

PART II ACCELERATING RURAL TELECOM PENETRATION: A STATE LEVEL ANALYSIS⁴

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INTRODUCTION

Regulatory and technological changes in the recent past have resulted in tremendous growth in teledensity. Total teledensity between 1998 and 2005 grew from 1.9 per cent to 9.08 per cent. Urban teledensity (UTD) increased from about 6 per cent to 26 per cent, but rural teledensity (RTD) increased from 0.4 per cent to about 2 per cent only in the same period. Here we suggest a framework for targetting of policy options, understanding of the nature of demand and perceived benefits of rural telecom services for prioritizing rollout and structuring of the Universal Service Obligations Fund. This research seeks to identify attributes that should determine policies related to rural telecom across and within states.

We examined trends in RTD growth at the state level and related them to the state level development parameters such as (i) fixed line UTD, (ii) literacy rates, (iii) rural literacy rates, (iv) rural income per capita, and (v) percentage of rural population. We also examined consumption patterns across states to understand the nature of rural demand in relation to telecom services and supply side policies such as lower rentals that are likely to drive growth trends with its possible implications of rural demand.

FIXED LINE TELECOM DENSITY IN STATES

States were categorized on the basis of RTD, to examine if there were common characteristics that contributed to their classification in a particular group and understand the relationships among the development parameters and their possible influence on RTD. Over five years of the study, all the states witnessed improvements in rural telecom density at varying rates, resulting in the national average teledensity rising from 0.65 per cent to 1.58 per cent. The CAGR (excluding states where appropriate data was not available) nationally was 19.44 per cent during 2000 to 2004.

There were large variations in RTD across different states during 2000 to 2004 (Table 4.2.1). Kerala, Andaman and Nicobar (A&N), and Himachal Pradesh (HP) had the top three RTDs of 8.45 per cent, 8.36 per cent, and 5.50 per

cent respectively while Jharkhand, Chhattisgarh, and Uttar Pradesh (UP) had the lowest RTDs at 0.46 per cent, 0.47 per cent and 0.48 per cent respectively. There were certain discrepancies in the data as highlighted in notes to the Table 4.2.1.

A review of the RTDs facilitated state groupings as presented in Figure 4.2.1. There exist four 'natural' categories. These are states having high (over 4 per cent), medium (those having from 2 per cent to 4 per cent), low (those having more than 0.9 per cent to 2 per cent) and poor RTD (below 0.9 per cent).

We examine the RTDs with respect to the following developmental parameters: (i) fixed line UTD, (ii) literacy rates, (iii) rural literacy rates, (iv) rural income per capita, and (v) percentage of rural population, category wise in Table A4.2.1.

Category 1: 'High' RTD States

Kerala, A & N, HP, and Punjab fall in this category. The UTD in this category was 73.0 per cent above the national average. HP had a UTD which was 241.5 per cent above national average and Punjab had the lowest UTD, but even this was 45.8 per cent above average. The literacy rate was 25.3 per cent above average. While Kerala had the highest literacy rate of 40.3 per cent above average, the same for Punjab was 7.6 per cent above average. The rural literacy rate in these states was 66.4 per cent above average, showing higher correlation of rural literacy rates with RTD than with overall literacy rates. Kerala had the highest rural literacy rate at 107.8 per cent above average, while Punjab, which ranked the lowest, had a rural literacy rate of 19 per cent above average. Rural per capita income was 30.2 per cent above average for these states, showing a correlation between higher RTD and rural per capita income. Punjab had 68.1 per cent above average, while HP and Kerala were 9.9 per cent and 5.1 per cent above average only. The relationship between RTD and SDP/capita showed SDP/capita 20.9 per cent above average for this group—the difference between Punjab, HP and Kerala was not pronounced for this parameter being at 16.9 per cent, 12.6 per cent and 12.1 per cent above average respectively. The percentage of rural population was 0.3 per cent above the national average. While HP had a rural population 24.9 per cent above average, Punjab had 8.5 per cent below average rural population.

⁴This is an abridged version of the report to the Department of Telecom (DOT) (sponsored by World Bank) on policy and regulatory options for Accelerated Rural Telecom Services submitted in April 2005.

