INFRASTRUCTURE
IN THE NORTH EASTERN REGION OF INDIA

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Broadly speaking, infrastructure means the stock of fixed capital (inclusive of equipments) in an economy, viz. factories, roads, schools, etc. considered as determinant of economic growth. Unlike other inputs of production whose magnitude vary with the magnitude of output and thus they are accounted for in the variable cost, infrastructure does not, by and large, vary with the magnitude of production unless the scale of production changes or the technology of production is altered. Thus for a given technology (or a set of technology) and scale of production (or the scale of an economy), infrastructure is fixed. When the scale of an economy (or production activity) or the technology of production changes substantially, given infrastructure may be utterly inadequate so as to drastically limit the scale of operation, augmentation in the stock of fixed capital takes place or the infrastructure is suitably developed to fit in the technology of production. This type of change may be termed as adjustment to "imbalance due to excess of directly productive activities" or adjustment to "imbalance due to shortage of infrastructure". Infrastructure development is usually a step function over time in which the cycle of "expansion - shifting of the production possibility curve to the right - under-utilization - optimum utilization - over-crowding - diseconomies of scale - expansion" is observed.

Depending upon the criterion of ownership (whether private or public/social), infrastructure may be classified into: (i) social infrastructure or social overhead capital and (ii) private infrastructure. In an economy, there are many instances of the first, like roadways, ports, railways, power network, universities, colleges and schools, hospitals, and so on that are publicly owned. There may be instances of roadways, schools, colleges, hospitals, etc. owned by individuals also.

Depending upon the function, infrastructure may be classified into the following broad categories:

i. Transport and communication infrastructure, viz., roads, railways, ports, post offices, telephone exchange and network, etc.

ii. Power infrastructure including power generation station, power line network, etc.

iii. Agronomic and Agro-marketing Infrastructure, like the system of canals, tube wells, Soil testing laboratories, fertilizer distribution points, HYV seed distribution shops, warehouses and cold storage facilities, etc.

iv. Industrial infrastructure, like factories, etc.

v. Marketing Infrastructure or the system of warehouses, etc.

vi. Financial Infrastructure, like the network of various branches of financial institutions, development banks, commercial banks, etc.

vii. Administrative and judicial Infrastructure like the network of police stations, law courts, administrative departments, etc.

viii. Educational Infrastructure, like the network of schools, colleges, universities, libraries, etc.

ix. Health Infrastructure, like the network of dispensaries, hospitals, etc.

x. Research and Exploration Infrastructure like geological, zoological, botanical survey machinery and stations, satellites, computer centres, etc.

In studying the role of infrastructure in development of a region and assessing the effectiveness of infrastructure in pushing the production possibility frontier upwards, the question of balance in infrastructure is very important. Various types of infrastructure must be commensurate with each other so as to produce optimal results. If the transport network is well developed, but side by side other types of infrastructure are deficient, one cannot expect optimum results.

A. TRANSPORTATION INFRASTRUCTURE

A greater part of the total area of the North-Eastern Region is hilly and undulating resulting into low density of population on the one hand and low per area production of merchandise on the other. Location of human settlements is sparse and the population size of settlements is smaller on an average. In such a terrain railways cannot connect all areas cost-effectively. Consequently, roadways are the major infrastructure for transportation. As it may be seen from table 4, there are no railway routes in Arunachal Pradesh, Manipur, Meghalaya, and Mizoram. Tripura and Nagaland have railway routes in their plain areas. However, Assam has a substantial length of railway routes. Of late, a substantial length of meter gauge tracks has been converted to the broad gauge tracks in Assam.

It is to be noted here that although the railways are initially costlier while the routes are being laid down, in the long run it serves as the cheapest and perhaps the most efficient means of transportation with its far-reaching impacts on the economy of the area. The long run cost of railways as the transportation infrastructure is much less than the roadways infrastructure. Moreover, railways are more environment-friendly than roadways since vehicles on the roads burn much more fuel per volume of the traffic.

