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## Development and Infrastructure Disparity across Indian Hill States: An Analysis

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### Abstract:

*Development disparity is an omnipresence phenomenon at global, continent, country and province level. At global level countries have been categorized into developed, developing and underdeveloped realm. This research has a fresh look on development and infrastructure disparity across the Indian hill states in post reform period. It reveals that no significant change in terms of development disparity in the first decade of liberalized economy across hill states. However, in the first decade of 21<sup>st</sup> century the development disparity ratio decreased from 0.29 in 2001 to 0.25 in 2011 and development index of all hill states increased from 0.40 in 2001 to 0.48 in 2011. It reflects that after a decade of reforms convergence of development took place in hill states. Infrastructure plays an important role for development. For this, the value of the coefficient of correlation between development and infrastructure indices of 2011 was worked out. It is +0.85. This reveals that development of hill states is strongly associated with the infrastructure development. Furthermore, the analysis reveals that the most of northeast hill states and Jammu & Kashmir have infrastructural deficit. Therefore, it is recommended that Union and State Governments should pay more heed towards north-east in infrastructural development.*

### 1. Introduction

It is established fact that in a large economy, different regions have different resource bases and endowments caused dissimilar growth. Development disparity is a ubiquitous phenomenon at global, continent, country and province levels. At global level countries have been categorized into developed, developing and underdeveloped realm. Even highly developed nations have pockets of less developed sub-region and vice versa. "The poor countries are characterized by large and growing regional disparities and rich countries are generally characterized by small and diminishing gap" (Williamson, 1965).

The United Nations observed sixties as first development decade, which stimulated the thought process of development among scholars, researchers, etc. The geographic interest emerged with the growing realization that vast country like India has geographical diversities of a high order. It requires sectoral and regional development approaches in order to optimize economic efficiency and minimize existing development disparities.

In context of India, the British oriented governance came to end on the eve of Independence of India, 1947. The planned era started with the commencement of First Five Year Plan. Indian economy experienced sluggish growth (3.5% per annum) in first three decades. The public sector was major player and engine of growth. The government used to regulate the private sector and its activities with licensing requirements. Through licensing the government determined the scale, technology, location of investment etc. The partial liberalization started in the second half of eighties but following a foreign exchange crisis in 1991, a complete paradigm shift took place by the announcement of new policy by Union Government in July, 1991. The neo-liberal policy encompassed substantial changes in industrial licensing and regulatory policy, tax, trade, investment and fiscal policies. The crux of policy was a greater thrust on privatization and globalization of Indian economy.

During eighties and last decade of 20<sup>th</sup> century attained an impressive growth rate of nearly 6 per cent. The regions better in infrastructure (both material infrastructure and human resources) can perform better as compared to that of backward or lagging regions. Developed regions do better due to the externalities. Consequently, development disparities increase in consonance with economic growth in developing countries.

### 2. Literature

Development disparity have been gauged in different dimensions by various social scientists. Some of the important studies have been referenced in this section. Schwartzberg (1962) examined the spatial pattern of economic development during fifties. He observed a peculiar feature of the Indian development and identified six types of areas: (a) isolated tribal economy (b) subsistence peasant economy (c) incipient commercialization (d) advanced commercialization (e) economic diversification and (f) large scale organization. The important manufacturing, commercial or administrative centers i.e. Kanpur, Hyderabad and Jaipur, whose level of growth did not reflect the development of their surrounding areas.

The different schools of thought perceive the development disparity in different ways. These schools of thought are categorized into convergence and divergence. Williamson (1965) concluded that regional inequalities in India increased during 1950s. This observation was refuted by Dhar and Sastry(1969) and Mahajan (1982). Lahiri(1969), Rao (1972), Nair(1977), Sampath(1977)Majumdar(1970), Ganguly and Gupta(1976), Mathur(1983, 1987) confirm the narrowing down trend in disparity overtime. Several reasons were traced for the above conclusions.

The second school of thought belongs to divergence in terms of spatial development in first three decades from inception of First Five Year Plan. Venkataramiah (1969), Rao (1973), Nair (1973), Chaudhary (1974), Sampath (1977) and Mahapatra (1978) claimed that regional imbalances have increased over the period of time. In post reform period especially during 1990s a number of studies have concluded that regional disparity in India has widened. These study (Ahluwalia 2000 and 2002; Shand and Bhide 2000; Shand and Kalirajan 1999; Nagraj, Varoudakis and Veganzous 1998) do not cover adequately the post reform period.

Sarker (1994) highlighted the link between regional imbalance and plan outlays. He emphasized about the strong link between development and per capita plan outlays for 15 Indian states. Dholakia (1994) claimed the tendencies of convergence of long term economic growth rates (1960-61-1989-90) for 20 Indian states. He identified 1980-81 to be the year of break in the trend of real incomes of Indian states. Several of the lagging states started growing after this date while the leaders to stagnate. Cashin and Sahay (1996) concluded the absolute convergence in 20 states during 1961-91 whereas dispersion increased in per capita income. Raman (1996), Marjit and Mitra (1996) and Ghosh et al. (1998) reported significant divergence across Indian states.

