CHAPTER VI

GROWTH OF URBAN CENTRE ALONG THE MAIN ROADS: A CASE STUDY OF ROHTAK CITY

This chapter of the study assesses the growth of urban centres along the main roads by selecting the old historic city of Rohtak as division's headquarter. Urban transport, both intra and inter-urban plays a key role in influencing the pattern of urban growth and development. The sub-urbanisation becomes possible because of transport structures which serve the main city, the satellite suburbs and new towns for movement of people, goods and services. A town or a city is said to be an index of the state or a nation. Unlike a village, where the function is agriculture, a town caters in varied functions. In the past a town was citadel of defence, but now it is much more than the house of education, industries, trade and commerce etc. Here persons of various walks of life join their hands for scientific and technological advancement. These advancements are a step towards prosperity of our towns and cities which should grow and rather be made to grow.

Several studies have highlighted the fact that the character of urban land use pattern in Indian cities is very different from those in western cities, but have also observed a degree of homogeneity within the Indian cities (Yadav, 1988).

Mishra observed that the spatial expansion of the Indian cities is more pronounced along the transport arteries and along the roads in particular. These roads change the pattern of the city growth from circular (as observed in western cities) to linear (as observed in Indian cities). With expansion, low-value land use is replaced by high-value land use (Mishra, 1998).

The transport system happens to be a pacesetter for a growing economy. It plays a significant role in urban development. The size and pattern of the urban area are often defined and dictated by transport facilities available to the city. The transport network serves as the primary structure of a city, provides the artery for the flow of activity (Bhaduri, 1991).

In view of variability of land availability over space, it is to be expected that different locations would specialize in different land uses. Areal specialisation
proceeds with development, but distance emerge as an important determinant of location for many land uses (Verma, 1995).

In comparison to railways, waterways and air transport, road is the most popular mode of transport in India because of its reliability, cheapness and moreover it needs less infrastructure than its alternative. Roads are specially important for transport over short distances. The road network has a significant influence on the areal expansion and transformation of land in an urban centre.

6.1 LOCATION AND SETTING OF ROHTAK CITY:

Rohtak town lies at a distance of 75 Kms from Delhi towards North-West on National Highway No. 10. Delhi being a metropolitan city in whole of northern region extends its influence on the areas of Uttar Pradesh, Rajasthan and Haryana falling on its outskirts. Rohtak town is one of the eight priority towns (regional centres) of National Capital Region. Rohtak town has always enjoyed a well defined political and social status in the history of erstwhile Punjab state. Its history is also related with the struggle of freedom of India. Rohtak has always remained as the nerve centre for education, transport, industries and trade. Although Rohtak urban centre has got diversified economic functions but trade and commerce is predominant.

6.2 MAIN - ROADS OF ROHTAK CITY:

1) Delhi Hisar road:

This is the most important road not only for the state but also for the country. This road has played a vital role in the development of the city. It connects the three urban centres two, of whom are class I towns namely Rohtak and Bahadurgarh. This enters in the Rohtak city from south-east direction from Delhi. This road bears heavy traffic inflow because most of the commercial transactions are made through this road (Map-6.3).

3) National Highway No. 71:

This is another important road, which connects the Rohtak city with Jind and Jhajjar towns. This road further joins the city with National Highway No.8 through Rewari district and in the last, approaches to Bawal which is an important industrial town of the southern Haryana. This road serves as bypass of Delhi for the material transported from Rajasthan, Maharastra and Gujarat to Punjab (Map-6.3).
4) **National Highway No. 71A:**
   This road connects Rohtak city with National Highway No.1 at Panipat and passes through Gohana town. This road enters in the city from north and acts as a transition line between National Highway No. 1 and National Highway No. 10 (Map-6.3).

5) **State Highway No. 18:**
   This road connects the Rohtak city with Sonipat and Bhiwani. This road also used to bring construction material from the nearby regions (Map-6.3).

**6.3 EXISTING PHYSICAL FEATURES:**
   There is an undulating area of about 200 hectares on the north-western side of town known as old Rohtasgarh (vanished with time and buried over here). This area has been reserved by the Archeology Department, Government of India for archeological findings. The heart of the town is in bowl shape. Besides, there are some areas in city where discharge of storm water through gravity is not possible and as such pumping system is the only remedial measures. The ground water being brackish, the water supply is canal based. There are two water works, one along the Sonipat road and other along Jhajjar road. In spite of water works there is acute shortage of water supply in the town. There are a number of drains on the northern side of the town. These drains have been creating flood problems time to time because of general slope being from north to south.

