CHAPTER- IV

FACTORS RESPONSIBLE FOR DISPARITIES IN RURAL DEVELOPMENT OF ASSAM AND ITS EFFECT ON ECONOMIC DEVELOPMENT

4.1 Introduction

Assam is a predominantly backward rural economy with multidimensional hurdles for development. In the earlier Chapter- III, it has been discussed the different rural developmental indicators and their variations across the rural districts or regions of Assam. It has been found that there exist vast disparities in the development indicators that have been taken into account in the study such as education, health, agricultural productivity and rural employment leading to inter-district disparities in rural development. The spatio- temporal variations among the different regions of Assam have been caused by several factors. The factors affecting variations in the extent of rural development have several dimensions such as- lack of infrastructural facilities, availability of resources, government expenditure on rural development programme, industrial and urban growth etc.

The present chapter wants to analyze the status and extent of different factors responsible for spatio- temporal variations in rural development of Assam for the three post reform census years- 1991, 2001 and 2011. Here, the study wants to investigate the various factors that have impact on disparities on rural development. The factors that the study has been taken into account are rural infrastructure which may includes health, education, irrigation and paved road, resource availability comprising size of operational holding and percentage of agricultural worker in the rural workforce, industrial and urban growth and government expenditure on rural development programme. Again, the study also wants to find out the effects of the factors on rural development in particular and economic development in general. In order to investigate the effects of the factors on rural development, the study will used simple econometric

methods like fitting of multiple linear regression line and computation of simple correlation coefficient with indices of the factors such as rural infrastructure, resource availability, industrial and urban growth and government expenditure on rural development programme as dependent variable and rural development as independent variable.

4.2 Probable Factors behind Disparities in Rural Development of Assam

There are different factors which are responsible for variations in the disparities in different indicators of rural development. The study has been taken into account four broad classifications of factors understanding spatio- temporal disparities in rural development of Assam. These factors are as follows-

1. Rural Infrastructure
2. Availability of Resources
3. Urbanization and Industrialization and
4. Government expenditure on various Rural Development Programmes

The rural infrastructure is an overall indicator of four indicators. These four indicators are- education infrastructure which is measured by number of primary schools per lakh of rural population, health infrastructure which is again measured by number of primary health centres per lakh of rural population, rural roads infrastructure which is computed through percentage of villages approach to rural pucca roads and finally, irrigation infrastructure which is again computed through two indicators viz, number of micro irrigation schemes per 1000 hectares to net sown area and percentage of irrigated area to net sown area. The average of these four components of rural infrastructure gives the value of rural infrastructure.

Further, similar to the rural infrastructure the resource availability factor is also an overall indicator of two sub indicators. These are - average size of operational holding and landlessness which is calculated from percentage of agricultural labourers to rural work force. The value of resource availability has been computed by taking into account the simple average of the two indicators.

In the study, the third factor, that is, government expenditure on rural development programme is measured from amount of government expenditure per lakh of rural population of the respective years. The amount of government expenditure from all the main rural development programmes such as Swarnajayanti Gram Swarojgar Yojana (SGSY), Sampoorna Gramin Rojgar Yojana (SGRY), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Indira Awaj Yojana (IAY) for the year concerned is added in order to find out value of government expenditure per lakh of rural population.

Again, the fourth and last probable factor is the urban and industrial growth which is an overall measurement of percentage of urban population to total population of the district and contribution of industrial sector to gross district domestic product (GDDP) of different regions.

4.3 Rural Infrastructure

Rural infrastructure plays a very important and crucial role in determinining economic prosperity of a particular region in general and underdeveloped rural economy in particular. Infrastructural facilities which are often referred as social overhead capital includes transport and communications, irrigation facilities, energy, financial services and social overheads like education and health etc. So far as the present study is concerned the rural infrastructural facilities include health, education, irrigation and roads which are the basic amenities that improve the quality of life and productivity. These facilities and services help in expansion of sectors like industrialization, development of agriculture etc. in rural areas as well as augment overall development of the region. It is obvious that infrastructure is the major factor responsible for regional disparities in Assam.

In this study, rural infrastructure has been analyzed by different infrastructural facilities like health infrastructure, education infrastructure, irrigation infrastructure and rural roads which are transformed into a standardize index (as discussed in Chapter-I) to analyze as factor understanding disparities in rural development across the State of Assam and to compare it through different years. These are discussed in the following sections-

4.3.1 Health Infrastructure

Health and education infrastructure are the prime indicators in rural development of a region. There exists vast regional disparity in health sectors across the different districts or clusters of districts in Assam. It may be due to the insufficient health care facilities in different districts of Assam. A better health care system of a region can be understood from the indicators like number of hospitals/dispensaries per lakh of rural population, number of medical beds per 10,000 populations etc. in different time periods.

In this study, for sake of convenience only one indicator of health infrastructure has been taken into account. Here, number of primary health centres (PHC's) per lakh of rural population in the rural districts of Assam for the all three census years is taken as convenient measure of health infrastructure through which health infrastructure index (I_{HIF}) have been computed. The health infrastructure index which is the primary component of rural infrastructure has a direct relationship with the number of PHC's. A higher health infrastructure index means an improvement of health facilities and thus improvement of rural infrastructure.

The district wise number of primary health centres per lakh of rural population and rural health infrastructure index along with their status and rank for the census years 1991, 2001 and 2011 are shown in the Table 4.1, Table 4.2 and Table 4.3 respectively as under-

From the Table 4.1 it has been evident that N. C. Hills has attained highest development in health infrastructure in contrast to Nalbari which has lowest development in health infrastructure out of the 23 districts of Assam. N. C. Hills is the only one high development district in health infrastructure followed by three moderate development regions such as Dibrugarh, Golaghat and Sibsagar. The remaining 19 districts viz, Sonitpur, Dhemaji, Hailakandi, Cachar, Morigaon, Bongaigaon, Jorhat, Lakhimpur, Kokrajhar, Tinsukia, Barpeta, Kamrup, Nagaon, Karimganj, Karbi-Anglong, Darrang, Goalpara, Dhubri and Nalbari have low development status. In the Table 4.1 the value of health infrastructure in 1991 as a whole in Assam is 0.314. This means that the status of overall health infrastructure in the State is low development.

Further, in the table since the value of coefficient of variation is found to be 76.43, there exists about 76 percent disparity in the health infrastructure across the rural regions of Assam.

Table 4.1: District wise Primary Health Centre's (PHC's) per lakh of Rural Population and Rural Health Infrastructure Index (I_{HIF}) of Assam, 1991

Districts	No. of PHC's per lakh of Rural Pupulation	I_{HIF} *	Status	Rank
Dhemaji	4.26	0.406	LD	6
Lakhimpur	3.13	0.277	LD	12
Sonitpur	4.77	0.465	LD	5
Dibrugarh	7.1	0.731	MD	2
Jorhat	3.25	0.291	LD	11
Golaghat	7.06	0.726	MD	3
Sibsagar	5.69	0.569	MD	4
Tinsukia	2.49	0.204	LD	14
Nagaon	2.07	0.156	LD	17
Morigaon	3.29	0.296	LD	9
Nalbari	0.7	0.000	LD	23
Darrang	1.78	0.123	LD	20
Barpeta	2.33	0.186	LD	15
Dhubri	1.11	0.047	LD	22
Bongaigaon	3.27	0.293	LD	10
Kokrajhar	2.54	0.210	LD	13
Goalpara	1.29	0.067	LD	21
Kamrup	2.31	0.184	LD	16
N. C. Hills	9.46	1.000	HD	1
Karbi-Anglong	1.86	0.132	LD	19
Cachar	3.65	0.337	LD	8
Karimganj	1.96	0.144	LD	18
Hailakandi	4.09	0.387	LD	7
Assam	3.09	0.314	LD	
Standard Deviation		0.240		
Coefficient of Variation		76.43		

Source: Constructed from,
Primary Census Abstract and Village Directory, 1991, Assam, Census of India

Note: **I_{HIF}***= Rural Health Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

The Table 4.2 in the following depicts district wise primary health centres per lakh of rural population and rural health infrastructure index of Assam in 2001.

Table 4.2: District wise Primary Health Centre's (PHC's) per lakh of Rural Population and Rural Health Infrastructure Index (I_{HIF}) of Assam, 2001

Districts	No. of PHC's per lakh of Rural Pupulation	I_{HIF} *	Status	Rank
Dhemaji	3.75	0.214	LD	5
Lakhimpur	2.79	0.118	LD	11
Sonitpur	2.66	0.105	LD	12
Dibrugarh	3.76	0.215	LD	4
Jorhat	3.62	0.201	LD	6
Golaghat	4.62	0.300	LD	3
Sibsagar	3.25	0.164	LD	7
Tinsukia	2.48	0.087	LD	14
Nagaon	1.96	0.036	LD	20
Morigaon	2.03	0.043	LD	18
Nalbari	2.85	0.124	LD	10
Darrang	2.45	0.084	LD	15
Barpeta	2.10	0.049	LD	17
Dhubri	2.01	0.040	LD	19
Bongaigaon	3.14	0.153	LD	8
Kokrajhar	2.97	0.136	LD	9
Goalpara	2.38	0.078	LD	16
Kamrup	2.60	0.099	LD	13
N. C. Hills	11.66	1.000	HD	1
Karbi-Anglong	4.99	0.337	LD	2
Cachar	2.09	0.049	LD	17
Karimganj	2.14	0.034	LD	21
Hailakandi	1.60	0.000	LD	22
Assam	2.76	0.159	LD	
Standard Deviation		0.198		
Coefficient of Variation		124.53		

Source: Constructed from,

Primary Census Abstract and Village Directory, 2001, Assam, Census of India

Note: **I_{HIF}***= Rural Health Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

From the Table 4.2 it is evident that in 2001 the status of health infrastructure of the State of Assam as a whole has low development having value of the health infrastructure index as 0.159 as most of the regions have low development position in rural health infrastructure. The disparity in health infrastructure has been found very high as compared to 1991 position. There exists about 125 percent disparity in health infrastructure in the rural economy of Assam as seen from coefficient of variation. Here also with value of the index as one N. C. Hills ranks first and with value of the index as zero Hailakandi district has the least development position. Among the 23 districts of Assam only one district N. C. Hills has high development status. There are no any regions that have moderate development status. The remaining 22 districts have experienced low development status.

The district wise primary health centres per lakh of rural population and the corresponding health infrastructure index for 2011 have been shown in the following Table 4.3.

From the Table 4.3 in the following, it is evident that there exists only one high development region out of the 27 districts of Assam at the time of 2011 Census. The remaining 26 districts have low development status in health infrastructure. Out of 27 districts Dima Hasao is in the first position with high development status and Karimganj has the lowest development with low development status. The overall position of Assam in health infrastructure is not found satisfactory which is in the low development position with value of the index as 0.291. Further, there exist about 63 percent variations in health infrastructure across the rural regions of Assam as the value of coefficient of variation is found as 63.23.

Thus, from the above it has been found that the disparities in health infrastructure for 1991, 2001 and 2011 are 76.43, 124.53 and 63.23 percent respectively. As compared to the census years 1991 and 2001, the year 2011 experiences a lesser variability in rural health infrastructure across Assam. From all the tables it has been evident that in 2001 there exists very high disparity in rural health infrastructure compared to the 1991 and 2011 Census. Again, at the time of 2001 Census the overall position of rural Assam is found to be very low development compared to the 1991 and 2011. Thus, from the tables of health infrastructure of different census years it has been

evident that the insufficient and very low availability of primary health centre's in some districts leads high disparity and low development in health infrastructure.

Table 4.3: District wise Primary Health Centre's (PHC's) per lakh of Rural Population and Rural Health Infrastructure Index (I_{HIF}) of Assam, 2011

Districts	No. of PHC's per lakh of Rural Pupulation	I_{HIF} *	Status	Rank
Dhemaji	4.07	0.302	LD	11
Lakhimpur	2.11	0.125	LD	23
Sonitpur	2.68	0.177	LD	19
Dibrugarh	4.34	0.326	LD	10
Jorhat	5.74	0.452	LD	3
Golaghat	4.89	0.376	LD	8
Sibsagar	5.57	0.437	LD	5
Tinsukia	2.94	0.200	LD	14
Nagaon	2.56	0.166	LD	20
Morigaon	4.64	0.353	LD	9
Nalbari	5.82	0.459	LD	2
Darrang	2.35	0.147	LD	22
Barpeta	3.49	0.249	LD	12
Dhubri	2.86	0.193	LD	16
Bongaigaon	2.06	0.121	LD	24
Kokrajhar	3.00	0.205	LD	13
Udalguri	5.66	0.445	LD	4
Baksa	4.99	0.385	LD	7
Chirang	2.91	0.197	LD	15
Goalpara	2.76	0.184	LD	17
Kamrup Metro	4.64	0.353	LD	9
Kamrup	2.47	0.158	LD	21
Dima Hasao	11.82	1.000	HD	1
Karbi-Anglong	2.70	0.178	LD	18
Cachar	5.28	0.411	LD	6
Karimganj	0.72	0.000	LD	25
Hailakandi	3.60	0.249	LD	12
Assam	3.55	0.291	LD	
Standard Deviation		0.184		
Coefficient of Variation		63.23		

Source: Constructed from,

Primary Census Abstract and Village Directory, 2011, Assam, Census of India

Note: **I_{HIF}***= Rural Health Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

4.3.2 Education Infrastructure

Education is one of the very important development indicators of every society. So, enhancements of infrastructural facility like educational institutions in the rural areas enhance educational level and rural development. The unequal distribution of educational institutions in different rural areas causes vast regional disparities in rural development of Assam. Similar to the health infrastructure index, in this study education infrastructure index (I_{EIF}) has been constructed through which comparability of educational facilities in the three census periods can be made. Here, in the study the education infrastructure is measured by number of primary schools per 100,000 of rural population in the rural areas through which education infrastructure index has been computed for the rural regions in different census periods.

The Table 4.4, Table 4.5 and Table 4.6 in the following respectively depict district wise primary schools per lakh of rural population and corresponding rural education infrastructure index for the three census years 1991, 2001 and 2011.

From the Table 4.4, it is revealed that the number of primary schools per lakh of rural population as a whole for Assam is 135.07. Here, the overall status of education infrastructure of Assam has low development being the value of education infrastructure index as 0.155. Among the 23 districts of Assam in 1991, it has been found that with value of the index as zero Sonitpur district is the least developed district and with value as one N. C. Hills is the highest developed district in education infrastructure. Here, N. C. Hills is the only one district that has high development status in education infrastructure. The remaining 22 districts including Sonitpur have low development status. Chronologically these districts are- Lakhimpur, Hailakandi, Jorhat, Nagaon, Tinsukia, Barpeta, Morigaon, Bongaigaon, Kokrajhar, Darrang, Dhubri, Cachar, Nalbari, Golaghat, Karimganj, Dibrugarh, Sibsagar, Goalpara, Karbi-Anglong, Kamrup, Dhemaji and Sonitpur.

From the Table 4.4 it is again evident that there exists very high regional disparity among the various districts in rural education infrastructure in 1991. It is found that there exists about 128 percent variation across the State of Assam as the coefficient of variation is found to be 128.39.

Table 4. 4: District wise Primary Schools (PSCH's) per lakh of Rural Population and Rural Education Infrastructure Index (I_{EIF}) of Assam, 1991

Districts	No. of PSC's per lakh of Rural Pupulation	I_{EIF}*	Status	Rank
Dhemaji	170.66	0.222	LD	5
Lakhimpur	213.84	0.363	LD	2
Sonitpur	103.00	0.000	LD	23
Dibrugarh	138.20	0.115	LD	10
Jorhat	181.26	0.256	LD	4
Golaghat	131.79	0.094	LD	12
Sibsagar	139.97	0.121	LD	9
Tinsukia	116.09	0.043	LD	21
Nagaon	105.60	0.009	LD	22
Morigaon	121.64	0.061	LD	19
Nalbari	131.43	0.093	LD	13
Darrang	125.44	0.073	LD	16
Barpeta	120.39	0.057	LD	20
Dhubri	125.76	0.075	LD	15
Bongaigaon	122.53	0.064	LD	18
Kokrajhar	125.08	0.072	LD	17
Goalpara	143.49	0.133	LD	8
Kamrup	145.59	0.139	LD	6
N. C. Hills	408.37	1.000	HD	1
Karbi-Anglong	145.04	0.138	LD	7
Cachar	128.08	0.082	LD	14
Karimganj	132.91	0.098	LD	11
Hailakandi	181.73	0.258	LD	3
Assam	135.07	0.155	LD	
Standard Deviation		0.199		
Coefficient of Variation		128.39		

Source: Constructed from,

Primary Census Abstract and Village Directory, 1991, Assam, Census of India

Note: **I_{EIF}*** = Rural Education Infrastructure Index; **LD** = Low Development; **MD** = Moderate Development; **HD** = High Development

The Table 4.5 in the following depicts district wise primary schools per lakh of rural population and education infrastructure index of Assam as per 2001 Census.

Table 4. 5: District wise Primary Schools (PSCH's) per lakh of Rural Population and Rural Education Infrastructure Index (I_{EIF}) of Assam, 2001

Districts	No. of PSC's per lakh of Rural Pupulation	I_{EIF}*	Status	Rank
Dhemaji	222.47	0.322	LD	2
Lakhimpur	210.96	0.289	LD	3
Sonitpur	110.51	0.000	LD	22
Dibrugarh	139.87	0.085	LD	12
Jorhat	192.78	0.237	LD	4
Golaghat	140.09	0.085	LD	12
Sibsagar	165.94	0.159	LD	7
Tinsukia	120.72	0.029	LD	20
Nagaon	111.77	0.004	LD	21
Morigaon	123.80	0.038	LD	19
Nalbari	153.48	0.124	LD	8
Darrang	129.63	0.055	LD	16
Barpeta	130.04	0.056	LD	15
Dhubri	126.86	0.047	LD	17
Bongaigaon	142.38	0.092	LD	9
Kokrajhar	138.39	0.080	LD	13
Goalpara	134.55	0.069	LD	14
Kamrup	140.51	0.086	LD	11
N. C. Hills	457.85	1.000	HD	1
Karbi-Anglong	177.71	0.193	LD	6
Cachar	125.77	0.044	LD	18
Karimganj	141.31	0.089	LD	10
Hailakandi	185.85	0.217	LD	5
Assam	143.32	0.148	LD	
Standard Deviation		0.201		
Coefficient of Variation		135.81		

Source: Constructed from,

Primary Census Abstract and Village Directory, 2001, Assam, Census of India

Note: **I_{EIF}*** = Rural Education Infrastructure Index; **LD** = Low Development; **MD** = Moderate Development; **HD** = High Development

As shown in Table 4.5 there is an increase of number of primary schools per 100,000 of rural population in 2001 which is computed as 143.32 as compared to 135.07 in 1991. Again as shown in Table 4.5, in 2001 also it has been found that N. C.

Hills is the only one district that has high development status across the State of Assam in education infrastructure. Here, having the value of education infrastructure index as zero Sonitpur district is the least developed district out of 23 districts of Assam. Further, it has been found that except N. C. Hills which has highest development in education infrastructure the remaining 22 districts are still falling in the low development status as in 1991. With value of the education infrastructure index as 0.148 the status of overall Assam has low development. In descending order these low development districts are Sonitpur, Nagaon, Tinsukia, Morigaon, Cachar, Dhubri, Darrang, Barpeta, Goalpara, Kokrajhar, Golaghat, Dibrugarh, Kamrup, Karimganj, Bongaigaon, Nalbari, Sibsagar, Karbi-Anglong, Hailakandi, Jorhat, Lakhimpur and Dhemaji.

Again, since the coefficient of variation is found to be 135.81, there exists about 136 percent variation in rural education infrastructure in the State of Assam. Thus, though there is an absolute increase in education infrastructure as compared to 1991, the variation in education infrastructure across the rural districts of Assam is found to be about 136 percent which is higher than 128 percent of 1991.

The Table 4.6 shows district wise variations in education infrastructure based on 2011 Census report. In the Table 4.6 as compared to 1991 and 2001 the number of primary schools per lakh of rural population has decreased to 98.56 in 2011. Here, also the overall status of education infrastructure has very low development with the value of index as 0.150. This is because of all the districts have low development status except one district Dima Hasao that have high development status among the 27 districts of Assam at the time of 2011 Census. The remaining 26 districts have low development status in education infrastructure. Dhubri district is the least developed region with value of the index as zero.

