRAI and were lower than mobile services in rural areas. For cellular mobile services, tariff regulation had been forborne. Another issue with not allowing mobile services under USO funding was the inability to target the lower tariffs only at rural subscribers, since urban subscribers could register themselves in rural areas and then use the phone in urban areas.

Framework for USOF

- Transfers from the USOF to DoT are made by the approval of the parliament. The USOF is to be spent in rural and remote areas on both the public access telephones or community telephones, individual household telephones in net high-cost rural/remote areas (nearly 1685 sub districts out of a total of nearly 2,626 sub districts and Public Tele information Centres.
- The funding covers net cost (i.e. cost minus revenue) of providing the service. Net cost is the difference between the sum of annualized capital and annual operating cost and annual revenue. The annualized capital recovery takes into account the aggregate of depreciation, return on equity, and interest on debt³. For calculation and estimating benchmark cost, fully allocated current costs method using proxy cost models was used. For operating expense, the costs were calculated on the basis of most efficient operations.

³ The unit for net cost determination is the secondary switching areas (district) for public access and sub district for rural household DELs

- The bidding was a multi tier process, with a starting point as a minimum reserve price calculated by the USOF administrator based on a) Geographical location, b) Distance from the nearest exchange, c) Technology deployed, d) Topological factors, e) Tele- density, f) Landline ratio, g) Extent of rural area, h) Availability of power using proxy cost models. To provide representative costs across different areas, the entire country, was divided into five regions. A sample set of four subdistricts from each region was taken as a basis. Analysis of data and critical variables that influenced costs and revenues were used as listed above. Fully allocated current costs over a 7/5 year period were taken. The least quoted subsidy below the benchmark determined the subsidy rate.
- An Inter ministerial Advisory Committee consisting of representatives from Ministry of Finance, Ministry of Law, Planning Commission, TRAI, DoT, IIM Ahmedabad and IITM, Chennai is responsible for formulating guiding principle for administration and implementation of USO and advising on monitoring mechanism and review of scope
- The implementation of USOF had been divided into two clearly identifiable streams.
 - Stream-I: Provision of Public Telecom and Information Services:
 - Stream-II – Support for provision of household telephones in rural and remote areas included both capital and operational expenses.
- *Disbursal from USOF*

While USOF has a corpus of Rs 2 bn, disbursements have been to the extent of nearly Rs 40 million only. This has largely been used to replace old equipment and install VPTs, but insignificant roll out otherwise despite bidders having bid for service provision.

The Universal Service Support is currently being provided on the basis of actual physical performance. Such reimbursements are made on completion of installations where new installations are involved and quarterly in arrears post installation of the facility based on the claims statement, subject to a later verification of the physical records or physical inspection.

Review of the USOF

- The guidelines for allocations from the USOF have been put in place and are operational which shows the government's commitment. The bidding guidelines are transparent and roll outs had begun without any legal challenges.
- One issue is disbursement of available funds in a way so as to accelerate the expansion of services in rural areas. The USOF rightly gives priority to public over private access as highlighted above. However, both types of coverage are being provided almost concurrently, with public access preceding private access. In South Africa, universal service is considered a long-term goal, and a universal access a short-term goal.

