International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Urbanization and Future Development of Satellite Towns Through Gis: A Case Study of Bagru Block, Rajasthan, India

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Abstract
Urban agglomerations in India support more than 30% of its population today and are expanding rapidly. The metropolitan city of Jaipur supports nearly 30 lakh population and attracts millions every day towards the wide range of economic and employment opportunity it provides. Such big urban centre drains and absorbs all the available resources of the nearby area which supplements its expansion as major economic hub, "as a mother city". Growth triggered expansion in developing countries like India is mostly so haphazard, unplanned and unchecked that it consumes surrounding small cities/towns. Therefore, the planning of these smaller municipalities adjacent to a major city (Satellite towns) becomes inevitable for the sustainable growth of urban centers and equitable resource allocation in future. "Bagru" is one such satellite town located along the south western fringes of Jaipur city, 30kms away on NH-8 .The study tries to contemplate "Bagru" as a satellite town along with other 15 towns for the master plan of Jaipur 2025 including parameters like economic potential, socio-economic and physical structure, connectivity, population.

Keywords: Satellite Towns,Socio-Economic, Urban Planning, Urban Centres.

Introduction

India's urban population is growing at exponential rate and city regions are expanding fast.The numbers of million plus cities have increased from 35 in 2001 to 53 in 2011; i.e.18 cities have been added to the ambit of million plus cities since 2001, currently supporting more than 43% of total Indian urban population. Jaipur the capital city of Rajasthan is no exception to this urban spatial change and currently supports more than 3 million people (census 2011) reflecting 32.2 percent of growth rate between 1951 to 2011 which is more than 5 times since 1951.With Jaipur's annual average growth rate of 5.3%, twice those of the nation's urban growth, the city expand at a much faster pace than anticipated. Its tremendous growth has brought it under top 10 million plus cities among 53 metropolitan cities in India. Objectives are to identify the various factors, objectives, planning principles and characteristics responsible for making the study area as one the satellite town of Jaipur for the Horizon year 2025.It seeks to evaluatethe need and challenges in the development of such satellite towns along with others in Jaipur region.

Study Area

Bagru along with Dhamikalan is considered important region within the Jaipur regionlocated at a distance of about 30 kms in south west direction of Jaipur city (Figure 1). The town has a geographical spread 41.65sq.kms and is located between 26°48'07" to 26° 50'18" north latitude and 75°32'07" to 75°34'06" east longitude Bagru is located in the semi –arid zones with minimum and maximum mean temperature of 7.8°C in January and 40.3°C in May respectively. It is famous for its cloth and hand block printing worldwide. The print is commonly known as 'Bagru print'. The town has compact streets occupied by various craft commodities and one of the major towns on the Jaipur –Ajmer road. Within last few years, the study area has shown a remarkable increase in the number of industries particularly in its type of printing to retain its traditional culture. Bagru is the places of Chipa community .Chipa community people are those, who are involved in this printing tradition since 100 years ago. Though the old town is 1 km off the NH 8, but presence of NH-8 has forced the urban expansion towards it.

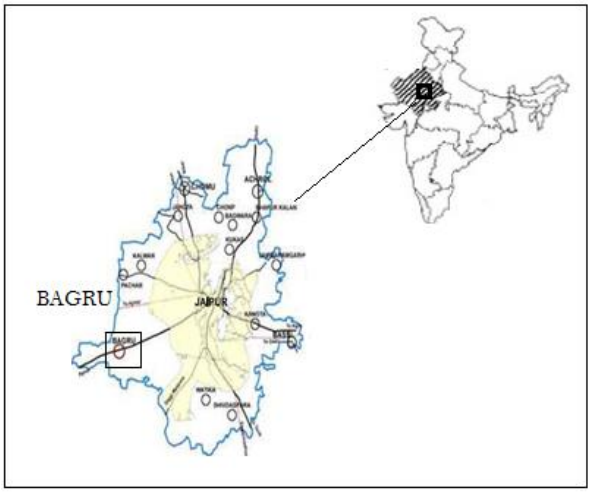


Figure 1: Location of the study area

The population of Bagru was 18,868 which increased to 26,534 in 2011 showing a decadal growth rate of 40.63%. The density of population was453/sq.km which increase to 637 in 2011 and the sex ratio improved to 903 in 2011 from 895 in 2001 which is better than national avrage of 933.The literacy rate of the town in 2001 was 64.75% with 80% male literacy and 19.03% of female literacy.

