Part one
Urbanization and Expansion of Aligarh City
Chapter I
Urbanization and Expansion of Aligarh City
Chapter I: Urbanization and Expansion of Aligarh City

1.1 An overview of urbanization of Aligarh city

1.1.1 History of Urbanization

(1) Ancient evolution
(2) Medieval period
(3) British period

1.1.2 Morphology of Aligarh city

(1) Achal Tal area/old part of the city
(2) Upper Kot area/old part of the city
(3) Civil Lines area/new part of the city
(4) Peripheral ring area/new part of the city

1.1.3 Urban growth: Status of city population and area

1.1.4 Urban Landuse

1.2 City Expansion and development of suburbs

1.2.1 Expansion of Aligarh city during the year 1951, 1971, 1991
1.2.2 Expansion of Aligarh city during the year 2000, 2007, 2009
1.2.3 Causes of expansion and development of suburbs

Summary
Today, half of the planet’s population lives in urban areas and the world’s cities and towns are growing at an unprecedented rate. According to the United Nations (2011), the urban areas of the world are expected to absorb all the population growth expected over the next four decades while at the same time drawing in some of the rural population. Globally, the level of urbanization is expected to rise from 50 per cent in 2009 to 69 per cent by 2050. Furthermore, most of the population growth expected in urban areas will be concentrated in the cities and towns of the less developed regions. Asia’s urban population will increase by an estimated 1.4 billion from 1.9 to 3.3 billion, Africa’s is expected to triple from 414 million to 1.26 billion people (UN, 2011). Population growth is therefore becoming largely an urban phenomenon concentrated in the developing world. Among the less developed regions, Latin America and the Caribbean have an exceptionally high level of urbanization (79 per cent), higher than that of Europe (73 per cent). Africa and Asia, in contrast, remain mostly rural, with 40 per cent and 42 per cent, respectively, of their populations living in urban areas (UN Habitat, 2011).

Urbanization refers to a process in which an increasing proportion of an entire population lives in cities and its suburbs. It is simply defined as the shift from a rural to an urban society, and it involves an increase in the number of people in urban areas during a particular year. It is the outcome of social, economic and political development that leads to urban concentration and growth of large cities, changes in land use and transformation from rural to metropolitan pattern of organization and governance (Nsiah-Gyabaah, 2010). Urbanization is the physical growth of urban areas as a result of global change. Urbanization is also defined as movement of people from rural to urban areas with population growth equating to urban migration. It is closely linked to modernization, industrialization and the sociological process of rationalization. Urbanization can be described as a specific condition at a set time, i.e. the proportion of total population or area in cities or towns, or the term can be described as the increase of this proportion over time. So the term urbanization can represent the level of urban relative to overall population, or it can represent the rate at which the urban proportion is increasing (United Nations, 2008).

Historically, the process of urbanization intensified in the wake of the Industrial Revolution in the Western world, which led to increased rural to urban migration. In the non-Western world, however, urbanization is more a defining feature of the twentieth century (United Nations, 2006). As may be expected, the
pattern of urbanization is found to be unequal between developed and developing countries as the majority of the population in developed countries lived in urban areas, while the bulk of the population in developing countries that are concentrated in Asia and Africa lived in rural areas. An inter-regional comparison in Asia reveals that South Asia is more rural and has significantly lower levels of per capita income than other regions. Not surprisingly therefore, the pace of urban change in the South Asian region has been relatively modest, yet urbanization presents enormous challenges due to the extreme poverty and the pressure on urban services that it has brought about (Cohen, 2004).

The developed countries have higher urbanization level (76 per cent in 2000) compared with developing countries (40 per cent in 2000). The urbanization level has almost stabilized in developed countries. Africa and Asian countries are in the process of urbanization. There are marked differentials in the level of urbanization between developed and developing countries. More than three-quarters of the population in developed countries live in urban areas, compared with less than half of the population in developing countries. Nevertheless, by 2015 more than half of the population in developing countries is projected to live in urban areas. From 2000 to 2030, the world’s urban population is projected to grow at an average annual rate of 1.8 per cent, nearly double the rate expected for the total population (United Nations, 2005). Population growth will be particularly rapid in the urban areas of less developed regions, averaging 2.3 per cent per year during this period, and almost all of the world’s population growth is expected to take place in the urban areas of less developed regions.

India shares most of the characteristics features of urbanization in developing countries. The number of urban agglomerations/towns have grown from 1,827 in 1901 to 5,161 in 2001 and reached upto 7,935 in 2011, while the total population has increased from 23.84 crores to 121.0 crores – with the urban population increasing from 2.58 crores to 37.71 crores during the same period (Various Census Reports of India from 1901 to 2011, table 1.1 and fig. 1.1). The pattern of urbanization in India is characterized by continuous concentration of population and activities in large cities. This is manifested in a high percentage of urban population being concentrated in class I cities and its population has systematically gone up over the decades in the last century. The trend in growth in urban population by size classes, over the last century, suggests an increase in inequality in the urban structure. The distribution of
Table 1.1: Population of India by residence (1901-2011)