- The imposition of roll out obligations is designed to ensure at least a minimum level of service availability. In the case of rural DELs, roll out obligations include the obligation to provide 100 rural DELs within six months from the effective date of agreement with the USOF in each of the sub districts for which the agreement has been signed by the selected USP. Another factor that would help accelerate roll out is the fact that USOF support is provided for the period up to 2010 only. It does not apply for a fixed period from the date of roll out. So, there is an incentive for the operator to roll out services quickly to be able to claim subsidy for a longer period. However, the present scheme may not ensure roll outs in specific geographic localities.
- Since the USP would get termination charges, for calls originating from other networks and terminating in rural areas, a quick roll out would ensure income from this source. The other benefit to the USP would be additional call revenue that may get generated from urban areas that is on the USP's own network. The USOF also provides for fixed amount of recurring subsidies, covering the operational deficit (based on the econometric model).
- Since provision of rural DEL through USOF is a highly visible, largest single program and involves both public and private operators, there are likely to be issues on the ground that would need to be addressed during the roll out. Therefore, it is essential that a system for early assessment of problems and issues is periodically undertaken, during the roll out phase. Such a system will help in identifying the early warning signals in case of problems and would provide useful feedback for future programs. This could be undertaken by third parties.
- That additional funds for rural infrastructure can be made available, once visibility of the service is there, is illustrated through the example of the Central Road Fund which was first created by cess on petrol of Rs. 1/- per litre of petrol from June, 1998 and Rs. 1/- per litre of diesel from March, 1999. The Central Road Fund seeks to distribute the total of 100% of cess on petrol and 50% of cess on diesel in the following way:
 - (i) 57.5% for National Highways
 - (ii) 30.0 % for State Roads.
 - (iii) 12.5% for safety works on Rail-Road crossings.

The remaining 50% of the cess on diesel is to be used to develop rural roads through the Pradhan Mantri Gram Sadak Yojna (The Prime Ministers Rural Road Plan). In February, 2003, the Budget imposed an additional Rs 0.50 cess on diesel and petrol for road development that would mop up Rs 2,600 crore annually into the Central Road Fund (CRF) which used to see a flow of about Rs 60,000 million annually. The PMGSY would be the major beneficiary of this move. An additional cess of Rs 0.50 per litre of diesel was proposed in January, 2004. The additional cess was again proposed for both diesel and petrol, and implemented from April, 2005. This means that the total cess now stands at Rs 2 per litre.

This example illustrates that step wise increments for infrastructure funds, when visible developments are there, can be managed and are a key to start a virtuous cycle of higher growth in the sector and consequent greater contributions to the fund.

- The USOF Administrator's current plans include providing funding for passive infrastructure for cellular services and making them available to the service providers on a sharing basis. The rural subscribers wishing to avail of such services would have to pay the charges prescribed by the service provider, unlike for a fixed/fixed wireless access where the rates are mandated by TRAI. The Universal Service Support is currently being provided on the basis of the actual physical performance. Such reimbursements are made on completion of installations where new installations are involved and quarterly in arrears post installation of the facility based on the claims statement, subject to a later verification of the physical records or physical inspection.
- The USOF is not adequately staffed to manage a fund of this proportion. So, while the government has shown some commitment in terms of setting up the fund, it has not been consistent in its approach by not giving adequate thought to the leadership and staffing.
- The inability of the USOF Administrator to disburse the available funds has led to a situation where the Finance Ministry (who manages the Fund and approves the sanctions) had consistently returned back the request for additional funding over the previous benchmark spending levels. Since the USOF is accumulated in the Consolidated Fund of India, the government possibly finds alternative uses of the fund.

Access Deficit Charge

Another regulatory initiative has been the imposition of ADC to be paid by all operators to fixed service operators. Since BSNL was the dominant fixed line service provider (with a market share of nearly 89%), all operators contributed to BSNL. This was supposed to compensate BSNL for the below cost rentals and call charges (both governed by TRAI) in rural areas. However, operationally, a number of issues related to the ADC needed ironing out, especially in a multi operator context [Jain, 2005]. While TRAI had been working on an ADC framework since 2002, it became operational from February 1, 2004. As of March 2004, BSNL was to receive nearly Rs 45,000 million through the ADC.

The TRAI had to review the then existing ADC regime several times, as operationally it had become difficult to manage the ADC reconciliations due to a complicated schedule of per minute charges. In addition, the increase in subscriber base and telecom usage and since BSNL had yet to implement a Call Detail Record (CDR) based system nation wide.

TRAI recommended a revenue share mechanism for implementing the ADC. This approach recognized the problems in making estimates based on detailed cost data, especially in view of the lack of accounting separation in BSNL, the problems with the data supplied by operators and the mechanism for reconciliation.