Sengupta et al. (2008) concluded that Indian economy witnessed a higher growth in the gross domestic product associated with rising concentration of money and wealth. The recent growth has been benefited a few and led to increasing disparities and inequalities (Gustafsson et al. 2008; Dev and Ravi2007; Sengupta et al. 2008; Bhaduri 2008). Sarkar et al. (2010) concluded that India witnessed a widening of income inequality during the phase of acceleration in economic growth in post reform period (1994-95 to 2004-05). Most of studies of development disparity were conducted on major states of India, all states of India, state level and intra state level. The literature is scanty on Indian hill states. This research paper looks development and infrastructure disparity and correlation between development and infrastructure among hill states.

### 3. Objectives

The objectives of this research paper are to:

- Study trends and patterns of development disparity among Indian hill states in post reform period.
- Pattern of infrastructure disparity among Indian hill states in 2011.
- Correlation between development and infrastructure in 2011.

### 4. Research Questions

Based on review of literature discussed above, the following major research questions are forwarded for investigation:

- What are the patterns and trends of development disparity among Indian hill states in post reform period?
- What is the pattern of infrastructure disparity among Indian hill states in 2011?
- To what extent the development is associated with infrastructure among Indian hill states in 2011?

### 5. Significance of the Study

Development disparity breeds regional tensions because the backward regions carry a feeling of neglect and discrimination. To redress development disparity is essential for maintaining an integrated social and economic fabric of the country without which the country may be faced with a situation of discontent, anarchy and breakdown of law and order. The study of development disparity in Indian Hill states will provide an insight into the processes of development and unfold the real nature and intensity of problems at state level. The correlation between development and infrastructure will determine the direction of development. The present study on development and infrastructure may be useful for policy makers and planners.

### 6. Period and Unit of Study

The development disparity in the hill states has been studied covering three points of time i.e. 1991, 2001 and 2011. The infrastructure disparity across the hill states has been worked in 2011. India has adopted policy of liberalization, privatization and globalization since 1990s. The free play of market accentuates spatial disparities in development. It attracts the considerable research interest to know the level of development disparity in Indian Hill states in post reform period. The state level data shall be used for interstate comparison. The data for new formed state (Uttarakhand) has been recasted in consonance with the administrative divisions of 2011.

### 7. The Study Area

The present study is focused on the Indian Hill states. These are: Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura and Uttarakhand. All hill states are special category states. It is spread between 21°57'N to 37°5'N latitudes and 72°40'E to 97°25'E longitudes covering an area of 515 thousand Km<sup>2</sup>. It shares one-seventh (15.67 per cent) of total geographical area of India and contains 3.63 percent of total population of the country in 2011.

### 8. Data and Methodology

Methodology is an important tool to achieve various objectives formulated for the study. This research is based on secondary data. The secondary data have been collected to measure social, rural and economic development data published by Census of India. In this

study, the social development has been inferred using female literacy, rural development from the non- agricultural rural workforce, and economic development from the degree of urbanization as used in 'Trends in Regional Disparities in India' (Krishan, 1989). The development Index used by the United Nations Institute for Social Research (UNISR: 1991) has used for measuring the different dimensions of development. The formula is as under:

$$\text{Deprivation Score} = \frac{\text{Maximum Value} - \text{Actual Value}}{\text{Maximum Value} - \text{Minimum Value}}$$

$$\text{Development Index} = 1 - \text{Deprivation Score}$$

Composite Index = Summation of development indices on the three indicators divided by three.

The similar methodology has been used to work out the infrastructure index of 2011.

The disparity ratio has been calculated through the standard deviation of development indices of states divided by the mean of indices. In this research, an attempt has been made to correlate development indices with infrastructure indices (2011) through the Karl Pearson's Coefficient of Correlation formula to know the association between development and infrastructure.

## 9. Limitations

The measurement of development defies unanimity, because interpretations vary with time, space, discipline and people. Hence, the consensus on selection of indicators and criteria shall always be subjective and open to criticism. The present study is vulnerable on this account. But the selected criteria and indicators were found to be most appropriate because the comparable and adjustable data from three points of time on these indicators for all hill states is possible.

## 10. Indicators of Development

The research paper has a fresh look on development disparities among hill states. This study examined the trends and patterns of disparities in the post-reform period at the state level among hill states. After going through the immense literature on regional disparity, it has been decided that development will be looked through the criteria of social development, economic development and rural development. To examine the various dimensions of development, the selection of appropriate and judicious indicators is imperative. In the present study, three indicators i.e. female literacy rate, degree of urbanization and proportion of non-agricultural rural main workers to total workers have been selected to identify the spatial patterns and trends of development disparities in hill states. The indicators are;

### 10.1. Urbanization

The settlement which qualifies the criteria determined by Census of India is known as urban settlement. It includes (a) all statutory places like municipality, corporation, cantonment board, notified town area committee etc. (b) a minimum population of 5000; at least 75 per cent of male working population engaged in non- agricultural activities and population density at least 400 persons/km<sup>2</sup>.

