

URBAN PATTERN AND CHALLENGES IN HARYANA: A SPATIAL ANALYSIS

Mr. Indraj¹ Mr. Kamaldeep Sangwan²

¹ Research Scholar, ² Asst. Prof, Rural Development

¹Indira Gandhi Open University, New Delhi, India

Abstract

Urbanization is not modern phenomenon, but rapid and historic transformation and replaced by predominantly urban culture. Urbanization is a complex socio-economic phenomenon which deals with the behavioral, structural and demographical transformations of the society. The process of urbanization is increasing in both the developed and developing countries. The present study is to clarify the trends and pattern of urban development in Haryana state at different duration with identification of regional variations. The study find out that rapid urbanization in particular the growth of Haryana large cities and the associated problems of unemployment, poverty, inadequate health, poor sanitation, urban slums and environmental degradation pose dreadful challenges. The state is experience unremitting augment in the proportion of urban population as a result of more liberal industrial policies as well as sharing a significant proportion of its area with national capital region (NCR).

Key words: Urbanization, Environment, Health, Sanitation, Industrialization.

Introduction

Urbanization refers to growth of the towns and the cities, often at the expense of rural areas. The people move to urban centers in search of jobs and employment and what they hope will be a better life. In most of developing countries the percentage of the total population living in urban areas is continually increasing. In other words, urbanization is change of residence which is geographically expressed as mobility or migration resulted by a way of life called urbanism (Singh and Singh, 2013). In fact urbanization two ways process which not only treats with progression but also the occurring modifications which takes place without any spatial movement. It is index of determination of economic growth and development as urbanization itself is a result of type and level of existing economic activities in a region. Urban is to provide a variety of services that small rural areas cannot. These might include a public transportation system, water and sewage services, a greater variety of educational and recreational facilities, and larger and more specialized healthcare facilities in the urban city. On the negative side, cities may experience traffic jams, infrastructure breakdowns such as water main breaks, lack of appropriate housing and jobs, and institutions that are so large that they become impersonal.

The urban areas are characteristics by diverse economy dominating manufacturing and commercial activities, advance stage of living standard, education and employment opportunities, good medical facilities, entertainment services and extensive transportation and communication network which provide easy

availability and accessibility to people for interacting with each other. Though urban vicinity dwells in small proportion of the earth surface yet it has significant impact on man environment coordination. The more concentration of people in urban places as a result of process of urbanization is also responsible for changes in demographic characteristics of population, unplanned infrastructure and lacks of basic amenities as well its surrounding environment (Ramachandra, 2012). The persistent speedy urbanization is also connected with diminution of natural possessions and deterioration ambiance in the urban location which demands the proper monitoring to reassure the potential sustainable cities (Kong, 2010).

Haryana is an agricultural state in the northern plain of India which having majority of its population in rural areas yet during the last few decades, the state has witnessed fast and unrestrained urban expansion due to progress in industries, trade and population. There is 34.88 per cent population live in different urban area in the state which is higher than 31.16 per cent population of the country. It is registered as most urbanized state among the states surrounding the National Capital Region, Delhi with a large number of 88,42,103 urban populations. As the state desires for a new-fangled development system in the coming years, it becomes essential to study the trends and pattern of urbanization and its implication for present and future economic growth.

Objectives

- To examine the trends of urbanization in Haryana with India from 1901-2011.
- To analyze the district level patterns of urbanization in Haryana from 1971-2011.
- To find out the responsible Challenges of urbanization in Haryana.

Data Sources and Methodology

The present paper is based on secondary data obtained from Primary Census Abstracts of Haryana State, various census publications of India. ArcGIS 9.3 has been used to preparing the different types of maps. Urbanization of all districts has been divided into four categories namely very highly (more than 32 per cent), highly (between 24-32 per cent), moderate (between 16 to 24 per cent), and low urbanized districts (below than 16 per cent) and calculated by using following method:

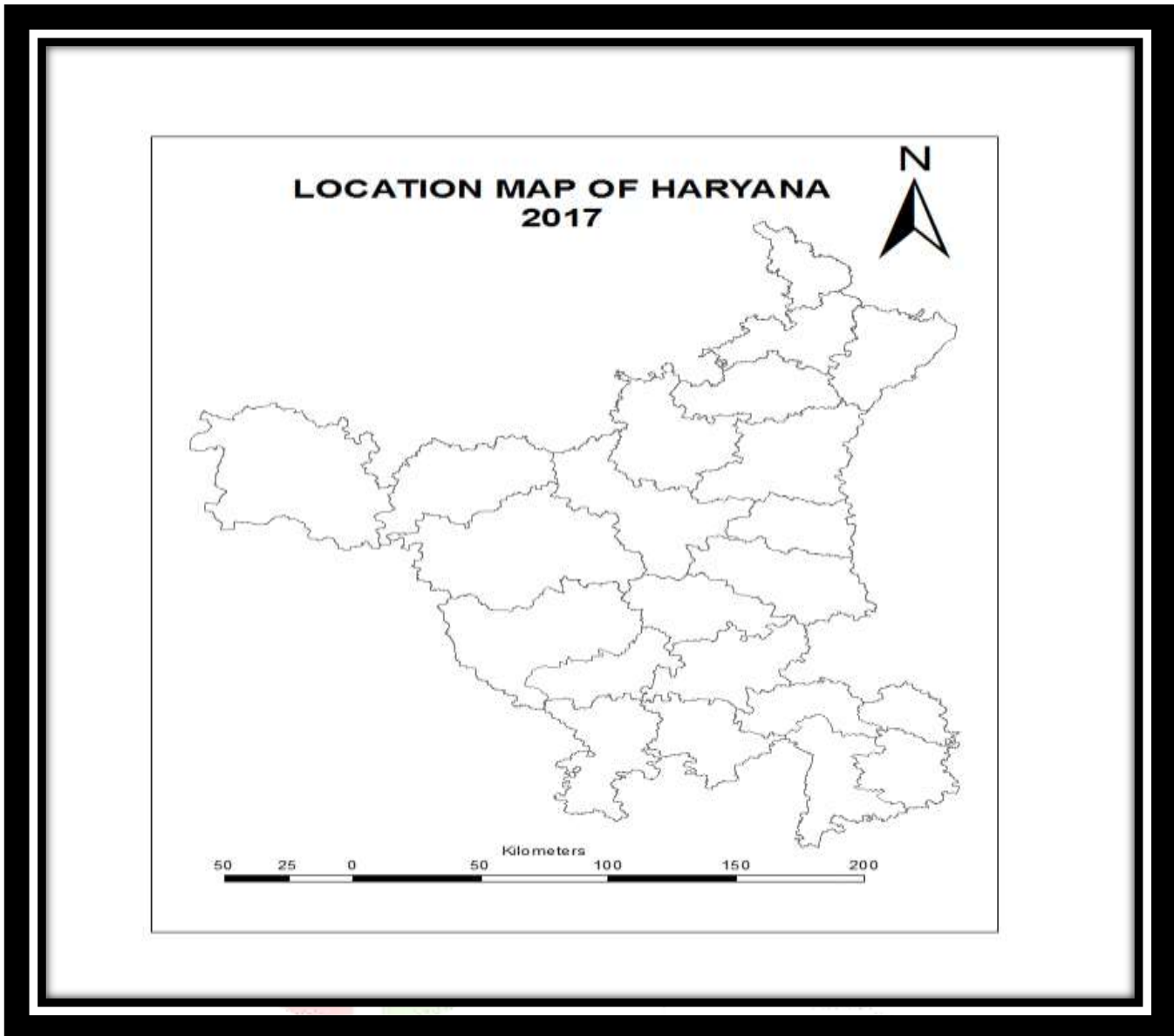
Urbanization = Total Urban Population of District / Total Population of the District \times 100