Using both ADC and USO to fund the RTS was inappropriate, as the ADC framework actually subsidized the customers of the incumbents, even those that were in metro areas. MTNL that operated only in metro areas also received ADC [Jain, 2006]. It also weakened the case for private

operators to contribute a higher revenue share component for USO. While this has limitations on the size of the fund, the USOF administrator inability to leverage the corpus is an issue.

4.4 Support for Development of Indigenous Technology for Rural Areas

A pioneering effort towards development of indigenous technologies and spread of rural telecommunications was the setting up of Centre for Development of Telematics (C-DOT) under the DoT in 1984 as an autonomous body with the objective of developing digital exchanges for rural areas. C-DOT has also successfully developed and deployed a number of switching and transmission products. The C-DOT developed Rural Automatic Exchanges (RAX) have been developed and deployed both the rural and urban areas. The availability of low cost, rugged low maintenance RAX that did not require air conditioning and was suited for easy installation in villages gave a huge boost to rural connectivity.

Subsequently, C-DOT had also developed an integrated Time Division Multiple Access Point to Multi Point (TDMA-PMP) equipment for serving up to 256 subscribers sparsely distributed in a radius of 20 km. This allows for wireless connectivity and has been selected by DoT as a suitable solution for rural connectivity.

Multi Access Rural Radio (MARR) systems were indigenously developed initially by a private vendor with specifications from DoT. This was a wireless analogue system to provide links from an exchange to the base station in villages. While it overcame the problem of long wire based solution that was often costly and difficult to maintain, the system that was developed had several technical problems regarding the conformance to specifications and other problems such as with the solar photovoltaic panels required to power the unit at the subscriber end. In managing the deployment of MARR, there were problems such as non/late receipt of equipment, non-availability of power plant, transmission media etc at DoT's end. There were organizational issues such as poor contract management and poor maintenance systems.

It has now been decided to use Digital MARR, WLL, satellite based communication and C-DOT's TDMA-PMP for rural connectivity. There is a focus on using indigenously developed CorDECT for wireless deployment in rural areas due to its cost effectiveness.

Thus, while there have been sporadic efforts at indigenizing technology for rural areas, there has been little sustained and visible effort at the national level.

4.5 Recommendations

- For getting greater visibility, the USOF could focus on setting a total carpet area coverage target for a state in a given time frame, especially in an existing high RTD, high rural literacy state (say Kerala). (Since with little contributions from USOF, there could be higher payoffs than in lower RTD state). The payoffs in terms of increased telecom revenues across all operators, higher quality of life could give the USOF higher visibility and credibility and build a case for higher contributions.
- The policy regime should focus on removing impediments to the growth of the sector, as under this scenario, USOF size would be larger and additional contributions required over

and above those available from the USOF would be less. The removal of impediments include focusing on spectrum availability, both from a long term perspective and easing the process of spectrum allocation. Other considerations include reduction in duty of wireless equipment as considered by DoT in its Broadband Policy recommendations.

- Other funding mechanisms could include grants from other government sources, development funds, and state specific development funds. The state specific funding could address issues specific to a state such as developments in tribal and/or hilly regions. For example, the North Eastern Council (NEC), which funds inter state projects in the North East, or the non-lapsable Central Pool of Resources for the North Eastern states could be sources of funding for developments in the North Eastern region.
- Given the disparities in UTD and RTD, the government may consider the following approaches:
 - For additional VPT provisioning, adopt a cluster approach to the spread of telecom services. For example, providing a “critical mass” of telecom access points in a specified geographical area, before spreading out to other areas could be considered. The “cluster” as a whole is likely to be more cost effective than equivalent expenditure on more spread out additional individual VPTs that may satisfy some equity consideration. In the long run, covering far flung areas would also have to be considered. This approach has been successfully adopted by Chile [Appendix 2]
 - The ADC regime needs to be phased out over a specified period of time or done away with. This would bring down the cost of services and generally make telecom services more affordable. There is no reason for MTNL to be a recipient of the ADC. If the ADC is continued, separate accounting for the services provided under this head should be kept.
 - There is a need to quickly develop an assessment system for rollout under the USOF. This could be done by third parties. This would help to the roll outs as per objectives and accelerate rural service provision. In addition, an assessment of the relative roll outs of rural DELS in those areas that are covered by USOF and those that are not, would help to determine, whether policy/regulatory interventions are required for facilitating roll out in the “uncovered” areas. These needs to be “concurrently” done with the roll out of the rural DELS under USOF.
 - The USOF Administrator/TRAI should make Quality of Service (QOS) parameters related to rural telecom services public. The USOF office collects this data for providing operational subsidy, if any. While, currently, the TRAI publishes QOS parameters for telecom service providers, it is available by different services (cellular, fixed line, ISP) in the license area. However, to provide visibility to rural telecom services, making rural QOS public would help.
- Public access needs to be given priority over private access.