Hill states	Urbanization (per cent)			Female literacy Rate (per cent)			Non-agricultural main workers to the total workers (per cent)		
	1991	2001	2011	1991	2001	2011	1991	2001	2011
2011	1991	2001	2011	1991	2001	2011	1991	2001	2011
J & K	DNA	24.80	27.38	DNA	43.00	56.43	DNA	28.82	31.71
H. P.	8.69	9.80	10.03	52.13	67.42	75.93	22.13	23.05	25.59
Uttarakhand*	23.14	25.67	30.23	41.69	59.63	70.01	20.01	22.30	25.78
Sikkim	9.10	11.07	25.15	46.69	60.40	75.61	27.56	33.67	32.99
Arunachal	12.80	20.75	22.94	29.69	43.53	57.70	27.13	24.46	24.23
Nagaland	17.21	17.23	28.86	54.75	61.46	76.11	16.11	19.06	18.30
Manipur	27.52	26.58	32.45	47.60	60.53	72.37	22.03	27.06	28.58
Mizoram	46.10	49.63	52.11	78.60	86.75	89.27	14.98	12.85	13.91
Tripura	15.30	17.06	26.17	49.65	64.91	82.73	27.20	33.76	31.07
Meghalaya	18.60	19.58	20.07	44.85	59.61	72.89	20.41	19.30	22.12
Hill States	18.44	23.17	25.53	47.56	57.34	69.18	21.63	24.90	26.84

Table 1: Select Socio- economic Indicators of Indian Hill States (1991, 2001 & 2011)

Source: Compiled from various documents of Census of India.

\* The data of Uttarakhand in 1991 has been the recasted in accordance with the administrative divisions of 2011.

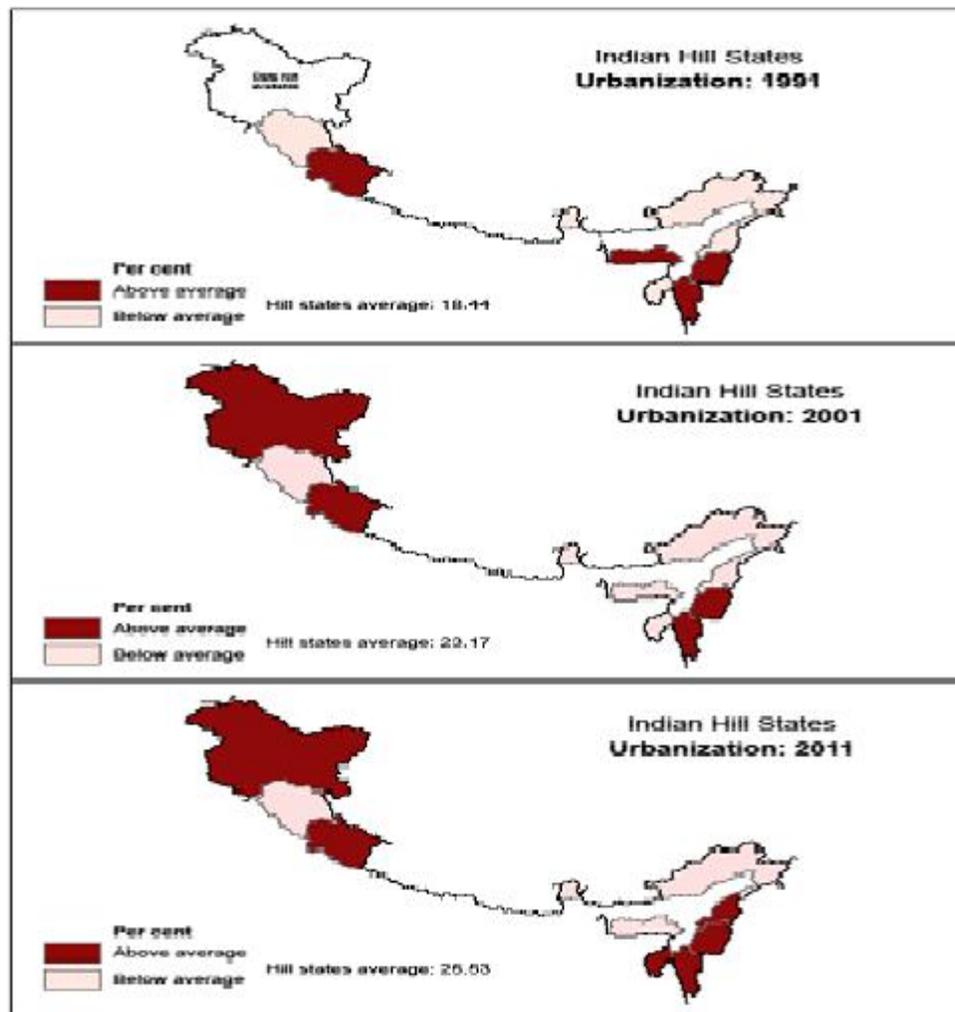


Figure 1

Urbanization reflects the transformation of economy from the primary sector to secondary and the service sector. The degree of urbanization is a fair index of the level of its economic development.