**6.4 EXISTING IMPORTANT FACILITIES:**
   The town enjoys a nodal location due to the following consideration:
   - Rohtak town, besides being District Headquarter is also functioning as Headquarter of Divisional commissioner and Inspector General of Police. Many administrative buildings like Court Complex, Central Excise and Custom Offices are also located here. Thus it accommodates a large number of government offices.
   - This town is well connected with the surrounding areas through a network of broad gauge railway line with National Capital Delhi, Bhiwani-Hisar-Sirsa.
towards west, Panipat-Ambala-Chandigarh towards north and Jind-Narwana on the north-west side.

- It has a large grain market, vegetable market, fodder market and also commands a position in cloth merchandise in Haryana. It is also famous for a sweet named ‘Rewari’.
- It enjoys pride position of having all India Radio Station of Haryana.
- It has two tourist complexes namely Tilyar and Myna. The Tilyar complex being situated on Delhi-Hisar-Sulemanki road in a spacious area, having a zoo and a lake, has become a centre of interest for the town citizens as well as for tourists.
- It has a large scale industrial unit i.e. sugar mill an agro based unit promoting sugarcane cultivation in the region. The industrial sector, Industrial Development Colony (IDC), houses Laxmi Precision Screws (LPS) and a number of ancillary units; Milk product unit under the nomenclature VITA exists on Gohana road.
- It has bus terminus, Jail complex, police line, Food Corporation of India (FCI) Godowns and three stadiums also exist in Rohtak town.

**URBAN LAND USE**

Land use is an assessment of the land, from the point of view of man. Broadly, it indicates the present utilisation and potentialities for future utilisation. As human life became more and more dissimilar in rural and urban spheres, the land use too became differentiated in these two segments. In rural environment, though the human impact is wide spread, it is not very intensive. In traditional economic pursuits, the human impact assessment ratio, per unit areas is quite low in rural areas as compared to the city and hence the rural land use is quite elastic. In urban areas the land utilisation is much more intensive spatially and temporally and the land use is more inelastic. So though the urban land occupies a small area of total geographical area but it forms a major area of study in social, biological and earth sciences (Khatu & D’souza, 1982).

This chapter discusses the major aspects of urban land use of Rohtak town for the period of 1971, 1991 and 2006. This chapter finds the changes in land use in near about four decades time span from 1971 to 2006. The major concern of the study is to
explore the impact of road accessibility on land use transformation in the urban centre. So GIS techniques have been used to find out the changes in various urban land use classes in buffer zone up to 500 meters from the main roads of the city. The land use of Rohtak city has been classified into 8 major land use categories.

**Table-6.1**  
**Rohtak city**  
**Classification of Land Use**

<table>
<thead>
<tr>
<th>Land use</th>
<th>Sub Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Residential Sector on neighborhood pattern</td>
</tr>
<tr>
<td>Educational</td>
<td>School, colleges, University and Training Centres</td>
</tr>
<tr>
<td>Transport &amp; Communication</td>
<td>Railway Station, Bus Stand, Roads, Transport Depots, Parking Areas and Broadcasting Stations, Television Stations.</td>
</tr>
<tr>
<td>Commercial</td>
<td>Retail Trade, Wholesale Trade, Warehousing, Banks, Hotels, Restaurants and other places of public assembly on commercial basis.</td>
</tr>
<tr>
<td>Open &amp; Agricultural</td>
<td>Gardens, Agriculture land, Open area</td>
</tr>
<tr>
<td>Others</td>
<td>Water Bodies and other features</td>
</tr>
</tbody>
</table>


6.5 **LAND USE AND LAND COVER OF ROHTAK CITY (1971):**

The Map-6.4 reveals a picture of urban land use of Rohtak city in 1971. We have excluded open and agriculture land from the municipality boundary, in order to find out the built up area of Rohtak city. The land use and land cover of Rohtak city for the year 1971 (Map-6.4) indicates that most of the residential area was found
along the National Highway No. 10 and city looked in a linear pattern from north-west to south-east.

Table-6.2
Rohtak City
Land Use and Land Cover (1971)

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area in hectares</th>
<th>% in Total Municipal Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>492.50</td>
<td>31.38</td>
</tr>
<tr>
<td>Educational</td>
<td>188.17</td>
<td>12.00</td>
</tr>
<tr>
<td>Transportation &amp; Communication</td>
<td>109.26</td>
<td>6.96</td>
</tr>
<tr>
<td>Commercial</td>
<td>74.86</td>
<td>4.77</td>
</tr>
<tr>
<td>Administration &amp; Public utilities</td>
<td>53.00</td>
<td>3.38</td>
</tr>
<tr>
<td>Industrial</td>
<td>8.90</td>
<td>0.58</td>
</tr>
<tr>
<td>Open &amp; Agricultural</td>
<td>633.00</td>
<td>40.34</td>
</tr>
<tr>
<td>Others</td>
<td>9.30</td>
<td>0.60</td>
</tr>
<tr>
<td>Total</td>
<td>1569</td>
<td>100</td>
</tr>
<tr>
<td>Built up</td>
<td>936</td>
<td>--</td>
</tr>
</tbody>
</table>