<table>
<thead>
<tr>
<th>Census years</th>
<th>Number of Urban agglomerations/towns</th>
<th>Total population</th>
<th>Urban Population</th>
<th>Rural population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>1,827</td>
<td>238,396,327</td>
<td>25,851,873</td>
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<tr>
<td>1911</td>
<td>1,825</td>
<td>252,093,390</td>
<td>25,941,633</td>
<td>226,151,757</td>
</tr>
<tr>
<td>1921</td>
<td>1,949</td>
<td>251,321,213</td>
<td>28,086,167</td>
<td>223,235,046</td>
</tr>
<tr>
<td>1931</td>
<td>2,072</td>
<td>278,977,238</td>
<td>33,455,989</td>
<td>245,521,249</td>
</tr>
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<td>1941</td>
<td>2,250</td>
<td>318,660,580</td>
<td>44,153,297</td>
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<tr>
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<td>2,843</td>
<td>361,088,090</td>
<td>62,443,709</td>
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<td>1961</td>
<td>2,363</td>
<td>439,234,771</td>
<td>78,936,603</td>
<td>360,298,168</td>
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<tr>
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<td>2,590</td>
<td>598,159,652</td>
<td>109,113,977</td>
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<td>1991</td>
<td>3,768</td>
<td>844,324,222</td>
<td>217,177,625</td>
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<td>2001</td>
<td>5,161</td>
<td>1,027,015,247</td>
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<td>2011</td>
<td>7,935</td>
<td>1,210,193,442</td>
<td>377,105,760</td>
<td>833,087,662</td>
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</table>

population in different size class is likely to become more and more skewed. The share of class I towns or cities with population size of 100,000 or more has gone up significantly from 26 per cent in 1901 to 70 per cent in 2011 whereas the percentage share of class IV, V and VI towns, together, has gone down drastically from 47 per cent to a low of 10 per cent from 1901 to 2001. This is largely due to the fact that the towns in lower categories have grown in size and entered the next higher category (table 1.2 and fig. 1.2).
Table 1.2: Number of towns and percentage of urban population by size class in India (1901-2011)

<table>
<thead>
<tr>
<th>Census Years</th>
<th>No of Towns by size class</th>
<th>Percentage of urban population by size class</th>
</tr>
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<tr>
<td></td>
<td>I</td>
<td>II</td>
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<td>1901</td>
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<td>1941</td>
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<td>1951</td>
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<tr>
<td>1961</td>
<td>102</td>
<td>129</td>
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<tr>
<td>1971</td>
<td>148</td>
<td>173</td>
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<td>1981</td>
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<tr>
<td>1991</td>
<td>300</td>
<td>345</td>
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<tr>
<td>2001</td>
<td>393</td>
<td>401</td>
</tr>
<tr>
<td>2011</td>
<td>468</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note: NA – Not available

Town/city by size class
Class I: > 100,000 population
Class II: 50,000-100,000 population
Class III: 20,000-50,000 population
Class IV: 10,000-20,000 population
Class V: 5,000-10,000 population
Class VI: < 5000 population

Fig. 1.2: Growth of city by size class in India (1901-2001)

Source: (i) Various Census Reports of India from 1901 to 2011, Registrar General and Census Commissioner, New Delhi, India.

India is becoming increasingly characterized by cities and the proportion living in cities is growing permanently. The population of cities is continuously growing and swelling due to both natural growth and in-migration from the
countryside, expansion of economic activities, infrastructure development especially transport network etc. has helped in extensive urbanization. Consequently urban and suburban areas are expanding. Although there is no national level data available for these unplanned growth and facilities present over here. For the first time in 90 years, India’s urban population has grown more – 91 million more than 2001 Census. Should this be the cause of concern in India where 31.7 per cent people live in urban areas up from 27.8 per cent in 2001 and 25.7 per cent in 1991 (Census of India, 1991, 2001, 2011)? Today, the need to accommodate the rising numbers is extending the city into multiple corridors eating away many villages and small towns along its path. Expansion takes place either in radial direction around the city or linearly along highways. This dispersed development along highways or surrounding the city and its rural countryside is often referred as urban expansion or urban sprawl.

The rapid and phenomenal growth and development of urban areas has been a topic of concern to the planners the world over. Today, with rapid urbanization and industrialization there is an increasing pressure on land, water and environment. As a consequence, the cities are expanding in all directions resulting in large scale urban expansion and changes in rural landuse pattern. The spatial patterns of such changes are clearly noticed on the suburban areas. This unscientific development and growth of cities has brought about loss of productive agricultural lands, forest cover, loss in surface water bodies etc.