It is evident from the Table 1 that in terms of urbanization Mizoram consistently maintained the top position and Himachal Pradesh at the bottom over the last two decades among hill states. There is a wide variation of urbanization across hill states. Uttarakhand, Mizoram and Manipur recorded all time higher urbanization than average of hill states in 1991, 2001 and 2011 censuses whereas Tripura and Nagaland gained its position over time. It is worth mentioning that despite the highest percentage increase in urbanization in Sikkim since liberalization, it has lower urbanization than the average of hills (Figure 1).

### 10.2. Female Literacy Rate

For the first time, in 1991 census, the population seven years and above was taken into account to work out the literacy rate. In earlier censuses the total population was taken into account to calculate the literacy rate.

Among various indicators of socioeconomic development, literacy level and educational attainment are vital to any engineering of social change. They are key indicators which affect other demographic indicators like fertility, mortality, life expectancy, migration, etc. The empirical observations about the space-time diffusion of literacy transition reveal a direct correlation between the literacy transition and economic transformation. Davis (1955) concluded that if the rate of literacy transition was low, the economic development slowed down while the economic development was rapid if the literacy transition was fast. Many scholars like Schultz (1988), Becker (1993), Drez and Sen (1995) etc. confirmed the association of education and development.

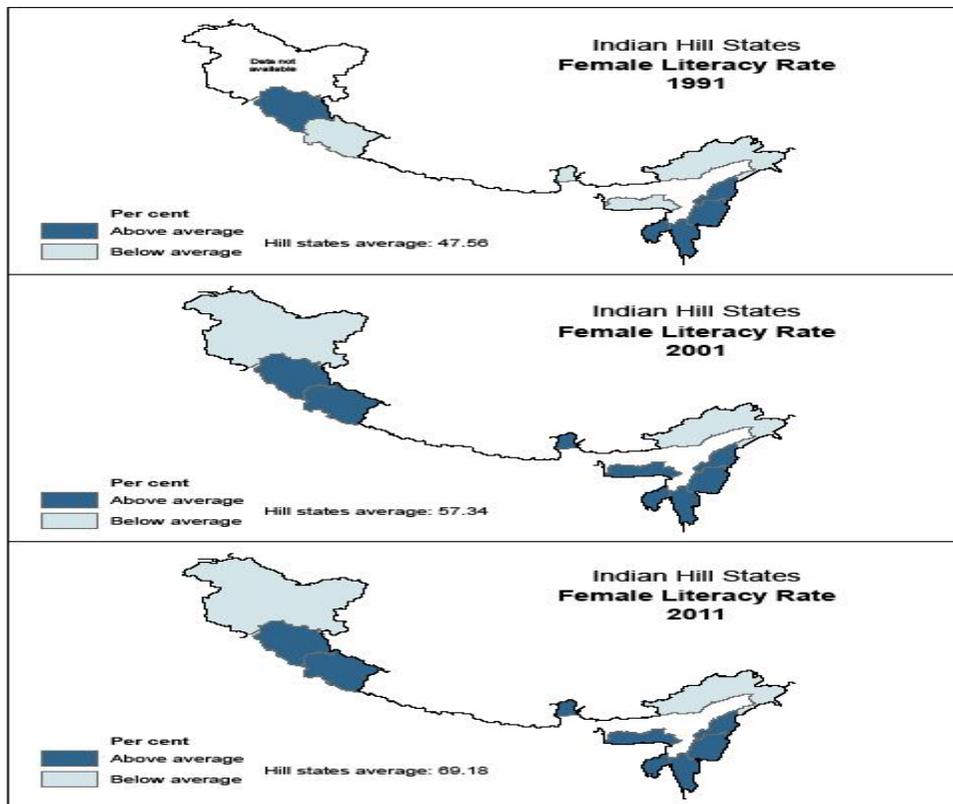


Figure 2

Human Development Report (2013) reveals that a mother's education level is more important to child than the household income. In the present study the female literacy rate is taken as tool to measure the level of social development. It greatly contributes in improving quality of life, infant mortality, child care, nutritional level of children etc. That is why Mahatma Gandhi rightly said, "educate one man, you educate one person, but educate a woman and you educate a whole civilization". It reflects the significance of female literacy in totality.

At state level, except Jammu & Kashmir and Arunachal Pradesh, all hill states recorded higher female literacy rate than the average of hill states in 2001 and 2011 censuses. Low female literacy was observed in Muslim majority state of Jammu & Kashmir while higher female literacy was recorded in the Christian majority states of Mizoram, Nagaland and Meghalaya among seven sister states. As far as the Arunachal Pradesh is concern the development processes accelerated after Indo-China war. Uttarakhand, the youngest special category state made a significant progress in literacy after getting the statehood.