Database and Methodology

The study is based on both primary and secondary data inputs. Spatial data from Carto SAT remote sensing imageries, and BHUVAN and Non spatial data from census 2011 have been merged together using GIS techniques mainly arc GIS 9.3 software to prepare an outlay plan proposal of the area as potential growth centre. Field survey through semi closed questionnaire has been conducted to generate the primary statistical data. Data analysis has been done by using simple statistical techniques to represent the data.

Land Transformation Analysis

The physical expansion of city leading to inefficient use of land resources and large-scale encroachment on agricultural land has pushed the growth of the city. It is observes that the residential area has higher rate of expansion after 1975; the major expansion is observed in the western, southern and south-eastern parts and along the national highways 8, 11 and 12. Towards south it has expanded about 20 km. from

Ajmeri gate covering Sanganer town and even along the Tonk road. Towards western direction it has almost reached to Bagru town, which is about 35 km. away from the city. The city has expanded towards south and western directions, engulfing used productive cropped areas, fallow land, and degraded forest land. Jaipur city is putting heavy pressure on the ecologically sensitive areas, due to deforestation and mining in Nahargarhand Jhalana reserve forest area(Figure 2).The imbalance between resource distribution among the fast growing population and environmental degradation has become major cause of concerns for future development.The capital city of Rajasthannot only supports the maximum slum population of the state but also fail to cater the basic amenities of its population wherein only 36% have connection to sewerage network,45% to solid waste management,36% to water connections and 49% of people have no access to private or public toilets,This scenario reiterates the need for development of long term,sustainable plans to support the future courses smart cities in India.

Today, Satellite towns are seen as a kind of small or media-sized settlement located around a large metropolis (Bai, 1981). It is physically separated from the main urban area, but economically they are an integral part of a large urban body (Golany, 1976; Weissbourd, 1972).Considering the dynamic process of temporal urban change and sustainable urban growth management the future urban sprawl has been expanded to cover the surroundings towns,which are developing as the satellite towns like Sanganer, Bagru, Chomu, Achrol, Kanota etc. Consequently a master plan has been prepared by JDU for the horizon year 2025,propsing 11 satellite town and 4 growth centres around 30-40 kms of its periphery to address the future course of development. Bagru is among the major satellite town in the master plan of Jaipur. Through this paper various developmental issues, objectives characteristics of Bagru town are assessed to be developed as major satellite within the Jaipur region.

The magnitude with which Jaipur is growing is bound to lead to massive problems in managing already over strained Jaipur city. Excessive concentration of population and unprecedented increase in the demand for infrastructure / facilities and amenities has led to problems of land shortage, housing shortfall, inadequate transportation etc(Yeung, 1976). Management of essential infrastructure like water supply, sewerage, drainage, solid waste disposal has become more challenging. Today city planners running into retrospective analysis of Jaipur region are trying to find out alternative long term management solutions in form of Satellite towns.