Table 4.2.1
State-wise Fixed Line RTD with CAGR

Sr. No.	States/UTs	RTD as on 31st March (%)					CAGR (%)
		2000	2001	2002	2003	2004	
1	Kerala	3.84	5.05	6.59	7.75	8.45	17.09
2	A&N Islands	4.63	6.18	6.97	7.72	8.36	12.54
3	HP	2.95	3.76	5.05	5.42	5.50	13.27
4	Punjab	1.88	2.70	4.10	4.55	4.74	20.32
5	Gujarat	1.07	1.48	2.09	2.48	2.53	18.78
6	Haryana	0.93	1.40	2.00	2.33	2.43	21.18
7	Karnataka	1.26	1.79	2.13	2.35	2.38	13.56
8	Andhra Pradesh	0.96	1.47	1.83	2.02	2.31	19.20
9	Maharashtra	0.95	1.33	1.87	2.15	2.29	19.24
10	Tamil Nadu	0.51	0.49	0.46	2.01	2.17	33.59
11	Uttaranchal	NA	2.09	1.13	1.29	1.47	NA
12	Rajasthan	0.59	0.81	1.15	1.27	1.36	18.18
13	North East	0.81	0.56	0.79	0.89	1.08	NA
14	West Bengal	0.34	0.51	0.75	0.89	0.95	22.81
15	Orissa	0.35	0.49	0.72	0.87	0.94	21.85
16	Madhya Pradesh	0.51	0.41	0.50	0.57	0.69	6.23
17	Jammu & Kashmir	0.10	0.13	0.23	0.53	0.63	44.50
18	Assam	0.20	0.25	0.39	0.50	0.56	22.87
19	Bihar	0.17	0.22	0.38	0.49	0.51	24.57
20	UP	0.21	0.25	0.40	0.57	0.48	NA
21	Chhattisgarh	NA	0.20	0.28	0.40	0.47	NA
22	Jharkhand	NA	0.20	0.30	0.41	0.46	NA
	India	0.65	0.90	1.22	1.49	1.58	19.44

Source: BSNL Internal Documents.

Notes:

a) NA: not available.

b) Highlighted areas indicate discrepancies of reducing teledensity.

We had sought clarification from BSNL. These are provided below:

1. In respect of Bihar and Madhya Pradesh, formation of Jharkhand and Chhattisgarh states in 2001 has contributed for the distortions.
2. The correct population figures for the year 2000 for North East are not available. The telephone connections have shown ~25 per cent growth in absolute terms. The tele-density figures may perhaps be revised backwards.
3. In Tamil Nadu there was re-organization of rural/urban areas.
4. The discrepancies for UP and Uttaranchal could not be explained.
5. No explanation for Gujarat was provided and the figures were stated to be correct.

Category 2: States with 'Medium' RTD

Gujarat, Haryana, Karnataka, Maharashtra, and AP fall in this category. The UTD in these states was 8.6 per cent above average while Haryana had a UTD which was 35.3 per cent above average, TN had a UTD that was just 0.18 per cent above average. The literacy rates of the category was 7.6 per cent above average, Maharashtra had the highest literacy rate which was 18.7 per cent above average, whereas AP had the lowest literacy rate of 6.6 per cent below average. The rural literacy rate of the category was 10.7 per cent above average, showing higher correlation of rural literacy rates with RTD than with over all literacy rates as was the case with category 1 states. TN had the highest rural literacy rate while AP had the lowest,

which was 19.8 per cent below average. The rural income per capita was 25.1 per cent above average for this category, which for Haryana is 50.9 per cent above average and Gujarat a close second at 48.1 per cent above average. For AP rural per capita income is lowest for the category at 12.1 per cent above average. The relationship between RTD and SDP/capita was stronger than category 1. Maharashtra had the highest SDP/capita at 38.8 per cent above average. Haryana, Gujarat, and TN are 35.3 per cent, 29.3 per cent, and 25.9 per cent above average respectively, while AP is 2.6 per cent below average value. The percentage of rural population was 12.3 per cent below the national average for the group. TN, Maharashtra and Gujarat are 22.3 per cent, 20.2 per cent