Growth of Population = Latest Year – Base Year / Base Year \times 100

Study Area

Haryana is a state in northwest India between 27°37' to 30°35' latitudes and between 74° 28' to 77°36' longitudes and separated from the state of Punjab on 1st November, 1966. It is surrounded by Uttar Pradesh in east, Punjab in west, Himachal Pradesh in north and Rajasthan in south where river Yamuna acts as the eastern division for administrative purpose. Haryana state extends for about 44,212 sq. kms with just 1.37 per cent of total geographical area and less than 2 per cent of India's population. Since it ambience Delhi in the northern, western and southern sides, a large area of state is included in National Capital Region (N.C.R.). Chandigarh, a union territory, is the capital of Haryana which is also share by Punjab. The state comprises 21 districts 74 sub districts, 80 statutory towns, 74 census towns and 6841 villages (Census of India, 2011).

Figure: 1



Pattern of Urbanization in India and Haryana 1901-2011

Haryana has been predominantly a rural part of India. The urbanization trend in state almost follow the pattern of India as it started with 10.77 per cent in 1911 followed by 11.3 per cent in 1921, 12.38 per cent in 1931 and 13.39 in 1941. In other words, it can be said that up to 1941, the level of urbanization was less than 15 per cent with a highly fluctuating decadal growth rate like the country .Only one-sixth of its total population lived in urban areas at the time of independence in 1947. In 1951 there was 17.07 per cent urban population in the state which has increased 17.22 and 17.66 per cent in 1961 and 1971 respectively against the national urban proportion of 17.97 and 19.90 per cent in the same years. In 1981 this proportion has reached up to 21.88 per cent and 28.92 per cent in 2001. In 2011 census, the urbanization share has been recorded 34.88 per cent that is more than Indian share of 31.16 per cent.

The low level of urbanization in Haryana was associated with the subsistence nature of agricultural economy. Industries, commerce and service sector, which provide the major stimuli for urban growth, had not made a breakthrough in the state. The partition of the country in 1947 stimulated the process of urbanization in this part of the country. A large number of refugees migrated from Pakistan to the Indian Punjab and settled down in towns of Punjab and Haryana, known as 'camps'. This led to the explosive growth of cities and towns in the state. However, level of urbanization in the state 17.22 per cent was still low in 1961 as compared to that of Punjab 23.10 per cent and the national average of 17.97 per cent. After its formation as a separate state in 1966; Haryana experienced a rapid acceleration in growth of urban population. Rapid developments in the agricultural sector during the Green Revolution period led to the establishment and growth of Mandi Towns in various parts of the state. Thus, with 34.88 per cent of its population as urban and state had a total urban population of 88,42,103 persons who lived in 154 urban centers of different classes.

Table 1: Urban Population and Its Growth Rate in India, 1901 to 2011

Census Year	Total Urban Population (in crore)	Urban Population (per cent)	Decadal Growth (per cent)
1901	02.59	----	----
1911	02.60	10.29	0.35
1921	02.81	11.17	08.22
1931	03.35	11.99	19.14
1941	04.42	13.85	31.97
1951	06.24	17.29	41.38
1961	07.89	17.97	26.41
1971	10.91	19.90	38.23
1981	15.97	23.31	46.02
1991	21.76	26.10	36.19
2001	28.61	27.81	31.50
2011	37.71	31.16	31.18

Source: Census of India, Primary Abstract Census 1901, 2001 and 2011, Chandigarh, Haryana

Table 2: Urban Population and Its Growth Rate in Haryana, 1901 to 2011

Census Year	Total Urban Population	Urban Population (per cent)	Decadal Growth (per cent)
1901	574074	----	----
1911	449,704	10.77	-21.66
1921	481,195	11.30	07.00
1931	564,743	12.38	17.36
1941	705,945	13.39	25.00
1951	968,694	17.07	37.19
1961	1,307,680	17.22	35.58
1971	1,772,959	17.66	35.58
1981	2,827,387	21.88	59.47

1991	4,054,744	24.63	43.41
2001	6,115,304	28.92	50.82
2011	8,842,103	34.88	44.59

Source: Census of India, Primary Abstract Census 1901, 2001 and 2011, Chandigarh, Haryana

Urban Pattern in Haryana (1971-2011)

The spatial and temporal urbanization in Haryana from 1971 to 2011 has been dealt with Table 3. The district wise profile reflects that in 1971 there was only 17.66 per cent proportion of urban population in Haryana which was concentrated in the study area. The highest level of urbanization has been contained in Ambala district (35.79 per cent) followed by Yamuna Nagar (28.75 per cent), Karnal (22.43 per cent) and Panipat (18.40 per cent) districts whereas in fifteen districts of the Haryana and total number of districts was 19 in 1971. The Haryana state the urbanization has been recorded below state average with lowest level of 7.16 per cent in Faridabad districts followed by districts Kaithal (11.13 per cent), Fatehabad (11.17 per cent), Jhajjar (11.91 per cent) and Mahendergarh (12.07 per cent) districts.