- USOF Administrator and Office needs to be strengthened by adequate quality human resources.
- Ring fencing the USOF would help in easier and quicker disbursements.

5.0 State Level Initiatives

A number of state governments [<http://rajasthan.gov.in/itactionplan.pdf>, [http://www.gujaratindia.com/Initiative/Initiative2\(1\).pdf](http://www.gujaratindia.com/Initiative/Initiative2(1).pdf), <http://apts.gov.in/apswan.html>], had taken the initiative to provide state wide area networks connecting their state capitals to the district, sub-district and sometimes the village level administration. Such networks were designed by the respective state governments and often funded by the Department of Information Technology. These could provide a ready base from which to extend the connectivity to village level. While these networks have the potential to support provision to the village level, most of these networks were limited to the sub district level at the time of this writing. However, the current framework does not provide funding for USO as that is available only to existing licensed service provider

5.1 Recommendations

- There is a need to dovetail the resources of state governments, TRAI and private operators to enhance the capacity to roll out rural services [Jain and Raghuram, 2005].
- The USOF framework should provide for funding to multiple players (not only licensed operators) as long as they cover rural areas.

6.0 Internet and Broad Band Connectivity

Information and Communication Technologies (including the Internet) have the potential to facilitate access to development related and other information to the rural and poor communities that may otherwise be deprived. However, the huge resource requirements for enabling ICT access to rural areas, especially in developing countries has created a need to seek public private partnerships (PPP) as governments are resource constrained to support such large investments. From the government's and civil society perspective, such partnerships are important as ICTs are sources of information to rural citizens and information is increasingly being viewed as vehicle for development and for involving the rural citizen in the governance process . A growing body of practitioners and policy makers believe that information kiosks could act as catalysts in the development process by providing access to relevant content and access to public administrators for governance opportunities (e-governance). These could also provide a mechanism for public-private partnerships.

In addition, the rapidly falling costs and new developments in technology (for example, broadband networks, emerging wireless opportunities, especially Wi-Fi and WiMax) and deregulation has

created a scenario where rural connectivity may be cost effectively provided for development and e-governance.

In order to assess the significance of key factors that influence the provision of rural telecommunications (content development and issues related to broadband facility deployment, etc), we carried out four case studies in different states. These included Community Information Centers (Nagaland), n-Logue (Karnataka and Tamil Nadu), Grameen Sanchar Seva Organization (GRASSO), W. Bengal, and Akshaya (Kerala). The selected projects cover the different parts of the country, including the North East, a focus area for development. The projects had substantial spread in terms of the numbers of villages covered. All the selected projects had been instrumental in reducing the physical, social and business isolation. The projects use wireless technology, though the specific choices of technology was different (CorDect, WLL-CDMA, VSAT etc). These projects gave us an opportunity to study the issues of costs, training, vendor support, functioning under drastic conditions (heat, dust, erratic power supply). Other than GRASSO, all projects provided Internet connectivity and hence a variety of services including video transmission, access to doctors, veterinary services and agricultural extension like services.