The region had 1.17 lakh kms of road length in 1992, out of which 0.31 lakh kms was surfaced, making up about 26 percent (ratio of surfaced road length to total road length) against 50 percent in India. This feature is largely due to the topography of the region.

Motorable road length as percentage to total road length in the region is about 63 (against 84 in India), again largely due to the topographical features of the region.

Due to sparse location of settlements and undulating topography, road density in the region is relatively lower (46 kms per 100 sq. kms of the area) than that in the country (63 kms per 100 sq. kms). However, due to low density of population, the road length per thousand population is larger 3.73 kms) than that in the country (2.44 kms). Economically, this leads to the higher cost of transportation for people and commodities both.

The number of vehicles on the roads in the region has been increasing at a very fast rate. During the period 1981-91, the number of trucks has increased by an exponential rate of 15 percent per year while the number of buses and small four-wheelers have increased by (approximately) 11 percent per year. This shows that the demand for transportation of commodities has grown much faster than the demand for movement of people. There has been a spectacular growth of three-wheelers and two-wheelers on the road (at exponential annual rates of 25 and 24 percent respectively).

As for the individual states in the region, Nagaland has experienced a very steep growth in the number of trucks (30 percent annual) followed by Meghalaya (18.6 %) and Assam (16 %). The number of four-wheelers has increased very fast in Nagaland, Mizoram and Meghalaya. The number of buses has increased at a very high rate in Manipur, Meghalaya, Mizoram, Nagaland and Arunachal Pradesh.

Table 1: Road Length in the NER (in KMs)

State	Total Road Length			Surfaced Road Length			Blacktop	Macadam
	1979	1989	1992	1979	1989	1992	1989	1989
Ar. Pr	11553	14950	7520	2396	5550	2496	1537	859
Assam	56983	35129	68913	8396	5534	10841	7387	987
Manipur	8842	7878	6765	1520	4110	2741	660	860
Megh.	3690	5624	7832	1475	3110	2931	1429	113
Mizoram	2916	4850	3708	1086	1760	1268	1086	0
Naga.	5785	8656	8805	1392	1948	6842	1379	13
Tripura	7836	6873	13008	1220	3693	4448	851	369
NER	96605	81960	116551	17485	25705	31567	14329	3101
India	1604110	1554204	2065209	623402	731132	1043365	377405	236144

The characteristic feature of transportation in the region is in its being costlier in terms of money, time and continuity. The main reason for this lies in the topographical features of the region, though the proximate reasons are lower volumes of traffic including men and merchandise both. This cost is ultimately reflected in the prices of commodities and the cost of living as well as the wage rate which are generally higher than elsewhere and varying substantially at different locations, introducing a substantial degree of imperfection in the commodity and factor markets. This imperfection in the commodity and the factor markets is ultimately reflected in the higher margins of profits on almost

all merchandise traded in the region. However, it is not warranted to conclude that relatively higher margins of profits and the higher prices and wage rates in the region are accountable to costlier transportation alone. There are indeed other factors contributing to them, though the cost of transportation is one of the significant factors. Imperfection in commodity and factor markets has its other ramifications also.

Table 2: Road Density and Per capita Road Length in the NER

State	Road per 100 Sq. Kms			Road per 000 Population			Motorable Road length (%)
	1979	1989	1992	1979	1989	1992	
Ar. Pr.	13.82	17.85	8.90	21.43	23.66	8.74	43.20
Assam	72.59	44.79	87.80	3.19	1.77	3.09	64.90
Manipur	39.47	26.33	30.30	7.15	4.14	3.70	72.30
Meghal.	16.40	25.07	34.90	3.17	4.21	4.45	98.56
Mizoram	13.82	22.99	17.60	7.48	9.82	5.37	100.00
Naga.	35.06	52.21	53.10	10.11	11.17	7.21	96.30
Tripura	74.63	65.46	124.10	4.37	3.35	4.74	68.87
NER	38.28	32.13	45.69	4.14	3.08	3.73	63.03
India	48.90	47.24	62.60	2.54	2.27	2.44	83.81

* For the year 1989.