### 10.3. Rural Non-Agricultural Main Workers

The worker who works for six months or more in non-agricultural activity in rural settlement is known as rural non-agriculture main workers. The proportion of rural non-agricultural main workers to total workers reflects level the transformation of rural agrarian economy to manufacturing and service economy. The transformation of rural economy leads to an overall rural development, economically and socially. It is for this reason only the proportion of rural non-agricultural main workers has been taken as indicator of rural development in the present study.

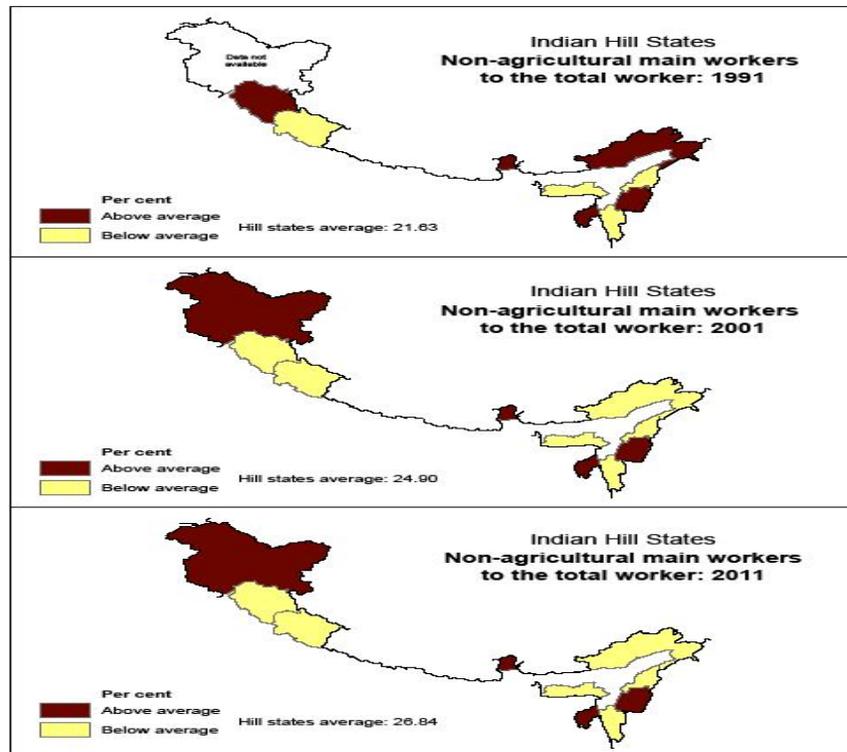


Figure 3

It has been observed that a marginal increase has been recorded in rural non-agricultural main workers to total workforce in hill states in post reform period. It increased from 21.63 per cent in 1991 to 26.84 per cent in 2011 over the period of 20 years of economic reforms. This slow growth is heart rendering to the policy makers and planners. However there is wide variation across the hill states. It is pertinent to mention that Himachal Pradesh, Uttarakhand, and Manipur are only hill states which recorded the gradual rise in rural non-agriculture workforce in post reform period. On contrary to it, Arunachal Pradesh is lone hill state where rural non-agriculture workforce decreased after neo-liberalization.

### 11. Trends and Patterns of Development

Development is a transcendental concept. It has always been flexible and open ended with respect to specific definition. Literature on development is vast, but the term defies a precise definition. Development means different things to different people. It is difficult concept with a different interpretation varying by time, space, discipline and people.

In the present study, the composite development index has been worked out of social development index, economic development index and rural development index for three points of time i.e. 1991, 2001, and 2011. It is an average of social development index, economic development index and rural development index. It is used to know the levels of development across hill states.

The development index of all hill states was 0.39 in 1991, 0.40 in 2001 and 0.48 in 2011. It recorded the marginal increase during 1991-2001 and a significant increase in the first decade of twenty first century. It reflects that convergence of development across hill states occurred in the first decade of twenty first century.

The finding revealed that Mizoram (0.67) recorded the highest relative development index and Nagaland (0.28) the lowest in 1991, Mizoram (0.67) and Arunachal (0.28) in 2001 and Tripura (0.69) and Arunachal (0.30) in 2011 across the hill states of India. Among hill states Mizoram (0.67) is a lone state which recorded the constant value of relative development index in post reform period. Seven out of ten hill states registered a consistent increase in their relative development indices during 1991-2011. They are Tripura, Manipur, Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Nagaland. But, Arunachal Pradesh and Meghalaya experienced a decline during 1991-2001 and further increase in the first decade of twenty first century.

Among hill states, Mizoram, Tripura, Manipur and Sikkim registered higher relative development indices than all hill state (0.39) in 1991. On contrary to it, Arunachal Pradesh, Uttarakhand, Himachal Pradesh, Nagaland and Meghalaya have recorded lower relative development indices in the corresponding period. Uttarakhand was included in the category of states which have higher development index than all hill states (0.40) in 2001. The pattern remained same in 2011.