Further, with value of the coefficient of variation as 120.67 the variation in education infrastructure across the rural regions of Assam is indicated as 120.67 percent. Now, compared to the coefficient of variation of the earlier census years viz, 128 and 136 respectively in 1991 and 2001, the coefficient of variation in 2011 is 121, which means disparity in education infrastructure is lower than 2001 and 1991.

Table 4. 6: District wise Primary Schools (PSCH's) per lakh of Rural Population and Rural Education Infrastructure Index (I_{EIF}) of Assam, 2011

Districts	No. of PSC's per lakh of Rural Population	I_{EIF}*	Status	Rank
Dhemaji	163.85	0.233	LD	3
Lakhimpur	150.10	0.191	LD	5
Sonitpur	103.77	0.051	LD	22
Dibrugarh	129.98	0.130	LD	12
Jorhat	152.23	0.198	LD	4
Golaghat	130.09	0.130	LD	12
Sibsagar	146.00	0.179	LD	6
Tinsukia	106.27	0.058	LD	20
Nagaon	94.88	0.024	LD	24
Morigaon	99.94	0.039	LD	23
Nalbari	126.86	0.121	LD	13
Darrang	95.11	0.024	LD	24
Barpeta	105.57	0.056	LD	21
Dhubri	87.08	0.000	LD	25
Bongaigaon	114.27	0.082	LD	18
Kokrajhar	139.5	0.159	LD	8
Udalguri	121.61	0.105	LD	15
Baksa	130.95	0.133	LD	14
Chirang	131.98	0.136	LD	10
Goalpara	111.58	0.074	LD	19
Kamrup Metro	134.52	0.144	LD	9
Kamrup	123.91	0.112	LD	14
Dima Hasao	416.93	1.000	HD	1
Karbi-Anglong	196.67	0.332	LD	2
Cachar	114.62	0.083	LD	17
Karimganj	115.56	0.086	LD	16
Hailakandi	143.02	0.169	LD	7
Assam	98.56	0.150	LD	
Standard Deviation		0.181		
Coefficient of Variation		120.67		

Source: Constructed from,

District Census Hand Book, 2011, Assam, Census of India

Note: **I_{EIF}*** = Rural Education Infrastructure Index; **LD** = Low Development; **MD** = Moderate Development; **HD** = High Development

4.3.3 Irrigation Infrastructure

Irrigation is another important component of rural infrastructure which has impact on rural development in general and agricultural productivity in particular. The agricultural productivity in rural areas depends directly on the irrigation scenario of the region. Thus, irrigation is the principal factor in enhancement of agricultural productivity for rural development.

As a factor concerning disparities in rural development of Assam the irrigation infrastructure have been divided into two components-

(a) Percentage of irrigated area to net sown area and
(b) Number of minor irrigation schemes per 1,000 hectares to the net sown area of the region

For each of the two heads separate indices for different regions have been calculated using secondary data for the census years 1991, 2001 and 2011. In the study, both for the two components of irrigation the status and extent of disparities have been observed. The first irrigation index (I_{IR1}) has been constructed from the percentage of irrigated area (in hectare) to net sown area (in hectare). The second irrigation index (I_{IR2}) has been calculated from number of minor irrigation schemes per 1,000 hectares to the net sown area. Finally, the composite index of irrigation has been calculated using the average of two indices.

Let us analyze the status and extent of disparities of irrigation infrastructure across the State of Assam through computation of irrigation index for the years 1991, 2001 and 2011 as under-

The district wise percentage of irrigated area to net sown area and the corresponding irrigation index for the year 1991 is shown in the Table 4.7. From the Table 4.7 it is clear that Nalbari and Dibrugarh district of Assam respectively has the highest and lowest percentage of irrigated area to net sown area in 1991. The districts Nalbari and Darrang chronologically have high development status followed by N. C. Hills the only one district which have moderate development status. The remaining 20 districts have low development status. The percentage of irrigated area to net sown area

for the overall Assam is found as 5.52. The overall status of Assam in percentage of irrigated area to net sown area in Assam has low development status with value of the index as 0.244. Further, it has been evident from value of coefficient of variation that the disparity in irrigation infrastructure index (I_{IR1}) is about 111 percent.

Table 4. 7: District wise Percentage of Irrigated Area to Net Sown Area and Irrigation Index (I_{IR1}) of Assam, 1991

Districts	Percentage of Irrigated area to Net Sown Area	I_{IR1} *	Status	Rank
Dhemaji	0.25	0.008	LD	20
Lakhimpur	1.13	0.053	LD	17
Sonitpur	7.49	0.375	LD	5
Dibrugarh	0.09	0.000	LD	21
Jorhat	1.04	0.048	LD	18
Golaghat	2.09	0.101	LD	15
Sibsagar	3.58	0.177	LD	11
Tinsukia	5.28	0.263	LD	7
Nagaon	6.26	0.313	LD	6
Morigaon	3.36	0.166	LD	12
Nalbari	19.81	1.000	HD	1
Darrang	18.56	0.937	HD	2
Barpeta	4.82	0.239	LD	8
Dhubri	1.73	0.083	LD	16
Bongaigaon	3.78	0.187	LD	9
Kokrajhar	3.68	0.182	LD	10
Goalpara	10.06	0.506	LD	4
Kamrup	2.50	0.122	LD	13
N. C. Hills	12.07	0.608	MD	3
Karbi-Anglong	1.04	0.048	LD	18
Cachar	1.13	0.053	LD	17
Karimganj	2.41	0.118	LD	14
Hailakandi	0.78	0.035	LD	19
Assam	5.52	0.244	LD	
Standard Deviation		0.270		
Coefficient of Variation		110.66		

Source: Constructed from,
Village Directory, 1991, Assam, Census of India and
Statistical Hand Book, Assam, 2001, Government of Assam

Note: **I_{IR1}*** = Irrigation Index 1 (Percentage of irrigated are to net sown area);
LD= Low Development; **MD**= Moderate Development; **HD**= High Development

The Table 4.8 indicates district wise number of minor irrigation schemes to the net sown area (NSA) and its corresponding indices of different rural regions of Assam in 1991.

Table 4. 8: District wise Nos. of Minor Irrigation per 1,000 Hectares to Net Sown Area (NSA) and Irrigation Index (I_{IR2}) of Assam, 1991

Districts	Nos. of Minor Irrigation per ,000 Hectares to NSA	I_{IR2} *	Status	Rank
Dhemaji	6.97	0.525	MD	6
Lakhimpur	8.44	0.643	MD	3
Sonitpur	4.35	0.313	LD	10
Dibrugarh	2.72	0.181	LD	16
Jorhat	7.66	0.580	MD	5
Golaghat	7.75	0.588	MD	4
Sibsagar	1.11	0.051	LD	20
Tinsukia	12.85	1.000	HD	1
Nagaon	2.89	0.195	LD	15
Morigaon	6.39	0.478	LD	7
Nalbari	3.29	0.227	LD	14
Darrang	3.53	0.247	LD	13
Barpeta	4.15	0.297	LD	12
Dhubri	4.23	0.303	LD	11
Bongaigaon	2.59	0.171	LD	17
Kokrajhar	5.18	0.379	LD	9
Goalpara	2.03	0.125	LD	18
Kamrup	5.67	0.419	LD	8
N. C. Hills	9.10	0.697	MD	2
Karbi-Anglong	1.22	0.059	LD	19
Cachar	0.48	0.000	LD	23
Karimganj	0.49	0.0008	LD	22
Hailakandi	0.497	0.001	LD	21
Assam	4.21	0.325	LD	
Standard Deviation		0.254		
Coefficient of Variation		78.15		

Source: Constructed from,
Village Directory, 1991, Assam, Census of India and
Minor Irrigation Census, 2000-01, Government of India

Note: **I_{IR2}*** = Irrigation Index 2 (No. of minor irrigation schemes per 1,000 hectares to net sown area); **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

Here, having the value of of minor irrigation schemes of overall State of Assam as 4.21 and the corresponding index as 0.325, the status of overall Assam has low development. In 1991 there exists only one district Tinsukia that has high development status contrary to five districts such as N. C. Hills, Lakhimpur, Golaghat, Jorhat and Dhemaji which have moderate development status in micro irrigation schemes. The remaining 17 districts viz, Morigaon, Kamrup, Kokrajhar, Sonitpur, Dhubri, Barpeta, Darrang, Nalbari, Nagaon, Dibrugarh, Bongaigaon, Goalpara, Karbi-Anglong, Sibsagar, Hailakandi, Karimganj and Cachar fall in the low development category. Cachar is the least developed region out of the 23 districts of Assam.

Further, from the table it has been cleared that the district wise variability across the State of Assam in number of minor irrigation schemes per 1,000 hectares to net sown area is estimated as about 78 percent as the coefficient of variation is found as 78.12.

Table 4.9 in the following shows overall rural irrigation infrastructure index of Assam in 1991 which is computed from Table 4.7 and Table 4.8.

The column 4 of Table 4.9 indicates the overall irrigation index which is the average of the indices of percentage of irrigated area (I_{IR1}) and number of minor irrigation per 1,000 hectares to net sown area (I_{IR2}) shown in column 2 and column 3 respectively. From the table it has been evident that the overall status of Assam in irrigation infrastructure is low development with value of the composite index as 0.285. In irrigation infrastructure, the districts N. C. Hills and Hailakandi respectively have attained highest and lowest development among the 23 districts of Assam. It has been found that there is no any region that has high development status in irrigation infrastructure. There are 4 districts viz, N. C. Hills, Tinsukia, Nalbari and Darrang that have moderate development status. The remaining 19 districts including the least developed district Hailakandi have low development status in irrigation infrastructure. Again, the disparity in irrigation infrastructure is found to be about 66 percent having the value of coefficient of variation as 65.61.

Table 4. 9: Overall Rural Irrigation Index (I_{IR}) of the Districts of Assam, 1991

Districts	I_{IR1}	I_{IR2}	I_{IR}** $=(I_{IR1}+I_{IR2})/2$	Status	Rank
Dhemaji	0.008	0.525	0.267	LD	14
Lakhimpur	0.053	0.643	0.348	LD	5
Sonitpur	0.375	0.313	0.344	LD	7
Dibrugarh	0.000	0.181	0.091	LD	19
Jorhat	0.048	0.580	0.314	LD	10
Golaghat	0.101	0.588	0.345	LD	6
Sibsagar	0.177	0.051	0.114	LD	18
Tinsukia	0.263	1.000	0.632	MD	2
Nagaon	0.313	0.195	0.254	LD	15
Morigaon	0.166	0.478	0.322	LD	8
Nalbari	1.000	0.227	0.614	MD	3
Darrang	0.937	0.247	0.592	MD	4
Barpeta	0.239	0.297	0.268	LD	13
Dhubri	0.083	0.303	0.193	LD	16
Bongaigaon	0.187	0.171	0.179	LD	17
Kokrajhar	0.182	0.379	0.281	LD	11
Goalpara	0.506	0.125	0.316	LD	9
Kamrup	0.122	0.419	0.271	LD	12
N. C. Hills	0.608	0.697	0.653	MD	1
Karbi-Anglong	0.048	0.059	0.054	LD	21
Cachar	0.053	0.000	0.027	LD	22
Karimganj	0.118	0.0008	0.059	LD	20
Hailakandi	0.035	0.001	0.018	LD	23
Assam (Mean)	0.244	0.325	0.285	LD	
Standard Deviation	0.270	0.254	0.187		
Coefficient of Variation	110.66	78.15	65.61		

Source: ** Constructed from, Table 4.7 and 4.8

Note: **I_{IR}****= Rural Irrigation Index; **I_{IR1}**= Irrigation Index 1 (Percentage of irrigated are to net sown area); **I_{IR2}***= Irrigation Index 2 (No. of minor irrigation per 1,000 hectares to net sown area); **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

The Table 4.10 in the following shows district wise percentage of irrigated area to net sown area and corresponding index for the year 2001.

Table 4. 10: District wise Percentage of Irrigated Area to Net Sown Area and Irrigation Index (I_{IR1}) of Assam, 2001

Districts	Percentage of Irrigated area to Net Sown Area	I_{IR1} *	Status	Rank
Dhemaji	1.95	0.056	LD	20
Lakhimpur	3.52	0.108	LD	15
Sonitpur	16.83	0.551	MD	7
Dibrugarh	2.48	0.074	LD	17
Jorhat	2.30	0.068	LD	18
Golaghat	16.57	0.542	MD	8
Sibsagar	1.98	0.057	LD	19
Tinsukia	1.64	0.046	LD	21
Nagaon	4.94	0.155	LD	14
Morigaon	18.44	0.604	MD	5
Nalbari	30.33	1.000	HD	1
Darrang	28.79	0.949	HD	2
Barpeta	5.09	0.160	LD	13
Dhubri	14.89	0.486	LD	9
Bongaigaon	13.39	0.436	LD	10
Kokrajhar	22.32	0.734	MD	3
Goalpara	17.94	0.588	MD	6
Kamrup	7.25	0.322	LD	11
N. C. Hills	9.65	0.312	LD	12
Karbi-Anglong	18.69	0.613	MD	4
Cachar	1.47	0.039	LD	22
Karimganj	3.01	0.091	LD	16
Hailakandi	0.27	0.000	LD	23
Assam	11.49	0.347	LD	
Standard Deviation		0.300		
Coefficient of Variation		86.46		

Source: Constructed from,

Village Directory, 2001, Assam, Census of India and

Statistical Hand Book, Assam, 2005, Government of Assam

Note: **I_{IR1}*** = Irrigation Index 1 (Percentage of irrigated are to net sown area);

LD= Low Development; **MD**= Moderate Development;

HD= High Development; **SD**= Standard Deviation

The overall percentage of irrigated area to net sown area for overall Assam has increased from 5.52 in 1991 to 11.49 in 2001. As shown in column 3 of Table 4.10, the

overall status of Assam has low development with value of the index as 0.347 which is again slight improvement from 0.244 in 1991. The districts Nalbari and Darrang have high development position contrary to six districts such as Kokrajhar, Karbi-Anglong, Morigaon, Goalpara, Sonitpur and Golaghat which have moderate development position. The remaining 15 districts have low development status in percentage of irrigated area to net sown area. In descending order these districts are Dhubri, Bongaigaon, Kamrup, N. C. Hills, Barpeta, Nagaon, Lakhimpur, Karimganj, Dibrugarh, Jorhat, Sibsagar, Dhemaji, Tinsukia, Cachar and Hailakandi. Thus, Nalbari and Hailakandi respectively have highest and lowest development among the 23 districts of Assam. Further, the disparity in irrigated area to net sown area is about 86 percent as the value of coefficient of variation is 86.46. Here, the disparity across the State has been reduced from 111 percent in 1991 to 86 percent in 2001.

The district wise number of minor irrigation per 1,000 hectares to net sown area and concerned indices of Assam for 2001 is depicted in Table 4.11.

From the table it is evident that out of the 23 districts of Assam at the time of 2001 Census, the districts Bongaigaon and Karimganj respectively have attained highest and lowest development in minor irrigation. Here, the all Assam status of minor irrigation is found as low development having the value of the index as 0.388. The districts Bongaigaon and Dhubri have high development status contrary to four moderate development regions viz, Morigaon, Barpeta, Kamrup and Goalpara. The remaining 17 districts including Karimganj in the Barak Valley the least developed district out of the 23 districts of Assam have low development status in minor irrigation schemes. Further, the inter-district disparity in minor irrigation schemes is found as 71.65 percent as is evident from the value of coefficient of variation which is lower than the value 78 percent found in 1991.

From the Table 4.10 and Table 4.11, Table 4.12 has been computed which shows district wise overall irrigation infrastructure index and variability in irrigation infrastructure across the State of Assam in 2001.

Table 4. 11: District wise Nos. of Minor Irrigation per 1,000 Hectares to Net Sown Area (NSA) and Irrigation Index (I_{IR2}) of Assam, 2001

Districts	Nos. of Minor Irrigation per ,000 Hectares to NSA	I_{IR2} *	Status	Rank
Dhemaji	21.28	0.294	LD	14
Lakhimpur	15.73	0.215	LD	18
Sonitpur	18.06	0.248	LD	16
Dibrugarh	32.79	0.456	LD	7
Jorhat	18.29	0.251	LD	15
Golaghat	29.99	0.417	LD	11
Sibsagar	16.66	0.228	LD	17
Tinsukia	26.32	0.365	LD	12
Nagaon	30.51	0.424	LD	10
Morigaon	54.69	0.766	MD	3
Nalbari	23.88	0.330	LD	13
Darrang	32.68	0.455	LD	8
Barpeta	54.29	0.761	MD	4
Dhubri	67.89	0.953	HD	2
Bongaigaon	71.20	1.000	HD	1
Kokrajhar	32.43	0.451	LD	9
Goalpara	38.43	0.536	MD	6
Kamrup	41.02	0.573	MD	5
N. C. Hills	10.13	0.136	LD	19
Karbi-Anglong	2.94	0.034	LD	20
Cachar	2.49	0.028	LD	21
Karimganj	0.54	0.000	LD	23
Hailakandi	0.58	0.001	LD	22
Assam	30.53	0.388	LD	
Standard Deviation		0.278		
Coefficient of Variation		71.65		

Source: Constructed from,
Village Directory, 2001, Assam, Census of India and
Minor Irrigation Census, 2000-01, Government of India

Note: **I_{IR2}*** = Irrigation Index 2 (No. of minor irrigation schemes per 1,000 hectares to net sown area); **LD**= Low Development;
MD= Moderate Development; **HD**= High Development

In the Table 4.12, the column 4 which shows irrigation infrastructure index is computed as average of column 2 and column 3. Here, the overall irrigation infrastructure index of Assam is found as 0.368 implying low development status. It is to be noted that in 2001 there exist no any high developed districts in irrigation

infrastructure, whereas 7 districts like Dhubri, Bongaigaon, Darrang, Morigaon, Nalbari, Kokrajhar and Goalpara have moderate development status. The remaining other 15 districts have low development status. From, the above table it is clear that Dhubri and Hailakandi respectively have highest and lowest development in irrigation infrastructure.

Table 4. 12: Overall Rural Irrigation Index (I_{IR}) of the Districts of Assam, 2001

Districts	I_{IR1}	I_{IR2}	I_{IR}** $=(I_{IR1}+I_{IR2})/2$	Status	Rank
Dhemaji	0.056	0.294	0.175	LD	17
Lakhimpur	0.108	0.215	0.162	LD	18
Sonitpur	0.551	0.248	0.399	LD	11
Dibrugarh	0.074	0.456	0.265	LD	14
Jorhat	0.068	0.251	0.159	LD	19
Golaghat	0.542	0.417	0.479	LD	8
Sibsagar	0.057	0.228	0.143	LD	20
Tinsukia	0.046	0.365	0.206	LD	16
Nagaon	0.155	0.424	0.289	LD	13
Morigaon	0.604	0.766	0.685	MD	4
Nalbari	1.000	0.330	0.665	MD	5
Darrang	0.949	0.455	0.702	MD	3
Barpeta	0.160	0.761	0.461	LD	9
Dhubri	0.486	0.953	0.719	MD	1
Bongaigaon	0.436	1.000	0.718	MD	2
Kokrajhar	0.734	0.451	0.593	MD	6
Goalpara	0.588	0.536	0.562	MD	7
Kamrup	0.322	0.573	0.448	LD	10
N. C. Hills	0.312	0.136	0.224	LD	15
Karbi-Anglong	0.613	0.034	0.324	LD	12
Cachar	0.039	0.028	0.034	LD	22
Karimganj	0.091	0.000	0.046	LD	21
Hailakandi	0.000	0.001	0.001	LD	23
Assam	0.347	0.388	0.368	LD	
Standard Deviation	0.299	0.278	0.233		
Coefficient of Variation	86.22	71.56	63.32		

Source: ** Constructed from, Table 4.10 and 4.11

Note: **I_{IR}****= Rural Irrigation Index; **I_{IR1}**= Irrigation Index 1 (Percentage of irrigated are to net sown area); **I_{IR2}***= Irrigation Index 2 (Nos. of minor irrigation schemes); **LD**= Low Development;
MD= Moderate Development; **HD**= High Development

Here, being the coefficient of variation value as 63.32, the disparity in irrigation index in 2001 is about 63 percent as compared to 66 percent in 1991.

Now, the Table 4.13 indicates district wise percentage of irrigated area to net sown area and the corresponding irrigation index (I_{IR1}) for the year 2011.