1. **Residential:**

   Residential area occupied high share in total municipal area with 492.50 hectares which corresponded to 31.38 percent of total municipal area. In 1971 the main residential areas were Model Town, Jhang Colony, Arya Nagar, Parat Nagar, Civil line, Bhagwan Colony, Ramkhus Colony, Vijay Nagar, Indira Colony, Janta Colony and old city area. Model Town was established by the government to rehabilitate the displaced persons from Pakistan. Most of the residential area was settled along the major roads and railway line.

2. **Educational:**

   The area under educational facilities occupied 188.17 hectares i.e. 12 percent of the total municipal area (Table-6.2 and Map-6.4). There were 19 primary schools, 4 middle schools, 16 high secondary schools and 11 colleges including separate industrial training institutions for boys and girls according to Census 1971. At that time in Rohtak city important educational institutes were Maharishi Dayanand
ROHTAK CITY
MAIN ROADS & URBAN LAND - USE
(1971)

S.H.71

N.H. 71A TO GOHANA

S.H.18 TO SONIPAT

N.H.10 TO BAHADURGARH

N.H.10 TO HISAR

TO BHIWANI

N.H.71 TO JHAJJAR

LAND USE CLASSIFICATION

- MUNICIPAL BOUNDARY
- RAILWAY LINE
- MAIN ROADS
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- TRANSPORTATION & COMMUNICATION
- EDUCATIONAL
- ADMINISTRATIVE & PUBLIC UTILITIES
- WATER BODIES

Source: Town & Country Planning Office, Rohtak
Map - 6.4
University, Medical College, C.R Memorial College, Gaur Brahmin Degree College, Jat College and Women College near police station.

3. **Transportation & Communication:**

   This land use category covered 109.26 hectares i.e. 6.96 percent of municipal area (Table-6.2 and Map-6.4) in 1971. In Rohtak city total road length was 60.00 kms in 1971. This category included a bus stand near Bhiwani stand, railway station and All India radio Station near Women College.

4. **Commercial:**

   Commercial area shared 74.86 hectares which is 04.77 percent of total municipal area. In Rohtak city important commercial areas were Anaj Mandi located near railway station, Qilla road, Shori market in old city, Kath Mandi located along the Jhajjar road and Sabji Mandi. Sabji Mandi was located in the western part of the walled city, engaged in the whole sale marketing of vegetables and Qilla road was an important commercial centre for old city and near by areas in 1971 (Sharma, 1984).

5. **Administrative & Public Utilities:**

   These two categories of land use comprised 53.00 hectares (3.38 percent) of Rohtak city in 1971 (Table 6.2 and Map-6.4). The major concentration of buildings performing the administrative functions continued to be in civil lines. After independence, most of the offices were located in the newly developed residential areas. In Rohtak city, main public utility was water works established by Britishers in 1932 (Sharma, 1984). In the city there were 3 hospitals, 3 dispensaries, 1 T.B. centre, 4 health centres, 3 nursing homes and 1 medical college as public service centres according to Census 1971.

6. **Industrial:**

   The industrial area occupied 0.58 percent which was 8.9 hectares of total municipal area of the city. Rohtak had important industrial units such as cotton spinning industry, tin industry and flour mill in 1971.

7. **Open & Agriculture area:**

   There was a large area available for agriculture and it occupied highest percentage of the municipal limit area with 40.34 percent and 633 hectares. It was called as open area with in the city (built –up) area and as agriculture area outside the
city (built-up) area. This area was mostly along the periphery of Rohtak city and was used for the cultivation of sugar cane and grains.