6.1 Background of the Four Projects

CIC

The North Eastern states (NE) characterized by isolation from the mainstream, hostile terrain, and poor availability of power pose a challenge to any development effort, especially those related to (ICT). However, as a part of overall development plan for the NE that aims to reduce the isolation of these communities and mainstream them, the Department of IT (DIT), provided at least two Community Information Centers (CICs) per block in NE and Sikkim. The project objective was to address the basic needs of citizens such as information, education, entertainment and health services through the CICs. It was envisaged that the CICs would serve as a platform for e-governance, e-learning and other IT enabled services in the state.

The CIC project was and is a joint effort by DIT, the National Informatics Centre (NIC), and the state governments of the NE. Nearly 500 CICs had been set up as of July 2005 and it had been decided to extend the project to other parts of the country, beginning with J&K., primarily due to the similarity in terrain “current” status.

n-Logue Project

Incubated by the Tenet group, IITM, Chennai (www.tenet.res.in), n-Logue was set up as a company by Vishal Bharat Comnet, a trust set up by several IITM Chennai alumni and the IT industry. Tenet was an academic community led by Dr Ashok Jhunjhunwala, dedicated to developing appropriate and cost effective telecom technology solutions for developing countries. Its major contribution had been the development of an indigenous wireless solution based on an internally developed standard called corDECT. The specific design choices in implementing corDECT had helped to reduce costs.

Towards meeting the objectives of providing a total cost-effective system solution, TENET had incubated several companies such as Midas Communications, (<http://www.midascomm.com>)

which marketed the corDECT and other wireless solutions, Banyan Networks (<http://www.banyannetworks.com>) that developed the Remote Access Switching Internet Technology.

n-Logue’s mission was “to fulfill the need for Internet and voice services in every underserved small town and village in India”. It believed that the potential demand for Internet services in these areas was huge and largely unfulfilled. To prevent dilution of its focus, the company had chosen not to operate in any of the top 150 population centers in India.

GRASSO

Grameen Sewa Sanchar Organization (GRASSO) in West Bengal was an NGO. Its aim was to form a self-sufficient rural India empowered with self-employment schemes which generated income and wealth among the rural population. GRASSO intended to integrate dispersed rural resources to create an IT enabled distribution network to benefit the rural economy. It had plans to develop a powerful rural resources management system to transform the rural entrepreneurs and bring them into a successful operational network. The ultimate aim was to connect the rural economies not only within India but to the vast markets of the globe. GRASSO also aimed to provide other value added information and services to the villages. Under the phase described below, GRASSO collaborated with BSNL to take over management of its existing wireless in the local loop (WLL) (CDMA) network in rural areas.

Akshaya Project

The Akshaya project, under the Kerala government, was started on demand from the local self-governance (LSG) bodies at the village level. The LSGs were in turn responding to the need for exploring alternative employment opportunities for the people in Mallapuram district in Kerala, Mallapuram had the largest number of expatriates (mostly in gulf countries) amongst the districts in Kerala but ranked 3rd or 4th in terms of remittances, indicating that most people from this district were employed in lower value jobs abroad. Moreover, a few years back there was a pressure in the gulf countries to award these lower level jobs to their own citizens. This led the local bodies to think of alternative avenues for employment and IT training emerged as a possible alternative.

The LSG approached the Kerala State IT Mission (KSITM) for help. The KSITM decided to design and implement the request for training as a bigger and wider E-Literacy program called Akshaya covering a larger population and having a wider scope.

Table 4 gives the comparative analysis of the four projects in terms of the spread of the projects. Table 5 gives comparative information on the Management Structures, Infrastructure, Funding, Content Availability and Capacity Building.