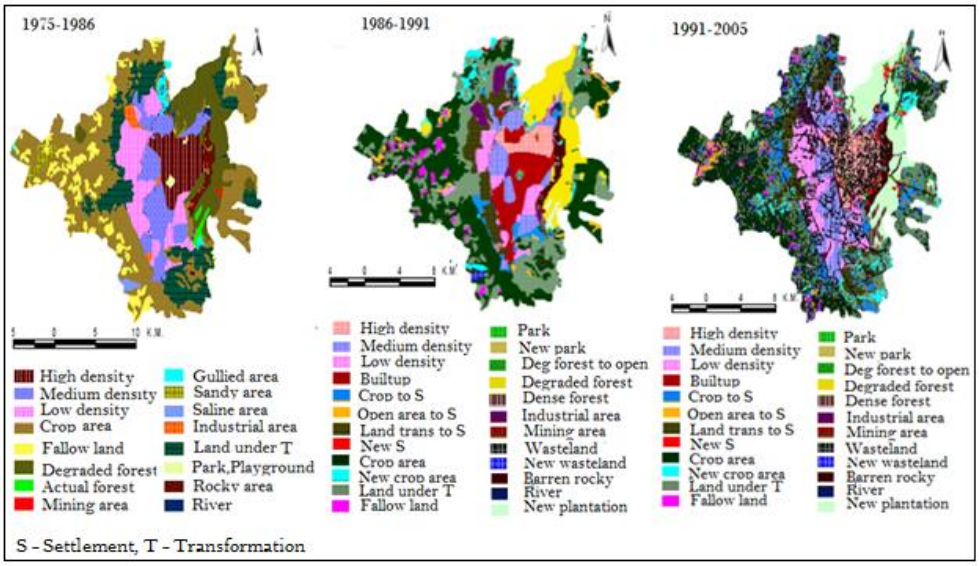


Figure 2: Jaipur city transformation 1975-2005

Result and Discussion

In general, it was found that study area is located in close proximity to the mother city Jaipur and has got huge potential to be developed as future Satellite town. The current land use pattern, existing economic activities, work force population and various other aspects of the town have been studied in order to study the future developmental policy framework.

Existing current land use scenario

The current land use pattern reflects a large proportion of land i.e. nearly 48% to be vacant and unutilized (Figure 3). The area is neither under agricultural, industrial, settlement or commercial area, which give a good scope for set up of future developmental activities. Economic activities are seen to be diverse ranging from agricultural, marketing, industries and even artisan activities like cloth printing and designing.Agricultural is predominantly practiced in the region but is restricted to 5% of the region, given the problems of irrigation and water availability.Besides agriculture cloth printing and designing remins the primary artisian activity of the town.Hand block printing work is the predominant activity being carried out in the region about 100 household units in the town are engaged in this traditonal artisan activity.The bargru prints are quite popular and hold huge domestic and international market demands.Besides printing,other activities include “Lakh” work,saw mills,oil mills and shoe making etc.Thetown also has nearly 5.75 Ha area under commercial land use,falling short of the growing requirements of the town.The current development and expansion trend is witnessed linearlyon both the sides of the N.H-8.Bagru town is also dominated by the industrial land use which is nearly 60% of the total landuse,where in RIICO industrial area has been establised on the eastern and western fringe(Chitroli) of the settlement area.

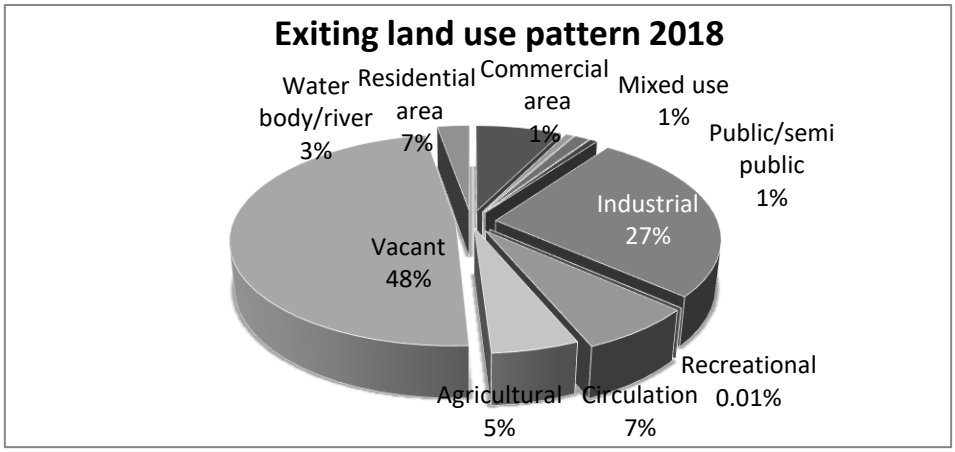


Figure 3: Existing landuse pattern of the study area.