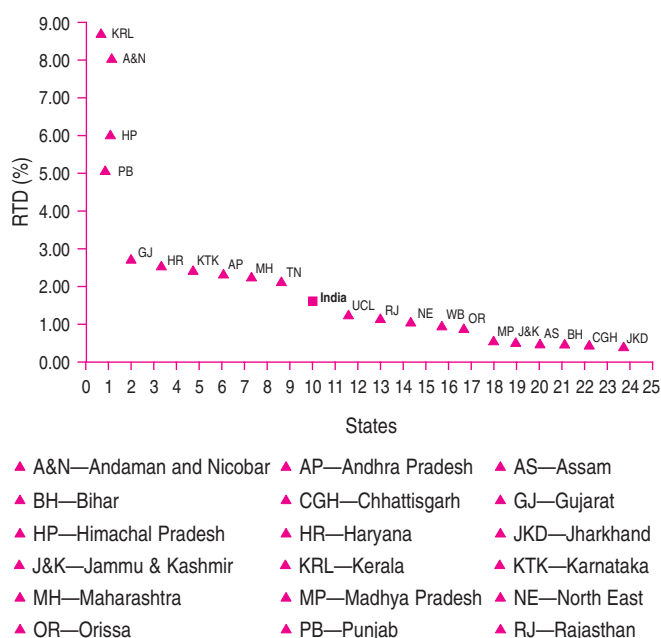


Fig. 4.2.1 States by Rural Tele-density (2004)

and 13.3 per cent below the national average in terms of percentage of rural population.

Category 3: States with 'Low' RTD

Uttaranchal, Rajasthan, NE, WB, and Orissa comprise this category⁵. The UTD of this category was 10.6 per cent below average. The literacy rates for this category were 0.8 per cent above average, with Rajasthan having the lowest value in this category at 6.8 per cent below average. The rural literacy rate of the category was 4.8 per cent below average. Rajasthan had the lowest rural literacy rates at 34.9 per cent below average. The rural income per capita was 11 per cent below average, with Orissa at 42 per cent below average and Rajasthan, 8.6 per cent above average. The SDP/capita in this category was 19.7 per cent below average. WB had the highest SDP/capita, but that was 7.8 per cent below average. Orissa had the lowest SDP/capita, at 44 per cent below average. The percentage of rural population was 5.7 per cent above the national average. WB had the lowest percentage of rural population (0.3 per cent below average) and Orissa had the highest percentage (17.7 per cent above average).

Category 4: States with 'Poor' RTD

MP, J&K, Assam, Bihar, UP, Chhattisgarh, and Jharkhand fall in this category. The UTD of these states was 26.1 per cent

below average substantially lower than category 3 states. While Assam had a UTD which was 3.8 per cent above average, Chhattisgarh had a value 42.47 per cent below average. MP, Jharkhand and Bihar also had very low values at 37.4 per cent, 30.9 per cent and 28.5 per cent below average. The literacy rates for this category were 13.3 per cent below average, with Bihar having the lowest value in this category at 27.5 per cent below average. In terms of the rural literacy rate, the category average was 21.2 per cent below average. Bihar had the lowest rural literacy rates at 27.8 per cent below average. The rural income per capita was 26.8 per cent below average for this category, with UP at 31.5 per cent below average and Assam 12.9 per cent above average. The SDP/capita in this category was 47 per cent below average. MP had the highest SDP/capita in the category, but that was 29.3 per cent below average. Bihar had the lowest SDP/capita, at 69 per cent below average. The rural population was 12 per cent above the national average. MP had the lowest percentage of rural population (1.5 per cent above average) and Bihar had the highest percentage (24 per cent above average).

Quantitative Analysis of Effect of Development Parameters on RTD

Further analysis was done using simple and multiple regressions to quantify the effects of the various causal development parameters on RTD.⁶

In the single variable model, UTD was the most significant driver of RTD, followed by rural literacy. The multiple regression models showed that rural per capita income and the UTD were more significant. It was possible that rural literacy was related to rural per capita income which in turn could be a determinant of RTD. It also appears that some of the variables, after a threshold value would have multiplier effect on the growth of telecom services. This model could help in sequencing roll outs by relating the influence of rural literacy, UTD, or rural per capita income on RTD.

LINKING CONSUMPTION PATTERNS TO TARGET POLICIES

The fact that the number of mobile subscribers worldwide was far greater than fixed line subscribers, despite the higher call rates, seems to indicate that customers are willing to pay for service they value. In India too, though mobile growth has been fuelled by urban subscribers, increasingly, demand for handsets and services in rural areas indicates a willingness to pay.

⁵Some of the data was not available for category 3 and 4 states.

⁶The details are available on request from the authors.