This chapter forms the background of the study. In this chapter an attempt has been made to examine the process of urbanization and expansion of Aligarh city. This chapter has been divided into two parts. In the first part an attempt has been made to trace the process of urbanization of Aligarh city which includes its history and morphology, the growth of city population and city area (from 1951 to 2011) and the city landuse. In the second part an attempt has been made to analyze the expansion of the Aligarh city (expansion beyond its municipal boundary from 1951 to 2009) and to explain the causes of this expansion. This chapter is mainly based on secondary sources of data collected from various sources (Aligarh Nagar Nigam, 2001, 2011; Census of India, from 1901 to 2011; Siddiqui, 1981; Atkinson, 1875; Satellite Imageries, 2000, 2007, 2009; Aligarh Development Authority, Aligarh Master Plan, 2001-2021; Singh, 2012) and partly from field work which was conducted during the years 2008 and 2009.
1.1 An overview of urbanization of Aligarh city

Aligarh (27° 53’ N latitudes and 78° 4’ E longitudes), a class I city of medium size, located in the fertile tract of Ganga-Ymuna doab in North India, in the western part of the state of Uttar Pradesh was selected as the study area (figures 1 and 2). The total population of Aligarh city was estimated to be 669,087 in 2001 and 826,825 in 2011 (Census of India, 2001; Aligarh Nagar Nigam, 2011). It is situated along the Delhi- Kolkata railway line about 130 km away from the country’s capital, New Delhi and 1,408 km from Kolkata. The city is the administrative headquarter of Aligarh District, located in the Lodha block of Koil tehsil and lies almost in the centre of the district.

Aligarh which originated in the long hazy past is very much more ancient than it is thought to be, and as it happens with ancient settlements, its name, and sometimes the mere spelling changed from time to time. The earliest name by which the place was known was Kol which has been variously spelt as Kol, Koil and Cole. Origin of this name is debatable for there are various views on it. In Puranas, Kol was malecha (dirty) tribe, or a mixed caste, or an aboriginal caste. In some other ancient texts Kol is variously referred as a place name, mountain, sage, demon and jhil (lake). Koils were a tribe of professional weavers. It is possible that a settlement of these tribes, before Turkish conquest gave Kol its name. The Census of 1872 stated that some 35,000 Koils lived in this district (Siddiqui, 1981). The fact that this area has been known for cotton cultivation throughout recorded history lends credibility to the view of Kol being named after a weaver tribe. Jhils and depressions abound in this area and in due course of time these depressions and jhils have silted up. There might have existed a settlement in the vicinity of a Kol (jhil) and that could have given the place its name. From medieval times onwards the name Kol, Koil has stayed and even today one of the administrative unit (tehsil) of Aligarh District is called Koil. In medieval period it was renamed many a time as Muhammadgarh, Sabitgarh, Ramgarh and Aligarh, though in some case it is referred to change of name of the fort only and the town retained the name of Koil. The last three in fact referred to the fort in the north.

1.1.1 History of Urbanization

The location of the city is an important geographical factor which has influenced its development. Aligarh is a city of great antiquity, wrapping in its fold many dynasties and their rise and fall. It is quite probable that a small proto settlement
of the present city of Aligarh came into being much before the recorded history. One can pay evidence to conviction that the early townships evolved from a growing village of functional diversity in its own esteem rather than the creation of a settlement on a virgin site. Origin of Aligarh goes back to pre-history. The early history of the region is fragmentary and uncertain. The antiquity of district itself is shrouded in mystery as it does not permit a mention in any literary record before the 12th century A.D. The growth of Aligarh city will be discussed under the following periods (fig. 1.3),

(1) Ancient evolution
(2) Medieval period
(3) British period

(1) Ancient evolution

In the earlier part of its history the settlement may have been associated with the kingdom of Surasena which had its capital at Mathura. Explorations undertaken suggests that settlement in this region had begun around 1500 B.C. (Siddiqui, 1981). Carbon datings of the household remains from the mounds make one believe that the ancient culture had established in this area around 1000 B.C. Hindu legends maintain that the ancient big town existed here which was then known as Koil or Kol after the name of an Asara King who was killed by Balarama, the Brother of Krishna. In ancient text, Kol is referred to as jhil (lake). Shallow lakes and depressions abound in this Ganga-Yamuna interfluve. A settlement might have come up on the banks or vicinity of a Kol which subsequently may have been named after it. The original name of the settlement, in all likelihood, is forgotten in the ancient period. Atkinson regards origin of Aligarh as a Buddhist Settlement following 400 B.C. (Atkinson, 1875). Buddhist remains were discovered down the north western edge of the great mound (Upper Fort/Balai Qila). Around 2nd century A.D. the area came under the possession of Mauryas, Sakas, Kushans and Naga rulers (Siddiqui, 1981). Archaeological remains of 5th to 9th century A.D. belonging to Gupta period and the Empire of Harsha have been recovered from Aligarh. In the 9th and 10th centuries A.D. the region remained under the control of Gujar-pratihar.

One of the most ancient localities identified in Aligarh city is the Achal Tal (tank) area in southeast. It is evident that this area dates back to the 10th century A.D. Achaleshwar temple beside the large masonary tank, is presumably the oldest place of
Photo plate (1) Achal Tal area in the old part of the city

Photo plate (2) Jama Masjid located in Uppar Kot in the old part of the city
worship in Aligarh. The massive dimension of the Achal Tal suggests the existence of a full-fledged large settlement in the ancient period.