Table 3: Railway Route length in the NER (in Kilometers)

State	Broad Gauge		Meter Gauge		Narrow Gauge		Total	
	1981	1991	1981	1991	1981	1991	1981	1991
Ar. Pr.	-	-	1	-	-	-	1	-
Assam	266	105	2200	2089	-	-	2467	2194
Manipur	-	-	1	-	-	-	1	-
Mizoram	-	-	2	-	-	-	2	-
Nagaland	-	-	9	9	-	-	9	9
Tripura	-	-	45	12	-	-	45	12
NER	266	105	2259	2110	-	-	2525	2216
India	24879	30000	23419	25600	4068	4500	62366	60100

Table 4: Percentage of Railway Route Length to Black Top Road Length in the NER (1989)

State	Ar.P	Assam	Mani	Megh	Miz	Nag	Tri	NER	India
Rly (KMs)	0	2194	0	0	0	9	12	2216	60100

BTR (KMs)	1537	7387	660	1429	1086	1379	851	14329	377405
Percent	0.00	29.70	0.00	0.00	0.00	0.65	1.41	15.47	15.92

Table 5: Number of Vehicle on Road in the NER

State	Trucks		Buses		Small 4-Wheelers		Three-Wheelers		Two-Wheelers		Others	
	1980	1991	1980	1991	1980	1991	1980	1991	1980	1991	1980	1991
Ar. P	1163	952	30	208	761	1528	-	25	145	2822	25	296
Assam	12090	61842	2680	7401	22006	46729	686	4764	12983	127627	12087	35217
Mani	1620	4017	432	1216	2143	6083	107	1292	2361	33145	417	934
Megh	1100	7183	215	1502	3131	13065	-	21	1450	7404	266	3114
Mizo	730	2094	59	474	1283	9149	-	-	170	3820	19	234
Naga	944	17718	258	1531	2264	24497	79	4105	980	14378	112	1988
Trip	2780	4062	370	949	3085	5367	114	1036	1365	8277	572	1275
NER	20426	97846	4044	13281	34673	106417	986	11243	19454	197473	13497	43058

Table 6: Growth Rate of No. of Vehicles on Road in NER (1980-91)

State	Trucks	Buses	Small 4-Wheelers	Three-Wheelers	Two-Wheelers	Others
Ar. Pr	. -0.016	0.539	0.092	0.000	1.678	0.985
	-0.018	0.192	0.065	0.000	0.310	0.252
Assam	0.374	0.160	0.102	0.540	0.803	0.174
	0.160	0.097	0.071	0.193	0.231	0.102
Manipur	0.135	0.165	0.167	1.007	1.185	0.113
	0.086	0.099	0.099	0.254	0.271	0.076
Meghal.	0.503	0.544	0.288	0.000	0.373	0.973
	0.186	0.193	0.139	0.000	0.160	0.251
Mizoram	0.170	0.639	0.557	0.000	1.952	1.029
	0.101	0.209	0.196	0.000	0.327	0.256
Nagaland	1.615	0.449	0.893	4.633	1.243	1.523
	0.305	0.176	0.242	0.432	0.277	0.299
Tripura	0.042	0.142	0.067	0.735	0.460	0.112
	0.035	0.089	0.052	0.222	0.178	0.076
NER	0.345	0.208	0.188	0.946	0.832	0.199
	0.153	0.114	0.107	0.248	0.235	0.111

* The first row (against each State name) is average annual (linear) growth rate while the row below it is annual exponential growth rate, r in $y_t = y_o.\exp(rt)$.

B. COMMUNICATION INFRASTRUCTURE

The network of Post Offices, Telephone Exchange and telephone connections are the major infrastructure for communication. Of late, spectacular technological innovations are being introduced in the communication sector making exchange of information much cheaper than it was earlier. As a result, telephone based communication is increasing at a very fast rate.