Table 4: Spread of Projects

Project	Villages Covered	Districts/States

CIC	457	81/8
n-Logue	Nearly 2000	44/7
GRASSO	883	11/1
Akshaya	552	1/1
Total	3892	137/17

Table 5: Comparative Information on the Management Structures, Infrastructure, Funding, Content Availability and Capacity Building

Proj	Management Structure	Infrastructure	Funding	Content Available	Capacity Building
CIC	Department of IT/Local operator selection/	VSAT connectivity to Central servers	Department of IT	Internal, Not significant from users point of view	Initial training to operators
n-Logue	Three tier, n-Logue (private/NGO), Local service providers (district, sub district), operators at village	Backhaul national network, corDECT (local loop)	State governments, LSP, operators	Variety, Educational CDs, “Video conferencing” doctors, teachers, Tie up with Bhoomi, Support from n-Logue	Training of operators from n-Logue
GRASSO	Telco incumbent, GRASSO	Backhaul national network, wireless (CDMA)	Incumbent telco	N/A	GRASSO
<i>Akshaya</i>	<i>Local self government, State government</i>	<i>Backhaul national network, wireless in local loop(wi-fi)</i>	<i>Local self government, State government, Operators</i>	<i>State government, private initiative</i>	<i>State government</i>

6.2 Recommendations

- **Commercially Viability:** Although all the projects (other than GRASSO) were designed with a concept that revenues for the Telecentre would be generated from information services, initial viability is through voice services and computer training.
- **Involvement of Private Entities/Civil Society:** Projects that involved civil society/private entrepreneur (GRASSO, n-Logue, Akshaya) were more successful than those that were totally owned by government.
- **Capacity of Rural Entrepreneur:** Rural private enterprise had limited resources to manage the process of roll out of telecentres and their connectivity. Formalization of processes, systems, knowledge, coordination with financial institutions and regulatory agencies are skills and resources that may not be as easily available in the rural population. Involvement of public agencies, civil society was important to provide support in these areas.
- **Role of Civil Society or Intermediating Organizations:** Civil society or intermediating organizations play a catalytic role in bringing together rural private enterprise and the public administration. [Choudrie, 2003]
- **Removing Impediments to the Physical Growth of the Sector:** Government policies that focused on spectrum availability, both from a long term perspective and easing the process of spectrum allocation, reduction in duty of wireless equipment, alternative power availability were important for commercial viability.
- **Criticality of Backhaul Infrastructure:** Since backhaul infrastructure and/or interconnection cost was a significant component of service provision, support infrastructure through USO funds by separating infrastructure and service provision and mandating sharing/interconnection could help to bring down the cost of service provision.
- **Enhancing the Scope of USOF:** The eligible bidders for USOF are the UASL, cellular, and fixed service providers in their service areas. However, some of the Internet Service Providers (ISPs) such as n-Logue or projects such as Community Information Centers (CIC) that do not operate under the above mentioned licenses are helping in the spread of rural telecom services. These projects are not only helping to reach the rural penetration targets, but are also providing broadband connectivity. These could also be made eligible for USOF funding. These operators could be supported through the “Niche Operator” concept (elaborated later).
- **Accelerating Content Availability:** Existing government content could be wireless enabled as a first step. With the spread of mobile services, this content over SMS would be useful. For this the mind sets of policy makers and IT architects needs to change. Alternative service delivery devices should be a part of design.

7.0 Experiences from Other Countries

Internationally, a number of options have been used. Creation of a specific fund for meeting USO targets has become a popular mechanism in several countries. For example, in Malaysia, fixed and mobile network operators are required to pay 6% of their revenues to the USOF. While from 199-2002, the incumbent operator, Telekom Malaysia, only had access to these funds, from July 2002, other operators also have access to these funds, based on competitive bidding. The fund hoped to cover all under served areas at the cost of US \$ 200 million. In Uganda, the USOF comprises a 1% levy not only on telecom operators but also on postal and courier service operators. Appendix 3 gives the details of other such funds. In comparison, the Indian USOF is bigger and manages a more complex program in terms of providing for both private and public access, and covers both voice and data access (including high speed).

In Chile, the government set up a fund to manage the roll out in rural and under served areas. Appendix 2 gives the details of the fund and its management. In South Africa, the incumbent operator had the primary role and it was required to install 2.69 million new lines by 2002 (1.67 millions in under-served areas), and 1,20,000 pay-phone lines. Other telecommunication operators were required to pay an annual contribution to the USOF, which was created in 1996.