(2) Medieval period

Medieval period spans from 11th to 18th century. As Aligarh seems to have lost much of its significance by the end of the ancient period, in the historical records of the early medieval period it is rarely mentioned as a place of some centripetal attraction. The city and the region experienced rejuvenation in the medieval period. 12th century A.D. marked the arrival of Muslims in this region. In 1194 the fortress of Kol was taken over by Qutubuddin Aibek of the Slave dynasty. Balban one of the kings of this dynasty constructed a minar (tower) in 1253 just close to the present Jama Masjid on the great mound. This magnificent tower which had architectural resemblance with Delhi’s world fame Qutub Minar was probably demolished in 1862.

From 1194 to 1526 Aligarh was ruled by the Turks or Afghan Kings of Delhi through their governor. During this period, four dynasties namely, the Slaves from 1194-1290, Khilji’s from 1290-1320, Tughlaq’s from 1320-1414 and Lodhi’s from 1451-1526 contributed to the control and construction of Aligarh. Umar Khan built the fort of Mohammadgarh in 1525 which was later known as Aligarh. All through the medieval period Balai Qila area or Upper Kot on the great mound remained the socio-economic and political hub. The fort was so formidable that it had atleast three concrete trenches around it for defence. These trenches, fort walls and bastion could be seen even today although they have been inhabited with the densest population in the city. The great mound of Aligarh, conceals beneath it many cultural realms of the past glory. The importance of Aligarh can be visualized by the fact that it had remained a walled city all though the medieval period with four gates, namely Delhi gate, Turkman gate, Madar gate and Sasni gate. During Akhar’s time Kol was the capital of an administrative Sarkar, Akbar had granted special privilege to Rajputs as landlords of Kol (Siddiqui, 1981). In the 18th century Sabit Khan was appointed as Governor of Kol. He constructed the Jama Masjid in 1724, a market, built up a water supply tank near the highland of Jama Masjid and linked it underground with a lowland tank which was located just east of Nandan or Surjeet Cinema Houses. During this time Kol was a prosperous and a flourishing place.
Fig. 1.3

Aligarh City
Urbanization of the city during various periods

(3) British period

Marathas took over the Aligarh Fort in 1785 and appointed Count De Biogne as their Commander in this region. The French commander in 1971 made Aligarh his headquarters to look after his own interests. Princes of the surrounding states paid respect to the General. After De Biogne, Maratha send general Cullier Perron to take his place. De Biogne and Cullier Perron improved the bastion of the fort and established a cantonment outside the present Sulaiman Hall. In 1802 Perron built a garden for his residence, which is still known as Saheb Bagh. In 1803 General Lake conquered the town of Kol and made Saheb Bagh his headquarters. At the commencement of British rule, in 1804 the district was formally named as Aligarh. In 1842 a post-office workshop was established by Dr. Patan, the Post Master General. The first railway line in the district was opened up in 1863 from Tundla to Aligarh. The history of Aligarh mutiny during 1857 is celebrated with many days of valour. By 30th June, 1857 a new government was established by Subedar Mohammad Ghous Khan with Nasimullah Khan incharge of the city.

From the preceding descriptions it becomes clear that in each period a different area of the city was developed. Thus, there are neatly delineated, areas in the city. Chronologically speaking the ancient area dominated by Hindus, the medieval area, dominated by Muslims, and the modern area of British period inhabited by a mixed Hindu and Muslim population. These areas instead of losing their identity with time have retained it. There are other factors which have strengthened this kind of segregation. The spates of communal riots have strengthened the segregation on communal lines. The city developed in different periods under different rulers and these areas grew independently of each other and till date it remains (fig. 1.3).

1.1.2 Morphology of the city

The Delhi-Kolkata railway line divides the city into two parts: the old part located in the west and the new part located in the east side of the railway line. Aligarh with passages of time had grown into 4 parts (fig. 2 in introduction) and they can be distinguished on the basis of their uniqueness,

1. Achal Tal area/old part of the city
2. Upper Kot area/old part of the city
3. Civil lines area / new part of the city
4. Peripheral ring area/new part of the city
(1) Achal Tal area/old part of the city

One of the most ancient localities identified in Aligarh city, is the Achal Tal area in the south east. The Achaleshwar temple besides the Achal Tal is the oldest place of worship in Aligarh city. This site is located on the east of the medieval zone and is predominantly inhabited by Hindus. In later period development of this area took between the Manik Chowk and Madar Gate which has the wholesale markets. This area has high population density and is congested.