Hill States	1991		2001		2011	
	Development index	Rank	Development Index	Rank	Development Index	Rank
Jammu & Kashmir	DNA	-	0.38	6	0.45	6
Mizoram	0.67	1	0.67	1	0.67	2
Tripura	0.52	2	0.56	2	0.69	1
Manipur	0.48	3	0.50	3	0.60	4
Sikkim	0.45	4	0.48	4	0.65	3
Arunachal Pradesh	0.36	5	0.28	10	0.30	10
Uttarakhand	0.34	6	0.41	5	0.51	5
Himachal Pradesh	0.34	7	0.35	7	0.40	8
Meghalaya	0.34	8	0.31	8	0.39	9
Nagaland	0.28	9	0.30	9	0.43	7
Hill States	0.39		0.40		0.48	
Disparity Ratio	0.27	-	0.29	-	0.25	-

Table 2: Development Index

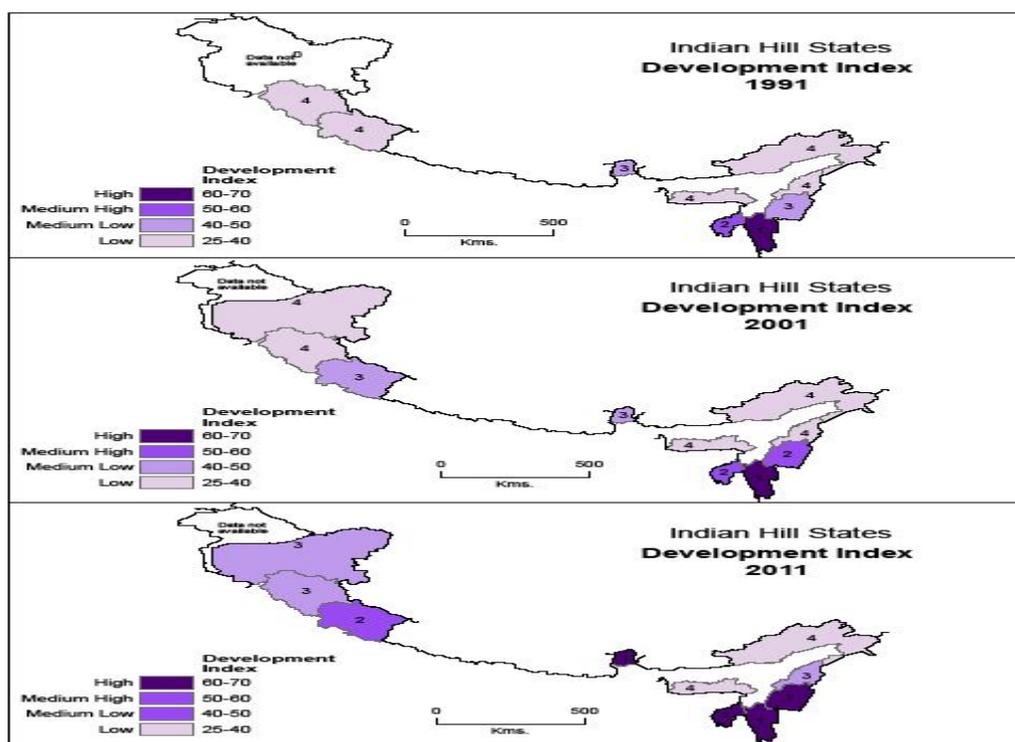


Figure 4

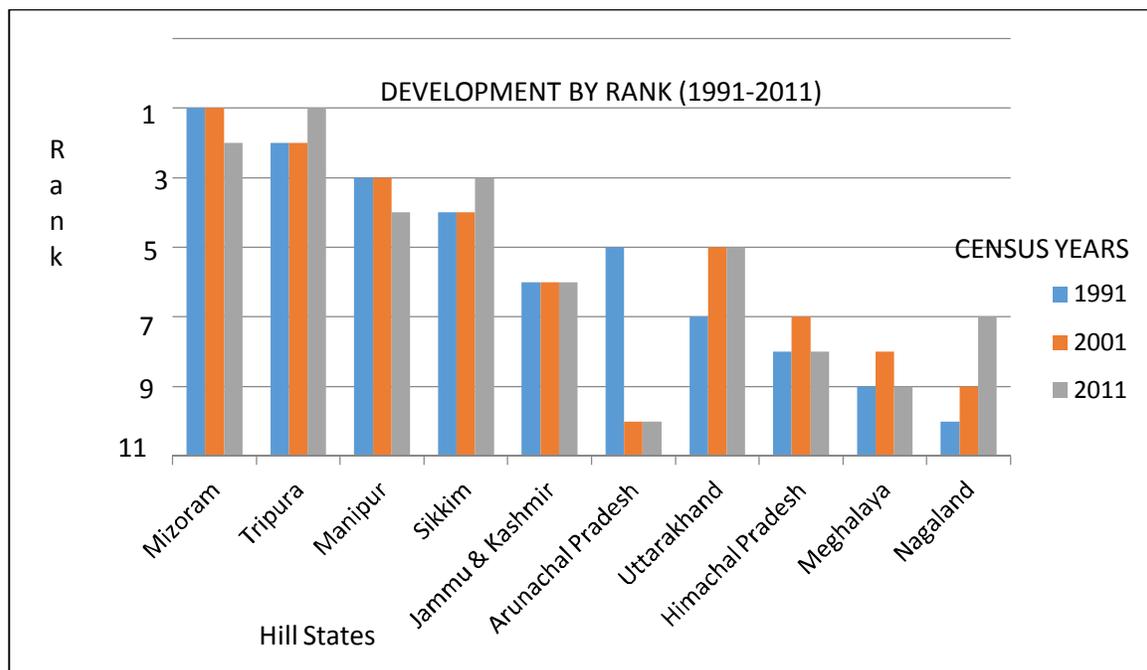


Figure 5

At the state level, Mizoram and Tripura occupied the first and second position in terms of relative rank of development in 1991 and 2001 respectively. Subsequently they interchanged their position in 2011. The western most hill state, Jammu & Kashmir did not change its position in 2001 and 2011. Manipur has altered its ranks from 3<sup>rd</sup> in 2001 to 4<sup>th</sup> in 2011, Sikkim 4<sup>th</sup> to 3<sup>rd</sup>, Himachal Pradesh 7<sup>th</sup> to 8<sup>th</sup>, Meghalaya 8<sup>th</sup> to 9<sup>th</sup>, Nagaland 9<sup>th</sup> to 7<sup>th</sup>. On the other hand, Arunachal Pradesh slipped its rank from 5<sup>th</sup> in 1991 to 10<sup>th</sup> in 2001 and Uttarakhand gained from 6<sup>th</sup> in 1991 to 5<sup>th</sup> in 2001. Arunachal Pradesh recorded the dramatic fall in relative development rank position among hill states.

The development disparity ratio increased in 1990s from 0.27 in 1991 to 0.29 in 2001. It reflects the divergence in terms of development in the first decade of liberalized economy across hill states. In the first decade of 21<sup>st</sup> century the development disparity ratio decreased from 0.29 in 2001 to 0.25 in 2011. After a decade of reforms convergence of development took place in hill states.

## 12. Pattern of Infrastructure Development

Infrastructure plays an important role for development. Economic development had been the main concern in pre-reform period. But development paradigm has gradually shifted its focus from economic to human development. Enhancement of human capabilities has been considered as the main instrument of the development process. Infrastructure facilities and amenities are therefore central to the issue of development.

In this section, infrastructure index (2011) has been constructed on following indicators taken from house listing and housing data, Census 2011.

(I) Drinking water: It is rightly said the water is life. Availability, quality and quantity of portable water are the prime need of every house. Health and water is directly associated with each other. In hill region the location of water is sporadic and scattered. The hill people have to consume substantial portion of their working hours for fetching drinking water from the natural sources. Consequently, person having the said facility have more time for development activities. The percentage of households having drinking water facility within premises has been taken as an indicator to construct the infrastructure index.