6.6 LAND USE AND LAND COVER OF ROHTAK CITY (1991):

The land use is the assessment of all developed and vacant land on specific point at a given time and space. It basically depends upon socio-economic structure of area, nature of land and mainly by the pressure of population. In 1991, the land use has been classified into following categories: (1). Residential, (2). Educational, (3). Transportation, (4). Commercial, (5). Public utilities and Administration, (6). Industrial, (7). Open and Agriculture area.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area in Hectares</th>
<th>% in Total Municipal Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>934.6</td>
<td>32.93</td>
</tr>
<tr>
<td>Educational</td>
<td>401.2</td>
<td>14.15</td>
</tr>
<tr>
<td>Transport &amp; Communication</td>
<td>221.3</td>
<td>7.79</td>
</tr>
<tr>
<td>Commercial</td>
<td>181.8</td>
<td>6.41</td>
</tr>
<tr>
<td>Administration &amp; Public utilities</td>
<td>150.1</td>
<td>5.29</td>
</tr>
<tr>
<td>Industrial</td>
<td>37.6</td>
<td>1.33</td>
</tr>
<tr>
<td>Open &amp; Agricultural</td>
<td>862.0</td>
<td>30.37</td>
</tr>
<tr>
<td>Others</td>
<td>49.40</td>
<td>1.74</td>
</tr>
<tr>
<td>Total</td>
<td>2838</td>
<td>100</td>
</tr>
<tr>
<td>Built up</td>
<td>1976</td>
<td></td>
</tr>
</tbody>
</table>


1. Residential Area:

The land use and land cover of Rohtak city for the year 1991 (Map-6.5) indicates that most of the residential area was confined with in north-east to south-west of the city along the National Highway No. 10. A significant feature of the city’s landscape was the residential area along the main roads. Most of the education institutes were settled in the south-east part of the city. The main commercial area is located in the southern part of Rohtak city.
Residential area showed highest share with 934.60 hectares which was 32.93 percent of municipal area. Main residential areas were same as that of 1971 but expanded considerably due to construction of new houses and buildings. Sham colony near National Highway No. 10 emerged newly due to the expansion of Indira colony. There was a remarkable change, which can be seen from 1971 to 1991. Janta colony located on Jhajjar road showed vast growth in area in comparison to 1971. New residential area emerged in 1991 were Kamla Nagar on National Highway No. 71, and Hari Singh Nagar behind Anaj Mandi. Most of the residential area showed expansion in and along the major roads and railway line of the city.

2. Educational:

The area under educational facilities was 401.2 hectares which is 14.15 percent of the municipal area (Table-6.3 and Map-6.5). There were many educational institutes in the city, which were distributed all over the area rather located in a specific zone. The city had 53 primary schools, 34 middle schools, 31 high secondary schools and 22 colleges including separate industrial training institutions for boys and girls according to census 1991. But a patch of institutions was situated along the Delhi road as Maharishi Dayanand University, Medical College, C.R. Memorial College, and Jat College.

3. Transportation & Communication:

This land use category covered 221.30 hectares which was 7.79 percent of municipal area (Table-6.3 and Map-6.5) in 1991. The total road length of metalled road in Rohtak city was 130 Kms according to Census 1991. The pattern of road network of city emerged due to its development while providing connectivity to the outer part of city with internal part. During last two decades the street pattern of the city became congested.

4. Commercial:

Commercial area shared 6.41 percent which was 181.80 hectares of total municipal area. In 1991, some new patches of commercial buildings emerged in a linear pattern along all the main roads of city (Map-6.5). It is observed that Qilla road, Shori market in old city was important places and played a very important role in the commercial and economical development of the city (Map-6.5). These were the hubs
of clothes and jewelry shops. A new commercial and market centre emerged along the National Highway No.10 as Model Town.

5. **Administrative & Public Utilities:**
   These two categories of land use comprised 150.01 hectares which was 5.30 percent of Rohtak city in 1991 (Table-6.3 and Map-6.5). The major expansion of buildings performing the administrative functions was in the civil lines. There were 3 hospitals, 3 dispensaries, 1 T.B. centre, 4 health centres, 3 nursing home and medical college as public service centres according to Census 1991.

6. **Industrial:**
   This category occupied 1.33 percent which was 37.6 hectares of the total area of the city. Two new patches were found developed near bypass road, behind the Janta colony and Anaj Mandi. The Sugar mill and Mohan spinning mill in the southern part and Hafed were newly established industries in 1991 in the northern part of the city.

7. **Open and Agriculture area:**
   Large amount of area was included in this class due to the expansion of municipal limit in 1991. The total geographical area of Rohtak city was 2,838 hectares according to town planning statistics. This land use category covered 862 hectares with 30.37 percent of municipal area (Table-6.3 and Map-6.5).

6.7 **LAND USE AND LAND COVER OF ROHTAK CITY (2006):**
   The land use and land cover of Rohtak city for the year of 2006 (Map-6.6) reports that there is a heavy expansion of newly constructed buildings in all the directions of city, but expansion is more prominent in the north-east and south-east direction along the important roads.