A study by A.C. Nielsen indicated that about 9 million families belonged to the more affluent class R1+R2+R3A⁷ and comprised nearly 22 per cent of the rural families.⁸ Also, that the basket of items of consumption for urban and rural users was similar for certain categories of rural users. The increase in spending on telecom services in urban areas could also be expected to replicate in affluent rural categories. A state level analysis of top 20 per cent of the rural population ranked according to the level of consumption helped us to estimate the state level demand.

The middle class in rural areas comprising 112.8 million people has an annual consumption of Rs 10,309 per capita compared to 128.3 million in urban areas with an annual per capita consumption of Rs 14,513 (Sen, 2004). The consumption patterns of the top20 (representing the top 20 per cent of the population by consumption) at the state level are quite diverse and their annual per capita consumption expenditure shows wide variations (Table 4.2.2).

The rural top20 having an above national average consumption comprises nearly 50 million people across different states. (For UP, the average consumption level for top 20 was slightly lower than the national average of Rs 10,309. We took one third of this category as the relevant category. This comprised nearly 7.6 million people.) Relating this distribution to the RTD categorization we find that even in states that had lower RTD and per capita income, there were segments where telecom services could become commercially viable. If low RTD was associated with specific pockets within states that displayed higher consumption levels, then, it may be an indicator of lack of supply rather than that of demand. However, a supply driven approach would need to be adopted for the large number of rural areas that had poor telecom services and low ability to pay.

PRICE REGULATION AND ITS EFFECT ON DEMAND

Registration charges, rentals, and cost per call have been identified both by the government and independent studies as important determinants of rural people's acquisition and usage of a telephone (Rao and Kumar, 2000). A policy initiative of keeping registration fee for rural areas lower than in urban areas has been taken. The government's policy has been adopted by TRAI, so that while it has foreborne on regulating both cellular and fixed service tariffs in urban areas, it also regulates

⁷The Rural Sector is divided into SEC R1, R2, R3, R4 (calculated as a function of Educational Qualifications of the Chief Wage Earner and the type of the household he/she stays in—Pucca, Semi Pucca or Kaccha). Someone with a professional degree living in a pucca house will come in R1 category and an illiterate living in a kutchra house will be classified as R4 (Source—FICCI Press Release September 9, 2005).

⁸*Business Today* January 30, 2005.

Table 4.2.2
The Indian Middle Class: Where does it Live?

States	Average Monthly per Capita Consumption Expenditure (Rs)	Number of Persons (millions)	Annual per Capita Consumption Expenditure (Rs)
Kerala rural top20	1,448	3.9	17,376
Punjab rural top20	1,295	2.7	15,540
Haryana rural top20	1,218	2.5	14,616
TN rural top20	950	5.8	11,400
Gujarat rural top20	948	5.3	11,376
Maharashtra rural top20	893	9.3	10,716
Rajasthan rural top20	884	7.2	10,608
Karnataka rural top20	864	5.8	10,368
UP rural top20	815	23.0	9780
AP rural top20	789	9.2	9468
WB rural top20	757	9.6	9084
Punjab rural mid40	712	5.4	8544
Kerala rural mid40	711	7.9	8532
Haryana rural mid40	693	5.0	8316
MP rural top20	684	10.2	8208

Source: The Hindu Business Line, Saturday, January 22, 2005.

rural tariffs. The registration fees had been lowered from Rs 3000 to Rs 1000 in 2000 and further to Rs 500 in 2004. The rentals for rural areas were lower than those for urban areas. These have also been reduced from the earlier Rs 70⁹ in 1999 to Rs 50 in December 2004. This has boosted rural demand as shown by the increasing rural DELs since 2000 (Figure 4.2.2). Although lowering the price boosted rural demand, the competitive pressure from mobile telephony led to reduction in incremental demand of DELs after 2000–1. Moreover, the reduction in charges led to a wider viability gap, making rural telecom unattractive for the BSNL.¹⁰

Another policy initiative was lowering local call charge (in relation to such calls in urban areas) and the increasing distance over which local call charges were applicable. This substantially increased the differential between the costs of travelling to a neighbouring village vis-à-vis a call, thus boosting demand for telecom services (Rao and Kumar, 2000).

⁹The rental depends on the category of exchange. Higher rentals are linked to higher capacity exchanges. This is the lowest rental.

¹⁰BSNL captured the demand by rolling out mobile telephony under the brand name 'One India' since 2001–2.