(II) House condition: Among basic requirements, good house is foremost requirement of the human beings. It reflects economic security and social status of an individual in social circle. Through condition of house one can understand directly and indirectly the socio-economic condition of a family. A good house provides many facilities for recreation, education, etc. over and above, it provides peace of mind to the human beings. It is rightly said that east or west, home is the best. On contrary to it, one who has not good house has to face all odds of life, discrimination and marginalization by the society. Keeping in view the importance of good house, it is selected as the indicator for infrastructure index.

(III) Electricity: Electricity plays an important role in economic and social development of the human beings. In the modern scientific world the consumption of electricity is the index of development/ standard of living of people. The performance of all sectors ranging from primary to quaternary sector depends upon electricity. Even the performance of social sector like health, education, etc. largely depends upon the availability and quality of electricity. In the present information era, internet facility is a major tool to access the information from any corner of the world. But electricity is the prerequisite to avail the internet facility. For the people with internet facility, the whole world is home for them and people without internet facility, the work place is world for them. That is why, electricity has been taken as indicator of infrastructure index.

(IV) Latrine Facility: Availability of toilet gives comfort in many ways. Women, children and old person feel too much relaxed. It enhances working hours, productivity, security, socioeconomic status, living standard and lessens tension to ease out and diseases. Many programs have been launched at national and state level by keeping the importance of it in mind by policy makers and planners. The main goal of program is to eradicate the practice of open defecation. It minimizes contamination of drinking water sources, soil and food to check diseases. Sanitation is the main factor to affect the quality of life.

(V) LPG/PNG: The facility of LPG/PNG is the requirement of the household. The other forms of fuel are not compatible with time consumption and hygiene consciousness. Old persons, women and children are badly affected with smoke and unburnt fuel particles. LPG/PNG is eco-friendly, user friendly and lessens pressure on flora. The user's house remains spic and span. Women feel hustle free, tension free cooking.

(VI) Bathroom Facility: Bathroom is the basic requirement of human being. It especially gives more comfort to woman for washing clothes, bathing etc. It promotes and enhances working hours, self-confidence, self-respect, social security etc. Availability of bathroom in the house is the reflection of socio-economic status and living standard. That is why it has been taken as indicator of infrastructure index.