1. **Residential area:**
   This category comprises highest 43.85 percent and 1297.20 hectares of the total municipal area due to heavy and extra ordinary growth of population associated with high urbanisation. In this time many planned sectors and colonies are developed which finally changed the landscape of the city.
Source: Based on Town Planning Informations & Google Image
### Table-6.4
**Rohtak City**
**Land Use and Land Cover (2006)**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area in Hectares</th>
<th>% in Total Municipal Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1297.20</td>
<td>43.85</td>
</tr>
<tr>
<td>Educational</td>
<td>428.10</td>
<td>14.47</td>
</tr>
<tr>
<td>Transport &amp; Communication</td>
<td>278.00</td>
<td>9.39</td>
</tr>
<tr>
<td>Commercial</td>
<td>238.00</td>
<td>8.05</td>
</tr>
<tr>
<td>Administration &amp; Public Utilities</td>
<td>187.70</td>
<td>6.34</td>
</tr>
<tr>
<td>Industrial</td>
<td>55.40</td>
<td>1.87</td>
</tr>
<tr>
<td>Open &amp; Agricultural</td>
<td>416.00</td>
<td>14.06</td>
</tr>
<tr>
<td>Others</td>
<td>59.00</td>
<td>1.99</td>
</tr>
<tr>
<td>Total</td>
<td>2958</td>
<td>100</td>
</tr>
<tr>
<td>Built up</td>
<td>2542</td>
<td>--</td>
</tr>
</tbody>
</table>


They functioned as centripetal force and diverted the development from central area to the outer zones. The morphology of Rohtak city is characterized by narrow lanes, old type of clustered houses and crowded shops. The slums and blighted areas are distributed in different parts. In contrast the newly developed residential areas of north-eastern and south-eastern parts are modern and well planned due to the newly constructed residential sectors by planning offices.

2. **Educational:**

The area under educational facilities covers 428.10 hectares and 14.47 percent of the municipal area (Table-6.4 and Map-6.6). During the last decade a new phenomenon has been observed, due to the rising cost of land many schools established themselves outside the municipal area boundary like Delhi Public School on National Highway No. 71 (Rohtak Gohana Road). Due to this reason there is not much change and very less development emerged in this particular category. Almost all educational institutes are the same as they were in 1991.
3. Transportation and Communication:

This land use category occupies 278 hectares which is 9.39 percent of municipal area (Table-6.4 and Map-6.6) in 2006. The transport facilities are very congested due to heavy commercialisation. Also, due to residential development many road links have been constructed in this time period. During this time period old bus stand has been shifted in the outer part of city near jail on bypass road. During this time period many new small parking places have been developed in the city.

4. Commercial:

This land use category shares 8.05 percent which is 238 hectares of total municipal area. In 2006, commercial area as C. B. D. also shows considerable expansion. The C.B.D. and many sub-C.B.D. like Model Town, Jhajjar Chungi and Bhiwani Chungi and some other markets, etc have come up in the developed and newly developed residential areas. Many offices and shopping complexes have come up on Delhi-Hisar and Rohtak-Sonipat Road (Table-6.4 and Map-6.6).

5. Administrative & Public Utilities:

These two categories of land use comprise 187.70 hectares which is 6.34 percent of Rohtak city municipal area in 2006 (Table-6.4 and Map-6.6). Almost all public utilities are same as they were in 1991.

6. Industrial:

The industrial area occupies 1.87 percent which is 55.40 hectares of the total area of the city. During this period main industrial development has been found on the National Highway No.10 in the western part of the city. Due to good transport links, this part of the city has attracted various industries like gas storage godowns, large industrial units and residential colonies. The industrial growth towards Delhi road has been spectacular.

7. Open and agriculture area:

This category covers 416 hectares with 14.06 percent of total municipal area. It can be concluded that most of the cultivated land got converted into built-up land. The vacant land has been converted into built-up land. The cultivation lands initially idle from speculation and have been converted to vacant lands for future built-up. Open and agriculture land can be found scattered throughout the city but mostly concentrated in the south eastern part along the Rohtak-Delhi railway line.
6.8 GROWTH OF AREAL EXTENT AND LAND USE CHANGES OF ROHTAK CITY (1971-2006):

The old Rohtak city was confined to the walled city. With the influx of immigrants after the partition in 1947 and natural growth rate of population, the city started expanding outside the wall. With the installation of the railways, importance of Rohtak city was increased. In 1901 the population of city was 20,323 persons. The rise in population was continuous but growth rate was not very high due to large number of death by plague, cholera etc. There was a steep rise in population from 48,148 to 124,755 people since 1941 to 1971, due to refugee influx after partition in 1947 and rapid industrialization etc. The population reached 284,807 people by 2001. The population had increased about six folds in a span of sixty years from 1941 to 2001 (Fig.-6.1).