In the table the percentage of irrigated area to net sown area for overall Assam has been computed as 4.45 which is less than 11.49 in 2001 and 5.52 in 1991. Again, the status of overall irrigation in Assam is found as low development with value of the index as 0.219 against 0.347 in 2001 and 0.244 in 1991 which again revealed downward development in irrigation infrastructure. From the table, it is evident that Udalguri and Dhemaji respectively have highest and lowest development in percentage of irrigated area to net sown area among the 27 districts of Assam. Here, only one district Udalguri has high development status followed by Chirang, Dhubri, Baksa and Jorhat which fall in the moderate development category. The remaining other 22 districts have low development status. Further, it has been observed that there exists about 117 percent disparity across the regions of Assam having the value of coefficient of variation as 116.89 which is higher than the value of 111 and 86 percent of 1991 and 2001 respectively.

Again, the Table 4.14 in the following depicts district wise numbers of minor irrigation per 1,000 hectares to net sown area (NSA) and the corresponding irrigation index in 2011 of Assam.

From this table it has been found that Dhubri district has the largest number of minor irrigation schemes per per 1,000 hectares to net sown area among the 27 districts of Assam. Here, Dhubri is the only one district that has high development status. There exist four districts viz, Barpeta, Bongaigaon, Goalpara and Darrang that have moderate development status and the remaining 22 districts belongs to low development category in minor irrigation schemes. Hailakandi is the least developed districts out of the 27 districts of Assam in 2011. In average, the all Assam status in minor irrigation is found as low development having the value 0.260 in contrast to 0.388 in 2001 and 0.325 in 1991. Further, with coefficient of variation value as 90.77 the disparity in minor

irrigation schemes across Assam is about 91 percent which again showing a higher level of disparity than 78 percent and 72 percent respectively for 1991 and 2001.

Table 4. 13: District wise Percentage of Irrigated Area to Net Sown Area and Irrigation Index (I_{IR1}) of Assam, 2011

Districts	Percentage of Irrigated area to Net Sown Area	I_{IR1} *	Status	Rank
Dhemaji	0	0.000	LD	26
Lakhimpur	1.91	0.069	LD	18
Sonitpur	4.02	0.145	LD	13
Dibrugarh	0.68	0.025	LD	22
Jorhat	14.93	0.539	MD	5
Golaghat	1.99	0.072	LD	17
Sibsagar	3.42	0.123	LD	14
Tinsukia	0.75	0.027	LD	21
Nagaon	3.34	0.121	LD	15
Morigaon	5.87	0.212	LD	8
Nalbari	1.06	0.038	LD	20
Darrang	3.96	0.123	LD	14
Barpeta	4.27	0.154	LD	12
Dhubri	16.53	0.596	MD	3
Bongaigaon	4.39	0.158	LD	11
Kokrajhar	12.58	0.454	LD	6
Udalguri	27.71	1.000	HD	1
Baksa	15.84	0.572	MD	4
Chirang	21.3	0.769	MD	2
Goalpara	5.27	0.190	LD	9
Kamrup Metro	5	0.180	LD	10
Kamrup	2.05	0.074	LD	16
Dima Hasao	5.99	0.216	LD	7
Karbi-Anglong	1.28	0.046	LD	19
Cachar	0.21	0.008	LD	23
Karimganj	0.01	0.0004	LD	25
Hailakandi	0.12	0.004	LD	24
Assam	4.45	0.219	LD	
Standard Deviation		0.256		
Coefficient of Variation		116.89		

Source: Constructed from,
District Census Hand Book, 2011, Assam, Census of India and
Statistical Hand Book, Assam, 2011, Government of Assam

Note: **I_{IR1}*** = Irrigation Index 1 (Percentage of irrigated are to net sown area);
LD= Low Development; **MD**= Moderate Development; **HD**= High Development

Table 4. 14: District wise Nos. of Minor Irrigation per 1,000 Hectares to Net Sown Area (NSA) and Irrigation Index (I_{IR2}) of Assam, 2011

Districts	Nos. of Minor Irrigation per ,000 Hectares to NSA	I_{IR2} *	Status	Rank
Dhemaji	24.68	0.173	LD	14
Lakhimpur	17.42	0.116	LD	20
Sonitpur	15.53	0.101	LD	21
Dibrugarh	36.42	0.264	LD	10
Jorhat	20.69	0.142	LD	17
Golaghat	19.56	0.133	LD	18
Sibsagar	19.24	0.130	LD	19
Tinsukia	27.84	0.197	LD	11
Nagaon	52.80	0.392	LD	9
Morigaon	57.42	0.428	LD	7
Nalbari	66.59	0.499	LD	6
Darrang	68.63	0.515	MD	5
Barpeta	80.98	0.611	MD	2
Dhubri	130.91	1.000	HD	1
Bongaigaon	72.71	0.547	MD	3
Kokrajhar	22.4	0.155	LD	16
Udalguri	22.81	0.158	LD	15
Baksa	13.27	0.084	LD	22
Chirang	26.30	0.185	LD	13
Goalpara	70.71	0.531	MD	4
Kamrup Metro	27.17	0.192	LD	12
Kamrup	55.93	0.416	LD	8
Dima Hasao	3.90	0.011	LD	24
Karbi-Anglong	3.49	0.008	LD	25
Cachar	4.92	0.019	LD	23
Karimganj	2.54	0.0002	LD	26
Hailakandi	2.51	0.000	LD	27
Assam	39.41	0.260	LD	
Standard Deviation		0.236		
Coefficient of Variation		90.77		

Source: Constructed from,

District Census Hand Book, 2011, Assam, Census of India and

Minor Irrigation Census, 2006-07, Government of India

Note: **I_{IR2}*** = Irrigation Index 2 (No. of minor irrigation schemes per 1,000 hectares to net sown area); **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

Now, the district wise overall indices of irrigation infrastructure of Assam for 2011 are presented by the following Table 4.15.

Table 4. 15: Overall Rural Irrigation Index (I_{IR}) of the Districts of Assam, 2011

Districts	I_{IR1}	I_{IR2}	I_{IR}** $=(I_{IR1}+I_{IR2})/2$	Status	Rank
Dhemaji	0.000	0.173	0.087	LD	23
Lakhimpur	0.069	0.116	0.093	LD	22
Sonitpur	0.145	0.101	0.123	LD	18
Dibrugarh	0.025	0.264	0.145	LD	16
Jorhat	0.539	0.142	0.341	LD	7
Golaghat	0.072	0.133	0.103	LD	21
Sibsagar	0.123	0.130	0.127	LD	17
Tinsukia	0.027	0.197	0.112	LD	20
Nagaon	0.121	0.392	0.257	LD	13
Morigaon	0.212	0.428	0.320	LD	9
Nalbari	0.038	0.499	0.269	LD	12
Darrang	0.123	0.515	0.319	LD	10
Barpeta	0.154	0.611	0.383	LD	4
Dhubri	0.596	1.000	0.798	MD	1
Bongaigaon	0.158	0.547	0.353	LD	6
Kokrajhar	0.454	0.155	0.305	LD	11
Udalguri	1.000	0.158	0.579	MD	2
Baksa	0.572	0.084	0.328	LD	8
Chirang	0.769	0.185	0.477	LD	3
Goalpara	0.190	0.531	0.361	LD	5
Kamrup Metro	0.180	0.192	0.186	LD	15
Kamrup	0.074	0.416	0.245	LD	14
Dima Hasao	0.216	0.011	0.114	LD	19
Karbi-Anglong	0.046	0.008	0.027	LD	24
Cachar	0.008	0.019	0.014	LD	25
Karimganj	0.0004	0.0002	0.0003	LD	27
Hailakandi	0.004	0.000	0.002	LD	26
Assam	0.219	0.260	0.240	LD	
Standard Deviation	0.256	0.236	0.184		
Coefficient of Variation	116.89	90.77	76.67		

Source: ** Constructed from, Table 4.13 and 4.14

Note: **I_{IR}****= Rural Irrigation Index; **I_{IR1}**= Irrigation Index 1 (Percentage of irrigated are to net sown area); **I_{IR2}***= Irrigation Index 2 (Nos. of minor irrigation schemes); **LD**= Low Development;
MD= Moderate Development; **HD**= High Development

The composite index of irrigation in Assam as has been depicted in column 4 of Table 4.15 which is computed as average of column 2 and column 3 indicating percentage of irrigated area to net sown area index and number of minor irrigation schemes per 1,000 hectares to net sown area index respectively. The status of overall irrigation infrastructure index is found as low development with value of the index as 0.240 which is again a degradation of value as has been computed as 0.285 and 0.368 in 1991 and 2001 respectively. Again, having the values as 0.798 and 0.579 the two districts Dhubri and Udalguri respectively have attained high development status in 2011. The remaining majority 25 districts have low development status in irrigation infrastructure. Further, the disparity in overall irrigation is computed as 76.67 percent as shown from the value of coefficient of variation.

Thus, it has been evident that all the three census years such as 1991, 2001 and 2011 experience high level of disparity in irrigation infrastructure across the districts of Assam. The disparity in irrigation is the lowest in 2001 having the coefficient of variation value as 63.32 and with value 76.67 the year 2011 experiences highest disparity. The disparity in irrigation infrastructure in 1991 is found as 65.61 percent. Further, the year 2001 experiences more development in irrigation infrastructure compared to the years 1991 and than to 2011.

4.3.4 Rural Roads Infrastructure

One of the very important rural infrastructures for smooth progress of rural development is rural connectivity such as telecom, pucca roads etc. Among them rural road is the basic indicator for rural development in particular and economic development in general. It has a very important role in upliftment of transport facilities for socio-economic development of a rural region.

Here, in the study rural roads as a measurement of factor behind disparities in rural development of Assam have been calculated from percentage of villages approach to rural paved road of the rural area. Table 4.16, Table 4.17 and Table 4.18 in the following depict district wise percentage of villages approach to rural pucca roads and the corresponding road indices (I_{RIF}) for 1991, 2001 and 2011 of Assam respectively.

Table 4. 16: District wise Percentage of Villages Approach to Pucca Roads and Rural Road Index (I_{RIF}) of Assam, 1991

Districts	Percentage of villages approach to pucca roads	I_{RIF}*	Status	Rank
Dhemaji	13.78	0.075	LD	21
Lakhimpur	19.97	0.299	LD	16
Sonitpur	23.73	0.434	LD	14
Dibrugarh	32.11	0.737	MD	3
Jorhat	28.44	0.605	MD	8
Golaghat	29.32	0.636	MD	7
Sibsagar	39.39	1.000	HD	1
Tinsukia	29.72	0.651	MD	5
Nagaon	37.84	0.944	HD	2
Morigaon	25.46	0.497	LD	12
Nalbari	22.21	0.379	LD	15
Darrang	29.61	0.647	MD	6
Barpeta	19.78	0.292	LD	17
Dhubri	14.85	0.114	LD	19
Bongaigaon	17.91	0.224	LD	18
Kokrajhar	24.00	0.444	LD	13
Goalpara	14.39	0.097	LD	20
Kamrup	27.77	0.580	MD	9
N. C. Hills	11.70	0.000	LD	23
Karbi-Anglong	27.66	0.576	MD	10
Cachar	31.71	0.723	MD	4
Karimganj	13.39	0.061	LD	22
Hailakandi	26.06	0.519	MD	11
Assam	25.01	0.458	LD	
Standard Deviation		0.273		
Coefficient of Variation		59.61		

Source: Constructed from,

Village Directory, 1991, Assam, Census of India

Note: **I_{RIF}*** = Rural Road Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

From the Table 4.16 it has been evident that percentage of villages approach to rural pucca roads as a whole for rural Assam in 1991 is 25.01. Only two districts Sibsagar and Nagaon have high development status contrary to nine districts like Dibrugarh, Cachar, Tinsukia, Darrang, Golaghat, Jorhat, Kamrup, Karbi-Anglong and

Hailakandi that have moderate development status. The remaining 12 districts viz, Morigaon, Kokrajhar, Sonitpur, Nalbari, Lakhimpur, Barpeta, Bongaigaon, Dhubri, Goalpara, Dhemaji, Karimganj and N. C. Hills have low development status. Here, Sibsagar and N. C. Hills respectively have the highest and lowest development status in rural road infrastructure across the State of Assam in 1991.

Further, it has been found that the status of road infrastructure for overall rural Assam is low development having the value of road index as 0.458. Again, with value of coefficient of variation as 59.61, the disparity in road infrastructure across Assam is about 60 percent.

The Table 4.17 in the following explains district wise percentage of villages approach to rural pucca road and road infrastructure index for 2001. As shown in the table, the status of overall rural road index of Assam in 2001 has moderate development with value of the index as 0.507. Further, along with highest developed district Darrang, there exist three districts, namely, Kamrup, Nagaon and Tinsukia that have high development status in rural road infrastructure. The districts like Kokrajhar, Sonitpur, Lakhimpur, Jorhat, Sibsagar, Golaghat and Nalbari have moderate development status against the districts such as Morigaon, Barpeta, Karimganj, Bongaigaon, Cachar, Hailakandi, Dibrugarh, Goalpara, Dhemaji, N. C. Hills, Dhubri and Karbi-Anglong which have low development status. Here, out of the 23 districts of Assam, Darrang and Goalpara respectively have highest and lowest development in rural road infrastructure.

Here, in the table as evident from the value of coefficient of variation the disparity in road index across the 23 districts of Assam is found as 55.42 percent which is less than compared to the value of 1991.

The Table 4.18 in the following shows district wise rural road index of Assam for the year 2011. Here, the percentage of villages approach to to rural pucca road as a whole for the entire State of rural Assam has been computed as 17.41. The districts Nagaon and Dima Hasao respectively have attained highest and lowest development in rural road infrastructure. Here, Nagaon is the only one high development district in rural pucca roads in 2011. There are 7 districts viz, Barpeta, Hailakandi, Darrang, Nalbari, Morigaon, Kamrup and Cachar that have moderate dervelopment status. As against

these the remaining 19 districts have low development status in villages approach to pucca roads.

Table 4. 17: District wise Percentage of Villages Approach to Pucca Roads and Rural Road Index (I_{RIF}) of Assam, 2001

Districts	Percentage of villages approach to pucca roads	I_{RIF} *	Status	Rank
Dhemaji	24.11	0.089	LD	21
Lakhimpur	55.56	0.722	MD	7
Sonitpur	57.06	0.752	MD	6
Dibrugarh	34.13	0.290	LD	17
Jorhat	51.93	0.649	MD	8
Golaghat	46.01	0.529	MD	10
Sibsagar	50.23	0.615	MD	9
Tinsukia	60.56	0.823	HD	4
Nagaon	65.63	0.925	HD	3
Morigaon	44.18	0.492	LD	12
Nalbari	45.34	0.516	MD	11
Darrang	69.35	1.000	HD`	1
Barpeta	43.71	0.483	LD	13
Dhubri	30.38	0.215	LD	19
Bongaigaon	37.84	0.365	LD	15
Kokrajhar	57.13	0.754	MD	5
Goalpara	19.71	0.000	LD	22
Kamrup	67.34	0.959	HD	2
N. C. Hills	24.81	0.103	LD	20
Karbi-Anglong	30.71	0.222	LD	18
Cachar	37.82	0.365	LD	15
Karimganj	43.51	0.479	LD	14
Hailakandi	34.74	0.303	LD	16
Assam	45.42	0.507	MD	
Standard Deviation		0.281		
Coefficient of Variation		55.42		

Source: Constructed from,

Village Directory, 2001, Assam, Census of India

Note: **I_{RIF}*** = Rural Road Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

Table 4. 18: District wise Percentage of Villages Approach to Pucca Roads and Rural Road Index (I_{RIF}) of Assam, 2011

Districts	Percentage of villages approach to pucca roads	I_{RIF}*	Status	Rank
Dhemaji	2.88	0.048	LD	25
Lakhimpur	8.45	0.158	LD	23
Sonitpur	13.43	0.255	LD	17
Dibrugarh	10.61	0.199	LD	22
Jorhat	20.52	0.395	LD	12
Golaghat	17.24	0.330	LD	15
Sibsagar	23.09	0.445	LD	10
Tinsukia	12.76	0.242	LD	18
Nagaon	51.35	1.000	HD	1
Morigaon	30.38	0.588	MD	6
Nalbari	32.46	0.629	MD	5
Darrang	35.29	0.685	MD	4
Barpeta	37.49	0.728	MD	2
Dhubri	7.33	0.136	LD	24
Bongaigaon	19.54	0.375	LD	13
Kokrajhar	10.67	0.201	LD	21
Udalguri	12.50	0.237	LD	19
Baksa	23.19	0.447	LD	9
Chirang	11.02	0.208	LD	20
Goalpara	18.09	0.347	LD	14
Kamrup Metro	17.13	0.328	LD	16
Kamrup	29.03	0.562	MD	7
Dima Hasao	0.43	0.000	LD	27
Karbi-Anglong	1.30	0.017	LD	26
Cachar	27.88	0.539	MD	8
Karimganj	20.94	0.403	LD	11
Hailakandi	37.16	0.721	MD	3
Assam	17.41	0.379	LD	
Standard Deviation		0.239		
Coefficient of Variation		63.06		

Source: Constructed from,

District Census Hand Book, 2011, Assam, Census of India

Note: **I_{RIF}*** = Rural Road Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

Further, as evident from Table 4.18 in the above the rural road infrastructure index for overall Assam has been computed as 0.379 which shows downward development than 0.458 of 1991 and 0.507 of 2001. Again, the value of coefficient of variation has computed as 63.06 which means there exist about 63 percent disparity in rural road infrastructure across districts of Assam in 2011 which again showing an increasing disparity in road infrastructure than in 2001 and 1991 having the value of coefficient of variation as 55.42 and 59.61 respectively.

4.3.5 Rural Infrastructure Index

Now, the study will construct the overall rural infrastructure index (I_{IF}) in order to analyze the entire infrastructure components in one single index which is computed as simple average of rural health infrastructure, education infrastructure, irrigation infrastructure and rural road infrastructure as have been discussed earlier.

The Table 4.19, Table 4.20 and Table 4.21 respectively depict the district wise composite index of rural infrastructure for the years 1991, 2001 and 2011 of Assam. In all the tables column 6 represent overall rural infrastructure index (I_{IF}) which is calculated as simple average of rural health infrastructure index (I_{HIF}), education infrastructure index (I_{EIF}), irrigation infrastructure index (I_{IR}) and rural road index (I_{RIF}) as have been represented in column 2, column 3, column 4 and column 5 respectively. Further, in the table of overall infrastructure index, status and rank of different regions are shown in column 7 and column 8 respectively.

In the Table 4.19 the district wise rural infrastructure index for 1991 has been computed from Table 4.1, Table 4.4, Table 4.9 and Table 4.16. Here, in the table out of 23 districts at the time of 1991 Census, N. C. Hills and Karimganj respectively have attained highest and lowest positions in rural infrastructure. The district N. C. Hills is the only one region which is categorized as moderate development. The remaining 22 districts have low development status. These transform the overall status of Assam as low development with value of the index as 0.303. Further, from the indices of rural infrastructure the coefficient of variation has been computed as 40.36 which means existence of about 40 percent disparity in rural infrastructure across the regions of Assam in 1991.

Table 4. 19: District wise Overall Rural Infrastructure Index (I_{IF}) of Assam, 1991

Districts	I_{HIF}	I_{EIF}	I_{IR}	I_{RIF}	$I_{IF}^{**}=(I_{HIF}+I_{EIF}+I_{IR}+I_{RIF})/4$	Status	Rank
Dhemaji	0.406	0.222	0.267	0.075	0.243	LD	16
Lakhimpur	0.277	0.363	0.348	0.299	0.322	LD	9
Sonitpur	0.465	0.000	0.344	0.434	0.311	LD	10
Dibrugarh	0.731	0.115	0.091	0.737	0.419	LD	4
Jorhat	0.291	0.256	0.314	0.605	0.367	LD	6
Golaghat	0.726	0.094	0.345	0.636	0.450	LD	3
Sibsagar	0.569	0.121	0.114	1.000	0.451	LD	2
Tinsukia	0.204	0.043	0.632	0.651	0.383	LD	5
Nagaon	0.156	0.009	0.254	0.944	0.341	LD	8
Morigaon	0.296	0.061	0.322	0.497	0.294	LD	12
Nalbari	0.000	0.093	0.614	0.379	0.272	LD	14
Darrang	0.123	0.073	0.592	0.647	0.359	LD	7
Barpeta	0.186	0.057	0.268	0.292	0.201	LD	18
Dhubri	0.047	0.075	0.193	0.114	0.107	LD	21
Bongaigaon	0.293	0.064	0.179	0.224	0.190	LD	19
Kokrajhar	0.210	0.072	0.281	0.444	0.252	LD	15
Goalpara	0.067	0.133	0.316	0.097	0.153	LD	20
Kamrup	0.184	0.139	0.271	0.580	0.294	LD	12
N. C. Hills	1.000	1.000	0.653	0.000	0.663	MD	1
Karbi-Anglong	0.132	0.138	0.054	0.576	0.225	LD	17
Cachar	0.337	0.082	0.027	0.723	0.292	LD	13
Karimganj	0.144	0.098	0.059	0.061	0.091	LD	22
Hailakandi	0.387	0.258	0.018	0.519	0.296	LD	11
Assam	0.314	0.155	0.285	0.458	0.303	LD	
SD	0.240	0.199	0.187	0.273	0.122		
CV	76.43	128.39	65.61	59.61	40.36		

Source: ** Constructed from, Table 4.1, Table 4.4, Table 4.9 and Table 4.16

Note: **I_{IF}=** Rural Infrastructure Index**;** **I_{HIF} =** Health Infrastructure Index;
I_{EIF} = Education Infrastructure Index; **I_{IR}** = Irrigation Infrastructure Index**;**
I_{RIF} = Road Infrastructure Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

Again, Table 4.20 in the following shows district wise overall rural infrastructure index of Assam for 2001. As shown in Table 4.20 the rural infrastructure index for the year 2001 has been computed similar to the computation of Table 4.19. Here, the value of the overall rural infrastructure index of Assam is found as 0.295 which implies a low development status in rural infrastructure. The district wise

differences of indices across the regions have been estimated as about 35 percent as the coefficient of variation is found as 35.13. In the table, N. C. Hills and Cachar respectively have highest and lowest infrastructural development out of the 23 districts in the State. Here, all the districts of Assam fall into the low development status except N. C. Hills which is the only one moderate developed region in rural infrastructure.