Table 3: Urbanization and Pattern in Haryana, from 1971 to 2011

Sr.No.	Districts	Census Years				
		1971	1981	1991	2001	2011
1	Ambala	35.79	36.77	35.44	35.20	44.38
2	Bhiwani	14.55	15.89	17.24	18.97	19.66
3	Faridabad	07.16	41.43	48.57	77.80	79.51
4	Fatehabad	11.17	14.87	15.93	17.36	19.06
5	Gurugram	13.81	18.61	20.30	35.58	68.82
6	Hisar	17.63	21.55	23.70	25.90	31.74
7	Jhajjar	11.91	12.77	13.90	22.17	25.39
8	Jind	13.55	15.14	17.18	20.30	22.90
9	Kaithal	11.13	11.94	14.69	19.39	21.97
10	Karnal	22.43	25.94	27.46	26.15	30.21
11	Kurukshetra	16.32	20.71	24.01	26.11	28.95
12	Mahenderagarh	12.07	12.39	12.41	13.49	14.41
13	Mewat	DNA	DNA	DNA	07.51	11.39
14	Palwal	DNA	DNA	DNA	19.18	22.69
15	Panchakula	12.54	19.47	35.82	44.49	55.81
16	Panipat	18.40	62.37	27.15	40.53	46.05
17	Rewari	12.92	12.20	15.59	17.79	25.93
18	Rohtak	16.68	19.27	21.31	35.06	42.04
19	Sirsa	14.29	18.07	21.16	26.28	24.65
20	Sonipat	15.06	21.19	23.58	25.15	31.27
21	Yamunanagar	28.75	29.58	33.69	37.73	38.94
22	Dadari	DNA	DNA	DNA	DNA	DNA
	Haryana	17.66	21.88	24.63	28.92	34.88

	India	19.90	23.31	26.10	27.81	31.16
--	-------	-------	-------	-------	-------	-------

Source:

- (i) Census of India 1991, Town Directory, Series-8, Haryana, Part IX-A, Statement-1, pp. 112-123.
- (ii) Census of India 2001, General Population Tables, Haryana (Tables A-1 to A-4), Series-7, India, Statement-4 & Table A-2, Directorate of Census Operations, Haryana, pp. 35, 86 -91.
- (iii) Census of India 2011, Primary Census Abstract, Haryana, Series 7, Tables - A5-A8, Directorate of Census Operations, Haryana.

Note: DNA- Data Not Available

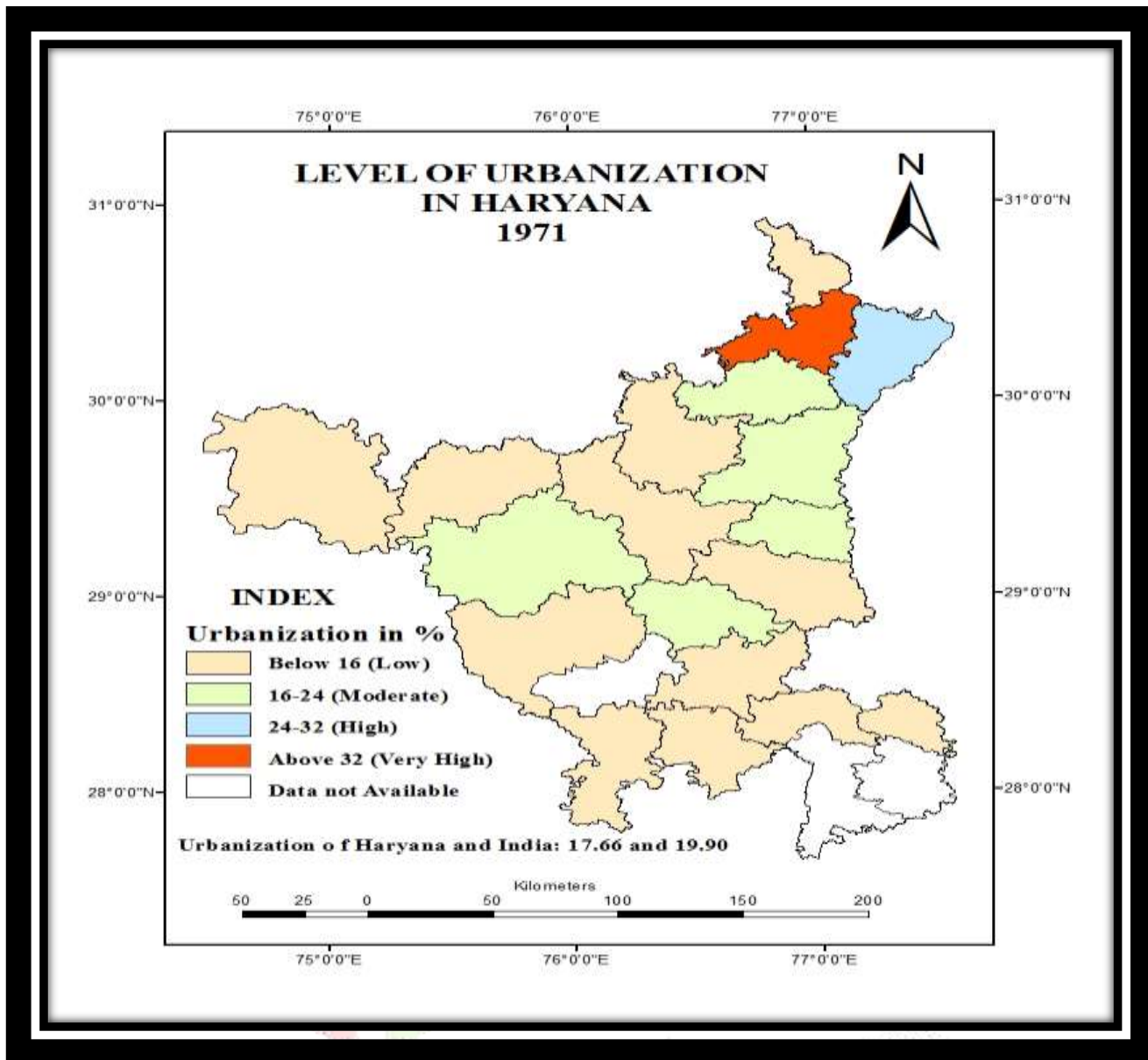
In 1981, census India, the state showed the upward trend and recorded 21.88 per cent urbanization with a notable inter-district variation in the study area. Surprisingly, the district Faridabad, who was at bottom in 1971, has been ranked first with highest 41.43 per cent level of urbanization pursued by Ambala 36.77 per cent and Yamunanagar 29.58 per cent districts but till now a large number of fourteen districts have been registered the low level of urbanization than the state average. The district Kaithal 11.94 per cent scored lowest proportion of urban population adjoining Rewari 12.2 Per cent, Mahendergarh 12.39 per cent and Jhajjar 12.77 per cent districts.