Due to the pressure of population, the city has grown abruptly in the areal extension. In 1961, the total geographical area of the city was 11.66 Sq. Kms Its geographical area was also the same as 11.66 Sq. Kms in 1971, but it was extended to 28.38 Sq. Kms in 1991 (Map-6.7 & Fig.6.2). The total change in the geographical area of Rohtak city was +16.72 Sq. Kms from 1971 to 1991. Most of the area of Rohtak city was lying along the highways and major roads. This shaped the Rohtak city elongated along the major roads. Roads played a significant role in the expansion of the Rohtak city e.g. in south Jhajjar bypass acted as outer boundary of the city. This change was most prominent on National Highway No.10, along Gohana and Sonipat road but when we consider the growth of the city from 1971 to 2006, it has been extended on two important routes of the city as National Highway No.10 and Rohtak-Gohana road as National Highway No.71 A. During near about four decades from 1971 to 2006 the growth rate is 153.60 percent and total change in area is 17.92 Sq. Kms.

The multi functional characteristics of Rohtak city, which had developed laterally, have also made it an unplanned city today. So here the result in areal expansion is clearly evident that the increase in population directly results in expansion of the area growth in physical terms.
It is clear (Table-6.5) that Rohtak city has witnessed large scale changes of land use. The statistics shows that urban area has increased by 1,389 hectares with +88.53 percentage change during 1971 to 2006. Similarly built up area has increased from 936 to 2,542 hectares.

The city has witnessed major land use changes among different classes. With the passage of time, the older parts of the city have become more and more congested while on the other hand, the city has expanded along and between the main roads in a haphazard manner and swallowed the agricultural land into the urban and fringe area. The urban land use change of Rohtak city is dominated by residential class, like all other large urban centres of India.

1. **Residential area:**

   In residential area increase is 804.7 hectares which is 163.40 percent of residential land use change from 1971 to 2006. It shows frontal expansion of this class. Most prominent changes in residential area along National Highway No.10 are in Model Town, Dev Colony and University Campus. In the northern part of the city most of the residential area has increased along with two roads, Jind road and Gohana road, as an expansion of the old city. During this time period Durga colony, Nankpura and Vinay Nagar along the Sonipat road are newly emerged colonies. A colony emerged along National Highway 10 near Gaur Brahmin Degree College named

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Total Gain or Loss (Area in Hectares)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>+804.7</td>
<td>+163.4</td>
</tr>
<tr>
<td>Educational</td>
<td>+239.39</td>
<td>+127.50</td>
</tr>
<tr>
<td>Transport</td>
<td>+168.74</td>
<td>+154.43</td>
</tr>
<tr>
<td>Commercial</td>
<td>+163.14</td>
<td>+217.92</td>
</tr>
<tr>
<td>Administration &amp; Public utilities</td>
<td>+134.1</td>
<td>+253.00</td>
</tr>
<tr>
<td>Industrial</td>
<td>+46.5</td>
<td>+522.47</td>
</tr>
<tr>
<td>Open &amp; Agricultural</td>
<td>-217.0</td>
<td>-34.28</td>
</tr>
<tr>
<td>Others</td>
<td>+49.70</td>
<td>+534.4</td>
</tr>
<tr>
<td>Total</td>
<td>+1389</td>
<td>+88.53</td>
</tr>
</tbody>
</table>

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It is clear (Table-6.5) that Rohtak city has witnessed large scale changes of land use. The statistics shows that urban area has increased by 1,389 hectares with +88.53 percentage change during 1971 to 2006. Similarly built up area has increased from 936 to 2,542 hectares.

The city has witnessed major land use changes among different classes. With the passage of time, the older parts of the city have become more and more congested while on the other hand, the city has expanded along and between the main roads in a haphazard manner and swallowed the agricultural land into the urban and fringe area. The urban land use change of Rohtak city is dominated by residential class, like all other large urban centres of India.

1. **Residential area:**

   In residential area increase is 804.7 hectares which is 163.40 percent of residential land use change from 1971 to 2006. It shows frontal expansion of this class. Most prominent changes in residential area along National Highway No.10 are in Model Town, Dev Colony and University Campus. In the northern part of the city most of the residential area has increased along with two roads, Jind road and Gohana road, as an expansion of the old city. During this time period Durga colony, Nankpura and Vinay Nagar along the Sonipat road are newly emerged colonies. A colony emerged along National Highway 10 near Gaur Brahmin Degree College named
Fig. 6.1
Rohtak City
Population Growth (1901-2001)
Fig. 6.2
Rohtak City
Growth of Area (1961 - 2001)
ROHTAK CITY
GROWTH OF AREAL EXTENT
(1971 - 2006)

N.H. 71 TO JHAJJAR

S.H.71

N.H. 10 TO HISAR

TO BHIWANI

S.H.18 TO SONIPAT

N.H. 71A TO GOHANA

N.H.10 TO BAHADURGARH

MUNICIPAL BOUNDARY 1971
MUNICIPAL BOUNDARY 1991
MUNICIPAL BOUNDARY 2006

0 0.5 1
KILOMETRES

Map - 6.7
Sham colony is the result of expansion of Indira colony. There is remarkable change in the area which is located along the main roads. These are Janta colony on the Jhajjar road and new colonies such as Kamla colony, Vijay Nagar, Hari Singh colony and Khad Mandi show expansion in that areas. A small patch is also seen along the Bhiwani road named as Rajender Nagar which has shown a large growth with time.