Existing physical and socio-economic conditions

Ground water is the main source for water demands in the area which is available at the depth of around 200feet but the water quality is not good because of which,PHED is responsible for water supply the town. Water needs are also met through hand pumps,open wells, and tube well outside the area.Further the electriciy supply is provided from 33KV electic substation.The provision of supply of power to industrially growing area are met seperately with other sources which are being developed fast.There is no sewerage system till date in the settlement,and for disposal of solid waste in the area.Houses having in house toilet facilities do have septic tanks, however in the absence of community toiltet facilities

several families areoutbound.The solid waste is also dumped in open spaces in and outside town area.The mismangement and dumping of solid waste in to open drains also led to chocking of drainage causing unhygenic, and unhealthy conditions.Therefore, the waste collection and disposal system in the town is not developed at all,which remains the prerequisite for and future sustainable growth.

Transportation networks are considered to be the life line of any satellite new town to remain well integrated with the mother city (Fung,1981). However, Bagru is already located aorund the N.H-8, but looking at the future course of commercial and industrial setup,it is very essential to broadcaste a network multi mode transportation sysyem which will act as backward and forward linkages to growing economy.Currenlty N.H-8 passes through northern extremtiy of the town, and is well connected to the town through numerous service roads. The town is well connected to jaipur and there is regular bus servises from jaipur to Bagru which include government as well as private ownership.However there is lack of infrastrucre in form of proper bus station in the town and the only informal bus stop is on N.H-8, which creats conditions of congestion and chayos during peak hours of road service.Besides roadways the railway services are not yet well developed in the town and the nearest Railway station is located in Dhankya which is 12 kms from the town.Further the nearest Airport is located in Jaipur 35kms way from the town.The settlement area of the town is the primary residential area,where in the residential complexes are not clearly planed,houses are low rise and hapazardly located in the old settlement.Some of the residential sreas are utilized for commercial puropses also forming 2.99% area under mixwd land use.59.13 hectares area fall under residential landuse which is expected to increase sharply,since the most of the town is expanding towards the north Natioanl Highway regionbecause in south it is restricted by river Sadharia.

The town has a public library,reading room,cinema hall,five dharamshallas,post office,guest house,P &T department etc.The level of education and health infradtruceture is quite low,wherein it has one senoir secondary school,one middle school(for girls) six primary schools and one Sanskrit Vidhyalaya.There are 2 government hospitals(one 6 beded allopathic hospital and one ayurvedic)and one private nursing home,along with this there are 8-10 running private clinics.The educational and health facilities available in the Bagru can only cater to the current needs of the surrounding villages,but it has to be tremendously enhanced to be developed as Satellite town.

Planning policies and principles for devloping Bagru as Satellite Town

To develop Bagru as major Satellite town of the region it becomes imperative topreparea comprehensive land use and land transformation policy which is being adopted by JDU where in an account of the generalised residential density have been calculated and future analysis of population growth in the jaipur urban sprawl have been calculated.One of the major parameters also include the growth of town visavis the state of local environment i.e concept urban sustainable development(Yeh,1986).Herein, the conservation of local environment,agricultural area,structural heritage to rampant urbanization is being considered through mainataines of open spaces,parks, green belts and recreational parks. Maintaining the green area is considered today as one of the most important tool of urban landscapping especially while developing new satellite centres,which are expected to attract people from congested city region to more open andd cleaner environmental conditions (Singh2007,Simmons 1979).

It is estimated that till 2025 the population of the town will be 53342, twice as against the population of 22,089 in 2001 (Table 1). The predicted density for this satellite town considered to be 4400 persons/sqkms.