To work out the composite infrastructure index, the house listing and housing census data (2011) have been used in following forms;

(a) Percentage of households having source of drinking water available within the premises of house.

(b) Percentage of households having good condition house.

(c) Percentage of households having electricity as the source of light.

(d) Percentage of households having latrine facility within the premises of house.

(e) Percentage of households having LPG/PNG fuel used for cooking.

(f) Percentage of households having bathroom facility within the premises of house.

The same methodology has been used to construct composite infrastructure index as used in calculating the composite development index.

Sl. No.	Hill states	Composite Infrastructure Index
1	J & K	0.59
2	Himachal Pradesh	0.84
3	Uttarakhand	0.78
4	Sikkim	0.86
5	Arunachal Pradesh	0.43
6	Nagaland	0.57
7	Manipur	0.30
8	Mizoram	0.82
9	Tripura	0.43
10	Meghalaya	0.27
	Indian Hill States	0.63

Table 3: Infrastructure Index of Indian Hill States (2011)

Source: Based on the house listing and housing census data (2011).

The infrastructure index of Indian hill states has been obtained. According to values of infrastructure index, hill states have been classified into four categories i.e. High (0.75-1.00), Medium High (0.50-0.75), Medium Low (0.25-50) and Low (0.00-0.25).

Sl. No.	Category	Hill states
1	High	Sikkim, Himachal Pradesh, Mizoram and Uttarakhand
2	Medium High	Jammu & Kashmir, Nagaland
3	Medium Low	Arunachal Pradesh, Tripura, Manipur and Meghalaya
4	Low	-

Table 4: Classification of Indian Hill States by Infrastructure Index, 2011.

Table 4 shows classification of the different hill states according to their values of infrastructure index. Himachal Pradesh, Uttarakhand, Sikkim and Mizoram hill states are in the 'High' category, which implies they are relatively more developed in terms of infrastructure. Two hill states, Jammu & Kashmir and Nagaland fall in the 'Medium High' category. Four hill states named Arunachal Pradesh, Tripura, Manipur and Meghalaya are placed in the 'Medium Low' category. None hill state fall under the 'Low' category. With the exception of Jammu & Kashmir, all hill states that fall in the 'Medium High', 'Medium Low' is situated in the north-east. On contrary to it, all north-west hill states are relatively developed in terms of infrastructure and placed in 'High' and 'Medium High' categories. The research reveals that the most of north-east hill states and Jammu & Kashmir states have infrastructural deficit. Therefore, it is recommended that Union and State Governments should pay more heed towards Jammu & Kashmir and north-east in infrastructural development.

### 13. Correlation between Development and Infrastructure Indices

To measure the degree of correlation between the development index and infrastructure index, the following Karl Pearson's Coefficient of Correlation formula has been used. Its value lie between  $\pm 1$ . when  $r = -1$ , it means there is perfect negative correlation between two variables. When  $r = 0$ , it means that there is no relationship between two variables. When  $r = +1$ , it means there is a perfect correlation between the variables. Karl Pearson's Coefficient of Correlation formula is as under;

$$r = \frac{\sum xy}{\sqrt{\sum x^2 * \sum y^2}}$$

Sl. No.	Name of Hill State	Composite Development Index	Composite Infrastructure Index
1	Jammu & Kashmir	0.45	0.59
2	Himachal Pradesh	0.40	0.84
3	Uttarakhand	0.51	0.78
4	Sikkim	0.65	0.86
5	Arunachal Pradesh	0.30	0.43
6	Nagaland	0.43	0.57
7	Manipur	0.60	0.30
8	Mizoram	0.67	0.82
9	Tripura	0.69	0.43
10	Meghalaya	0.39	0.27
	Indian Hill States	0.48	0.63

Table5: Development and Infrastructure indices, 2011

The value of the coefficient of correlation as obtained by the above formula is +0.85. It results that development of hill states is associated with the infrastructure development. It reflects not only the magnitude of correlation between development and infrastructure, but provides the direction of development for future planning of development.

### 14. Conclusion

The development index of all hill states was 0.39 in 1991, 0.40 in 2001 and 0.48 in 2011. It reflects the marginal increase during 1991-2001 and a significant increase in the first decade of twenty first century. The development disparity ratio increased in 1990s from 0.27 in 1991 to 0.29 in 2001. It reflects the divergence in terms of development in the first decade of liberalized economy across hill states. In the first decade of 21<sup>st</sup> century the development disparity ratio decreased from 0.29 in 2001 to 0.25 in 2011. After a decade of reforms convergence of development took place in hill states.

The value of the coefficient of correlation is +0.85 between development and infrastructure indices in 2011. The study concludes that development of hill states is associated with the infrastructure development. It reflects not only the magnitude of correlation between development and infrastructure, but provides the direction of development for future planning of development. The research reveals that the most of north-east hillstates and Jammu & Kashmir states have infrastructural deficit. Therefore, it is recommended that Union and State Governments should pay more heed towards north-east and Jammu & Kashmir in infrastructural development.

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