2. Educational:

The area under education facilities has increased by 239.93 hectares and percentage change is 127.05 percent. The location pattern of the various educational institutes in the city reveals that there are few educational institutes inside the walled city where the land values are high and land use intensives consequently, these are located at economically more favorable sites near walled city. As on Rohtak-Bahadurgarh road (National Highway No.10) some important educational institutes are located named Mast Nath Institute and others. In the new planned areas the factor of intensive land use and high land values do not influence the location of educational institutions. The government provides space for educational intuitions in the ground plan of every planned area. Also, unlike in the older part of the city, the establishment of the educational institutions and the development of a residential area are contemporaneous.

Thus, the locational pattern of educational institutions in Rohtak city is similar to that of any Indian city, with a clustering near the walled city and an even spread in the new planned areas (Sharma, 1984).

Newly established educational institutes during the period are Hindu college on S.H.18, expansion of C.R Memorial institutes on National Highway No.10, K.M school, D. Royal School on Jhajjar road and Govt. Girl Secondary school in Model Town.

3. Transportation:

From Table-6.5 it can be depicted that area under roadways, bus stand, railway station and communication has been increased from 109.26 to 278 hectares and change in percentage is 154.43 percent from 1971 to 2006. These facilities work as veins in the body of towns. The growth of transport is always affected by the growth of town and on the other hand, town’s growth is also affected by growth of transport.
4. **Commercial:**

An increase of 217.92 percent has been recorded in commercial land use reflecting its demand for accessible sites on or very close to main roads. These areas are characterized by high land value. The two main commercial zones in the Rohtak city, one namely Qilla Road and Shori Market are located in the older part of the city. These are very famous for clothes and domestic items. Second one is located in the newer part of the city as Model Town and near by area. This is very clear from the Map-6.4,6.5,6.6 that commercial area grows more along the roads and shows linear growth. Some other commercial areas are scattered like Anaj Mandi near Vaish College, Sabji Mandi etc., but located along the main roads and their concentration declines with distance from the roads. These commercial areas are crowded and becoming the sites of congestion and traffic jams.

5. **Public utilize and administration:**

These two categories jointly gain 134.1 hectares and 253 percent of total area of 1971 during this period. Because due to Rohtak city is a commissioner headquarter so many new government offices have been constructed here. On the other hand, same goes for public utilities such as many parks, water works have been constructed during this time span.

6. **Industrial:**

During this period there is also considerable gain in industrial area with + 46.5 hectares. The city as also benefited from its nearness to Delhi, a large centre of trade and commerce. During the time span from 1971 to 2006, the main expansion of industries has been found on the northern side of the city. These industries are of products such as sugar, cycle parts, automobile spares, electrical goods, surgical appliances, agricultural implements and for cotton ginning and baling.

7. **Open and Agricultural Area:**

The above Table 6.5 shows that there is a vast change in the open and agricultural land of Rohtak city between this time period from 1971 and 2006. The area under open and agricultural is reduced to - 217.00 hectares and -34.28 percent of total municipal area. The reduction of open and agricultural area in these thirty five years is because of urban expansion and growth of built up area.
6.9 LAND TRANSFORMATION IN BUFFER ZONE OF 500 METERS ALONG MAIN ROADS (1971-2006):

Accessibility plays an important role in determining the land use pattern and its distribution in the urban area. The accessibility may be defined as the distance from a point to the National, State Highways and other roads. This factor is very significant as settlements get developed along roads. Accessibility is termed as high with the increase in nearness to road, width of road, number of connecting roads etc.

As changes in land use take place much faster along the transport corridors than that in distant areas. It is worth while to study how much changes in land use take place along the major roads in Rohtak city. For this analysis, buffer zone has been created for two different years i.e. for 1971 and 2006. The buffer zone has included distance of 500 meters along the main roads.