(2) Upper Kot area/old part of the city

The growth pattern and consequent morphological components of Aligarh city are woven around the Upper Kot (Balai Quila) located on a mound, which historically and textually represents the core of the city. For most of its medieval history it was a walled city with gates (Turkman gate, Madar gate, Delhi gate) opening towards Delhi, Agra, Budaun etc. The antiquity of sequential occupation, contained within the wall has produced a high level of congestion and very high population density. With the passage of time vertical growth took place and most of the buildings became two to three stories high. Larger mansions were compartmentalized adding to residential congestion. The congested and overcrowded houses and areas, with the framework of narrow circular lanes, bylanes and blind alleys speak of age and territorial constraints. The mohallas are separated by very narrow lanes. These are just broad enough to allow access to pedestrians and rickshaws. They are choked with traffic in the day time, with labourers pushing hand carts and rickshaws piled high with goods sent to other mohallas for processing, assembling and packaging. All mohallas have shops, household manufacturing units, factories and residences, but retail and wholesale outlets are concentrated on the main roads leading in and out of the city. This area acquired its basic form in the medieval period that is continuing even today. Generally concentric but occasionally sectoral growth has taken place in this area. Fact is that the numerous sarais (inns), which were lying outside the city, along the roads leading to the city have become full-fledged mohallas and were drawn into the city matrix. Mohallas with pre-fix sarai like Rahman, Hakim, Qazi Kaba, Qutub, Mansingh, Virandhavan, Narottam and Mian are all known as sarais. Upper Kot area is largely inhabited by Muslim working class and middle class people. Some of the families trace their history to the medieval period and represents the social elite of the area. Industry and trade has improved the well being of a section of the people. Households
industries like lock, dyes, biscuit, mutry, building fitting etc. which are polluting the environment.

(3) Civil lines area / new part of the city

This area was developed by the Britishers during the nineteenth century. It has been much enlarged now. It is characterized by almost complete segregation from the first and second area. Its remoteness from earlier areas of ancient and medieval settlements speaks of the British intentions of keeping a distance from commoners and from the people to be governed. Development of the railway line in the later half of the nineteenth century, dividing the city into a western and eastern half, made the segregation of this area more pronounced. This segregation however was overwhelmed by the post independence of the city.

The principal lines of development were along the Marris road, University road, Anupshahar road, Ramghat road and The Russel Ganj (now Rasalganj). The grain of this zone has a linear north-south basis. All the aforesaid roads have a north-south trend and seem to have been oriented with reference to the railway station. The British made straight broad roads, buildings set well back on them, Clock tower, Government Press, Church and the Collectorate. The civil lines houses, Aligarh Muslim University campus, the main government offices such as the law court, the main post office, the railway station and residences of the ex- zamindars elite and wealthier businessmen. In the west lies the Industrial Estate which harbours factories and Government Offices dealing with industrial development, such as the District Industrial Centre and Small Scale Industrial Centre (SSCI). This area is sparsely built having large spacious houses with lawns in front and kitchen gardens in the backyard. It presents a refreshing contrast to the congested and dilapidated areas of old city. Gradually this part is also getting congested.

(4) Peripheral ring area/ new part of the city

The district of Aligarh (27°29’ to 28°11’ North latitudes and 77°29’ to 78°38’ East longitudes) has been divided into five tehsils (Koil, Atrauli, Khair, Gavana and Iglass), these tehsils are further sub divided into 12 blocks (Jawan, Dhanipur, Lodha, Akrabad, Khair, Chandaus, Tappal, Atrauli, Bijauli, Gangeri, Gonda and Iglass) and spreads over 1,210 villages. Since Aligarh city is located in Koil tehsil, while its fringe areas spreads over Lodha, Dhanipur and Jawan blocks. The recent growth of the city spreads over these blocks.
Photo plate (3) Clock Tower located in the Civil Line area

Photo plate (4) Government Press building located in the Civil Line area
The growth of Aligarh city started slowly earlier along the municipal margins, but now it spreads beyond 10 km from the city centre due to massive increase in population, commercialization and industrialization. Industries, educational institutions, research and training centres, state institutions, state and central government offices, markets, apartments, residential colonies have come up in the past four decades around the municipal margins, along the 7 main entry metalled roads (Anupshahar road, Ramghat road, GT road (towards Kanpur), Agra road, Mathura road, Khair road and GT road (towards Delhi)). First the development took place around the city margins then by the side of the roads and when they had spread to sufficient distance from the centre of the city, the houses started being built along arcs connecting the two adjacent roads (Singh, 2012).

The peripheral ring does not make a well-demarcated zone but appears in the form of small clusters. Most of them are residential but some are industrial. These areas are well laid out on rectangular patterns. Many of these areas were till recent past villages; well outside the city limits and its infrastructure not well developed but then the sprawling city swapped their lands and occupations. Villages like Kishanpur, Dodhpur, Begpur, Jamalpur, Bhamola, Nagla Baraula etc. witnessed in mute silence their transformation. New industrial and residential colonies have developed, many of them, like the Industrial colony, Medical, Begpur, Kaila Nagar, Dodhpur and Janakpuri colonies. These have developed on the northern circumference of the city. While in the south, Jawalapuri, Mahindra Nagar, Saheb Singh Nagar and Nagala Masani colonies were developed.

1.1.3 Urban growth: Status of city population and area

The increase in the share of people living in urban areas (due to natural growth and migration) plays an important role to the growth of any city. Provisional 2011 Census data shows that more people are moving to towns and cities; almost 1 in 3 Indians now live in an urban centre (Census of India, 2011).