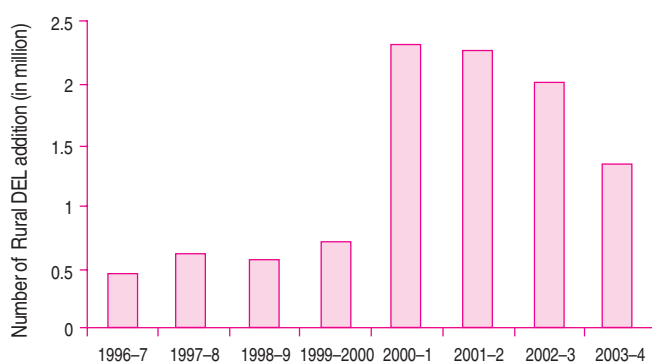


Fig. 4.2.2 Rural DELs additions

Source: TRAI (2004).

IMPLICATIONS AND RECOMMENDATIONS

Even though the DoT had targets for increasing RTDs at the national level, the outcomes were extremely uneven across states. The analysis helped to disaggregate the state level RTD by socio-economic attributes rather than based on geographic (for example hill states or by regions (north, south, east, west) or administrative considerations alone. For example, the analysis shows that within hill states, HP falls within the high RTD category, whereas all other states fall within the low or poor category RTD states. The analysis shows that UTD, rural literacy rate, and rural income per capita, were important determinants of RTD. This has implications for future deployments of USOF, in terms of prioritizing investments.

This implies that USOF, TRAI and DoT may want to *focus on specific states, rather than overall RTD targets*. While on one hand, the focus should continue to be on states that had achieved higher than average RTD, as due to the network externalities, smaller investments could lead to substantially higher demand, a significant part of which could be commercially viable.

The states that were consistently (50 per cent or more) below average such as Assam, Bihar, J&K, UP, MP, Chhattisgarh, and Jharkhand require *sustained development focus if the disparities of RTD were to substantially decrease*. Even within low RTD states, areas with higher growth potential driven by rural consumption should be targeted to ensure greater commercial viability.

The USOF needs to take into account the factors that drive demand in formulating its guidelines. For example, *adopting a 'cluster' approach would require it to focus on sequencing of roll out*. The USOF examines both cost and revenue data for support and to that extent incorporates the demand profile. New technological options have the potential to fundamentally change the demand profile and institutional support for further work on such technologies is called for. There was a requirement to explicitly focus on how the government would provide the policy framework to enable wireless broadband in the rural areas. While TRAI has requested that rural broadband access be considered for Universal Service Obligation (USO), the Broadband Policy 2004 does not make specific mention of this.

Another important decision point relates to pricing in rural areas vis-à-vis urban areas. This would have a bearing on network growth and financial sustainability of rural operators. Many countries have geographically averaged tariffs that is tariffs were not differentiated by different geographic areas. In India, choice had been made to keep tariffs low in rural areas. This was one of the factors that may make rural telecom unviable. In Chile, operators were free to decide rural tariffs for individual connections and rural payphone tariffs had been kept higher than in urban areas. Given that providing rural communications was more expensive than providing urban communication, experts working in developing countries now argue that regulators *should consider allowing rural operators to charge their customers more for the service*.