Table 4. 20: District wise Overall Rural Infrastructure Index (I_{IF}) of Assam, 2001

Districts	I_{HIF}	I_{EIF}	I_{IR}	I_{RIF}	$I_{IF}^{**}=(I_{HIF}+I_{EIF}+I_{IR}+I_{RIF})/4$	Status	Rank
Dhemaji	0.214	0.322	0.175	0.089	0.200	LD	18
Lakhimpur	0.118	0.289	0.162	0.722	0.323	LD	8
Sonitpur	0.105	0.000	0.399	0.752	0.314	LD	10
Dibrugarh	0.215	0.085	0.265	0.290	0.214	LD	17
Jorhat	0.201	0.237	0.159	0.649	0.312	LD	11
Golaghat	0.300	0.085	0.479	0.529	0.348	LD	6
Sibsagar	0.164	0.159	0.143	0.615	0.270	LD	13
Tinsukia	0.087	0.029	0.206	0.823	0.286	LD	12
Nagaon	0.036	0.004	0.289	0.925	0.314	LD	10
Morigaon	0.043	0.038	0.685	0.492	0.315	LD	9
Nalbari	0.124	0.124	0.665	0.516	0.357	LD	5
Darrang	0.084	0.055	0.702	1.000	0.460	LD	2
Barpeta	0.049	0.056	0.461	0.483	0.262	LD	15
Dhubri	0.040	0.047	0.719	0.215	0.255	LD	16
Bongaigaon	0.153	0.092	0.718	0.365	0.332	LD	7
Kokrajhar	0.136	0.080	0.593	0.754	0.391	LD	4
Goalpara	0.078	0.069	0.562	0.000	0.177	LD	19
Kamrup	0.099	0.086	0.448	0.959	0.398	LD	3
N. C. Hills	1.000	1.000	0.224	0.103	0.582	MD	1
Karbi-Anglong	0.337	0.193	0.324	0.222	0.269	LD	14
Cachar	0.049	0.044	0.034	0.365	0.123	LD	22
Karimganj	0.034	0.089	0.046	0.479	0.162	LD	20
Hailakandi	0.000	0.217	0.001	0.303	0.130	LD	21
Assam	0.159	0.148	0.368	0.507	0.295		
SD	0.198	0.201	0.233	0.281	0.104		
CV	124.53	135.81	63.32	55.42	35.13		

Source: ** Constructed from, Table 4.2, Table 4.5, Table 4.12 and Table 4.17

Note: **I_{IF}=** Rural Infrastructure Index**;** **I_{HIF} =** Health Infrastructure Index;
I_{EIF} = Education Infrastructure Index; **I_{IR}** = Irrigation Infrastructure Index**;**
I_{RIF} = Road Infrastructure Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

The district wise status and extent of disparities in rural infrastructure index of Assam for the year 2011 is shown with the help of Table 4.21.

Table 4. 21: District wise Overall Infrastructure Index (I_{IF}) of Assam, 2011

Districts	I_{HIF}	I_{EIF}	I_{IR}	I_{RIF}	$I_{IF}^{**}=(I_{HIF}+I_{EIF}+I_{IR}+I_{RIF})/4$	Status	Rank
Dhemaji	0.302	0.233	0.087	0.048	0.168	LD	22
Lakhimpur	0.125	0.191	0.093	0.158	0.142	LD	25
Sonitpur	0.177	0.051	0.123	0.255	0.152	LD	24
Dibrugarh	0.326	0.130	0.145	0.199	0.200	LD	21
Jorhat	0.452	0.198	0.341	0.395	0.347	LD	5
Golaghat	0.376	0.130	0.103	0.330	0.235	LD	18
Sibsagar	0.437	0.179	0.127	0.445	0.297	LD	9
Tinsukia	0.200	0.058	0.112	0.242	0.153	LD	23
Nagaon	0.166	0.024	0.257	1.000	0.362	LD	3
Morigaon	0.353	0.039	0.320	0.588	0.325	LD	7
Nalbari	0.459	0.121	0.269	0.629	0.370	LD	2
Darrang	0.147	0.024	0.319	0.685	0.294	LD	10
Barpeta	0.249	0.056	0.383	0.728	0.354	LD	4
Dhubri	0.193	0.000	0.798	0.136	0.282	LD	12
Bongaigaon	0.121	0.082	0.353	0.375	0.233	LD	19
Kokrajhar	0.205	0.159	0.305	0.201	0.218	LD	20
Udalguri	0.445	0.105	0.579	0.237	0.342	LD	6
Baksa	0.385	0.133	0.328	0.447	0.323	LD	8
Chirang	0.197	0.136	0.477	0.208	0.255	LD	15
Goalpara	0.184	0.074	0.361	0.347	0.242	LD	17
Kamrup Metro	0.353	0.144	0.186	0.328	0.253	LD	16
Kamrup	0.158	0.112	0.245	0.562	0.269	LD	13
Dima Hasao	1.000	1.000	0.114	0.000	0.529	MD	1
Karbi-Anglong	0.178	0.332	0.027	0.017	0.139	LD	26
Cachar	0.411	0.083	0.014	0.539	0.262	LD	14
Karimganj	0.000	0.086	0.0003	0.403	0.122	LD	27
Hailakandi	0.249	0.169	0.002	0.721	0.288	LD	11
Assam	0.291	0.150	0.240	0.379	0.265	LD	
SD	0.184	0.181	0.184	0.239	0.089		
CV	63.23	120.67	76.67	63.06	33.58		

Source: ** Constructed from, Table 4.3, Table 4.6, Table 4.12 and Table 4.15

Note: **I_{IF}=** Rural Infrastructure Index**;** **I_{HIF} =** Health Infrastructure Index;
I_{EIF} = Education Infrastructure Index; **I_{IR}** = Irrigation Infrastructure Index**;**
I_{RIF} = Road Infrastructure Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

The column 6 of Table 4.21 indicates rural infrastructure index which is calculated from Table 4.3, Table 4.6, Table 4.11 and Table 4.18. Here, the overall status of Assam is found as low development with value of the index as 0.295. Out of the 27 districts of Assam at the time of 2011 Census, again the Dima Hasao (N. C. Hills) ranks first in rural infrastructure with moderate development status having the value as 0.529 contrary to Karimganj district that have lowest development status with value of the index as 0.122. From the table, it has been evident that all the districts except Dima Hasao have low development status. It is worth mentioning here is that there are no any regions that have high development status. In the study the value of coefficient of variation is found 33.58 which indicate that the disparity in rural infrastructure across the State of Assam is about 34 percent.

It is to be noted that the status of overall rural Assam in all the three census years has been found as low development. The rural infrastructure index of Assam in 1991 was 0.303 which was declined to 0.295 in 2001 and further declined to 0.265 in 2011 showing a downward development in rural infrastructure from 1991 to 2011. This is because low development in different rural infrastructure like health, education, irrigation and roads. Along with increase in the population though there is an absolute increase in number of primary schools, primary health centres and irrigated area but these are not sufficient to cope up the development along with population growth as well as in some areas like Karimganj, Cachar, Dhubri etc. which are lying in difficult socio-economic conditions.

Again, from all the tables of composite index of infrastructure it is clear that the disparity in rural infrastructure have been decreasing from about 40 percent in 1991 to 35 percent in 2001 and then to 34 percent in 2011.

Lastly, in the study, the investigator want to find out the micro zone wise disparities in Assam which are composed of some cluster of districts based on location of the districts. The Table 4.22 represents micro zone wise overall rural infrastructure index of Assam for the year 1991, 2001 and 2011.

It has been evident from the table that all the zones have low development status in all the census years viz, 1991, 2001 and 2011. The Hill Zone area has attained highest

development both in 1991 and 2001 contrary to Central Brahmaputra Valley that has highest development in 2011. In contrast to these, the Lower South Brahmaputra Valley, Barak Valley and Upper North Bank Plain respectively have attained lowest development in 1991, 2001 and 2011. Further, the values of coefficient of variation for the years 1991, 2001 and 2011 respectively have been found as 27.53, 27.01 and 22.83. It means that micro zone wise there exist about 28, 27 and 23 percent variations in rural infrastructure in 1991, 2001 and 2011 respectively across the State of Assam. Thus, micro zone wise the disparity in rural infrastructure has been declining from 1991 to 2011.

Table 4. 22: Micro zone wise Overall Rural Infrastructure Index (I_{IF}) of Assam

Sl. No.	Micro Zone	I_{IF}/1991	I_{IF}/2001	I_{IF}/2011
1	Upper North Bank Plain	0.292	0.279	0.154
2	Upper South Bank Plain	0.414	0.286	0.264
3	Central Brahmaputra Valley	0.318	0.315	0.344
4	Lower North Bank Plain	0.230	0.343	0.297
5	Lower South Brahmaputra Valley	0.224	0.288	0.255
6	Barak Valley	0.226	0.138	0.224
7	Hill Zone	0.444	0.426	0.334
	Mean	0.307	0.296	0.267
	Standard Deviation	0.084	0.080	0.061
	Coefficient of Variation	27.53	27.01	22.83

Source: I_{IF}/1991, I_{IF}/2001 and I_{IF}/2011 are calculated from Table 4.19, Table 4.20 and Table 4.21 respectively

Note: I_{IF} = Rural Infrastructure Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

4.4 Resource Availability

Similar to the rural infrastructure, availability of resources are also very important factor for enhancing economic development in general and rural development in particular. The availability of resources is the driving force for development to be sustaining. For sake of convenience of the study, in order to analyze resource availability as factor understanding rural developmental disparities across the State of

Assam, it is grouped into two heads- (a) size of operational holding and (b) Landlessness.

For standardization and comparability, the study has made a composite resource availability index (I_{RA}) which is constructed as average of the indices of the size of operational holding and landlessness. The study uses secondary sources data from various Agricultural Census in order to compute operational holdings index (I_{OH}) and landlessness index (I_L). Let us discuss these two indices for all the three census years viz, 1991, 2001 and 2011as under-

4.4.1 Average Size of Operational Holding

As stated above the first component of resource availability is the average size of operational holding[1]. Here, the average size of operational holding from total holding such as individual holding, institutional holding and joint holding have been used for all the three census years- 1991, 2001 and 2011.

The Table 4.23 shows district wise average size of operational holding and operational holding index (I_{OH}) in Assam for the year 1991.

The column 3 of the table indicates district wise average size of operational holding index which is calculated from average size of operational holding as shown in column 2. In the table, the average size of operational holding as a whole for the State of Assam is 1.17 hectare. With average size of operational holding as 1.72 and 0.8 the districts Karbi-Anglong and Morigaon respectively have attained highest and lowest development out of the 23 districts in Assam in 1991. The three districts viz, Karbi-Anglong, Cachar and N. C. Hills have high development status followed by six districts such as Lakhimpur, Hailakandi, Dhemaji, Nalbari, Golaghat and Tinsukia that have moderate development status. The remaining 14 districts like Nagaon, Jorhat, Dibrugarh, Karimganj, Kamrup, Kokrajhar, Barpeta, Darrang, Sibsagar, Dhubri, Goalpara, Sonitpur, Bongaigaon and Morigaon have low development status in operational holding. These transform the overall status of Assam as low development with value of the index as 0.498.

[1] http://agcensus.nic.in/document/definition.htm

Again, from the coefficient of variation value it is clear that in 1991 there exist about 42 percent disparity across the State of Assam in operational holding.

Table 4. 23: District wise Average size of Operational Holding and Operational Holding Indices (I_{OH}) in Assam, 1991

Districts	Average size of OH (in Hect.)	I_{OH}*	Status	Rank
Dhemaji	1.3	0.543	MD	6
Lakhimpur	1.42	0.674	MD	4
Sonitpur	1.09	0.315	LD	17
Dibrugarh	1.23	0.467	LD	10
Jorhat	1.24	0.478	LD	9
Golaghat	1.28	0.522	MD	7
Sibsagar	1.17	0.402	LD	14
Tinsukia	1.27	0.511	MD	8
Nagaon	1.24	0.478	LD	9
Morigaon	0.8	0.000	LD	19
Nalbari	1.28	0.522	MD	7
Darrang	1.18	0.413	LD	13
Barpeta	1.19	0.424	LD	12
Dhubri	1.14	0.369	LD	15
Bongaigaon	1.0	0.217	LD	18
Kokrajhar	1.22	0.457	LD	11
Goalpara	1.13	0.359	LD	16
Kamrup	1.22	0.457	LD	11
N. C. Hills	1.57	0.837	HD	3
Karbi-Anglong	1.72	1.000	HD	1
Cachar	1.64	0.913	HD	2
Karimganj	1.23	0.467	LD	10
Hailakandi	1.37	0.619	MD	5
Assam	1.17	0.498	LD	
Standard Deviation		0.210		
Coefficient of Variation		42.17		

Source: Constructed from,
Agricultural Census, Input Survey, 1996-97, Government of India
http://www.agcensus.dacnet.nic.in

Note: I_{OH}* = Operational Holding Indices; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

The district wise average size of operational holding and operational holding index for the year 2001 of Assam is shown in Table 4.24.

Table 4. 24: District wise Average size of Operational Holding and Operational Holding Indices (I_{OH}) in Assam, 2001

Districts	Average size of OH (in Hect.)	I_{OH}*	Status	Rank
Dhemaji	1.14	0.443	LD	13
Lakhimpur	1.19	0.487	LD	10
Sonitpur	0.96	0.287	LD	21
Dibrugarh	1.78	1.000	HD	1
Jorhat	1.16	0.461	LD	11
Golaghat	1.09	0.400	LD	14
Sibsagar	1.21	0.504	MD	9
Tinsukia	1.72	0.948	HD	3
Nagaon	1.15	0.452	LD	12
Morigaon	0.63	0.000	LD	22
Nalbari	1.06	0.374	LD	16
Darrang	1.04	0.357	LD	17
Barpeta	1.08	0.391	LD	15
Dhubri	1.48	0.739	MD	5
Bongaigaon	0.98	0.304	LD	20
Kokrajhar	1.22	0.513	MD	8
Goalpara	1.01	0.330	LD	18
Kamrup	1.0	0.322	LD	19
N. C. Hills	1.08	0.391	LD	15
Karbi-Anglong	1.35	0.626	MD	6
Cachar	1.76	0.983	HD	2
Karimganj	1.49	0.748	MD	4
Hailakandi	1.3	0.583	MD	7
Assam	1.15	0.506	MD	
Standard Deviation		0.237		
Coefficient of Variation		46.84		

Source: Constructed from,

Agricultural Census, 2000-01, Government of India

http://www.agcensus.dacnet.nic.in

Note: I_{OH}* = Operational Holding Indices; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

From the Table 4.24 it is evident that the average size of operational holding for the overall Assam is 1.15 hectare. Here, in the table the districts Dibrugarh, Cachar and Tinsukia have high development status followed by 6 districts viz, Karimganj, Dhubri, Karbi-Anglong, Hailakandi, Kokrajhar and Sibsagar that have moderate development

status. The remaining districts like Lakhimpur, Jorhat, Nagaon, Dhemaji, Golaghat, Barpeta, N. C. Hills, Nalbari, Darrang, Goalpara, Kamrup, Bongaigaon, Sonitpur and Morigaon have low development status in operational holding. Thus, Tinsukia and Morigaon have experienced highest and lowest development in operational holding among the 23 districts of Assam. In the table the overall status of operational holding in Assam is found as moderate development with value of the index as 0.506.

Again, the disparity in operational holding has been found as about 47 percent having the value of coefficient of variation as 46.84.

The Table 4.25 in the following depicts the district wise average size of operational holding and its corresponding indices in 2011 of Assam.

It is evident from the table that the average size of operational holding for the State of Assam is only 1.1 hectare which is less than the figure of 1991 and 2001. From the column 4 of Table 4.25 it is clear that Tinsukia and Karimganj are the only two districts that have attained high development status out of 27 districts of Assam followed by two moderate development districts viz, Dibrugarh and Sibsagar at the time of 2011 Census. The majority of the districts comprising Golaghat, Barpeta, Jorhat, Baksa, Karbi-Anglong, Kamrup Metro, Lakhimpur, Hailakandi, Cachar, Sonitpur, Dhemaji, Nalbari, Udalguri, Nagaon, Chirang, Kamrup, Dhubri, Morigaon, Goalpara, Darrang, Bongaigaon, Kokrajhar and Dima Hasao have low development status in operational holding. The overall status of Assam in 2011 is found as low development with value of the index as 0.356 against the the value of 0.506 of 2001 and 0.498 of 1991 showing a low level development in operational holding than the earlier census years.

Again, the value of coefficient of variation shows about 64 percent variation in average size of operational holding across the rural regions of Assam in 2011 which is again higher than 42 percent and 47 percent as in 1991 and 2001 respectively. Thus, the disparity in average size of operational holding has increased in 2011 as compared to 1991 and 2001.

Table 4. 25: District wise Average size of Operational Holding and Operational Holding Indices (I_{OH}) in Assam, 2011

Districts	Average size of OH (in Hect.)	I_{OH}*	Status	Rank
Dhemaji	1.07	0.325	LD	12
Lakhimpur	1.12	0.368	LD	10
Sonitpur	1.07	0.325	LD	12
Dibrugarh	1.5	0.692	MD	3
Jorhat	1.26	0.487	LD	6
Golaghat	1.27	0.496	LD	5
Sibsagar	1.41	0.615	MD	4
Tinsukia	1.86	1.000	HD	1
Nagaon	1.03	0.291	LD	15
Morigaon	0.92	0.197	LD	19
Nalbari	1.05	0.308	LD	13
Darrang	0.81	0.103	LD	21
Barpeta	1.27	0.496	LD	5
Dhubri	0.93	0.205	LD	18
Bongaigaon	0.73	0.034	LD	22
Kokrajhar	0.71	0.017	LD	23
Udalguri	1.04	0.299	LD	14
Baksa	1.21	0.444	LD	7
Chirang	0.99	0.256	LD	16
Goalpara	0.89	0.171	LD	20
Kamrup Metro	1.13	0.376	LD	9
Kamrup	0.97	0.239	LD	17
Dima Hasao	0.69	0.000	LD	24
Karbi-Anglong	1.15	0.393	LD	8
Cachar	1.07	0.325	LD	12
Karimganj	1.63	0.803	HD	2
Hailakandi	1.1	0.350	LD	11
Assam	1.1	0.356	LD	
Standard Deviation		0.227		
Coefficient of Variation		63.76		

Source: Constructed from,

Agricultural Census, 2010-11, Government of India

http://www.agcensus.dacnet.nic.in

Note: I_{OH}* = Operational Holding Indices; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

4.4.2 Landlessness

The second component of resource availability is the access to land. This is computed through percentage of agricultural labourer to rural workforce (main workers). The access to land has inverse relationship with agricultural labourer. From the access to land, landlessness index has been constructed as one less index of access to land. There is a direct relationship between agricultural labourer and landlessness. That is, higher the value of landlessness index higher will be the proportion of holding land per agricultural labourer which means more resources at the disposal of the labourer. Let us analyze the computation of landlessness index using secondary data for 1991, 2001 and 2011.