Status of city population

Population size and density provides an essential background to this study. It plays a significant role with respect to city the growth and expansion. The total population of Aligarh city was 669,087 in 2001 and 872,500 in 2011 (Census of India, 2001, 2011; Aligarh Nagar Nigam, 2011). Aligarh is a Class I city due to its population but due to its areal extent it is said to be a medium sized city. A perusal of table 1.3 shows that the city experienced rapid increase in population. The decadal
Table 1.3: Status of Aligarh city population, variations, growth rate and future projections (1951 to 2021)

<table>
<thead>
<tr>
<th>Years</th>
<th>Population</th>
<th>Population variation</th>
<th>Growth Rate</th>
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<td>-</td>
</tr>
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<td>1981</td>
<td>320,861</td>
<td>68,547</td>
<td>27.06</td>
</tr>
<tr>
<td>1991</td>
<td>480,520</td>
<td>159,659</td>
<td>49.76</td>
</tr>
<tr>
<td>2001</td>
<td>669,087</td>
<td>188,567</td>
<td>39.24</td>
</tr>
<tr>
<td>2011</td>
<td>872,500</td>
<td>203,413</td>
<td>30.40</td>
</tr>
<tr>
<td>2021**</td>
<td>1,209,464</td>
<td>336,964</td>
<td>38.62</td>
</tr>
</tbody>
</table>

Note: **Projections are based on geometric extrapolation method
Source: (1) *Census of India, 2001, Registrar General and Census Commissioner, India (Data from 1951 to 2001)
(2) Aligarh Nagar Nigam, 2011, Aligarh
(3) Aligarh Development Authority, Aligarh Master Plan (2001-2021)

Table 1.4: Ward-wise classification of Aligarh city on the basis of population density (2009)

<table>
<thead>
<tr>
<th>Categories/ Population density (sq. km)</th>
<th>No. of wards</th>
<th>Location of Wards</th>
<th>Name of Wards</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density &gt;46,665 Population/per sq. km</td>
<td>19</td>
<td>City Zone 15</td>
<td>Sarai Kaba, Nauner Gate, Delhi Gate, Sarai Bala, Durga Puri, Gambhirpura, Sarai Pakki, Usman Para, Brahan Puri, Tan Tan Para, Kala Mahal, Shivpuri, Rasalganj, Khai Dora, Baniya Para</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil Lines zone 04</td>
<td>Jamalpur, Begumbagh, Nagla Jamalpur, Maulana Azad Nagar</td>
</tr>
<tr>
<td>Moderate density 46,665-20,245 Population/per sq. km</td>
<td>19</td>
<td>City Zone 13</td>
<td>Sarai Garhi, Sarai Lavaria, Sarai Deendayal, Nagla Masani, Krishna Puri, Nai Basti, Sanechari Paith, Sarai Hakeem, Kanwariganj, Shahjamal Area, Bhujpura, Ashok Nagar, ADA Colony Area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil Lines zone 06</td>
<td>Dori Nagar, Naurangabad, Bhamola, Jeewan Garh, Zohra Bagh, Badam Nagar</td>
</tr>
<tr>
<td>Low density &lt;20,245 Population/per sq. km</td>
<td>32</td>
<td>City Zone 15</td>
<td>Indra Nagar Khair road, Nagla Kalar, Pala Sahibabad, Beema Nagar, Numaish Ground, Slaughter House, Kalideh, Sarai Nawab, Fire Brigade, Gandhi Nagar, Kishore Nagar, Avas Vikas Colony (Iglas road), Vikas Nagar ADA Colony, Iglas road pumping station, Manik chaowk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil lines zone 17</td>
<td>Chawani, Kishanpur, Sudampuri, Beg Pur, Dodphur, Badarbagh, Ravan Tila (Jwalapuri), Janak Puri, Nagla Tikona, Lekhraj Nagar, Ghanshyam Puri, Firdaus Nagar, Medical College, University Area, Kela Nagar, Sir Sayyed Nagar, Hamdard Nagar</td>
</tr>
</tbody>
</table>

Total wards 70

Source: Aligarh Nagar Nigam, 2009, Aligarh
Aligarh City
Ward-wise population density
(2009)

Population Density
(person per sq. km)
- High (> 45,665)
- Moderate (46,665 - 20,245)
- Low (< 20,245)

-- Municipal boundary
\(\forall\) Railway line

Source: Aligarh Nagar Nigam, 2009, Aligarh

Fig. 1.4
Photo plate (5) Overcrowding and congestion in old city

Photo plate (6) Traffic congestion in the city
The growth rate of population during 1971 to 1981 was about 27 per cent, during 1981 to 1991 it was nearly 50 per cent and during 1991 to 2001 it was nearly 39 per cent (Census of India, 2001). Geometric extrapolation technique was used to calculate population projections for 2021. Projection shows that population of Aligarh city will reach to be 1,209,464 by 2021 with the growth rate of about 37 per cent (Aligarh Development Authority, Aligarh Master Plan, 2001-2021).

The density of population also varies. Table 1.4 and fig. 1.4 reveals that the core area of the city (15 wards from old and 4 from new part) has high density of population (> 46,665 persons per sq. km). But out of 4 wards of new part of the city, 3 wards (Jamalpur, Nagla Jamalpur, Maulana Azad Nagar) are located in the peripheral zone. About 19 wards (13 from old and 6 from new part) came under the moderate density category (46,665-20,245 persons per sq. km), while 32 wards (15 wards from old and 17 wards from new part) came under the category of low density (<20,245 persons per sq. km). Most of the high density wards lie in the old part of the city. There is no land available in the city centre, which is characterized by overcrowding and congestion and high land prices. People like to settle in the suburban areas which have open space and low land prices.