APPENDIX

Table A4.2.1
Category-wise RTD with Respect to Development Parameters

Sr. No.	States/UTs (1)	RTD (%)		Fixed UTD (%)		Literacy Rate (%)		Rural Literacy Rate* (%)		Rural Income Per Capita		SDP Per Capita		Rural Population (%)	
		Value (2)	Average (3)	Value (4)	Average (5)	Value (6)	Average (7)	Value (8)	Average (9)	Value (10)	Average (11)	Value (12)	Average (13)	Value (14)	Average (15)
Category 1: High RTD Rates															
1	Kerala	8.45	434.8	17.71	61.7	90.9	40.3	77.0	107.8	10.3	5.1	12.1	4.3	74.0	2.5
2	A&N Islands	8.36	429.1	19.07	74.2	81.3	25.5	57.4	54.9	NA	NA	NA	NA	67.3	-6.8
3	HP	5.50	248.1	37.40	241.6	76.5	18.1	51.6	39.4	10.8	9.9	12.6	8.6	90.2	24.9
4	Punjab	4.74	200.0	15.96	45.8	69.7	7.6	44.1	19.0	16.5	68.1	16.9	45.7	66.1	-8.5
	Average	6.72	325.3	18.95	73.0	81.2	25.3	61.6	66.4	12.8	30.2	14.0	20.9	72.5	0.3
Category 2: Medium RTD Rates															
5	Gujarat	2.53	60.1	12.10	10.5	69.1	6.6	44.0	18.8	14.6	48.1	15.0	29.3	62.7	-13.3
6	Haryana	2.43	53.8	14.84	35.5	67.9	4.8	40.1	8.3	14.9	50.9	15.7	35.3	71.0	-1.7
7	Karnataka	2.38	50.6	11.79	7.7	66.6	2.8	39.4	6.5	11.3	14.8	13.1	12.9	66.0	-8.6
8	AP	2.31	46.2	11.39	4.0	60.5	-6.6	29.7	-19.8	11.0	12.1	11.3	-2.6	72.9	1.0
9	Maharashtra	2.29	44.9	12.18	11.2	76.9	18.7	45.4	22.7	11.8	19.6	16.1	38.8	57.6	-20.2
10	TN	2.17	37.3	10.97	0.2	73.5	13.4	47.1	27.1	12.9	30.9	14.6	25.9	56.1	-22.3
	Average	2.33	47.4	11.89	8.6	69.7	7.6	41.0	10.7	12.3	25.1	14.2	22.5	63.3	-12.3
Category 3: Low RTD Rates															
11	Uttaranchal	1.47	-7.0	15.78	44.1	71.6	10.5	NA	NA	NA	NA	NA	NA	74.4	3.0
12	Rajasthan	1.36	-13.9	10.24	-6.5	60.4	-6.8	24.1	-34.9	10.7	8.6	9.2	-20.7	76.6	6.1
13	North East	1.08	-31.6	10.23	-6.6	69.3	6.9	42.1	13.6	NA	NA	NA	NA	78.2	8.3
14	WB	0.95	-39.9	8.25	-24.7	68.6	5.9	41.0	10.7	8.8	-10.7	10.7	-7.8	72.0	-0.3
15	Orissa	0.94	-40.5	11.03	0.7	63.1	-2.6	37.6	1.7	5.7	-42.0	6.5	-44.0	85.0	17.7
	Average	1.10	-30.4	9.81	-10.4	65.3	0.8	35.2	-4.8	8.8	-11.0	9.3	-19.7	76.3	5.7
Category 4: Poor RTD Rates															
16	MP	0.69	-56.3	6.85	-37.4	63.7	-1.7	28.5	-23.0	7.1	-28.1	8.2	-29.3	73.3	1.5
17	J&K	0.63	-60.1	10.61	-3.1	55.5	-14.4	NA	NA	NA	NA	NA	NA	75.1	4.0
18	Assam	0.56	-64.6	11.37	3.8	63.3	-2.3	39.2	6.0	11.1	12.9	6.6	-43.1	87.3	20.9
19	Bihar	0.51	-67.7	7.83	-28.5	47.0	-27.5	26.7	-27.8	7.0	-29.1	3.6	-69.0	89.5	24.0
20	UP	0.48	-69.6	8.30	-24.2	56.3	-13.1	29.1	-21.5	6.7	-31.5	6.6	-43.1	79.2	9.7
21	Chhattisgarh	0.47	-70.3	6.30	-42.5	64.7	-0.2	NA	NA	NA	NA	NA	NA	79.9	10.7
22	Jharkhand	0.46	-70.9	7.56	-31.0	53.6	-17.3	NA	NA	NA	NA	NA	NA	77.8	7.7
	Average	0.53	-66.5	8.09	-26.1	56.2	-13.3	29.2	-21.2	7.2	-26.8	6.1	-47.0	80.9	12.0
23	All India	1.58		10.95		64.8		37.0		9.8		11.6		72.2	
	Average														

Source: Columns (2) and (4) – BSNL Internal Documents, Column (10) - Indian Market Demographics Report reported in 'The Nature of Rural Infrastructure: Problems and Prospects' by Suman Bery, D.B.Gupta, Reeta Krishna and Siddhartha Mitra, Introductory chapter of the Indian Rural Infrastructure Report, Columns (6), (12) and (14) – www.censusindia.com, Columns (3), (5), (7), (9), (11), (13) and (15) – Author's Analysis.

Notes: NA: not available.

Categories are as per the text and Figure 4.2.1.

* Literacy Rate, Rural Income Per Capita, Per Capita SDP and Percentage Rural Population are based on data from Census India 2001. Rural literacy rate has been calculated by us based on data from Census India 1991.

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