Table 7.A : Post Offices, Telephone Exchange and Telephone Connections in the NER

State	Post Offices (Number)		Area Served per PO (Sq km)		No. of Exchanges		Working Connections	
	1977	1992	1977	1992	1977	1992	1977	1992
Ar. Pr.	187	249	447	336	14	39	-	4177
Assam	3072	3580	26	22	130	226	18038	49800
Manipur	476	576	29	47	39	9	1581	6286
Meghalaya	399	446	56	50	7	29	3149	7663
Mizoram	238	322	90	65	5	14	694	3053
Nagaland	207	262	80	63	15	31	1773	4753
Tripura	580	652	18	16	15	38	2229	6765
NER	5159	6087	49	42	225	384	27464	82497
India	136970	147238	24	22	NA	5819	NA	1616590

In the North-Eastern Region, the area served by a Post Office is twice larger than that in the country, largely due to sparse location of settlements and low density of population. A telephone exchange serves 59 thousand persons in the region while this figure is 151 thousand for the Nation. In the region telephone connections are relatively more per population than that in the country.

Post Offices and telephone exchange as social overheads for communication therefore are costlier in the region as compared to the country, which is mainly attributable to the sparse location of settlements and low density of population in the region.

Although the average area served by a Post Office in Arunachal Pradesh is comparatively very large (vis-à-vis other States in the NER), the average number of people served by the Post office there is not so much. This is due to very low density of population in Arunachal Pradesh. Population served by a Post Office is given in Table 8.

Table 7.B: Telecommunication Infrastructure in the NER

State/ Telecom specifics	Arun Pr.	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura	NER
	(Titled row is for 1987 and the row following it is for 1992)							
No. of Electronic Exch.	1	5	1	-	2	4	-	
	31	162	12	26	14	14	26	
Electro-mech Auto Exch.	33	182	21	24	9	25	30	
	8	64	10	3	-	17	12	
No. of Mechanical Exch.	-	19	-	1	1	3	5	
	-	-	-	-	-	-	-	
Total no. of Exchanges	34	206	22	25	12	32	35	
	39	226	22	29	14	31	38	
Switching Capacity	3380	42080	4660	6850	2400	4579	5315	
	5568	59622	7304	8952	3420	6322	7797	
Working Connections	2477	35511	3917	6058	1826	3666	4078	
	4177	49800	6286	7763	3053	4753	6765	
No. of Substations	2826	42266	4552	8684	1914	4465	5266	
	4577	56659	7112	10029	3504	5946	8877	
Manual Trunk Exchange	5	38	5	4	2	3	5	
	5	38	4	5	2	3	5	
LDPTs on O/H Line	15	717	34	52	2	21	51	
	18	1147	54	59	2	5	46	
LDPTs on MARR System	-	-	16	10	1	3	20	
	14	55	57	66	14	14	36	
Urban Public Telephones	5	740	31	48	1	3	5	
(Local Only)	73	942	54	47	68	31	172	
Urban Public Telephone	26	-	20	41	8	36	53	
(With Trunk Facility)	40	-	36	39	1	11	4	
Urban Public Telephones	-	-	2	6	4	2	10	
(With STD Facility)	15	135	14	41	1	29	26	
No of CTO/DTO	1	15	1	1	1	2	1	
	3	28	2	2	1	2	3	
No. of CO	35	451	37	62	10	43	54	
	26	447	47	61	9	15	52	
No. of Telex Exchanges	-	6	1	1	-	-	1	
	-	6	1	1	1	2	1	
Telex Capacity	-	490	20	50	-	-	20	
	-	389	17	49	15	14	16	
No. of Telex Connections	-	330	17	42	24	3	11	
	-	389	17	49	15	14	16	
Stations with NSD/ISD	2	8	1	3	2	2	1	
	12	35	9	6	4	8	3	
No of PT and PTSD	-	14	13	3	1	1	3	
	-	80	6	5	2	1	5	
No of Setellite Stations	8	-	1	1	1	2	2	
	9	2	3	5	3	2	5	
No of MARR System	-	-	2	1	1	1	3	
	2	9	4	4	3	1	6	