In 1991, the state has kept the increasing trend of urbanization with 24.63 per cent proportion nearby country's proportion of 26.10 per cent. Again the districts Faridabad get first position (48.57 per cent) again followed by Panchkula, Ambala and Yamunanagar with 35.82, 35.44 and 33.69 per cent urbanization respectively whereas lowest urbanization has been seen in Mahendergarh 12.41 per cent followed by Jhajjar 13.90 per cent, Kaithal 14.69 per cent, and Rewari 15.59 per cent district respectively. The districts Karnal, Kurukshetra, Panipat and Sonipat have also witnessed the positive change in urban population with steady increase. In 2001, the regional gap of urbanization has maintained its spacious gap as compared to previous census. Faridabad district registered highest 77.80 per cent urbanization trailed by 44.49 per cent in Panchkula, 37.73 per cent in Yamunanagar and 35.20 per cent in Ambala districts whereas on another hand the newly set up district of Mewat has been characterized by lowest urban population of only 7.51 per cent but the optimistic point is that except these two, all districts documented the moderate increase in urban proportion in their population due to decentralization of industrial and other activities. The census 2011 reports the 34.88 per cent urbanization in the state against the country's of 31.16 per cent. The district wise profile has shown significant variation in level of urbanization. The district Faridabad has still engaged first place with an amazing proportion of 79.51 urban populations. The district Gurugram has emerged as big urban centre competing with neighboring district Faridabad with 68.82 per cent urbanization. The table 3 also reports that every district has reported increase in urbanization at various scales which indicates towards the future possibility of overall development of the region.

Urban Pattern in Haryana 1971

Figure 2 shows that in 1971, there was 17.66 proportion of total population live in various urban locale of the state which is near the average of India 19.90 per cent in the same census year. During this time, only one district specifically Ambala has registered in the category of very high urbanization above 32 per cent followed by nearest Yamunanagar district having high urbanization 24-32 per cent.

Figure: 2



Source: Based on Table 3

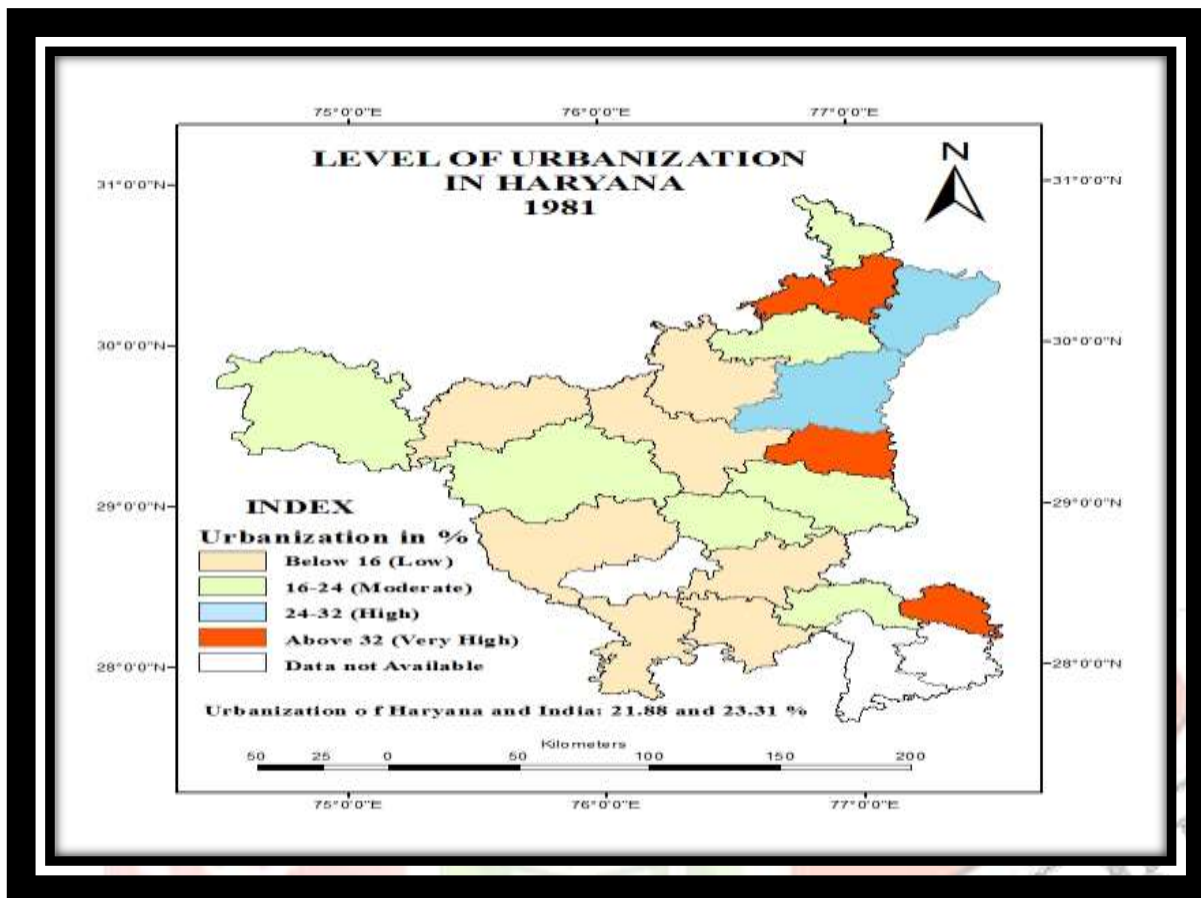
A group of five districts namely Kurukshetra, Karnal, Panipat, Hisar and Rohtak have shown 16-24 per cent urbanization whereas highest twelve districts out of nineteen Panchkula, Kaithal, Jind, Sirsa, Fatehabad, Sonapat, Bhiwani, Jhajjar, Mahendergarh, Rewari, Gurgaon and Faridabad have less than 16 per cent share of urban population. It has been observed that except two districts of north which have historical importance and timber activities at large scale respectively, overall state has a less significant level of urbanization.