8.0 Summary

A number of factors working together contributed to the viability of rural telephone services. These included a) a reliance on market forces for determining location, bidders, and subsidies allocation, b) minimal regulation with respect to choice of technology and price, c) access charges that reflected costs, d) efficient processing of applications (concurrent allocation of spectrum), e) leadership and competence in managing the Fund, and f) provision of business opportunities to bidders.

However, in the Indian case, adequate thought was not given to the role of entrepreneur in selection of service areas and leveraging the business opportunities for their personal gain. The USO in India was not technology neutral, limiting the choices available to fixed and fixed wireless, prices were regulated to be below cost, further reducing commercial viability and office operations were not efficient for processing spectrum, as these were dealt with across different divisions. Though the corpus was significant, the deployments were insignificant. The implications for policy makers was that the USOF needed restructuring of business processes for enabling a single window clearance to the RSP, an able administrator, and leverage the role of private enterprise at the village level.

9.0 Conclusions

Accelerated provision of RTS is possible when the policies focus on enhancing commercial viability. Targeted policies at a more dis-aggregated level (than at the national level) are better suited. These need to take into account the socio economic profile of the geographic units. An incentive to operators for higher termination charges for rural calls makes such projects more commercially viable. There needs to be detailed implementation plan in terms of the appropriate management structures, processes and incentives for USOF disbursements as highlighted by the contrasting examples of India and Chile. Monitoring and review mechanisms can help identify early problems in large rural roll out programs.

Appendix 1: Growth of the Telecom Sector

	1997	2000*	2001*	2002*	2003*	2004*	2005*	2006*	<i>CAGR (%) 1997- 06</i>
GDP [^] (US \$ billion)	-	465	484	510	601	691	775	<i>Not available</i>	<i>10.76 (2000-05)</i>
Fixed Line Subscribers (in millions)	17.80	26.65	32.71	38.33	41.48	42.84	46.19	50.18	<i>12.21</i>
Cellular Subscribers (in millions)	0.88	1.90	3.58	6.54	13.00	33.69	52.22	90.14	<i>67.26</i>
Tele Density per 100 population	1.90	2.81	3.52	4.25	5.10	7.04	9.11	12.80	<i>23.61</i>

Source: www.itu.int, www.trai.gov.in

*: refers to figures as of April 1.

Appendix 2 Key Aspects of Chile's Telecommunication Development Fund[†]

The Chile's Telecommunication Development Fund is considered one of the most cost effective telecom support programs. It was largely financed by private parties; the total subsidy provided by the Fund amounted to 0.3% of the total sector revenue during that period. As of 2002, it was expected that only 1% of the population would be excluded from access, as compared to 15% when the fund started.

Selection of Projects

Project selection was participative, including from the village operator, regulator and regional authorities. Requests were clustered according to geographical proximity and technical solutions likely to be cost-effective, and carried out private and social cost-benefit analyses for each project. Projects that were unlikely to be commercially viable on their own were also added to the list.

The winning bidder was the one that offered the maximum subsidy. Any necessary radio authorizations were processed and granted concurrently on payment of an annual fee and no additional initial cost.

Pricing Regulation

Licensees were free to set the retail prices of all services, except for regional call charges from payphones for which maximum charges were defined in the tender documents for the full 10 years of required service. These maximum charges were subject to a fixed adjustment formula to reflect

[†] Largely excerpted from World Bank Discussion Paper No. 430, "Closing the Gap in Access to Rural Communications", Chile 1995-2002 by Björn Wellenius.

changes in wholesale prices, cost of labor, foreign exchange, and the corporate tax rate. The maximum retail charges from payphones were higher than for equivalent calls from urban payphones. Access charges were determined in terms of the costs of a hypothetical efficient rural operating company. The approach illustrated how efficient, roughly correct prices could be set quickly—without resort to mature cost accounts. The IRR for these projects varied between 16%-20%.