Table 4.26 depicts district wise percentage of agricultural labourer to rural workforce and landlessness index (I_L) of Assam in 1991.

The column 2 of the table shows percentage of agricultural labourer to rural workforce from which index of access to land (I_{AL}) has been calculated in column 3. Here, the percentage of agricultural labourer to rural workforce as a whole for the State of Assam has been computed as 13.35. Due to inverse relationship between agricultural labourer and landholding, landlessness index has been computed as one less index of access to land as shown in column 4 of the Table 4.26. From the column 4 of the Table 4.26 it has been evident that the regions like N. C. Hills, Dhemaji, Jorhat, Lakhimpur, Tinsukia, Sibsagar and Karbi-Anglong have high development status in landlessness index compared to the districts like Dibrugarh, Golaghat, Morigaon, Sonitpur and Kamrup which have moderate development status. The remaining 11 districts like Darrang, Nagaon, Kokrajhar, Barpeta, Karimganj, Hailakandi, Bongaigaon, Nalbari, Cachar, Goalpara and Dhubri have low development status in landlessness. It has been found that N. C. Hills and Dhubri respectively have highest and lowest development in landlessness. These different development groups transform rural Assam as moderate development status having the value of the index as 0.532.

Further, the coefficient of variation value shows that there exists about 51 percent disparity across the State of Assam in landholding.

Table 4. 26: District wise Percentage of Agricultural Labourer to Rural Workforce (main) and Landlessness Index (I_L) of Assam, 1991

Districts	Percentage of agricultural labourer to rural workforce	Access to land index (I_{AL})	$I_L^*=1-I_{AL}$	Status	Rank
Dhemaji	5.06	0.118	0.882	HD	2
Lakhimpur	6.42	0.179	0.821	HD	4
Sonitpur	12.28	0.443	0.557	MD	11
Dibrugarh	7.27	0.218	0.782	MD	8
Jorhat	6.04	0.162	0.838	HD	3
Golaghat	8.77	0.285	0.715	MD	9
Sibsagar	6.56	0.186	0.814	HD	6
Tinsukia	6.54	0.185	0.815	HD	5
Nagaon	16.15	0.617	0.383	LD	14
Morigaon	12.08	0.434	0.566	MD	10
Nalbari	18.80	0.736	0.264	LD	20
Darrang	14.62	0.548	0.452	LD	13
Barpeta	17.67	0.685	0.315	LD	16
Dhubri	24.67	1.000	0.000	LD	23
Bongaigaon	18.64	0.729	0.271	LD	19
Kokrajhar	16.69	0.641	0.359	LD	15
Goalpara	20.01	0.790	0.210	LD	22
Kamrup	12.44	0.450	0.550	MD	12
N. C. Hills	2.43	0.000	1.000	HD	1
Karbi-Anglong	6.74	0.194	0.806	HD	7
Cachar	19.15	0.752	0.248	LD	21
Karimganj	17.93	0.697	0.303	LD	17
Hailakandi	18.53	0.724	0.276	LD	18
Assam	13.35	0.468	0.532	MD	
Standard Deviation			0.270		
Coefficient of Variation			50.75		

Source: Constructed from,
Village Directory, 1991, Assam, Census of India

Note: I_{AL}**=** Access to land index $\mathbf{I_L^*}$ = Landlessness Index;
LD=Low Development; **MD**=Moderate Development; **HD**=High Development

Again, the district wise percentage of agricultural labourer to rural workforce and the corresponding landlessness index along with their status and rank of Assam for 2001 is shown in Table 4.27.

As seen in the Table 4.27 that percentage of agricultural labourer to rural workforce for the State of Assam in 2001 has been declined to 10.42 compared to 13.35 in 1991. It is evident from the Table 4.27 that the overall status of Assam in landlessness index has moderate development with value of the index as 0.684 showing an improvement from 0.532 of 1991. Here, as shown in the table Sibsagar and Dhubri district respectively have highest and lowest development position in landlessness. There are nine districts viz, Sibsagar, Jorhat, Tinsukia, Dhemaji, N. C. Hills, Dibrugarh, Lakhimpur, Golaghat and Karbi-Anglong that have high development status contrary to the districts like Sonitpur, Kamrup, Nalbari, Cachar, Hailakandi, Karimganj, Darrang and Barpeta which have moderate development status in landlessness. The remaining six districts viz, Goalpara, Bongaigaon, Morigaon, Kokrajhar, Nagaon and Dhubri have low development status in landlessness index.

Again, in the table as the value of coefficient of variation is found as 37.72, there exists about 38 percent variability in landlessness in 2001 across the districts of Assam which shows a lower level of disparity in landlessness than 51 percent of 1991.

The district wise percentage of agricultural labourer to rural workforce and landlessness index (I_L) of Assam in 2011 is shown in Table 4.28.

From the Table 4.28, it has been evident that the district wise percentage of agricultural labourer to rural workforce in 2011 has been computed as 12.11 as compared to 10.42 in 2001 and 13.35 in 1991. Among the 27 districts of Assam in 2011, six districts viz, Dhemaji, Dima Hasao, Sibsagar, Tinsukia, Lakhimpur and Dibrugarh have high development status in contrast to 12 districts like Jorhat, Golaghat, Karbi-Anglong, Kamrup Metro, Cachar, Sonitpur, Kamrup, Nalbari, Hailakandi, Chirang, Karimganj and Kokrajhar which have moderate development status in landlessness. The remaining other 9 districts such as Barpeta, Udalguri, Bongaigaon, Goalpara, Baksa, Morigaon, Nagaon, Darrang and Dhubri have low development status. As shown in the Table 4.28, the overall status of landlessness index is found as moderate development with value of the index as 0.585. This again indicates poor performance in landlessness in 2011 than the earlier census year 2001 having value of the index as 0.684.

Further, it has been shown that with value of the coefficient of variation as 40.34 the disparity in landlessness is found to be about 40 percent across the various regions of Assam in 2011. From this it is clear that the disparity in landlessness across the districts of Assam has been lowered down from 51 percent in 1991 to 38 percent in 2001 whch again increased to 40 percent in 2011.

Table 4. 27: District wise Percentage of Agricultural Labourer to Rural Workforce (main) and Landlessness Index (I_L) of Assam, 2001

Districts	Percentage of agricultural labourer to rural workforce	Access to land index (I_{AL})	$I_L^*=1-I_{AL}$	Status	Rank
Dhemaji	3.62	0.031	0.969	HD	4
Lakhimpur	4.15	0.056	0.944	HD	7
Sonitpur	8.27	0.247	0.753	MD	10
Dibrugarh	4.12	0.055	0.945	HD	6
Jorhat	3.25	0.014	0.986	HD	2
Golaghat	5.49	0.118	0.882	HD	8
Sibsagar	2.94	0.000	1.000	HD	1
Tinsukia	3.54	0.028	0.972	HD	3
Nagaon	17.52	0.675	0.325	LD	22
Morigaon	15.25	0.570	0.430	LD	20
Nalbari	8.89	0.276	0.724	MD	12
Darrang	12.30	0.434	0.566	MD	16
Barpeta	13.04	0.468	0.532	MD	17
Dhubri	24.53	1.000	0.000	LD	23
Bongaigaon	14.93	0.555	0.445	LD	19
Kokrajhar	16.03	0.606	0.394	LD	21
Goalpara	14.82	0.550	0.450	LD	18
Kamrup	8.52	0.258	0.742	MD	11
N. C. Hills	3.96	0.047	0.953	HD	5
Karbi-Anglong	7.03	0.189	0.811	HD	9
Cachar	9.69	0.313	0.687	MD	13
Karimganj	11.65	0.403	0.597	MD	15
Hailakandi	11.00	0.373	0.627	MD	14
Assam	10.42	0.316	0.684	MD	
Standard Deviation			0.258		
Coefficient of Variation			37.72		

Source: Constructed from,
Village Directory, 2001, Assam, Census of India

Note: I_{AL}**=** Access to land index $\mathbf{I_L^*}$ = Landlessness Index;
LD=Low Development; **MD**=Moderate Development; **HD**=High Development

Table 4. 28: District wise Percentage of Agricultural Labourer to Rural Workforce (main) and Landlessness Index (I_L) of Assam, 2011

Districts	Percentage of agricultural labourer to rural workforce	Access to land index (I_{AL})	$I_L^*=1-I_{AL}$	Status	Rank
Dhemaji	2.43	0.000	1.000	HD	1
Lakhimpur	6.22	0.176	0.824	HD	5
Sonitpur	10.09	0.355	0.645	MD	12
Dibrugarh	6.74	0.200	0.800	HD	6
Jorhat	7.04	0.214	0.786	MD	7
Golaghat	8.23	0.269	0.731	MD	8
Sibsagar	4.85	0.112	0.888	HD	3
Tinsukia	5.81	0.157	0.843	HD	4
Nagaon	16.96	0.674	0.326	LD	25
Morigaon	16.42	0.649	0.351	LD	24
Nalbari	10.86	0.391	0.609	MD	14
Darrang	20.68	0.847	0.153	LD	26
Barpeta	14.29	0.550	0.450	LD	19
Dhubri	23.98	1.000	0.000	LD	27
Bongaigaon	15.54	0.608	0.392	LD	21
Kokrajhar	12.51	0.468	0.532	MD	18
Udalguri	14.95	0.581	0.419	LD	20
Baksa	16.11	0.635	0.365	LD	23
Chirang	12.24	0.455	0.545	MD	16
Goalpara	15.83	0.622	0.378	LD	22
Kamrup Metro	8.99	0.304	0.696	MD	10
Kamrup	10.76	0.387	0.613	MD	13
Dima Hasao	3.35	0.043	0.957	HD	2
Karbi-Anglong	8.54	0.284	0.716	MD	9
Cachar	9.68	0.336	0.664	MD	11
Karimganj	12.46	0.465	0.535	MD	17
Hailakandi	11.59	0.425	0.575	MD	15
Assam	12.11	0.415	0.585	MD	
Standard Deviation			0.236		
Coefficient of Variation			40.34		

Source: Constructed from,

District Census Hand Book, Assam, 2011, Census of India

Note: I_{AL}**=** Access to land index $\mathbf{I_L^*}$ = Landlessness Index;

LD=Low Development; **MD**=Moderate Development; **HD**=High Development

4.4.3 Overall Resource Availability Index

The point of the study here is to examine resource availability as a factor responsible for disparities in rural development across the various districts of Assam in 1991, 2001 and 2011. With the help of a composite index as has been computed in construction of rural infrastructure index the resource availability index has been constructed. The resource availability index (I_{RA}) can be directly computed as simple average of operational holding index (I_{OH}) and landlessness index (I_L). There is a direct relationship between resource availability and operational holding and landlessness index. The increase in the value of operational holding and landlessness index increases resource availability in a region and vice versa.

The Table 4.29 depicts district wise disparities in overall resource availability index of Assam for the year 1991.

In the table column 4 is the resource availability index which is computed as the simple average of the column 2 and column 3, i.e., operational holding index and landlessness index depicted in Table 4.23 and Table 4.26 respectively. From the resource availability index of different districts of Assam, it has been found that in 1991 only two districts have high development status viz, N. C. Hills and Karbi-Anglong both of whom are fall in the Hill region. The districts such as Lakhimpur, Dhemaji, Tinsukia, Jorhat, Dibrugarh, Golaghat, Sibsagar, Cachar and Kamrup have moderate development status in contrast 12 districts viz, Hailakandi, Sonitpur, Darrang, Nagaon, Kokrajhar, Nalbari, Karimganj, Barpeta, Goalpara, Morigaon, Bongaigaon and Dhubri that have low development status in resource availability. Thus, among the 23 districts of Assam the districts N. C. Hills and Dhubri respectively have highest and lowest development position. Again, the status of resource availability as a whole for Assam in 1991 has moderate development status with value of the index as 0.515.

Further, in the Table 4.19 as the value of coefficient of variation is found as 37.64, this means the disparity across rural Assam in resource availability is about 38 percent for the year 1991.

Table 4. 29: Overall Resource Availability Index (I_{RA}) of the Districts of Assam, 1991

Districts	I_{OH}	I_L	I_{RA}** $=(I_{OH}+I_L)/2$	Status	Rank
Dhemaji	0.543	0.882	0.713	MD	4
Lakhimpur	0.674	0.821	0.748	MD	3
Sonitpur	0.315	0.557	0.436	LD	13
Dibrugarh	0.467	0.782	0.625	MD	7
Jorhat	0.478	0.838	0.658	MD	6
Golaghat	0.522	0.715	0.619	MD	8
Sibsagar	0.402	0.814	0.608	MD	9
Tinsukia	0.511	0.815	0.663	MD	5
Nagaon	0.478	0.383	0.431	LD	15
Morigaon	0.000	0.566	0.283	LD	21
Nalbari	0.522	0.264	0.393	LD	17
Darrang	0.413	0.452	0.433	LD	14
Barpeta	0.424	0.315	0.369	LD	19
Dhubri	0.369	0.000	0.185	LD	23
Bongaigaon	0.217	0.271	0.244	LD	22
Kokrajhar	0.457	0.359	0.408	LD	16
Goalpara	0.359	0.210	0.285	LD	20
Kamrup	0.457	0.550	0.504	MD	11
N. C. Hills	0.837	1.000	0.919	HD	1
Karbi-Anglong	1.000	0.806	0.903	HD	2
Cachar	0.913	0.248	0.581	MD	10
Karimganj	0.467	0.303	0.385	LD	18
Hailakandi	0.619	0.276	0.448	LD	12
Assam	0.498	0.531	0.515	MD	
SD	0.209	0.270	0.194		
CV	42.17	50.75	37.67		

Source: ** Constructed from, Table 4.23 and Table 4.26

Note: I_{RA} = Resource Availability Index; **I_{OH} =** Operational Holding Index;

I_L= Landlessness Index; **LD**= Low Development;

MD= Moderate Development; **HD**= High Development;

SD= Standard Deviation; **CV**= Coefficient of Variation

The district wise status and extent of disparity in overall resource availability index for the year 2001 is shown in the Table 4.30.

Table 4. 30: Overall Resource Availability Index (I_{RA}) of the Districts of Assam, 2001

Districts	I_{OH}	I_L	I_{RA}** $=(I_{OH}+I_L)/2$	Status	Rank
Dhemaji	0.443	0.969	0.706	MD	8
Lakhimpur	0.487	0.944	0.716	MD	7
Sonitpur	0.287	0.753	0.520	MD	15
Dibrugarh	1.000	0.945	0.973	HD	1
Jorhat	0.461	0.986	0.724	MD	5
Golaghat	0.400	0.882	0.641	MD	11
Sibsagar	0.504	1.000	0.752	MD	4
Tinsukia	0.948	0.972	0.960	HD	2
Nagaon	0.452	0.325	0.389	LD	19
Morigaon	0.000	0.430	0.215	LD	22
Nalbari	0.374	0.724	0.549	MD	13
Darrang	0.357	0.566	0.462	LD	16
Barpeta	0.391	0.532	0.462	LD	16
Dhubri	0.739	0.000	0.369	LD	21
Bongaigaon	0.304	0.445	0.375	LD	20
Kokrajhar	0.513	0.394	0.454	LD	17
Goalpara	0.330	0.450	0.390	LD	18
Kamrup	0.322	0.742	0.532	MD	14
N. C. Hills	0.391	0.953	0.672	MD	10
Karbi-Anglong	0.626	0.811	0.719	MD	6
Cachar	0.983	0.687	0.835	HD	3
Karimganj	0.748	0.597	0.673	MD	9
Hailakandi	0.583	0.627	0.605	MD	12
Assam	0.506	0.684	0.595	MD	
SD	0.237	0.258	0.189		
CV	46.84	37.72	31.76		

Source: ** Constructed from, Table 4.24 and Table 4.27

Note: I_{RA} = Resource Availability Index; **I_{OH} =** Operational Holding Index;
I_L= Landlessness Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

In the Table 4.30, column 4 implies resource availability index computed from simple average of operational holding index of Table 4.24 and landlessness index of Table 4.27. As shown in the table it is evident that four districts viz, Dibrugarh, Tinsukia, Cachar and Sibsagar have attained high development status in resource availability followed by 11 districts such as Jorhat, Karbi-Anglong, Lakhimpur,

Dhemaji, Karimganj, N. C. Hills, Golaghat, Hailakandi, Nalbari, Kamrup and Sonitpur that have moderate development status. Further, whereas Morigaon the only one backward district in resource availability, the remaining districts viz, Darrang, Barpeta, Kokrajhar, Goalpara, Nagaon, Bongaigaon and Dhubri have low development status. The overall resource availability for the entire Assam is found to be moderate development having value of the index as 0.595 showing an improvement than in 1991 where the value of index was 0.515. Further, having the coefficient of variation value as 31.76 the disparity in resource availability across Assam for the year 2001 is about 32 percent as compared to 38 percent variation of 1991. Thus, the year 2001 experiences a lesser variability in resource availability than in 1991.

Lastly, the district wise overall resource availability index for the year 2011 of Assam is shown through Table 4.31.

Here also column 4 of the Table 4.31 shows resource availability index constructed in a similar manner from Table 4.25 and Table 4.28 as has been calculated earlier in 1991 and 2001. It has been evident from the column 4 of the table that the overall resource availability status of the State of Assam has low development with value of the index as 0.471 showing lowering down of resource availability than in 2001 and 1991. In the table only one district Tinsukia has high development status followed by districts Sibsagar, Dibrugarh, Karimganj, Dhemaji, Jorhat, Golaghat, Lakhimpur, Karbi-Anglong and Kamrup Metro which have moderate development status. The remaining 16 districts like Cachar, Sonitpur, Dima Hasao, Barpeta, Hailakandi, Nalbari, Kamrup, Baksa, Chirang, Udalguri, Nagaon, Kokrajhar, Goalpara, Morigaon, Bongaigaon and Darrang have low development status in resource availability. Thus, with value of index 0.922 and 0.103, the districts Sibsagar and Dhubri respectively have highest and lowest development out of the 27 districts of Assam at the time of 2011 Census.

Further, the value of coefficient of variatrion estimated from the resource availability index of column 4 indicates about 41 percent variability in resource availability in 2011 as against about 38 percent in 1991 and 32 percent in 2001 across the State of Assam. Thus, the disparities in availability of resources are comparatively high in 2011 as compared to the values of 1991 and 2001.

Table 4. 31: Overall Resource Availability Index (I_{RA}) of the Districts of Assam, 2011

Districts	I_{OH}	I_L	I_{RA}** $=(I_{OH}+I_L)/2$	Status	Rank
Dhemaji	0.325	1.000	0.663	MD	5
Lakhimpur	0.368	0.824	0.596	MD	8
Sonitpur	0.325	0.645	0.485	LD	12
Dibrugarh	0.692	0.800	0.746	MD	3
Jorhat	0.487	0.786	0.637	MD	6
Golaghat	0.496	0.731	0.614	MD	7
Sibsagar	0.615	0.888	0.752	MD	2
Tinsukia	1.000	0.843	0.922	HD	1
Nagaon	0.291	0.326	0.309	LD	21
Morigaon	0.197	0.351	0.274	LD	23
Nalbari	0.308	0.609	0.459	LD	16
Darrang	0.103	0.153	0.128	LD	25
Barpeta	0.496	0.450	0.473	LD	14
Dhubri	0.205	0.000	0.103	LD	26
Bongaigaon	0.034	0.392	0.213	LD	24
Kokrajhar	0.017	0.532	0.275	LD	22
Udalguri	0.299	0.419	0.359	LD	20
Baksa	0.444	0.365	0.405	LD	18
Chirang	0.256	0.545	0.401	LD	19
Goalpara	0.171	0.378	0.275	LD	22
Kamrup Metro	0.376	0.696	0.536	MD	10
Kamrup	0.239	0.613	0.426	LD	17
Dima Hasao	0.000	0.957	0.479	LD	13
Karbi-Anglong	0.393	0.716	0.555	MD	9
Cachar	0.325	0.664	0.495	LD	11
Karimganj	0.803	0.535	0.669	MD	4
Hailakandi	0.350	0.575	0.463	LD	15
Assam	0.356	0.585	0.471	LD	
SD	0.227	0.236	0.192		
CV	63.76	40.34	40.76		

Source: ** Constructed from, Table 4.25 and Table 4.28

Note: I_{RA} = Resource Availability Index; **I_{OH} =** Operational Holding Index;

I_L= Landlessness Index; **LD**= Low Development;

MD= Moderate Development; **HD**= High Development;

SD= Standard Deviation; **CV**= Coefficient of Variation

Now, let us estimate the micro zone wise disparities in resource availability across the State of Assam for the three post reform census periods. The Table 4.32 represents micro zone wise overall resource availability Index (I_{RA}) of Assam in 1991, 2001 and 2011.