Urban Pattern in Haryana 1981

Figure 3 show the wide variation in level of urbanization at district level in the Haryana. The district Faridabad, emerging as an industrial sector has listed very high level of urbanization with Ambala district. The high

urbanization has been viewed in district Yamunanagar, Karnal and Panipat followed by the moderate urbanization 16-24 per cent in Panchkula, Kurukshetra, Hisar, Sirsa, Sonipat, Rohtak and Gurgaon districts.

Figure: 3

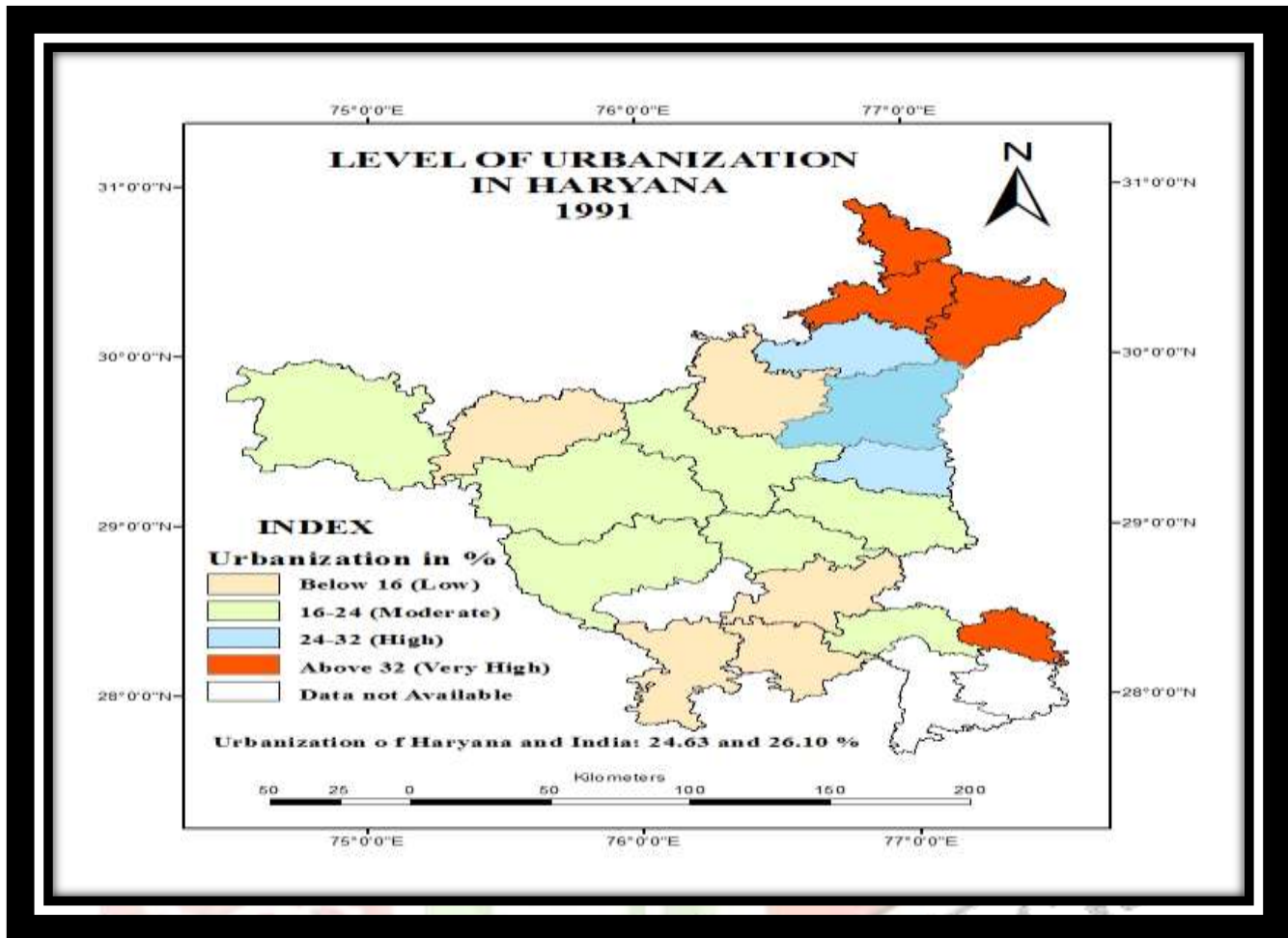


Source: On Based of Table 3

The districts Kaithal, Jind, Fatehabad, Bhiwani, Jhajjar, Mahendergarh and Rewari are found least urbanized in the state. The western and southern of the state is lagging behind in urbanization as compared to highly urbanized north-eastern districts. The reason of this may be that this is agricultural belt dominating by semi-arid and arid climatic conditions and characterized by poor industrial and social development while the districts of north and eastern part have witnessed high to moderate urbanization due to development in different activities like, lumbering, dairying, textiles, hardware and software industries, administrative centers as well as gaining the benefits of Grand Truck Road and nearness to state and national capital cities.