**Status of city area**

Aligarh city evoked images of a semi pastoral town until fifties but today it has developed tremendously in all spheres. It has grown to be a big city from a very humble beginning due to its site and situation. As per 2001 Census, the total area of the city was estimated to be 44.82 sq. km. A perusal of the table 1.5 shows that the city experienced rapid increase in area. The decadal growth rate of area during 1951 to 1961 was about 99.09 per cent, the area increased from 11.05 sq. km (1951) to 22.0 sq. km (1961). During 1961 to 1971 the growth rate was 52 per cent, in 1971 to 1981 it was 1.79 per cent, in 1981 to 1991 it was 7.78 per cent, and during 1991 to 2001 it was about 22.13 per cent. Calculation by geometric extrapolation method shows that the city area will increase to 78.23 sq. km by 2011 with the growth rate of 74.54 per cent. The Aligarh development authority reports that 114.70 sq. km area will be developed by 2021 (Aligarh Development Authority, Aligarh Master Plan, 2001-2021).
Table 1.5: Status of Aligarh city area, variations, growth rate, and future projections (1951 to 2021)

<table>
<thead>
<tr>
<th>Years</th>
<th>Area (sq. km)</th>
<th>Variations</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951*</td>
<td>11.05</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1961</td>
<td>22</td>
<td>10.95</td>
<td>99.09</td>
</tr>
<tr>
<td>1971</td>
<td>33.45</td>
<td>11.45</td>
<td>52.05</td>
</tr>
<tr>
<td>1981</td>
<td>34.05</td>
<td>0.60</td>
<td>1.79</td>
</tr>
<tr>
<td>1991</td>
<td>36.70</td>
<td>2.65</td>
<td>7.78</td>
</tr>
<tr>
<td>2001**</td>
<td>44.82</td>
<td>8.12</td>
<td>22.13</td>
</tr>
<tr>
<td>2011</td>
<td>78.23</td>
<td>33.41</td>
<td>74.54</td>
</tr>
<tr>
<td>2021</td>
<td>114.70</td>
<td>36.47</td>
<td>46.62</td>
</tr>
</tbody>
</table>

Fig. 1.5: Aligarh City: Growth of city population and area (1951-2021)

Note: **Projections are based on geometric extrapolation method
Source: (1) *Census of India, 2001, Registrar General and Census Commissioner, India (Data from 1951 to 2001)
(2) Aligarh Nagar Nigam, 2011, Aligarh
(3) Aligarh Development Authority, Aligarh Master Plan (2001-2021)

1.1.4 Urban Landuse

Aligarh city is subdivided into 70 wards spread over 427 mohallas and has 102,004 households (Aligarh Nagar Nigam, 2009). The urban landuse of Aligarh city shows that the city covers an area of 44.82 sq. km of which only 67.48 per cent is developed while rest of the area is lying undeveloped. The urban land use pattern shows that there is no clear-cut demarcation between the landuse patterns but the functions are mixed.

Table 1.6 is showing the urban landuse of Aligarh city in 1951, 1971, 1991 and 2001. The future projections for 2021 (Aligarh Development Authority, Aligarh Master Plan, 2001-2021) has also been shown. Increase in total developed area and
Table 1.6: Urban Landuse of Aligarh city (1951 to 2021)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Type of land</th>
<th>1951* Area (hec tare)</th>
<th>1971 Per cent</th>
<th>1991 Area (hect are)</th>
<th>2001 Per cent</th>
<th>2021** Area (hect are)</th>
<th>2021 Per cent</th>
<th>2021 Area (hect are)</th>
<th>2021 Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Developed land</td>
<td>562.35</td>
<td>50.76</td>
<td>1842</td>
<td>52.42</td>
<td>2235</td>
<td>60.90</td>
<td>3025</td>
<td>67.48</td>
</tr>
<tr>
<td>2</td>
<td>Undeveloped land</td>
<td>542.65</td>
<td>49.24</td>
<td>1503</td>
<td>46.58</td>
<td>1435</td>
<td>39.10</td>
<td>1457</td>
<td>32.52</td>
</tr>
<tr>
<td>3</td>
<td>Residential</td>
<td>246.45</td>
<td>43.85</td>
<td>832</td>
<td>45.16</td>
<td>1097.38</td>
<td>49.1</td>
<td>1546.98</td>
<td>51.14</td>
</tr>
<tr>
<td>4</td>
<td>Commercial</td>
<td>35</td>
<td>6.20</td>
<td>93</td>
<td>5.05</td>
<td>136.35</td>
<td>6.1</td>
<td>190.57</td>
<td>6.30</td>
</tr>
<tr>
<td>5</td>
<td>Industrial</td>
<td>20</td>
<td>3.55</td>
<td>68</td>
<td>3.69</td>
<td>73.75</td>
<td>3.3</td>
<td>107.69</td>
<td>3.56</td>
</tr>
<tr>
<td>6</td>
<td>Recreational</td>
<td>04</td>
<td>0.7</td>
<td>12</td>
<td>0.6</td>
<td>8.95</td>
<td>0.4</td>
<td>21.78</td>
<td>0.72</td>
</tr>
<tr>
<td>7</td>
<td>Transport</td>
<td>173</td>
<td>30.78</td>
<td>564</td>
<td>30.68</td>
<td>628.01</td>
<td>28.1</td>
<td>790.13</td>
<td>26.12</td>
</tr>
<tr>
<td>8</td>
<td>Parks &amp; open spaces</td>
<td>16</td>
<td>2.85</td>
<td>45</td>
<td>2.44</td>
<td>46.95</td>
<td>2.10</td>
<td>62.02</td>
<td>2.05</td>
</tr>
<tr>
<td>9</td>
<td>Public utility</td>
<td>43.10</td>
<td>7.66</td>
<td>147</td>
<td>7.94</td>
<td>156.45</td>
<td>7.0</td>
<td>206.31</td>
<td>6.82</td>
</tr>
<tr>
<td>10</td>
<td>Administrative</td>
<td>24.80</td>
<td>4.41</td>
<td>81</td>
<td>4.44</td>
<td>87.16</td>
<td>3.9</td>
<td>99.52</td>
<td>3.29</td>
</tr>
<tr>
<td>11</td>
<td>Total area</td>
<td>1,105</td>
<td>100</td>
<td>3,345</td>
<td>100</td>
<td>3,670</td>
<td>100</td>
<td>4,482</td>
<td>100</td>
</tr>
</tbody>
</table>