Table 4. 32: Micro zone wise Overall Resource Availability Index (I_{RA}) of Assam

Sl. No.	Micro Zone	I_{RA}/1991	I_{RA}/2001	I_{RA}/2011
1	Upper North Bank Plain	0.632	0.647	0.581
2	Upper South Bank Plain	0.635	0.810	0.734
3	Central Brahmaputra Valley	0.357	0.302	0.292
4	Lower North Bank Plain	0.339	0.445	0.313
5	Lower South Brahmaputra Valley	0.395	0.461	0.412
6	Barak Valley	0.471	0.704	0.542
7	Hill Zone	0.911	0.696	0.517
	Mean	0.534	0.581	0.484
	Standard Deviation	0.191	0.167	0.145
	Coefficient of Variation	35.69	28.81	29.98

Source: I_{RA}/1991, I_{RA}/2001 and I_{RA}/2011 calculated from Table 4.29, Table 4.30 and Table 4.31 respectively

Note: I_{RA} = Resource Availability Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

From the Table 4.32, it has been evident that in 1991 Hill Zone has the highest development in contrast to Lower North Bank Plain that has lowest development status across the State of Assam. Again, the zones Upper South Bank Plain and Central Brahmaputra Valley respectively have highest development and lowest development in resource availability both in 2001 and 2011. Further, micro zone wise coefficient of variation values for the years 1991, 2001 and 2011 respectively are estimated at 35.69, 28.81 and 29.98 which shows the disparity in resource availability for the respective census years. Thus, micro zone wise disparity in resource availability is highest in 1991 followed by 2011 and than in 2001. With the coefficient of variation value as 28.81 the year 2001 experienced lowest disparity in resource availability across the State of Assam.

4.5 Government Expenditure on Rural Development Programme

So, far as factors responsible for dfisparities in rural development is concerned the government expenditure on rural development programme has the key role in diversification of rural development across a region. Since the adoption of Five Year Planning in India after independence as the State becomes welfare State, government spends a huge amount of rupee on various rural development programmes such as Swarnajayanti Gram Swarojgar Yojana (SGSY), Sampoorna Gramin Rojgar Yojana (SGRY), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Indira Awaj Yojana (IAY) which are the ongoing scheme.

Now, to analyze government expenditure on rural development programme as factor understanding disparities in rural development across the State of Assam in the three different census years the study has standardized an index which is Government Expenditure on Rural Development Programme Index (I_{GE}). Here, the index is measured through amount of government expenditure per lakh of rural population of the respective years. The amount of government expenditure from all the rural development programmes have added in order to find out government expenditure per lakh of rural population and the corresponding indices of the respective years.

The Table 4.33 shows district wise amount of government expenditure per 100,000 of rural population and the corresponding index of government expenditure on different rural development programmes (I_{GE}) of Assam for the year 1991.

The column 2 and column 3 of Table 4.33 implies respectively the amount of government expenditure per lakh of rural population and government expenditure index. As seen from the column 2, the government expenditure per lakh of rural population of Assam in 1991 is 105.77 lakhs. Again, as has been evident from the table that the overall status of Assam in government expenditure per lakh of rural population has low development with value of the index as 0.165. Here, N. C. Hills is the only one district that has high development status out of the 23 districts of Assam in 1991. The remaining 22 districts have low development status, Dhubri being the the least developed district having value of the index as zero. Further, there exists about 116

percent disparity in government expenditure on rural development programme having coefficient of variation value as 115.76.

Table 4. 33: District wise Amount of Government Expenditure per lakh of Rural Population (Rs. in lakh) and Indices of Government Expenditure on Rural Development Programme (I_{GE}) of Assam, 1991

Districts	Govt. Exp. Per lakh of Rural Populaion (in lakh Rs.)	I_{GE} *	Status	Rank
Dhemaji	213.29	0.282	LD	3
Lakhimpur	117.39	0.135	LD	10
Sonitpur	98.73	0.106	LD	14
Dibrugarh	103.77	0.114	LD	12
Jorhat	88.52	0.090	LD	15
Golaghat	69.35	0.061	LD	19
Sibsagar	86.82	0.088	LD	16
Tinsukia	141.73	0.172	LD	6
Nagaon	46.89	0.027	LD	21
Morigaon	120.76	0.140	LD	9
Nalbari	150.98	0.186	LD	5
Darrang	67.51	0.058	LD	20
Barpeta	84.39	0.084	LD	17
Dhubri	29.55	0.000	LD	22
Bongaigaon	161.86	0.203	LD	4
Kokrajhar	124.11	0.145	LD	8
Goalpara	109.78	0.123	LD	11
Kamrup	103.08	0.113	LD	13
N. C. Hills	681.26	1.000	HD	1
Karbi-Anglong	233.79	0.313	LD	2
Cachar	83.28	0.082	LD	18
Karimganj	130.01	0.154	LD	7
Hailakandi	109.58	0.123	LD	11
Assam	105.77	0.165	LD	
Standard Deviation		0.191		
Coefficient of Variation		115.76		

Source: Constructed from,
Statistical Hand Book, Assam, 2001, Government of Assam

Note: $\mathbf{I_{GE}}^{*}$= Indices of Government Expenditure on Rural Development Programme**; LD**= Low Development; **MD**= Moderate Development;
HD= High Development

Again, the Table 4.34 depicts district wise amount of government expenditure per lakh of rural population and the government expenditure on rural development programme index (I_{GE}) of Assam for the year 2001.

Table 4. 34: District wise Amount of Government Expenditure per lakh of Rural Population (Rs. in lakh) and Indices of Government Expenditure on Rural Development Programme (I_{GE}) of Assam, 2001

Districts	Govt. Exp. Per lakh of Rural Populaion (in lakh Rs.)	I_{GE} *	Status	Rank
Dhemaji	398.95	0.243	LD	3
Lakhimpur	217.08	0.083	LD	11
Sonitpur	170.24	0.042	LD	17
Dibrugarh	148.89	0.024	LD	20
Jorhat	220.52	0.086	LD	10
Golaghat	200.85	0.069	LD	13
Sibsagar	207.67	0.075	LD	12
Tinsukia	176.99	0.048	LD	16
Nagaon	134.02	0.011	LD	22
Morigaon	315.77	0.169	LD	6
Nalbari	260.33	0.121	LD	8
Darrang	153.81	0.028	LD	19
Barpeta	142.56	0.018	LD	21
Dhubri	186.34	0.056	LD	15
Bongaigaon	305.24	0.161	LD	7
Kokrajhar	462.23	0.298	LD	2
Goalpara	224.86	0.090	LD	9
Kamrup	121.90	0.000	LD	23
N. C. Hills	1264.15	1.000	HD	1
Karbi-Anglong	378.69	0.225	LD	4
Cachar	196.06	0.065	LD	14
Karimganj	157.95	0.032	LD	18
Hailakandi	338.58	0.189	LD	5
Assam	226.06	0.136	LD	
Standard Deviation		0.200		
Coefficient of Variation		147.06		

Source: Constructed from,

Statistical Hand Book, Assam, 2005, Government of Assam

Note: $\mathbf{I_{GE}}^{*}$= Indices of Government Expenditure on Rural Development Programme**; LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

From the above Table 4.34, the amount of government expenditure for the rural economy of Assam as a whole is found as 226.06 lakhs. Here also as shown in column 3 of the table only one district N. C. Hills has attained high development status in government expenditure contrary to the remaining 22 districts that have low development status. The districts N. C. Hills and Kamrup respectively have attained highest and lowest position in government expenditure out of the 23 districts of Assam in 2001. Here, the overall position of Assam has low development with value of the index as 0.136. Again, as the value of coefficient of variation is found as 147.06, it has been concluded that the district wise variation in government expenditure on rural development programme across the State of Assam is about 147 percent in 2001.

The district wise amount of government expenditure per lakh of rural population and the index of government expenditure along with status and rank for the year 2011 of Assam has been depicted in the following Table 4.35.

As seen in the table the government expenditure per lakh of rural population in 2011 is 515.56 lakhs. Again, it has been evident that out of 27 districts in 2011 there exist 3 high, 3 moderate and remaining 21 districts have low development status. The districts that have high development status are Morigaon, Dhemaji and Baksa followed by Kokrajhar, Chirang and Nagaon that have moderate development status. The remaining districts such as Dima Hasao, Sibsagar, Lakhimpur, Jorhat, Bongaigaon, Goalpara, Nalbari, Dibrugarh, Sonitpur, Barpeta, Cachar, Udalguri, Tinsukia, Karbi-Anglong, Dhubri, Golaghat, Kamrup Metro, Darrang, Hailakandi, Karimganj and Kamrup have low development status in government expenditure. In this table Morigaon and Kamrup districts respectively have attained highest and lowest development in government expenditure programme. With value of the index 0.289 the overall status of Assam in 2011 is found to be less developed which is quite impressive than that of value of 1991 and 2001. Further, with value of the coefficient of variation as 95.50 the disparity in government expenditure on rural development programmes is about 96 percent which is comparatively lower than in 1991 and 2001. The disparity in government expenditure on rural development programme is highest in 2001 having the value as 147 percent contrary to 116 percent in 1991.

Table 4. 35: District wise Amount of Government Expenditure per lakh of Rural Population (Rs. in lakh) and Indices of Government Expenditure on Rural Development Programme (I_{GE}) of Assam, 2011

Districts	Govt. Exp. Per lakh of Rural Populaion (in lakh Rs.)	I_{GE} *	Status	Rank
Dhemaji	1007.36	0.867	HD	2
Lakhimpur	588.41	0.360	LD	9
Sonitpur	403.48	0.136	LD	15
Dibrugarh	426.69	0.164	LD	14
Jorhat	571.09	0.339	LD	10
Golaghat	350.99	0.073	LD	22
Sibsagar	589.43	0.361	LD	8
Tinsukia	387.91	0.117	LD	19
Nagaon	737.92	0.541	MD	6
Morigaon	1116.99	1.000	HD	1
Nalbari	446.19	0.188	LD	13
Darrang	346.39	0.067	LD	24
Barpeta	393.10	0.124	LD	16
Dhubri	370.72	0.096	LD	21
Bongaigaon	502.53	0.256	LD	11
Kokrajhar	805.00	0.622	MD	4
Udalguri	388.16	0.118	LD	18
Baksa	988.12	0.844	HD	3
Chirang	750.29	0.556	MD	5
Goalpara	447.81	0.189	LD	12
Kamrup Metro	350.23	0.072	LD	23
Kamrup	291.02	0.000	LD	27
Dima Hasao	669.39	0.458	LD	7
Karbi-Anglong	375.30	0.102	LD	20
Cachar	389.12	0.119	LD	17
Karimganj	298.68	0.009	LD	26
Hailakandi	303.28	0.015	LD	25
Assam	515.56	0.289	LD	
Standard Deviation		0.276		
Coefficient of Variation		95.50		

Source: Constructed from,

Statistical Hand Book, Assam, 2014, Government of Assam

Note: $\mathbf{I_{GE}}^{*}$= Indices of Government Expenditure on Rural Development Programme**; LD**= Low Development; **MD**= Moderate Development;

HD= High Development

Now, let us compute the micro zone wise indices of government expenditure on rural development programme of Assam in 1991, 2001 and 2011 as shown in the Table 4.36.

Table 4. 36: Micro zone wise Indices of Government Expenditure on Rural Development Programme (I_{GE}) of Assam

Sl. No.	Micro Zone	I_{GE}/1991	I_{GE}/2001	I_{GE}/2011
1	Upper North Bank Plain	0.174	0.123	0.454
2	Upper South Bank Plain	0.105	0.060	0.211
3	Central Brahmaputra Valley	0.084	0.090	0.771
4	Lower North Bank Plain	0.113	0.114	0.319
5	Lower South Brahmaputra Valley	0.118	0.045	0.288
6	Barak Valley	0.119	0.095	0.047
7	Hill Zone	0.657	0.613	0.280
	Mean	0.196	0.163	0.339
	Standard Deviatrion	0.190	0.185	0.210
	Coefficient of Variation	97.03	113.50	61.87

Source: I_{GE}/1991, I_{GE}/2001 and I_{GE}/2011 calculated from Table 4.33, Table 4.34 and Table 4.35 respectively

Note: $\mathbf{I_{GE}^{*}}$= Indices of Government Expenditure on Rural Development Programme**; LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

In the Table 4.36 column 3, column 4 and column 5 respectively represents micro zone wise indices of government expenditure per lakh of rural population for the year 1991, 2001 and 2011. In 1991, the Hill Zone and Central Brahamaputra Valley respectively have highest and lowest development with value of the index as 0.657 and 0.084. In 2001 also Hill Zone ranks first with value of the index 0.613 against Lower South Brahmaputra Valley that has lowest development with value of the index as 0.045. Contrary to these, in 2011 the Central Brahmaputra Valley and Barak Valley respectively have highest and lowest development with values of index as 0.771 and 0.047. Further, in 1991 there exists about 97 percent variation in government expenditure across the regions. As against this, 2001 experiences a higher level of disparity of about 114 percent as the value of coefficient of variation has been computed as 113.50. In contrast to these, the disparity in government expenditure per lakh of rural population in 2011 was about 62 percent which is less than the value of 1991 and 2001.

Thus, the micro zone wise disparity in 2011 is found to be lowest as compared to 2001 and 1991. Thus, the year 2001 has highest level of disparity in government expenditure on rural development programme among the three census years.

4.6 Urban and Industrial Growth

Urbanization and industrialization are playing a very important and crucial role in enhancement of rural development of a rural economy like Assam as well as to some extent eliminates disparities in rural development across the various regions of an economy. The diversification of urban and industrial growth in different rural areas leads to reduction of uneven distribution of rural development across various regions and thus enhances rural development.

In today's world, urbanization and industrialization are a worldwide phenomenon. These are common features of economic development in general and rural development in particular. Urbanization and industrialization has serious effect in a predominantly rural economy like Assam where majority of population living in rural areas. Therefore, the need of the hour is to analyze urbanization and industrialization as one of the factor for disparities in rural development across the State of Assam for the years 1991, 2001 and 2011.

To analyze urban and industrial growth for rural developmental disparities across the regions of Assam, the study constructed a composite index of urbanization and industrialization. For each of urban and industrial growth separate indices have been constructed through which composite index of urbanization and industrialization has been constructed as simple average of the indices of the two components. In the study, urban growth is measured in a simple way as the percentage of urban population to total population which is converted into a standardize index viz, urbanization index (I_{UR}) for the districts or regions of Assam in 1991, 2001 and 2011. Further, the industrial growth is measured by the percentage of contribution of industry (manufacturing, construction, electricity, gas and water supply) to the gross district domestic product (GDDP) through which industrial growth index (I_{IND}) has been constructed for the regions of Assam in 1991, 2001 and 2011.

4.6.1 Urbanization Index

The Table 4.37, Table 4.38 and Table 4.39 in the following respectively depict district wise urban growth and urbanization index for the year 1991, 2001 and 2011 of Assam.

Table 4. 37: District wise Percentage of Urban Population to Total Population and Urbanization Index (I_{UR}) of Assam, 1991

Districts	Percentage of urban population to total population	I_{UR} *	Status	Rank
Dhemaji	2.08	0.000	LD	23
Lakhimpur	6.54	0.145	LD	17
Sonitpur	7.29	0.169	LD	15
Dibrugarh	18.37	0.531	MD	3
Jorhat	15.97	0.453	LD	5
Golaghat	6.41	0.141	LD	18
Sibsagar	7.66	0.182	LD	12
Tinsukia	17.44	0.501	MD	4
Nagaon	11.15	0.296	LD	8
Morigaon	5.42	0.109	LD	20
Nalbari	2.31	0.007	LD	22
Darrang	4.93	0.093	LD	21
Barpeta	7.02	0.161	LD	16
Dhubri	12.16	0.329	LD	6
Bongaigaon	9.15	0.230	LD	10
Kokrajhar	6.34	0.139	LD	19
Goalpara	7.79	0.186	LD	11
Kamrup	32.76	1.000	HD	1
N. C. Hills	23.80	0.708	MD	2
Karbi-Anglong	11.24	0.299	LD	7
Cachar	9.87	0.254	LD	9
Karimganj	7.42	0.174	LD	14
Hailakandi	7.54	0.178	LD	13
Assam	11.09	0.273	LD	
Standard Deviation		0.227		
Coefficient of Variation		83.15		

Source: Constructed from,
Village Directory, 1991, Assam, Census of India and
Statistical Hand Book, Assam, 2001, Government of Assam

Note: **I_{UR}*** = Urbanization Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development

In the Table 4.37 the district wise urban growth is shown in column 2 and urbanization index is shown in column 3. Depending upon the value of the index column 4 and column 5 have been computed which shows district wise status and rank of urban growth in Assam. As shown in column 2, the percentage of urban population to total population as a whole for the State of Assam has been computed as 11.09. From the table it has been evident that Kamrup is the only one district that has high development status in urban growth among the districts of Assam in 1991. On the contrary, Dhemaji is the least developed district across Assam in urban growth. From the table it is found that there exist three districts that have moderate development status such as N. C. Hills, Dibrugarh and Tinsukia. The remaining 19 districts viz, Jorhat, Dhubri, Karbi-Anglong, Nagaon, Cachar, Bongaigaon, Goalpara, Sibsagar, Hailakandi, Karimganj, Sonitpur, Barpeta, Lakhimpur, Golaghat, Kokrajhar, Morigaon, Darrang, Nalbari and Dhemaji have low development status. The overall status of Assam in urban growth has low development with value of the index as 0.273.

Again, as the value of coefficient of variation is found as 83.15, there exists about 83 percent disparity across the State of Assam in urban growth.

The Table 4.38 in the following depicts district wise percentage of urban people to total population and urbanization index for the year 2001. Here, the overall percentage of urban population has been computed as 12.90 showing an increase in urban population than in 1991. The status of Assam in urban growth is found as low development with value of the index as 0.288 which again shows a slight improvement than 0.273 as in 1991. Further, from the table it is cleared that only two districts N. C. Hills and Kamrup have high development status in urbanization contrary to two districts Tinsukia and Dibrugarh that have moderate development status. Along with these the remaining 19 districts have low development status in urban growth in 2001. Here, the districts Kamrup and Nalbari respectively have highest and lowest position in urbanization across the 23 districts of Assam.

From the table it is found that district wise disparity in urbanization has been computed as about 82 percent having the value of coefficient of variation as 82.29. This is almost same to that of the value of 1991.

Table 4. 38: District wise Percentage of Urban Population to total population and Urbanization Index (I_{UR}) of Assam, 2001

Districts	Percentage of urban population to total population	I_{UR} *	Status	Rank
Dhemaji	6.79	0.131	LD	19
Lakhimpur	7.33	0.147	LD	17
Sonitpur	10.45	0.239	LD	11
Dibrugarh	19.28	0.502	MD	4
Jorhat	17.15	0.439	LD	5
Golaghat	8.57	0.184	LD	13
Sibsagar	9.24	0.204	LD	12
Tinsukia	19.47	0.508	MD	3
Nagaon	12.02	0.286	LD	8
Morigaon	4.89	0.074	LD	21
Nalbari	2.39	0.000	LD	22
Darrang	4.97	0.077	LD	20
Barpeta	7.70	0.158	LD	16
Dhubri	11.75	0.278	LD	9
Bongaigaon	12.13	0.289	LD	7
Kokrajhar	7.06	0.139	LD	18
Goalpara	8.14	0.171	LD	14
Kamrup	36.01	1.000	HD	1
N. C. Hills	31.60	0.869	HD	2
Karbi-Anglong	11.30	0.265	LD	10
Cachar	13.94	0.344	LD	6
Karimganj	7.33	0.147	LD	17
Hailakandi	8.12	0.170	LD	15
Assam	12.90	0.288	LD	
Standard Deviation		0.237		
Coefficient of Variation		82.29		

Source: Constructed from,

Village Directory, 2001, Assam, Census of India and

Statistical Hand Book, Assam, 2005, Government of Assam

Note: **I_{UR}*** = Urbanization Index; **LD**= Low Development;

MD= Moderate Development; **HD**= High Development

The Table 4.39 in the following shows urban growth and its corresponding index for the year 2011 of Assam.