Urban Pattern in Haryana 1991

Figure 4



Source: On the Base of Table No. 3

Figure 4 reveals that almost all districts have upgraded their category of previous census by positive increase in proportion of urban population. The districts Panchkula, Ambala, Yamunanagar and Faridabad have been found very highly urbanized above 32 per cent chased by Kurukshetra, Karnal and Panipat districts having high level of urbanization 24-32 per cent.

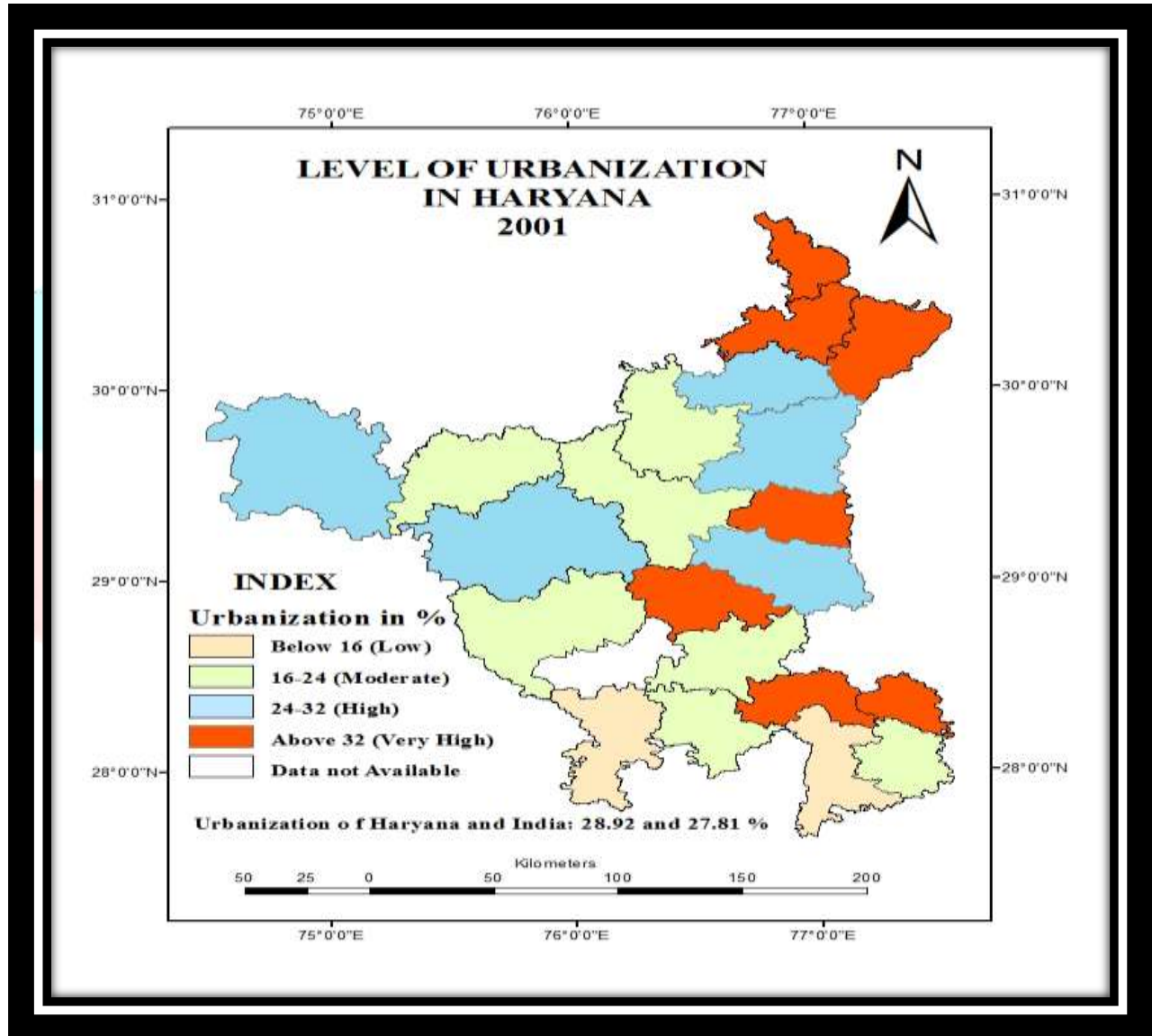
A cluster of seven districts, Sirsa, Jind, Hisar, Bhiwani, Sonapat, Rohtak and Gurgaon, have shown moderate urbanization whereas five districts, Kaithal, Fatehabad, Jhajjar, Mahendergarh, and Rewari witnessed low level of urbanization. The observation reflects that northern and eastern ribbon is continuously experiencing more urbanization. Though some districts of western and southern Haryana have promoted in higher category yet the major part is at the back in urbanization and require more attention in development policies and programmes.

Urban Pattern in Haryana 2001

The regional analysis reflects that seven districts namely Panchkula, Ambala, Yamunanagar, Panipat, Rohtak, Gurgaon and Faridabad have established very high urbanization pursued by highly urbanized districts of

Kurukshetra, Karnal, Sonapat, Hisar and Sirsa. The districts Kaithal, Jind, Fatehabad, Bhiwani, Jhajjar, Rewari and Palwal have been observed moderately urbanized areas whereas only two districts, Mahendergarh and Mewat, have registered low urbanization. The picture reveals that whole northern and eastern strip of the state except Sonapat district, comprise either very high or high ratio of urban population because of development in manufacturing activities, good educational institutions, amusement sources and high-quality residential sectors. In west part of Haryana, Hisar and Sirsa districts have also come forward with development of heavy steel industries as well as other activities supported by agricultural economy.