Table-6.6
Rohtak City
Changes in Land Use & Land Cover in 500 Meters Buffer Zone (1971-2006)

<table>
<thead>
<tr>
<th>Land use</th>
<th>1971</th>
<th>2006</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>447.23</td>
<td>1073.89</td>
<td>626.66</td>
<td>140.12</td>
</tr>
<tr>
<td>Educational</td>
<td>72.31</td>
<td>148.14</td>
<td>75.82</td>
<td>104.86</td>
</tr>
<tr>
<td>Transport</td>
<td>35.20</td>
<td>75.20</td>
<td>40.00</td>
<td>113.63</td>
</tr>
<tr>
<td>Commercial</td>
<td>33.91</td>
<td>85.82</td>
<td>51.91</td>
<td>153.08</td>
</tr>
<tr>
<td>Administration &amp; Public utilities</td>
<td>40.51</td>
<td>82.51</td>
<td>42.00</td>
<td>103.67</td>
</tr>
<tr>
<td>Industrial</td>
<td>7.10</td>
<td>15.10</td>
<td>8.00</td>
<td>112.67</td>
</tr>
<tr>
<td>Open &amp; Agricultural</td>
<td>429</td>
<td>296.54</td>
<td>-159.46</td>
<td>-37.17</td>
</tr>
<tr>
<td>others</td>
<td>7.1</td>
<td>21.8</td>
<td>14.7</td>
<td>207.00</td>
</tr>
<tr>
<td>Total</td>
<td>643.26</td>
<td>1502.46</td>
<td>859.20</td>
<td>133.56</td>
</tr>
<tr>
<td>Built-up area</td>
<td>636.16</td>
<td>1480.66</td>
<td>844.5</td>
<td>132.74</td>
</tr>
</tbody>
</table>

From Table-6.6, it can be concluded that Rohtak city has shown a considerable expansion from its original size and also there is significant interchange of land use from open area to other land use classes. These changes are due to the development of city resulting in increase of area coverage, specially residential and commercial use. This demand of land use is mainly governed by accessibility and connectivity by roads. It is clear that the growth of city has taken places along the major roads like National Highway No.10 and National Highway No .71. The built up area in 500
meters zone shows 636.16 hectares in 1971 and 1480.66 in 2006 along the main roads. It has been increased by 132.74 percent and 844.5 in hectares. It is evident that there are more prominent changes along National Highway No.10. (Map-6.8 and 6.9).

An increase of 153 percent in commercial and 140 percent in residential area shows its demand for accessible sites on or very close to the main roads. These areas are characterized by high land values. All the land use categories expect open and agricultural land has observed positive growth during 1971 to 2001. But the open and agriculture area has suffered a negative growth because, with increase in population and houses, building and commercial areas consume land from agricultural area.

Residential area has increased in all the directions along the main roads. The Table-6.6 shows change in residential area which is 626.66 hectares and 140.12 percent. The main expansion of residential parts along the main roads are DLF Colony along S.H.18, Sham Colony as a result of expansion of Indira Colony along National Highway No.10, Rajender Nagar along Bhiwani Road, Kamla Nagar and Janta Colony along the Jhajjar Road. This shows frontal expansion of residential class along the transport corridors. There is always direct relationship between land use location and distance from the city centre. The area near to road is easily accessible where the area far from it is less accessible. This is the main reason of frontal expansion along the main roads.

The area under educational facilities along the main roads has increased to 104.86 percent and 75.82 in hectares. Transport facilities have marked an increase of 40 hectares which is 113.63 percent from 1971 to 2006.

The fourth class of land use is commercial use. This shows highest percentage change with 153.08 percent in the city. There are two important commercial zones i.e. Qilla Road and Model Town market along National Highway No.10. The commercial area has increased mostly along the main roads. Commercial area has expanded rapidly and is characterized by linear pattern along both the sides of National Highway No.10. This is most prominent on National Highway No.10 and Jhajjar road. These areas enjoy better accessibility and lie in very high land value zone. Due to this factor the commercial areas have pushed the residential area and characterized by vertical expansion. Large multiple storey buildings and showrooms have been established in Model Town and other areas.
Map 6.8

ROHTAK CITY
(1971)

LAND USE ALONG THE MAIN ROADS
N.H. 71 TO GOHANA

N.H. 10 TO HISAR

500 METERS BUFFER

TO BHIWANI
Also there are considerable changes in the Services Utilities and Administration area along the main roads showing 103.67 percent. A new water works has been constructed along the Jhajjar road. But industrial development is more along the roads showing 112.67 percent. The growth in residential area is second highest but utilities show less growth in comparison to others which indicates haphazard expansion in the city. This shows that the growth of city is not substantial. The industrial class shows high changes along the National Highway No.10 in the western part of the city as this area is easily accessible. It can be concluded that increase in all these above mentioned categories are on the expense of open and agricultural area. In 1971, the area under open and agricultural land was 429 hectares but in 2006 this area has been decreased to 269 hectares. With the development of urban area there is a negative change in open areas and growth of urban centres always feeds the open area along the main roads and highways.