Table 1: Current population and population projection

Year	Population	Population increase	Decadal growth rate%
1971	9014	2260	33.46
1981	13462	4448	49.35
1991	18868	5406	40.16
2001	26534	7666	38.63
2011	36061	9527	32.87
2021	53342	5561	34.83

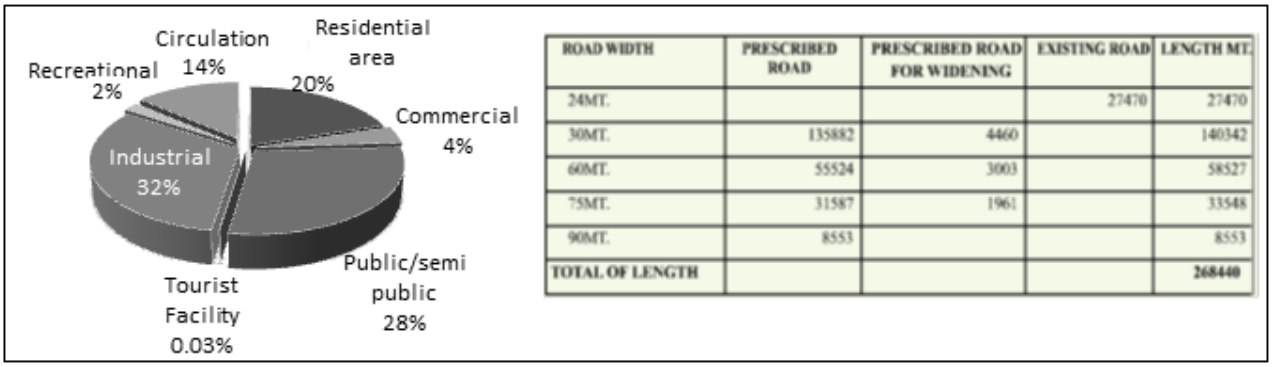
Developmental Parameters

The main parameters of development include the regional setting of the place for appropriate future land use planning and urban landscaping (Fisher, 1943). The emphasis also includes the concerns of connectivity through multimodal transportation system to enhance the connectivity with Mother city. The fast changing population dynamics in form of growth, distribution, density, migration etc are very important concerns related to future growth which has to be well accounted before designing planning of satellite towns.(Nakamura 1988,Pan 1957)These parameters will allow the planned sustainable development of Bagru town and development of appropriate infrastructure which will cater to the demand of expected population which is estimated to reach 53,342 by the horizon year 2025.The Jaipur region master plan considering the above parameters seeks to achieve balanced regional development of the region where in following categories have been provided for Bagru town:

	Categories	Area covered
1.	U-1 area	Including all use zones such as residential area.
2.	U-2 area	Do not have defined use zones but can accommodate certain activities as enumerated in D.P.C.R.
3.	U-3 area	Located along NH & SH with specific depth as per developmental proposal.
4.	G-1 area	Is green/ eco sensitive area like hills, river courses, water bodies, reserved forest area etc.
5.	G-2 area	Is buffer zone along Sadriya river(located in the southern part of the town)
6.	Rural area	Outskirt periphery from main town
7.	Ecological areas	According to the plan

Prescribed land use pattern for bagru

Based on above parameters and urban land use categories a comprehensive land classification and land use pattern have been identified for future, which is considered to accelerate the development of Bagru town The prescribe land use pattern aims to develop the 48% of vacant land into well planned industrial,commercial and Public sectors.Nearly 32% of the area will be bought under industrial sector,with industrial ifrastructure proposals of RICO including land near Chitroli industrial complex also (Figure 4). The residential area is proposed to expand to 20% of land use area by bulding town ships and settlement colonies supporting density of 90P.P.H.The residential space is considered to expand on both the sides of NH-8 including the northward located settlemnt of Dahmi Kalan and Anupam vihar scheme prescribed by JDA is also part of Bagru urbanisable area.