Figure 5



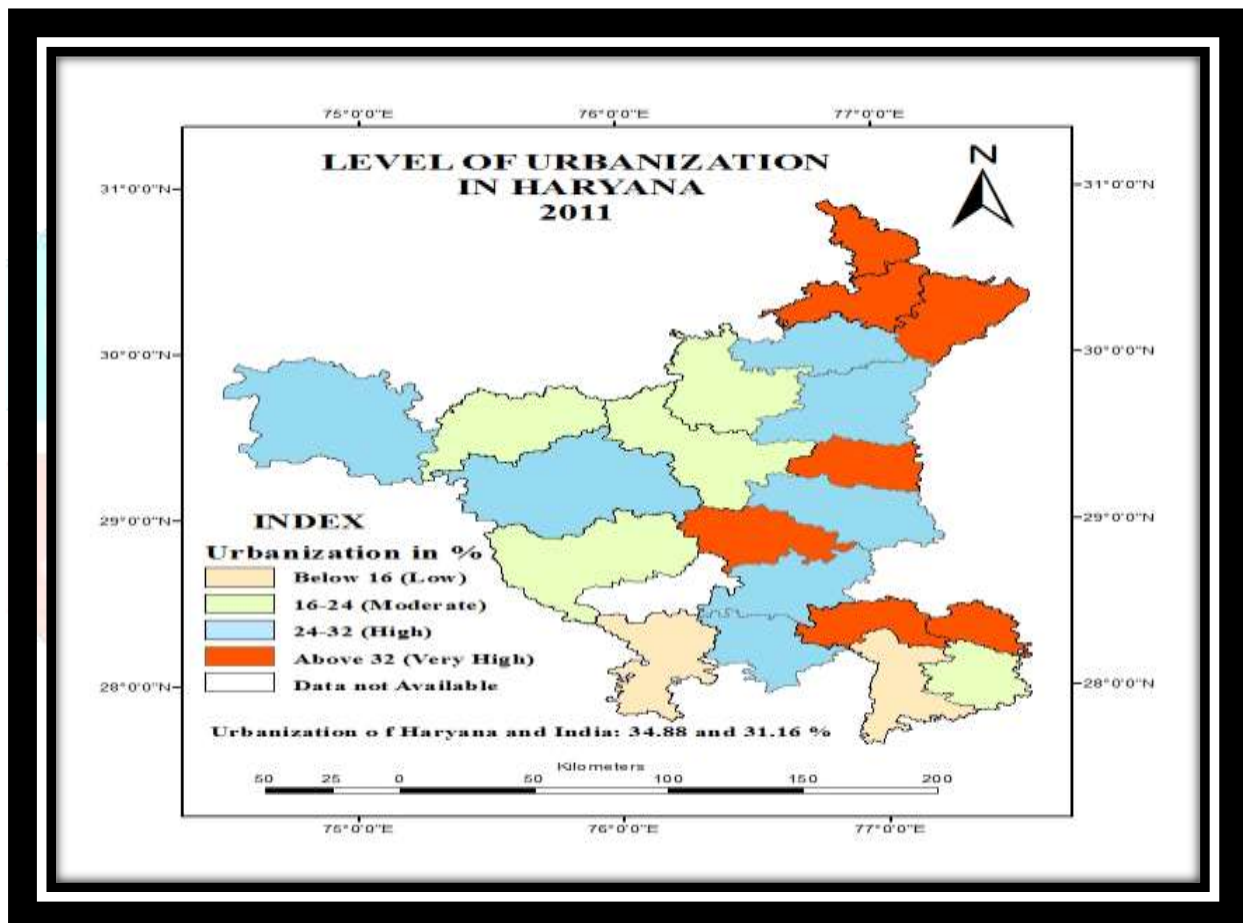
Source: On the base of table No. 3

Urban Pattern in Haryana 2011

The urban pattern of 2011 shows same scene as like of 2001 apart from little ups and downs in the study area. Likewise seven districts of 2001 as Panchkula, Ambala, Yamunanagar, Panipat, Rohtak, Gurgaon and

Faridabad have maintained their earlier position in 2011 also whereas addition of two new districts of Jhajjar and Rewari, the class of high urbanization include seven districts in total with prior Kurukshetra, Karnal, Sonapat, Hisar, Sirsa districts. The moderate districts are Kaithal, Jind, Fatehabad, Bhiwani and Palwal and low urbanization level Mahendergarh and Mewat also matching with former pattern excluding of the conversion of two districts Jhajjar and Rewari in higher group show figure 6. The depiction too shows that the northern and eastern districts has shown more urbanization because of old cantonments and scientific instrument and sports items manufacturing of Ambala, paper mills of Yamunagar and national fertilizer Ltd, textiles industries, oil refinery and a number of industries in Panipat attract the people from adjoining rural areas in search of employment opportunities

Figure: 6



Source: On the basis of table No. 3

Problems and Challenges of Haryana cities

In Haryana, urbanization is unplanned due to uncontrolled migration from the country side and other state. Due to unplanned urbanization, Haryana is facing too much problem such as unemployment, electricity problem, pollution, social problems, improper sanitation facilities etc. fast rise in urban population in Haryana cities are leading to many problems like increasing slums, decrease in standard of living in urban areas, also causing environmental damage. Following problems need to be highlighted.

Urban sprawl

Urban sprawl or real expansion of the Haryana cities, both in population and geographical area, of rapidly growing cities is the root cause of urban problems. In most cities the economic base is incapable of dealing with the problems created by their excessive size. Massive immigration from rural areas as well as from small towns into big cities of Haryana has taken place almost consistently, and increased size of cities of Haryana in particular National Capital Region.

Congestion

Congestion is a situation in which too many people live in too minute space. Overcrowding is a logical consequence of over-population in urban areas. It is naturally expected that cities having a large size of population squeezed in a small space must suffer from overcrowding. This is well exhibited by almost all the big cities in Haryana.

Accommodation and Settlement

Housing provision for the growing urban population will be the major challenge before the government of Haryana and urban planner. The growing cost of houses comparison to the income of the urban middle class has made it impossible for majority of lower income groups and is residing in congested accommodation and many of those are devoid of proper ventilation, lighting, water supply, sewage system. Housing Poverty includes individuals and households who lack safe, secure and healthy shelter, with basic infrastructure such as piped water and adequate provision for sanitation, drainage and the removal of household waste.