Table 4. 39: District wise Percentage of Urban Population to total population and Urbanization Index (I_{UR}) of Assam, 2011

Districts	Percentage of urban population to total population	I_{UR} *	Status	Rank
Dhemaji	7.04	0.071	LD	23
Lakhimpur	8.77	0.092	LD	18
Sonitpur	8.89	0.093	LD	17
Dibrugarh	18.36	0.209	LD	5
Jorhat	20.12	0.231	LD	3
Golaghat	9.24	0.098	LD	15
Sibsagar	9.55	0.101	LD	13
Tinsukia	19.97	0.229	LD	4
Nagaon	13.03	0.144	LD	9
Morigaon	7.65	0.078	LD	20
Nalbari	10.72	0.116	LD	11
Darrang	6.10	0.059	LD	25
Barpeta	8.69	0.091	LD	19
Dhubri	10.36	0.111	LD	12
Bongaigaon	13.76	0.153	LD	7
Kokrajhar	6.17	0.060	LD	24
Udalguri	4.51	0.157	LD	26
Baksa	1.28	0.000	LD	27
Chirang	7.37	0.075	LD	21
Goalpara	13.66	0.152	LD	8
Kamrup Metro	82.89	1.000	HD	1
Kamrup	9.36	0.099	LD	14
Dima Hasao	28.67	0.336	LD	2
Karbi-Anglong	11.82	0.129	LD	10
Cachar	18.20	0.207	LD	6
Karimganj	9.06	0.095	LD	16
Hailakandi	7.31	0.074	LD	22
Assam	14.08	0.153	LD	
Standard Deviation		0.180		
Coefficient of Variation		117.65		

Source: Constructed from,

District Census Hand Book, Assam, 2011, Census of India and Statistical Hand Book, Assam, 2011, Government of Assam

Note: **I_{UR}*** = Urbanization Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

From the column 2 of the above Table 4.39, it is evident that the percentage of urban population to total population of Assam as a whole in 2011 is 14.08 showing an increase of urbanization from 11.09 in 1991 and 12.90 in 2001. The overall position of urban growth is not found satisfactory in 2011 having the urbanization index as 0.153 in contrast to 1991 and 2001 having urbanization index 0.273 and 0.288 respectively. Further, as revealed from column 4 of the table only one district Kamrup Metro have high development status out of 27 districts at the time of 2011 Census contrary to the the remaining 26 districts which have low development status. Among the 27 districts Baksa district has experienced least development in Urbanization.

Again, from the table it has been evident that in case of urban growth the district wise disparity in Assam in 2011 has been found as about 118 percent as the value of coefficient of variation is estimated as 117.65. Thus, the variation in urbanization across the regions of Assam in 2011 is quite high as compared to 1991 and 2001 with values of the coefficient of variation as 83.15 and 82.29 respectively.

4.6.2 Industrialization Index

Let us compute district wise industrialization index (I_{IND}) of Assam for the years 1991, 2001 and 2011 chronologically as under-

The district wise industrial growth and the corresponding industrialization index of Assam in 1991 have been shown with the help of the following Table 4.40.

In the Table 4.40, column 2 and column 3 respectively implies contribution of industry to gross district domestic product and industrialization index. As shown in column 2, the contribution of industry to district domestic product of the State of Assam in 1991 has been computed as 16.49 percent. It has been evident that with 3 high, 4 moderate, and remaining 16 low developed districts the status of overall Assam has low development with value of the index as 0.405. Kamrup and Sibsagar district respectively have attained highest and lowest development in industrialization out of the 23 districts of Assam in 1991. Along with Kamrup district, Nalbari and Karimganj have attained high development status followed by the districts like Goalpara, Jorhat, Dhubri and Cachar that have moderate development status. As against these, the remaining 16

districts such as Nagaon, Bongaigaon, Barpeta, Karbi-Anglong, Dibrugarh, Hailakandi, Darrang, Golaghat, N. C. Hills, Tinsukia, Kokrajhar, Sonitpur, Morigaon, Dhemaji, Lakhimpur and Sibsagar have low development status in industrial growth. Again, with value of the coefficient of variation as 65.68 the disparity in industrial growth across the various regions of Assam has been found as about 66 percent.

Table 4. 40: District wise Percentage of Contribution of Industrial Sector to Gross District Domestic Product (GDDP) and Industrialization Index (I_{IND}) of Assam, 1991

Districts	Contribution of industry to GDDP (in percentage)	I_{IND} *	Status	Rank
Dhemaji	9.56	0.039	LD	20
Lakhimpur	9.34	0.027	LD	21
Sonitpur	12.31	0.203	LD	18
Dibrugarh	15.51	0.392	LD	12
Jorhat	19.25	0.614	MD	5
Golaghat	13.98	0.302	LD	15
Sibsagar	8.89	0.000	LD	22
Tinsukia	12.38	0.207	LD	17
Nagaon	16.76	0.466	LD	8
Morigaon	11.75	0.169	LD	19
Nalbari	23.77	0.882	HD	2
Darrang	14.37	0.325	LD	14
Barpeta	15.84	0.412	LD	10
Dhubri	17.93	0.536	MD	6
Bongaigaon	15.99	0.421	LD	9
Kokrajhar	12.31	0.203	LD	18
Goalpara	20.84	0.708	MD	4
Kamrup	25.77	1.000	HD	1
N. C. Hills	12.94	0.239	LD	16
Karbi-Anglong	15.56	0.395	LD	11
Cachar	17.55	0.513	MD	7
Karimganj	23.60	0.971	HD	3
Hailakandi	15.38	0.384	LD	13
Assam	16.49	0.405	LD	
Standard Deviation		0.266		
Coefficient of Variation		65.68		

Source: Constructed from,
Village Directory, 1991, Assam, Census of India and
Statistical Hand Book, Assam, 2001, Government of Assam

Note: **I_{IND}*** = Industrialization Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development

Now, the district wise contribution of industry to gross domestic product and the corresponding industrialization (I_{IND}) for the year 2001 of Assam is shown in the following Table 4.41.

Table 4. 41: District wise Percentage of Contribution of Industrial Sector to Gross District Domestic Product (GDDP) and Industrialization Index (I_{IND}) of Assam, 2001

Districts	Contribution of industry to GDDP (in percentage)	I_{IND} *	Status	Rank
Dhemaji	12.48	0.147	LD	18
Lakhimpur	12.88	0.168	LD	17
Sonitpur	18.67	0.472	LD	7
Dibrugarh	14.79	0.268	LD	11
Jorhat	13.55	0.203	LD	15
Golaghat	10.07	0.021	LD	21
Sibsagar	9.79	0.006	LD	22
Tinsukia	13.74	0.213	LD	14
Nagaon	16.03	0.334	LD	8
Morigaon	9.67	0.000	LD	23
Nalbari	28.74	1.000	HD	1
Darrang	14.28	0.242	LD	13
Barpeta	11.83	0.113	LD	20
Dhubri	20.98	0.593	MD	4
Bongaigaon	19.08	0.493	LD	6
Kokrajhar	12.45	0.146	LD	19
Goalpara	22.59	0.678	MD	3
Kamrup	19.71	0.526	MD	5
N. C. Hills	15.36	0.298	LD	9
Karbi-Anglong	14.88	0.273	LD	10
Cachar	13.50	0.201	LD	16
Karimganj	25.49	0.829	HD	2
Hailakandi	14.43	0.249	LD	12
Assam	15.89	0.325	LD	
Standard Deviation		0.255		
Coefficient of Variation		78.46		

Source: Constructed from,
Village Directory, 2001, Assam, Census of India and
Statistical Hand Book, Assam, 2005, Directorate of Economics and Statistics

Note: **I_{IND}*** = Industrialization Index; **LD**= Low Development;
MD= Moderate Development; **HD**= High Development

From the above Table 4.41 it is evident that the contribution of industry to gross district domestic product is 15.89 percent. The two districts Nalbari and Karimganj have high development status in contrast to only three districts viz, Goalpara, Dhubri and Kamrup that have moderate development status in industrial growth. Out of the 23 districts of Assam in 2001, the remaining 17 districts such as Bongaigaon, Sonitpur, Nagaon, N. C. Hills, Karbi-Anglong, Dibrugarh, Hailakandi, Darrang, Tinsukia, Jorhat, Cachar, Lakhimpur, Dhemaji, Kokrajhar, Barpeta, Golaghat, Sibsagar and Morigaon have low development status. Here, the Nalbari district in the lower North Brahmaputra Valley has attained highest development in contrast to Morigaon district of Central Brahmaputra Valley that has attained lowest development out of the 23 districts of Assam. Further, the overall status of Assam in industrialization has found to be low development having the value of the index 0.325 showing a degradation of the value than in 1991. Again, it is found that there exists about 78 percent disparity in industrialization across the State of Assam as has been evident from value of coefficient of variation.

The district wise contribution of industry to district domestic product and corresponding index of industrialization of Assam for the year 2011 have been shown with the help of Table 4.42 depicted as under.

In the Table 4.42, contribution of industry to district domestic product for the entire Assam has been computed as 17.18 which is an improvement from 16.49 and 15.89 of 1991 and 2001 respectively. Overall, the State of Assam has moderate development status in industrial growth having value of the index as 0.608 which is again an improvement from 0.405 in 1991 and 0.325 in 2001. This satisfactory development in industrialization is due to the existence of more number of high and moderate industrial growth regions. There exist 8 numbers of district such as Kamrup Metro, Kokrajhar, Cachar, Hailakandi, Kamrup, Dima Hasao, Baksa and Karimganj that have high development status contrary to 10 numbers of district viz, Barpeta, Nagaon, Udalguri, Karbi-Anglong, Golaghat, Dhubri, Dhemaji, Chirang, Tinsukia and Nalbari which have attained moderate development status. The remaining 9 districts such as Sonitpur, Jorhat, Darrang, Lakhimpur, Bongaigaon, Goalpara, Morigaon, Sibsagar and

Dibrugarh have low development status. Among the 27 districts in 2011, Kamrup Metro and Dibrugarh respectively have highest and lowest development in industrialization.

Table 4. 42: District wise Percentage of Contribution of Industrial Sector to Gross District Domestic Product (GDDP) and Industrialization Index (I_{IND}) of Assam, 2011

Districts	Contribution of industry to GDDP	I_{IND} *	Status	Rank
Dhemaji	15.94	0.547	MD	15
Lakhimpur	13.25	0.387	LD	22
Sonitpur	14.97	0.489	LD	19
Dibrugarh	6.75	0.000	LD	27
Jorhat	14.66	0.471	LD	20
Golaghat	16.29	0.568	MD	13
Sibsagar	10.86	0.245	LD	26
Tinsukia	15.73	0.535	MD	17
Nagaon	19.32	0.748	MD	10
Morigaon	11.79	0.300	LD	25
Nalbari	15.34	0.511	MD	18
Darrang	14.20	0.443	LD	21
Barpeta	19.52	0.760	MD	9
Dhubri	16.00	0.551	MD	14
Bongaigaon	12.54	0.345	LD	23
Kokrajhar	23.31	0.986	HD	2
Udalguri	18.28	0.686	MD	11
Baksa	20.99	0.848	HD	7
Chirang	12.79	0.539	MD	16
Goalpara	11.91	0.307	LD	24
Kamrup Metro	23.55	1.000	HD	1
Kamrup	22.08	0.913	HD	5
Dima Hasao	21.68	0.889	HD	6
Karbi-Anglong	17.42	0.635	MD	12
Cachar	23.07	0.971	HD	3
Karimganj	20.19	0.800	HD	8
Hailakandi	22.75	0.952	HD	4
Assam	17.18	0.608	MD	
Standard Deviation		0.255		
Coefficient of Variation		41.94		

Source: Constructed from,

District Census Hand Book, Assam, 2011, Census of India
Statistical Hand Book, Assam, 2011, Government of Assam

Note: **I_{IND}*** = Industrialization Index; **LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

Again, from the Table 4.42 it is estimated that the value of coefficient of variation is 41.94 which indicates 42 percent variability in industrialization across the State of Assam. This data shows a reduction of variability from 66 percent in 1991 and 78 percent in 2001 to 42 percent in 2011.

4.6.3 Overall Urbanization and Industrialization Index

Now, let us analyze the composite index of urbanization and industrialization as factor understanding spatio-temporal disparities in rural development of Assam for all the three census years, 1991, 2001 and 2011.

The district wise composite index of urban and industrial growth along with status and rank for the year 1991 has been shown in Table 4.43.

The column 4 of the table represents composite index of urban and industrial growth which is computed as simple average of column 2 and column 3. The column 2 and column 3 indicate respectively urbanization and industrialization index as has been computed in Table 4.37 and Table 4.40. With value of the composite index as 0.339 the overall position of the State of Assam in urban and industrial growth has low development. From the table it is evident that Kamrup is the only one high developed district in 1991 followed by two moderate developed districts viz, Jorhat and Karimganj. The remaining districts like N. C. Hills, Dibrugarh, Goalpara, Nalbari, Dhubri, Cachar, Nagaon, Tinsukia, Karbi-Anglong, Bongaigaon, Barpeta, Hailakandi, Golaghat, Darrang, Sonitpur, Kokrajhar, Morigaon, Sibsagar, Lakhimpur and Dhemaji have low development status. Further, as the value of the coefficient of variation is found as 59.29 in column 4 of the Table 4.43, there exists about 59 percent disparity across the State of Assam in urban and industrial growth.

Again, the Table 4.44 in the following depicts district wise urbanization and industrialization index of Assam for the year 2001.

Here, it has been found from column 4 of the Table 4.44 that among the 23 districts of Assam in 2001 there is no any district that has high development status. Only two districts viz, Kamrup and N. C. Hills have attained moderate development status. The remaining 21 districts have low development status in urban and industrial growth.

Here, with overall composite index of 0.306 the status of overall Assam has low development showing a downward movement from 0.339 in 1991. Again, from the column 4 of the Table 4.44 it is found that as the coefficient of variation value is 56.86, it means there exist about 57 percent disparity in urbanization and industrialization across the State of Assam in 2001.

Table 4. 43: District wise overall Urbanization and Industrialization Index (I_{UI}) of Assam, 1991

Districts	I_{UR}	I_{IND}	I_{UI}** $=(I_{UR}+I_{IND})/2$	Status	Rank
Dhemaji	0.000	0.039	0.019	LD	23
Lakhimpur	0.145	0.027	0.086	LD	22
Sonitpur	0.169	0.203	0.186	LD	18
Dibrugarh	0.531	0.392	0.462	LD	5
Jorhat	0.453	0.614	0.534	MD	2
Golaghat	0.141	0.302	0.222	LD	16
Sibsagar	0.182	0.000	0.091	LD	21
Tinsukia	0.501	0.207	0.354	LD	11
Nagaon	0.296	0.466	0.381	LD	10
Morigaon	0.109	0.169	0.139	LD	20
Nalbari	0.007	0.882	0.445	LD	7
Darrang	0.093	0.325	0.209	LD	17
Barpeta	0.161	0.412	0.287	LD	14
Dhubri	0.329	0.536	0.433	LD	8
Bongaigaon	0.230	0.421	0.326	LD	13
Kokrajhar	0.139	0.203	0.171	LD	19
Goalpara	0.186	0.708	0.447	LD	6
Kamrup	1.000	1.000	1.000	HD	1
N. C. Hills	0.708	0.239	0.474	LD	4
Karbi-Anglong	0.299	0.395	0.347	LD	12
Cachar	0.254	0.513	0.384	LD	9
Karimganj	0.174	0.971	0.523	MD	3
Hailakandi	0.178	0.384	0.281	LD	15
Assam (Mean)	0.273	0.405	0.339	LD	
SD	0.227	0.266	0.201		
CV	83.15	65.68	59.29		

Source: ** Constructed from, Table 4.37 and 4.40

Note: **I_{UR}=** Urbanization Index; **I_{IND}** = Industrialization Index;
I_{UI} = Urbanization and Industrialization Index**; LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

Table 4. 44: District wise overall Urbanization and Industrialization Index (I_{UI}) of Assam, 2001

Districts	I_{UR}	I_{IND}	I_{UI}** $=(I_{UR}+I_{IND})/2$	Status	Rank
Dhemaji	0.131	0.147	0.139	LD	19
Lakhimpur	0.147	0.168	0.158	LD	17
Sonitpur	0.239	0.472	0.356	LD	10
Dibrugarh	0.502	0.268	0.385	LD	8
Jorhat	0.439	0.203	0.321	LD	11
Golaghat	0.184	0.021	0.103	LD	22
Sibsagar	0.204	0.006	0.105	LD	21
Tinsukia	0.508	0.213	0.361	LD	9
Nagaon	0.286	0.334	0.310	LD	12
Morigaon	0.074	0.000	0.037	LD	23
Nalbari	0.000	1.000	0.500	LD	3
Darrang	0.077	0.242	0.159	LD	16
Barpeta	0.158	0.113	0.136	LD	20
Dhubri	0.278	0.593	0.436	LD	5
Bongaigaon	0.289	0.493	0.391	LD	7
Kokrajhar	0.139	0.146	0.143	LD	18
Goalpara	0.171	0.678	0.425	LD	6
Kamrup	1.000	0.526	0.763	MD	1
N. C. Hills	0.869	0.298	0.584	MD	2
Karbi-Anglong	0.265	0.273	0.269	LD	14
Cachar	0.344	0.201	0.273	LD	13
Karimganj	0.147	0.829	0.488	LD	4
Hailakandi	0.170	0.249	0.209	LD	15
Assam	0.288	0.325	0.306	LD	
SD	0.237	0.255	0.174		
CV	82.29	78.46	56.86		

Source: ** Constructed from, Table 4.38 and 4.41

Note: **I_{UR}=** Urbanization Index; **I_{IND}** = Industrialization Index;
I_{UI}= Urbanization and Industrialization Index**; LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

Now, let us analyse district wise composite index of urbanization and industrialization across the different districts of Assam in 2011 with the help of the following Table 4.45.

Table 4. 45: District wise overall Urbanization and Industrialization Index (I_{UI}) of Assam, 2011

Districts	I_{UR}	I_{IND}	I_{UI}** $=(I_{UR}+I_{IND})/2$	Status	Rank
Dhemaji	0.071	0.547	0.309	LD	17
Lakhimpur	0.092	0.387	0.240	LD	22
Sonitpur	0.093	0.489	0.291	LD	19
Dibrugarh	0.209	0.000	0.105	LD	26
Jorhat	0.231	0.471	0.351	LD	13
Golaghat	0.098	0.568	0.333	LD	14
Sibsagar	0.101	0.245	0.173	LD	25
Tinsukia	0.229	0.535	0.382	LD	11
Nagaon	0.144	0.748	0.446	LD	8
Morigaon	0.078	0.300	0.189	LD	24
Nalbari	0.116	0.511	0.314	LD	16
Darrang	0.059	0.443	0.251	LD	20
Barpeta	0.091	0.760	0.426	LD	9
Dhubri	0.111	0.551	0.331	LD	15
Bongaigaon	0.153	0.345	0.249	LD	21
Kokrajhar	0.060	0.986	0.523	MD	4
Udalguri	0.157	0.686	0.363	LD	12
Baksa	0.000	0.848	0.424	LD	10
Chirang	0.075	0.539	0.307	LD	18
Goalpara	0.152	0.307	0.230	LD	23
Kamrup Metro	1.000	1.000	1.000	HD	1
Kamrup	0.099	0.913	0.506	MD	6
Dima Hasao	0.336	0.889	0.613	MD	2
Karbi-Anglong	0.129	0.635	0.382	LD	11
Cachar	0.207	0.971	0.589	MD	3
Karimganj	0.095	0.800	0.448	LD	7
Hailakandi	0.074	0.952	0.513	MD	5
Assam	0.153	0.608	0.381	LD	
SD	0.180	0.255	0.173		
CV	117.65	41.94	45.41		

Source: ** Constructed from, Table 4.39 and 4.42

Note: **I_{UR}=** Urbanization Index; **I_{IND}** = Industrialization Index;
I_{UI} = Urbanization and Industrialization Index**; LD**= Low Development;
MD= Moderate Development; **HD**= High Development;
SD= Standard Deviation; **CV**= Coefficient of Variation

In the Table 4.45, as shown in column 4, the overall status of Assam in urbanization and industrialization is not found satisfactory which has low development status having the value of the composite index as 0.381 though it shows some

improvement from 0.339 in 1991 and 0.306 in 2001. The Kamrup Metro is the only one district that has high development status in contrast to districts like Dima Hasao, Cachar, Kokrajhar, Hailakandi and Kamrup that have attained moderate development status. In contrast to these, the remaining 21 districts viz, Karimganj, Nagaon, Barpeta, Baksa, Tinsukia, Karbi-Anglong, Udalguri, Jorhat, Golaghat, Dhubri, Nalbari, Dhemaji, Chirang, Sonitpur, Darrang, Bongaigaon, Lakhimpur, Goalpara, Morigaon, Sibsagar and Dibrugarh have low development status in urban and industrial growth. From the table it has been evident that Kamrup Metro and Dibrugarh respectively have highest and lowest development in urban and industrial growth out of the 27 districts of Assam in 2011.