ROAD WIDTH	PRESCRIBED ROAD	PRESCRIBED ROAD FOR WIDENING	EXISTING ROAD	LENGTH MT.
24MT.			27470	27470
30MT.	135882	4460		140342
60MT.	55524	3003		58527
75MT.	31587	1961		33548
90MT.	8553			8553
TOTAL OF LENGTH				268440

Figure 4. Prescribed lanaduse pattern and road connectivity

The 4% commercial land use has been assigned along the major roads, and along the entry road margins of Bagru town to develop maketing hub in the region,so that commercial establishment can efficiently become par tof exisiting mixed land use pattern in the area. 2-3% of recreation space in form of recreation parks,open grounds, is proposed to be developed, which today stands less than .05% in the area.The public utilities and community infrastructure will also be strenghtened in a big way and nearly 28.43% of the area's resources will be diverted to thissector in order to provide better living conditions to people. Administrative,Institutional and educational infrastructure is deliberately proposed to be concentrated to the north part of town for better accessibility and connectivity.Road connectivity has been improved in the plan to interlink important activities.The hierarcy of road network given as under is proposed to be developed in the town

Higher order roads are proposed to be developed in the south and east of this town,which today are not well connected.The exiting Mohana road is already connected to bagru town circumnavigating the whole town. Extension of infrastructure support by developing Bus terminals/Bus stands along N.H -8 and other roads is also in the proposal. For the state,distrct roads already existing in the area the proposal is to widen them,reconstruct and maintain them to ensure uninturupted road connectivity in land use plan of 2025 (Figure 5).

Considering the sustainibility issues large underdeveloped agriculutral tracts,ecosensitive areas,water bodies,and water channels are brought under coverage of U-2,U-3,G-2 urban land use categorisation which will act asinterface buffer zone between town and its surrounding region.

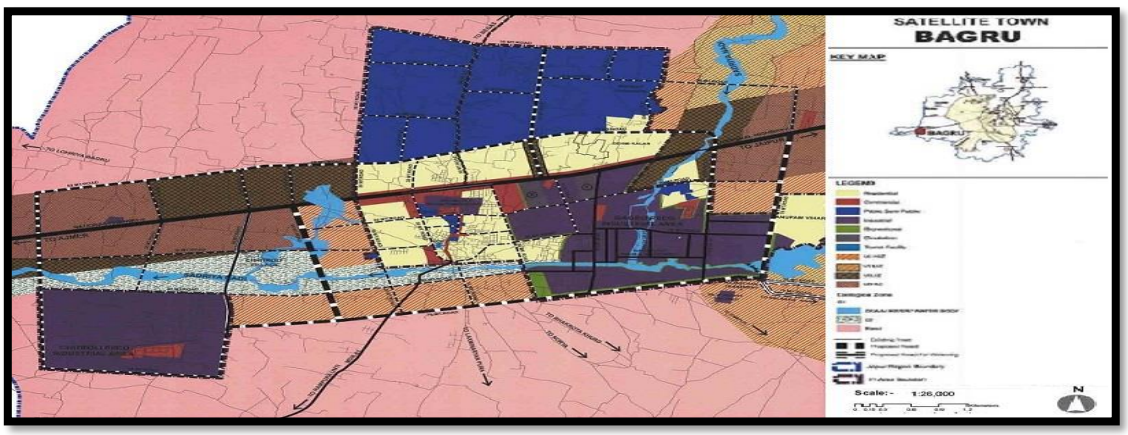


Figure 5: Proposed land use map of the bagru town based on land use categorisationa and developmenta parameters.