Table 8: Population Seved by Communication Infrastructure in the NER

State	Population (Projected) in Lakh		Population Served by per PO (in 000)		Population Served by Tel. Exch. (in 000)		Persons Served by a Telephone (in 000)	
	1977	1992	1977	1992	1977	1992	1977	1992
Arun. Pr.	5.59	9.12	2.99	3.66	39.95	23.39	NA	0.22
Assam	165.76	232.59	5.40	6.50	127.51	102.92	0.92	0.47
Manipur	12.85	19.21	2.70	3.34	32.95	13.46	0.81	0.31
Meghalaya	11.96	18.61	3.00	4.17	170.89	64.17	0.38	0.24
Mizoram	11.53	6.37	4.84	1.98	230.59	45.50	1.66	0.21
Nagaland	6.47	13.31	3.13	5.08	43.15	42.92	0.37	0.28
Tripura	18.28	29.09	3.15	4.46	121.85	76.56	0.82	0.43
Ner	232.45	328.30	4.51	3.75	103.31	59.45	0.85	0.28
India	6302.71	8803.38	4.60	5.98	NA	151.29	NA	0.54

C. POWER GENERATION INFRASTRUCTURE

Power Infrastructure in the region is important for improving the quality of life as well as the productive activities. The region employs three major types of generation technology; thermal, hydal and diesel. The installed capacities for these are 552, 170 and 77 MW respectively, all managed by the State Government. Additionally, there is a pool of Central Sector Projects, using hydal generation technology, with an installed capacity of 255 MW. About 52 percent of the total installed capacity of power generation in the region employs thermal technology, the other 40 percent of the installed capacity uses hydal technology and the remaining is diesel based.

Table 9: Thermal Power Generation in the NER

Generating Station Project/State	Installed Capacity in MW	Gross Generating Capacity in MW
ASSAM	514.50	514.50
Chandrapur	60.00	60.00
Namrup	111.50	111.50
Namrup Waste Heat	22.00	22.00
BTPS	240.00	240.00
Lakwa Gas	60.00	60.00
Mobile Gas	21.00	21.00
MEGHALAYA	5.00	-
Nangal Bibra	5.00	-
TRIPURA	32.50	32.50
Baramura	16.50	16.50
Rokhia	16.00	16.00
NER	552.00	547.00

Table 10: Hydal Power Generation in the NER

Generating Station Project	Installed Capacity in MW	Gross Generating Capacity in MW
ARUN Pr.	16.45	11.75
Micro Hydro	16.45	11.75
ASSAM	2.00	2.00
Badri Kheri	2.00	2.00
MANIPUR	2.80	2.80
Micro Hydro	2.80	2.80
MEGHALAYA	126.71	126.52
Umshing - I	36.00	36.00
Umshing - II	18.00	18.00
Kyrdem Kullai	60.00	60.00
Umtru	11.20	11.20
Micro Hydro	1.51	1.32
MIZORAM	3.35	3.35
Micro Hydro	3.35	3.35
NAGALAND	2.50	2.50
Micro Hydro	2.50	2.50
TRIPURA	16.00	16.00
Gumti	15.00	15.00
Maharani	1.00	1.00
NER	169.81	164.92

Table 11: Diesel Power Generation in the NER

Generating Station Project	Installed Capacity in MW	Gross Generating Capacity in MW
Arunachal Pradesh	14.14	11.20
Assam	20.69	5.00
Manipur	7.41	7.41
Meghalaya	2.05	1.14
Mizoram	23.35	20.98
Nagaland	3.62	2.86
Tripura	6.14	2.92
NER	77.40	51.51

Table 12: Central Sector Power Generation in the NER

Generating Station Project	Installed Capacity in MW	Gross Generating Capacity in MW
Loktak	105.00	105.00
Khandong	50.00	50.00
Kopili	100.00	100.00
Total	255.00	255.00

Table 13: Technology/Management of Power Generation in the NER

Generation technology Project/Management	Installed Capacity in MW	Gross Generating Capacity in MW
State Management	799.21	763.41
(a) Thermal	552.00	547.00
(b) Hydal	169.81	164.92
(c) Diesel	77.40	51.51
Central Sector	255.00	255.00
NER	1054.21	1018.43