The pattern of usage showed that while, initially about 80 percent of regional calls went to the nearest town or city, but with the lowering of long-distance charges with increased competition, the long distance calls increased substantially. In addition to outgoing calls, rural payphones received a significant number of incoming calls, in some cases as much as one-half of outgoing calls, for which the operating company was paid access charges by the company originating this traffic.

Critical Success Factors

Market Based Framework

- *Reliance on market forces:* Bottom-up identification of demand led to more responsible outcomes. Information about the opportunity, timetable, and process to request payphones were disseminated by regional government officials with support from the regulator.
- *Competition for the market:* Competition was fueled by the incumbents' efforts to defend territories where it had a dominant presence as well as by newcomers trying to gain a foothold in local service that gave them direct access to end customers.
- *Subsidies allocated through the market:* Competitive bidding, least cost subsidies, economic analysis to select localities for which bids would be tendered in a particular round and the maximum subsidies to be made available for each project, led to more efficient outcomes.

Minimal Regulation

- *Freedom of business and technical choice.* Operators were free to design their business strategies and technologies.
- *Attractive licenses designed to encourage growth.* Bidders for payphone licenses and subsidies were encouraged to propose unregulated additional services, which would be included in the licenses although they were neither considered for bid evaluation nor eligible for additional subsidy. The licenses also included access to scarce radio frequencies at no additional initial cost.
- *Limited price controls.* Rural operators were free to set all prices for their services except for payphone call charges within the primary calling area (fixed for 10 years in the license) and for interconnection charges (fixed for 5 years in a separate tariff decree).

- *Cost-reflective access charges.* Rural operators were allowed to levy access charges on incoming calls that were significantly higher than those paid to urban companies reflecting higher investment and operating costs of rural service.

Simple and Relatively Fast Processing

- *One-stop process.* The Fund offered the opportunity to obtain operating licenses and at the same time gain access to scarce radio frequencies, all significantly faster and with less paper work than the standard existing procedures.
- *Recurrence.* The Fund held seven consecutive rounds between 1995 and 2000, with the process and rules largely unchanged. This built up experience and trust, and reduced the cost of organizing and participating in successive rounds.

Competence and Leadership

- *Leadership.* Effective and sustained leadership was demonstrated by senior government officials who conceived the Fund, shepherded enabling legislation, and oversaw initial implementation until the program was well established.
- *Competence.* Minimal but competent and dedicated staff ran the program day to day. Local consultants helped develop, apply, and update the engineering models and cost-benefit analyses.

Appendix 3: Details of International Universal Service Funds

Country	Fund Status	Funding Source	Fund Administrator	Disbursement of Funds
Argentina	Planned	1% of all operators' gross revenues	Operators (virtual fund)	Government to determine based on its goal to increase fixed teledensity to 0.35 and mobile teledensity to 0.20
Brazil	Operational	1% of service providers' gross operational revenues earned from the provision of telecom services	Anatel, regulatory agency	-
Chile	Operational	Government's budget	Subtel, regulatory agency	Subsidies distributed through competitive bidding (lowest bid wins)

Country	Fund Status	Funding Source	Fund Administrator	Disbursement of Funds
Colombia	Operational	5% of national and long distance operators' revenues plus funds from license fees	Ministry of Communications	Subsidies distributed through competitive bidding (lowest bid wins)
Ghana	Planned	1% of fixed operators' net revenues	-	-
India	Operational	5% of all operators' revenues	DoT, Department of Telecommunications	-
Malaysia	Operational	Fixed and mobile network operators contribute 6% of their weighted revenue from designated services to the Fund	Malaysian Communications and Multimedia Commission (CMC), regulatory agency	During interim period (1999 to 2002), Telekom Malaysia was the only operator with access to funds. Starting July 2002, other operators were invited to submit proposals for USP and be compensated from the fund through a competitive process. The CMC's goal for 2004 is to connect 84 unserved areas at a cost of over US\$ 200 million.

Source: Universal Access Funds, Intelcon Research
(www.intelecon.research.com/pdf/ua%20funds%202004%20update)

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