Prescribed occupational structure of Bagaru town for the year 2025,consider the current (1991 and 2001)occupational and work participation stucture is very diversified .The House hold artisian industry has been consider important traditional activity of the area and has been proposed to enhanced from 18% in 2001 to 25% in 2015. Cultivation still remains important activity accounting for (20%) of Occupational structure.The work force participation rate was found to be

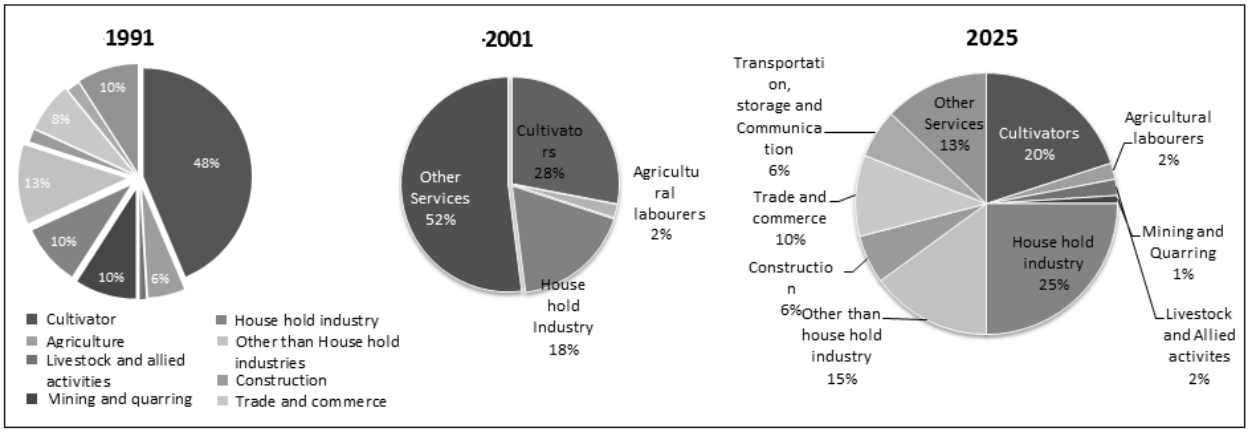


Figure 6: Existing and prescribed occupational structure in the study area

36.16 in 1991,with male female participation accounting for 47.02% and 19.03% respectively,which reflect immense untapped human resource potential for future satellite town if trained and skilled properly. Besides agricultural labourers that remains to 2% as in 2001,additional category of livestock and alled actvities (2%) have been incorporated for the year 2025 prescribed occupational structure looking into the vast potential of animal husbandry in the area (Figure 6).Further looking at the growth potential and diversification of economy in the area with establishment of industrial,commercial complexes and extension of transportation servics,it is estimated that nearly 6% of the work frce will be diverted to Transportation,storage and communication sector,10% to trade and commerce and nearly 6% to constructional acticities.This working structure will not only provide for diversed range of economic acticites but also stabled socio economic development.

Conclusion

The urban landscaping of the Satellite towns and growth centers will not only check the population growth and migration in Jaipur city but will also foster balanced regional growth through planned and equitable resource distribution within the Jaipur region.There is a need to develop counter magnets to stop migration to mega city and become part of population explosion. The satellite towns have beencome up as the only solution to decongest the mega urban areas as they are properly facilitated with all the amenities. Availability and identification of urban land resources is also considered to critical component of urban land use planning.Considering the available physical and human resources and dynamic city regions the planning policies have been rationalised in the study area.One of the foremost planning initiaves in the region is to develop the multi modal transportation system,and strenghten and maintain the existing ones,which will not only include development of Hierarchy of road network systems but also to decongest the existing roads in order to achieve free and uninterupted flow of traffic in the region.In order to decongest city centres and divert migrating population the plan is to develop Bagru with industrial hubs, work centres and with provision of utility services and community

facilities.The prominent commercial area of the town is surrounding the major roads merging towards the old town near N.H-8.In order to initiate developmental plan the future population growth has been projected, so the developmental initiatives does not fall short of futuristic demands and needs.Further, analyzing and calculating the present scenario, population of the town estimated is twice the existing.The core importance and concept underlining is the decentralization and decongestion of Jaipur city region. The assessment and planning is also inclusive of identifying the available human resource of the area through identification of current occupational structure, and work force participation rate etc.

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