Table 14: Installed Capacity and Effective Capacity (MW) of Power Generation in the NER

State	Hydro-electricity		Thermal Electricity		Diesel Generated		Total		Effective Capacity
	1982	1992	1982	1992	1982	1992	1982	1992	1992
Arun Pr.	9.17	16.45	-	-	2.40	14.14	11.57	30.59	22.95
Assam	-	2.00	306.50	514.50	23.27	20.69	329.77	537.19	521.50
Manipur	0.60	2.80	-	-	9.81	7.41	10.41	10.21	10.21
Meghalaya	126.71	126.71	2.50	5.00	1.99	2.05	131.20	133.76	127.66
Mizoram	-	3.35	-	-	6.60	23.35	6.60	26.70	24.33
Nagaland	1.50	2.50	-	-	3.88	3.62	5.38	6.12	5.36
Tripura	10.00	16.00	-	32.50	5.15	6.14	15.15	54.64	51.42
Central Sector	-	255.00	-	-	-	-	-	255.00	255.00
NER	147.98	424.81	309.00	552.00	53.10	77.40	510.08	1054.21	1018.43

Among the constituent States, Assam has the largest capacity of 537 MW, mainly based on the thermal technology. The second is Meghalaya, 134 MW, mainly hydal. Tripura uses a mix of thermal, hydal and diesel technologies to meet its ends. Most of the other states use micro hydel stations, and a mix of thermal or diesel technologies for generation of power.

The State of Meghalaya generates power more than its own demand, supplying power to Assam in the main. Other States have to purchase power from Meghalaya or Central Sector Projects (NEEPCO, Loktak and Kopili) or the Northern region. Assam has to depend on others (mainly Meghalaya, Central Sector Projects and the Northern Region) for about 50 percent of its total consumption. Arunachal Pradesh, Manipur, Mizoram and Nagaland meet only a minor portion of their demand from their own generating stations and thus mainly depend on import of power. Only Tripura is relatively in better position, importing only 1/3rd of its total requirements.

Table 15:Exchange of Power (in MU) between Constituent States of the NER and between the NER and Others (1991-92)

State/state	AP	Assam	Mani	Megh	Mizo	Naga	trip	Neepco	Loktak	Eastern	NER
Arunachal Pr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Assam	26.00	0.00	2.00	10.13	10.33	18.81	28.80	0.00	0.00	27.66	123.73
Manipur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meghalaya	0.00	260.14	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	260.28
Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nagaland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tripura	0.00	0.31	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	2.17
NEEPCO/NTPC	0.00	731.00	1.61	97.91	52.15	0.00	40.51	0.00	0.00	0.00	923.19
Loktak	0.00	83.87	253.23	0.00	0.00	85.93	0.00	114.95	0.00	0.00	537.98
Eastern Region	0.00	77.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.14
NER	26.00	1152.47	256.84	108.04	64.34	104.74	69.31	115.09	0.00	27.66	1924.49

Table 16: Generation, Consumption, Import, Export, System Peak and Annual Load Factor in the NER (1991-92)

State/state	Generation of Power in MU	Auxilary Consumpti-on in MU	Net Consumpti-on in MU	Net Import/ Export (MU)	System Peak (MW)	Annual Load Load factor (Per cent)
Arun Pradesh	-	-	26.00	26.00	5.00	59.20
Assam	1077.43	69.85	2036.32	1028.74	378.60	61.23
Manipur	-	-	256.84	256.84	56.00	52.21
Meghalaya	422.20	3.97	265.99	-152.24	66.00	45.88
Mizoram	-	-	64.34	64.34	17.40	42.09
Nagaland	-	-	104.74	104.74	24.00	49.68
Tripura	137.50	4.06	200.58	67.14	51.80	44.08
NEEPCO/NTPC	823.68	15.58	-	-808.10	150.00	100.00
Loktak	543.41	5.43	-	-537.98	97.00	100.00
NER	3004.22	98.89	2954.81	49.48	566.00	59.43

Note :Export denoted by minus sign. As the data regarding Generation of isolated Micro or Diesel sets are not available, only the Grid Generation/Consumption is shown.