No clear-cut distinction can be drawn between slums and squatter settlements in practice except that slums are relatively more stable and are located in older, inner parts of cities compared to squatter settlements which are relatively temporary and are often scattered in all parts of the city in Haryana, especially outer zones where urban areas merge with their rural hinterland. Normally, squatter settlements contain makeshift dwellings constructed without official permission and on unauthorized land.

Transport

As high income individual are buying more private vehicle and use less public transport. Such huge number of vehicles in cities is causing more traffic clog, which in turn decreases the efficiency of public transport. Also the penetration of public transport is less, which makes people use private vehicle. Public transport is less disabled friendly. There is also lack of infrastructure and poor maintenance of existing public transport infrastructure.

Sanitation

In context of large the cities of Haryana, the poor sanitation condition is another gloomy feature in urban areas and particularly in slums and unauthorized colonies of urban areas such as Faridabad, Gurugram, Ambala, Sonapat, Panipat, Hisar and Rohtak. These unsanitary conditions lead too many sanitation related diseases such as diarrhoea and malaria. Unsafe garbage disposal is one of the critical problems in urban areas and garbage management always remained a major challenge in the study areas.

Environmental

In the Urban areas in the Haryana vulnerability to risk posed by the increasing man-made and natural disasters. According to UNDP 70 % of Indian population is at risk to floods and 60% susceptible to earthquakes, but in Haryana also affects these. The risk is higher in urban areas owing to density and overcrowding. Urban areas are becoming heat islands, ground water is not being recharged and water crisis is persistent.

Poverty

Today roughly one third of the urban population lives below poverty line. There are glaring disparities between haves and have-nots in urban areas. The most demanding of the urban challenges unquestionably is the challenge posed by poverty and challenge of reducing exploitation, relieving misery and creating more human condition for urban poor. There is rise urban inequality, as per UN habitat report, 2010; urban inequality in India rose from 34 to 38 % based on consumption in period of 1995 to 2005.

Unemployment

The problem of unemployment is more serious such as the problem of housing mentioned. Urban unemployment in Haryana is estimated at 15 to 25 per cent of the labor force. This percentage is even higher among the educated people.

Water

What is one of the most essential elements of nature to sustain life and right from the beginning of urban civilization, sites for settlements have always been chosen keeping in view the availability of water to the inhabitants of the settlement. However, supply of water started falling short of demand as the cities grew in size and number.

Waste Disposal

In particular Haryana cities NCR grow in number and size the problem of waste disposal is assuming alarming proportions. Huge quantities of garbage produced by our cities pose a serious health problem in the Haryana. Most of cities do not have proper arrangements for garbage disposal and the existing landfills are full to the edge. These landfills are hotbeds of disease and innumerable poisons leaking into their surroundings.

Urban Crimes

In context of Haryana cities present a meeting point of people from different walks of life having no affinity with one another. Like other problems, the problem of crimes increases with the increase in urbanization. In fact the increasing trend in urban crimes tends to disturb peace and stillness of the cities and make them unsafe to live in particularly for the women.

Conclusion

On the behalf of exceeding discussion it has been depicted that the state is better performing yet it is characterized by low urbanization in districts of north-west, south and south west due to lack of industrial development, economic and cultural backwardness, regrettable infrastructural services in the region. The biasness in policy making at political level is also responsible for regional disparities in urbanization. So there

is need to decentralize the secondary and tertiary activities with intentionally focusing on equality in the state to uplift the backward area and to join them in the main stream of development.

Urbanization is the physical growth of urban areas as a result of rural migration and it is closely linked to modernization, industrialization, and the sociological process of rationalization. Poverty, unemployment and under employment among the rural immigrants, beggary, thefts, burglaries and other social evils are on rampage.

REFERENCES

1. Annez, P.C. and Buckely, R.M (2009): Urbanization and Growth, in Spence, M., Annez, P.C. and Buckely, R.M edited Urbanization and Growth, published by The International Bank for Reconstruction and Development/ The World Bank, Washington DC, Chapter 1, pp. 1-2
2. Bhardwaj, P. and Kalkal, S (2013): Monitoring Urban Sprawl of Rohtak Using Open Source Satellite Data. Eastern Geographer, Vol. 19(1), pp. 9-18.
3. Census of India (1991): Town Directory, Series-8, Haryana, Part IX-A, Statement-1, pp. 112-123.
4. Census of India (2001): General Population Tables, Haryana (Tables A-1 to A-4), Series-7, India, Statement-4 & Table A-2, Directorate of Census Operations, Haryana, pp. 35, 86 -91.
5. Census of India (2011): Primary Census Abstract, Haryana, Series 7, Tables - A5- A8, Directorate of Census Operations, Haryana.
6. Chandan, M.C., Bharath, H.A and Ramachandra, T.V (2014): Quantifying Urbanization Using Geospatial Data and Spatial Metrics- A Case Study of Madras, Paper Presented in LAKE-2014: Conference on Conservation and Sustainable Development of Wetland Ecosystems in Western Ghats held on 13th -15th November.
7. Davis, K (1965): The Urbanization of Human Population, Scientific American, vol.213, p.44.
8. Davis, K. and Golden, H.H (1954): Urbanization and Development in Pre- Industrial Areas, Economic Development and Cultural Change, vol.3 (1), pp. 6-26.
9. Kong, F., Yin, H., Nakagoshi, N., and James, P (2012): Simulating Urban Growth Processes Incorporating A Potential Model With Spatial Metrics, Ecological Indicators, vol. 20, pp. 82-91.
10. Ramachandra, T.V., Bharath, H.A. and Durgappa D.S (2012): Insights to Urban Dynamics Through Landscape Spatial Pattern Analysis, International Journal of Applied Earth Observations and Geoinformation, vol. 18, pp. 329-343.
11. Singh, S. and Singh, D (2013): Urbanism versus Urbanization in Haryana: A Regional Analysis, International Journal of Environment, Ecology, Family and Urban Studies, vol. 3 (5), pp. 11-22
12. Singh, A.L (2012): Urban Sprawl: Causes, Consequences and Policies. B.R. Publishing Corporation, New Delhi.
13. Trewartha (1969): A Geography of Population: World Patterns, John Wiley and Sons, New York.