Further, the disparity among the different regions of Assam is found to be about 45 percent as the value of coefficient of variation is found to be 45.41 in contrast to the 59 percent in 1991 and 57 percent in 2001. As compared to the variation of 1991 and 2001, there exists low variation in urban and industrial growth 2011.

The Table 4.46 in the following shows micro zone wise indices of urban and industrial growth for 1991, 2001 and 2011 of Assam.

The column 3, column 4 and column 5 of Table 4.46 represent micro zone wise composite index of urbanization and industrialization for 1991, 2001 and 2011 which are computed from Table 4.43, Table 4.44 and Table 4.45 respectively. Here, from the table it is evident that out of the seven micro zones of Assam, Lower South Brahmaputra Valley has attained highest development in all the three census years. The zones Upper North Bank Plain, Central Brahmaputra Valley and Upper South Bank Plain respectively have attained lowest development across the different zones of Assam. Further, from the values of the coefficient of variation the disparities in urbanization and industrialization across the seven micro zones have been found as 48.83, 40.63 and 29.07 respectively for 1991, 2001 and 2011. In 1991, the micro zone wise disparity in Assam is found to be highest contrary to 2011, in which micro zone wise disparity in urban and industrial growth is lowest.

Table 4. 46: Micro zone wise Indices of Urbanization and Industrialization (I_{UI}) of Assam

Sl. No.	Micro Zone	I_{UI}/1991	I_{UI}/2001	I_{UI}/2011
1	Upper North Bank Plain	0.097	0.217	0.280
2	Upper South Bank Plain	0.332	0.255	0.269
3	Central Brahmaputra Valley	0.260	0.174	0.318
4	Lower North Bank Plain	0.314	0.294	0.354
5	Lower South Brahmaputra Valley	0.724	0.594	0.579
6	Barak Valley	0.396	0.323	0.517
7	Hill Zone	0.410	0.427	0.497
	Mean	0.361	0.326	0.402
	Standard Deviation (SD)	0.177	0.132	0.117
	Coefficient of Variation (CV)	48.83	40.63	29.07

Source: I_{UI}/1991, I_{UI}/2001 and I_{UI}/2011 calculated from Table 4.43, Table 4.44 and Table 4.45 respectively

Note: **I_{UI} =** Urbanization and Industrialization Index**; LD**= Low Development; **MD**= Moderate Development; **HD**= High Development

4.8 Effects of the Factors of Disparities in Rural Development of Assam and its Impact on Economic Development

So far as the study has analyzed the factors responsible for the extent of spatio-temporal disparities in rural development across the various districts of Assam, now the need of the hour is to find out the effects of the different factors in disparities in rural development across the different regions of Assam as well as impact of it on economic development of the State. This is very important to test hypotheses and answer the research questions. In order to find out the overall significance of the various factors responsible for variations in rural development the study is going to fit a multiple regression model of the factors upon rural development for all the three census years as 1991, 2001 and 2011. Here in the analysis the different factors of rural development have been taken as independent variable and rural development as dependent variable. For each of the variable district wise indices have been taken into account for the different census years.

For further reconfirmation of which of the factors account for significant disparities in rural development of Assam the estimation of simple correlation coefficient of each of the explanatory variables with the dependent variable also have been computed.

The regression model used in the study is-

$$RD_t = \beta_0 + \beta_1 IF_t + \beta_2 RA_t + \beta_3 GP_t + \beta_4 UI_t + U_t \text{ ---------- (1)}$$

Where, RD_t is rural development index of district t which implies dependent variable;

IF_t, RA_t, GP_t, and UI_t are rural infrastructure index, resource availability index, government expenditure on different rural development programme index and urban and industial growth index of district t respectively and are implying explanatory variables;

β_0, β_1, β_2, β_3 and β_4 are positive parameters and

U_t is Random Disturbance Term;

t = 1, 2, 3 ---------- 23 (for 23 districts of Assam in 1991 and 2001) and

t = 1, 2, 3 ----------27 (for 27 districts in 2011)

Now, using the OLS (Ordinary Least Square) method the multiple regression line (1) has estimated for the census years 1991, 2001 and 2011.

The estimated regression line for 1991 is obtained as –

$$RD_t = 0.048 + 0.633\ IF_t + 0.455\ RA_t - 0.145\ GP_t - 0.066\ UI_t + U_t \text{ ------ (2)}$$

The results of the multiple regression line (1) for 1991 of Assam have been presented in the Table 4.47.

R^2 is the goodness of fit of the predictors on the dependent variable rural development in the multiple regression equation (1). That is, it is the value that helps to capture the dependent variable rural development by the factors encountered into the model. In the Table 4.47, the R^2 value is found to be 0.710 indicating that about 71 percent of the disparity in rural development of Assam in 1991 is explained by the factors such as resource availability, rural infrastructure, urbanization and

industrialization and government expenditure on different rural development programme.

Table 4. 47: Results of the Multiple Regression Model of the Index of Rural Development upon the Indices of the Explanatory Variables, 1991

Explanatory Variables/Constants	Co-efficient Values	Standard Error	t values	Significance	VIF
Constant	0.048	0.078	0.607	0.551	-
IF	0.633	0.226	2.794***	0.012	1.801
RA	0.455	0.147	3.098***	0.006	1.900
GP	-0.145	0.136	-1.067	0.300	1.584
UI	-0.066	0.104	-0.632	0.535	1.027
R^2	0.710				
F (4,18)	10.992			0.000	

*** Significant at 1 percent level- implies highly significant

Note: **IF** = Rural Infrastructure; **RA** = Resource Availability;
GP = Government Expenditure on different Rural Development Programme and
UI = Urban and Industrial Growth;
RD = Rural Development (Dependent Variable)
VIF = Variance Inflating Factor

Again, the value of F implies the overall fit of the model which is statistically significant at 1 percent level. From the table it has been evident that the value of F is 10.992 which is highly significant at 1 percent level. Thus the overall fit of the regression model (2) is satisfactory one.

From the table, it is again found that the t value for the coefficient term β_1 and β_2 i.e., rural infrastructure and resource availability are respectively 2.794 and 3.098 which are highly significant at 1 percent. This shows that rural infrastructure and resource availability have positive impact on rural development.

The t values of the coefficient of other factors including the constant term are not significant. To check whether non-significance of the other factors is due to multicollinearity, the collinearity diagnostic has been checked. Here, as the highest condition index is found to be 9.900, the multicollinearity does not seem to be a puzzle.

Thus, the factors like urbanization and industrialization and amount of government expenditure on different rural development programmes do not have significant impact in the disparities in rural development of Assam in 1991. The value of the coefficient of the above two factors have came out to be negative which implies they yet to make positive impact on rural development of Assam.

Again, variance inflating factor (VIF) shows how the variance of an estimator is influenced by the presence of multicollinearity. In the Table 4.47 since the value of VIF are found less than 5 there is no presence of multicollinearity in the regression model.

For further reconfirmation the simple correlation coefficient of each of the explanatory variables with the dependent variable rural development were also computed as shown in Table 4.48.

Table 4. 48: Simple Correlation Coefficient of Rural Development Index with Indices of the Explanatory Variables, 1991

Factors/Explanatory Variables	Correlation Coefficient	t value (significant at two tailed)
IF	0.736**	0.000
RA	0.754**	0.000
GP	0.371	0.081
UI	-0.158	0.472

** Correlation coefficient is significant at 1 percent level (2-tailed)

Note: **IF** = Rural Infrastructure; **RA** = Resource Availability;
GP = Government Expenditure on different Rural Development Programme and
UI = Urban and Industrial Growth;
RD = Rural Development (Dependent Variable)

From the above Table 4.48 it has found that the correlation coefficient of rural infrastructure and resource availability are highly significant and positive at 1 percent level. The correlation coefficients of other explanatory variables are not found statistically significant. The negative value of correlation coefficient of urban and industrial growth shows that it is yet to make positive impact on improving rural development.

Let us estimate the multiple regression line for the year 2001.

The multiple regression equation for the year 2001 is estimated as –

$RD_t = 0.107 + 0.332\ IF_t + 0.495\ RA_t - 0.087\ GP_t - 0.135\ UI_t + U_t$ ------ (3)

The descriptive statistics and results of multiple regression line for the year 2001 are shown in Table 4.49.

Table 4. 49: Results of the Multiple Regression Model of the Index of Rural Development upon the Indices of the Explanatory Variables, 2001

Explanatory Variables/Constants	Co-efficient Values	Standard Error	t values	Significance	VIF
Constant	0.107	0.115	0.923	0.368	-
IF	0.332	0.262	1.268	0.221	1.538
RA	0.495	0.121	4.085***	0.001	1.100
GP	-0.087	0.131	-0.665	0.514	1.428
UI	-0.135	0.129	-1.049	0.308	1.057
R^2	0.487				
F (4,18)	4.272			0.013	

*** Significant at 1 percent level- implies highly significant

Note: **IF** = Rural Infrastructure; **RA** = Resource Availability;
GP = Government Expenditure on different Rural Development Programme and
UI = Urban and Industrial Growth;
RD = Rural Development (Dependent Variable)
VIF = Variance Inflating Factor

From the Table 4.49, it has been found that the value of R^2 is 0.487 showing an about 49 percent variation in rural development of Assam in 2001 as explained by the factors such as resource availability, rural infrastructure, urbanization and industrialization and amount of government expenditure on different rural development programmes.

Again, it has been found that the value of F is 4.272 which is statistically significant at 0.013, i.e, one percent level. Thus, the overall fit of the model is statistically significant one.

In this model the t value for the factor resource availability has been computed as 4.085 which is found highly significant at 1 percent. The coefficients of other factors are not found statistically significant. This means the factors like rural infrastructure, government expenditure and urbanization and industrialization are yet to influence rural development across the State of Assam in 2001. Further, here though rural infrastructure has some sort of positive influence on rural development the other non-significant factors have yet to make positive impact on rural development. Again, in this model the collinearity diagnostic indicates the non-significance of these factors are not due to multicollinearity because the highest condition index is found to be 13.32.

In the above Table 4.49 also, since the value of VIF (Variance Inflating Factor) are found less than 5 there is no presence of multicollinearity among the variables in the regression model (3) of 2001.

The significance of the factors affecting disparities in rural development can also be seen from the simple correlation coefficient between the dependent variable and predictors as shown in the Table 4.50.

Table 4. 50: Simple Correlation Coefficient of Rural Development Index with Indices of the Explanatory Variables, 2001

Factors/Explanatory Variables	Correlation Coefficient	t value (significant at two tailed)
IF	-0.006	0.980
RA	0.648**	0.001
GP	-0.005	0.980
UI	-0.105	0.635

** Correlation coefficient is significant at 1 percent level (2-tailed)

Note: **IF** = Rural Infrastructure; **RA** = Resource Availability;
GP = Government Expenditure on Rural Development Programme and
UI = Urbanization and Industrialization;
RD = Rural Development (Dependent Variable)

Here, also the value of correlation coefficient of resource availability is found highly significant. The values of the correlation coefficient of other three factors are yet to make positive role in disparities in rural development of Assam.

Now, the multiple regression line for the year 2011 is estimated as-

$RD_t = 0.220 + 0.071\ IF_t + 0.501\ RA_t + 0.139\ GP_t + 0.080\ UI_t + U_t$ ------ (4)

The descriptive statistics and results of the multiple regression analysis are presented in the following Table 4.51.

Table 4. 51: Results of the Multiple Regression Model of the Index of Rural Development upon the Indices of the Explanatory Variables, 2011

Explanatory Variables/Constants	Co-efficient Values	Standard Error	t values	Significance	VIF
Constant	0.220	0.100	2.205**	0.038	-
IF	0.071	0.243	0.292	0.773	1.243
RA	0.501	0.108	4.623***	0.000	1.141
GP	0.139	0.074	1.881*	0.073	1.103
UI	0.080	0.118	0.678	0.505	1.105
R^2	0.535				
F (4, 22)	6.323			0.002	

*** Significant at 1 percent level- implies highly significant
** Significant at 5 percent level
* Significant at 10 percent level

Note: **IF** = Rural Infrastructure; **RA** = Resource Availability;
GP = Government Expenditure on different Rural Development Programme and
UI = Urban and Industrial Growth;
RD = Rural Development (Dependent Variable)
VIF = Variance Inflating Factor

It has been found in the Table 4.51 that R^2 value is 0.535 which indicate existence of about 54 percent disparity in rural development across different regions of Assam which are explained by the different factors such as resource availability, rural infrastructure, urbanization and industrialization and amount of government expenditure on different rural development programmes.

Again, the value of F is found as 6.323 which is highly significant at 0.002, i.e, one percent level. Thus, the overall fit of the model is statistically significant. Again, it is estimated that t value for the resource availability factor is 4.623 which is highly significant at 1 percent level. The t value for the constant term as well as the amount of government expenditure on different rural development programmes are found

statistically significant having the value as 2.205 and 1.881 respectively. The coefficient of other two factors like urban and industrial growth and rural infrastructure are not statistically significant though they have positive influence on rural development.

To test whether non-significance of the factors are due to multicollinearity, collinearity diagnostic have been checked and it is found that non-significance of factors are not due to multicollinearity because the highest condition index is found as 12.511 which is less than 20. Further, since the values of VIF (Variance Inflating Factor) are found less than 5 there is no presence of multicollinearity among the variables in the regression model (4) of 2011.

The Table 4.52 in the following depicts the values of simple correlation coefficient of rural development with indices of the factors as explanatory variables affecting disparities in rural development in Assam in 2011.

Table 4. 52: Simple Correlation Coefficient of Rural Development Index with Indices of the Explanatory Variables, 2011

Factors/Explanatory Variables	Correlation Coefficient	t value (significant at two tailed)
IF	-0.120	0.550
RA	0.657**	0.000
GP	0.190	0.344
UI	0.065	0.748

** Correlation coefficient is significant at 1 percent level (2-tailed)

Note: **IF** = Rural Infrastructure; **RA** = Resource Availability;
GP = Government Expenditure on Rural Development Programme and
UI = Urbanization and Industrialization;
RD = Rural Development (Dependent Variable)

It has been found that resource availability factor is highly significant at 0.000 which means it is statistically significant at 1 percent level. The coefficient of other three factors viz, amount of government expenditure on different rural development programmes, rural infrastructure and urban and industrial growth are statistically insignificant. Having the negative value of coefficient of rural infrastructure it implies rural infrastructure is yet to make positive impact in rural development of Assam in 2011.

Thus, from the above discussion it is concluded that the research hypothesis adopted in the study that resource availability factor has no effect in spatio-temporal disparities in rural development of Assam and thus it has no significant impact in reducing disparities in rural development is not accepted for all the three census years viz, 1991, 2001 and 2011. This means the alternative hypothesis that availability of resources has significant impact on spatio-temporal variations in rural development of Assam is accepted.

Again, the second hypothesis of the study that urbanization and industrialization reduce disparities leading to more rural development by reducing pressure on land is not accepted. On the contrary the corresponding alternative hypothesis that it has no impact is accepted for all the three census years. It indicates that whatever urbanization and industrialization has taken place in the different regions of Assam the spread effect to the surrounding rural economies have at best been marginal.

From the results of the multiple regression model and simple correlation analysis of the factors understanding rural development of Assam with that of rural development as dependent variable it has been evident that in 1991, resource availability and rural infrastructure are the two significant factors in variations in rural development across different regions of Assam. These two factors have positive impact on rural development in the economy. The remaining other two factors such as government expenditure on rural development programme has yet to make positive impact on rural development and it hasn't significant effect in economic development of Assam.

In 2001 also, the resource availability has significant positive impact upon rural development of Assam as the value of coefficient is found as positive and is highly significant. Thus, it is the significant factor in disparities in rural development across the different regions of Assam in 2001. Here, rural infrastructure though has direct relationship with rural development the effect on disparities in rural development is marginal. The other factors have yet to make positive impact in rural development.

Similar to the 1991 and 2001, the factor availability of resources also has significant impact in variations in rural development of Assam in 2011. Along with the above factor the amount of government expenditure on different rural development

programmes have positive relationship with that of rural development. It means these two factors have great role in enhancement of economic development of the State. The other factors though don't have significant impact they have positive relationship with rural development and thus economic development of Assam in 2011.

Let us analyse the impact of the factors on economic development of Assam. From the above discussion it is cleared that all the factors responsible for variations in rural development across the districts or micro regions have impact on economic development of the State of Assam. In this study, rural infrastructure and resource availability have positive impact on rural development in 1991 and 2001 except in 2011 where all the factors have positive impact though not significant. It has been found that due to the effect of the factors the disparities in rural development across different rural regions of Assam has been declining from 1991 to 2001 and then to 2011. This trend is very important for balanced regional development as well as to increase rural development in the region.

We know that, education, health, per capita income, agricultural productivity etc. are the basic indicators of economic development. It has been evident from preceding Chapter- III that in entire rural Assam there is an increase in literacy rate from 49.52 percent in 1991 to 59.73 percent in 2001 which again increased to 69 .34 percent in 2011.

Again, the overall position of health in rural Assam also shows an increasing value from 0.491 in 1991 to 0.631 in 2001 and then to 0.678 in 2011. Here, though the value of child sex ratio has been decreasing from 977 in 1991 to 967 in 2001 and then to 964 in 2011, it was offset by lowering down of infant mortality rate from 92 in 1991 to 64 in 2001 and then to 55 in 2011 resulting an increase in health status of overall Assam.

The rural agricultural productivity in Assam also seen to be increasing from 29.76 percent in 1991 to 41.06 percent in 2001 which again increase to the extent of 73.53 percent in 2011. In case of work force participation rate though there was a decrease of rural employment rate from 31.30 percent in 1991 to 26.06 percent in 2001, the figure again rose to 27.27 percent in 2011.

The state domestic product and per capita state domestic product are the most effective tools for measuring economic development of a State. The Gross State Domestic Product (GSDP) of Assam in 1993-94 at constant (1993-94) prices was 15143.17 crore which increase to 18619.32 crore in 2001-02 at constant (1993-94) prices. In 2011-12 the gross state domestic product further increased to 80465.13 crore at constant (2004-05) prices. The per capita gross domestic product of Assam also increases from Rs. 6422.00 (at constant, 1993-94 prices) in 1993-94 to Rs. 6883.00 (at constant, 1993-94 prices) in 2001-02, which further increases to Rs. 24,957.00 (at constant, 2004-04 prices) in 2011-12.

The Net State Domestic Product (NSDP) in 1993-94 (at constant, 1993-94 prices) was 13476.83 crores out of which the contribution of agricultural sector, secondary sector and service sector to NSDP was 37.26, 13.26 and 38.60 percent respectively. In 2001-02 the Net State Domestic Product increased to 16172.81 crores (at constant, 1993-94 prices) out of which contribution to agriculture, secondary and service sector were 33.09, 10.89 and 46.28 respectively. Again, in 2011-12 out of total NSDP at constant prices (2004-05) the contribution of agriculture, secondary and tertiary sector to the NSDP was 19.32, 15.52 and 56.62 percent respectively. Here, the point to be noted here is that the contribution of agriculture sector to state domestic product has been decreasing as compared to service sector. That is, service sector growth has been increasing at a rapid rate than the other sectors which has more impact on economic development. In case of industrial sector though the contribution of secondary sector has decreased from 1991 to 2001, it increased again in 2011.

Further, along with state domestic product and per capita state domestic product the growth rate of population is also a demographic indicator of economic development. For economic development to be sustainable, growth rate of population must have to be reduced. The decadal percentage growth rate of population in Assam in 1991-2001 was 18.92 which decreased to 15.35 in 2001-2011. In contrast to these the all India figure for decadal percentage of population growth in 1991-2001 was 21.54 which decreased to 17.64 in 2001-2011. Thus, in population growth rate, Assam is lying below the national growth rate and there is fall in the growth rate both in the State as well as in India.

Thus, in the rural economy of Assam among the factors such as rural infrastructure, urban and industrial growth, resource availability and amount of government expenditure on different rural development programmes the two factors rural infrastructure and resource availability have positive role in enhancing economic development of rural Assam in 1991 and 2001. In the year 2011, all the factors have positive role in enhancing economic development across the State of Assam.