Per Capita power consumption in the region is increasing at a very high rate. During the period 1978-90, per capita consumption of power has increased 3.8 times in the region against 1.95 times in the country. Among the constituent States, Manipur has

Table 17: Generation, Consumption, Import, Export and Per Capita Consumption of Power in the NER (1988)

State/state	Generation of Power in MU	Auxiliary Consumption in MU	Net Consumption in MU	Export in MU	Import in MU	Per Capita Consumption (in KWH)
Arunachal Pradesh	4.500	0.072	5.478	-	1.050	71
Assam	87.159	4.566	154.523	10.391	82.095	65
Manipur	0.520	0.020	17.067	-	16.567	100
Meghalaya	44.33	0.432	18.488	40.822	15.412	113
Mizoram	1.320	0.063	2.972	-	1.715	46
Nagaland	0.030	0.003	9.266	-	9.239	89
Tripura	8.565	0.277	12.411	0.051	4.123	51
Kopili	51.455	6.814	-	45.378	0.737	-
Loktak	34.501	0.205	-	34.296	-	-
NER	232.380	12.175	220.205	130.938	130.938	69
India	-	-	253	-	-	-

Table 18 : Per Capita Power Consumption in the NER

State	1970-71	1977-78	1978-79	1980-81	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
Arunachal P.	-	9	9	15	32	32	34	45	55	58
Assam	24	35	36	34	46	53	51	71	63	78
Manipur	5	5	12	6	26	34	48	60	57	80
Meghalaya	-	25	35	31	61	76	83	84	98	108
Mizoram	-	5	11	7	24	32	26	41	49	57
Nagaland	8	23	31	32	65	67	56	65	67	70
Tripura	5	9	11	13	25	28	29	35	41	51
NER	20	29	31	29	44	51	50	66	62	76
India	90	121	131	135	167	178	191	203	216	236

Table 19: Number of Villages Electrified in the NER

State	No. of Villages in 1981	No. of Electified Villages			Degree of Rural Electrification*			% of Rural Population Covered	Pump sets Energized		
		1980	1988	1992	1980	1988	1992	1980	1980	1988	1992
Arun. Pr.	3257	295	1068	1625	9.06	32.79	49.89	24.4	-	-	-
Assam	21995	4486	17897	21385	20.40	81.37	97.23	31.3	1845	3225	3514
Manipur	2035	322	887	1580	15.82	43.59	77.64	45.4	10	45	45
Megha	4874	618	1622	2315	12.68	33.28	47.50	29.1	47	65	65
Mizoram	721	77	261	517	10.68	36.20	71.71	22.7	-	-	-
Nagaland	1112	346	928	1099	31.12	83.45	98.83	54.2	-	10	172
Tripura	4727	803	2329	3028	16.99	49.27	64.06	50.9	255	1191	1432
NER	38721	6947	24992	31549	17.94	64.54	81.48	34.0	2157	4536	5228
India	579562	256992	436172	485813	44.34	75.26	83.82	65.5	4076946	NA	9103592

Degree of Rural Electrification = Percentage of Electrified Villages to Total No. of Villages.

have shown growth of less than 3.8 times. Initially, per capita consumption of power in the region was more skewed, but the situation has improved over the years. The co-efficient of variation in 1977-78 was 0.69 (10.89/15.86), which decreased to 0.25 (17.97/71.71) in 1989-90.

Per capita power consumption at the state level may not reveal the true picture unless its distribution between urban and rural sectors is analysed. In this regard, one may look into the information on electrification of villages. Electrification of villages is doubly important, first for improvement of quality of life in the rural areas and second for improvement of yield rate of crops through enhancement of irrigation facilities and promotion of small scale industries viable in the rural areas.

Table 20: Sector wise Per Capita Consumption of Power in the NER (1977-78) in Units KWH

State	Domestic	Agricultural	Industrial	Unutilized	Total
Arun. Pr.	5	-	2	2	9
Assam	3	-	27	5	35
Manipur	4	-	1	0	5
Meghalaya	6	1	14	4	25
Mizoram	4	-	-	1	5
Nagaland	8	-	1	14	23
Tripura	5	1	3	0	9
NER	3.68	1.02	20.50	3.38	28.58
Indi	11.00	16.00	75.00	19.00	121.00

During 1980-92, number of electrified villages has increased 4.55 times against 1.89 in India. In Assam and Tripura 97.23 and 98.83 percent (respectively) of the villages were already electrified by 1992. However, in Arunachal Pradesh and Meghalaya about 50 percent of villages were not electrified up to 1992. It is curious to note that Meghalaya which is a power surplus state and exports almost 36 percent of power generated by it has the least percentage of villages electrified (47.50%). In 1980 only 29 percent of its rural population was covered by electrification which was only higher than Arunachal Pradesh (24.2 %) and Mizoram (22.7 %). On the other hand, per capita power consumption in Meghalaya is the highest (108 Kwh in 1992). Other States in the NER lie in between 50 to 80 Kwh. It seems therefore that rural to urban disparity in power consumption is very high in Meghalaya. That Meghalaya is a power surplus state is only due to unavailability of power to a great many people living in the rural areas. It reminds us of the criticism of the concept of marketed surplus, in which needs, lacking the support of purchasing power and thus entitlement, are not taken care of and the market demand determines the surplus.

In 1980, a little over 2 thousand irrigation pump sets were energized in the NER which increased to a little over 5 thousand in 1992, registering an increase of 2.4 times. In Manipur the increase was 4.5 times (from 10 to 45 in number), in Nagaland 17.2 times (10 to 172 in number), in Tripura 5.6 times (255 to 2432 in number), in Assam 1.9 times (1845 to 3514 in number) and in Meghalaya 1.38 times (47 to 65 in number). It may be noted that Meghalaya registered only a meager growth in energization of irrigation pumps in the rural areas, which may be largely due to low degree of rural electrification.

D. AGRONOMIC AND AGRO-MARKETING INFRASTRUCTURE

Agronomic Infrastructure relates to economic activities dealing with the management and productivity of land. In the traditional agriculture there were no felt requirements for the development of agronomic infrastructure except for irrigating the land in dry seasons. Especially in the Northeastern region, which has been known for heavy rainfall well distributed all over, the year, and the need for development of irrigation infrastructure had been considered less important. However, things are changing very fast in the recent years. Due to deforestation, rainfall is no longer as heavy and well distributed as before. Variation in the yield rate of crops has been increasing over the years partly due to increased irregularity in the rainfall. Cash crops and cultivation for meeting the needs of the ever-increasing urban population need more regular irrigation. These changes have led to the felt requirement of irrigation infrastructure in the recent years.

Gone are the days when land used to have (or at least, economists used to believe so) "original and indestructible powers" to bare crops. Pressure of population over the land has increased manifold now and extensive cultivation is giving way to intensive cultivation. Tradition no longer decides choice of crops to be raised, nor crop combination and crop rotation rely on the conventional wisdom. Need for testing the soil for its ingredients, deficiencies, acidity and alkalinity, suitability to particular crops, need for using various fertilizers in required proportion and so on is gradually coming up. In view of all these changes, agronomic infrastructure must be developed.

In India, agriculture sector is almost wholly in the private sector. But cultivators would not be either capable or interested in developing the agronomic infrastructure and hence it has been the concern of the government to develop the infrastructure. Wherever it is possible to exercise the principle of exclusion in utilization of infrastructure, the financial institutions forward easy loans to the cultivators. Elsewhere, the Government develops the infrastructure under the public control.

Soil testing laboratories, irrigation infrastructure like deep and/or energized tube wells, system of canals, sale points of fertilizers, HYV seed distribution centres, pesticide sale/distribution points (centres) etc. are major types of agronomic infrastructure.