Fig. 1.6 (1): Aligarh City: Developed and residential areas (1951-2021)

Source: (1) * Census of India, 2001, Registrar General and Census Commissioner, India (data from 1951-2001)
(2) ** Aligarh Development Authority, Aligarh Master Plan (2001-2021)
particularly in the residential area is observed. The developed city area increased from 50.76 per cent in 1951 to 52.42 per cent in 1971, 60.90 per cent in 1991 to 67.48 per cent in 2001. It has been estimated that by 2021, the developed area will be 114.71 sq. km. The residential area has increased from 43.85 per cent in 1951 to 45.16 per cent in 1971, 49.1 per cent in 1991 and 51.14 per cent in 2001. Future projection shows that by the year 2021, 53.42 per cent of the developed city area will be used for residential purposes (table 1.6 and figures 1.6 (1), 1.6 (2)). Area under other uses like transportation, commercial, industrial and recreational purposes has remained almost the same (1971 to 2001). The Aligarh Development Authority has planned that by 2021, 114.7 sq. km of city area will be developed. Out of which 53.42 per cent will be for residential uses. 2.26 per cent for commercial, 9.40 per cent for industrial, 4.59 per cent for recreational, 9.45 per cent for transport, 9.67 per cent for parks and open spaces, 8.22 per cent for public utility and 2.99 per cent for administrative purposes (Aligarh Development Authority, Aligarh Master Plan, 2001-2021).
1.2 City Expansion and development of suburbs

Like other cities of India, Aligarh had a humble beginning as a trading centre. Its origin dates back to about 1500 B.C. when a Buddhist settlement existed here. During the ancient period development of the city took place around a Hindu temple at the bank of a small lake called ‘Achal Tal’. After a gap of couple of centuries from the end of 12th century Muslims exercised their control over the area. Although it remained a walled city with four gates (Delhi gate, Turkman gate, Madar gate and Sasni gate) but the city developed tremendously and remained an important administrative, industrial and agricultural town. After the final collapse of Muslim rule in mid 19th century, the city passed into the British hands and during this period too the city had witnessed a large scale development, which includes opening of post office (1842) and the first railway line between Aligarh to Tundla (1863). The Britishers developed a separate area of residence and administration in the north and north east of the city in a planned manner.

Although earlier, the growth of city started slowly, but now due to industrialization and urbanization the growth has accelerated. Industries, educational institutions, state and central government offices etc. have come up in the past decades which led to a continuous development and physical growth of the city and helped in developing the suburbs. There is a design in the expansion of the city, the city is crisscrossed by seven inter city metalled roads (Anupshahar road, Ramghat road, GT road (Kanpur), GT road (Delhi), Gonda road, Mathura road, Agra road). First the development took place along the side of these roads and when it has spread to a sufficient distance from the city centre development started along the arcs (wedges) connecting the two adjacent roads.

1.2.1 Expansion of Aligarh city during the years 1951, 1971, 1991

The expansion of Aligarh city from 1951 to 1971 and 1991 has been mapped (fig. 1.7; Singh, 2012) with the help of,

(i) Census of India 1951, 1971, 1991 data
(ii) Topographic sheets no 54I/1, 54E/13 for 1971

Change deduction and visual interpretation techniques were also considered for mapping the sprawling city.
The urban growth (fig. 1.7) in 1951 of the city was mostly confined within the 2 km radius in the east, west and the southern parts. While in the north the city area has formed a bulge extending up to 5 km radius. This bulge was along the Anupshahar road and Ramghat road. After two decades i.e. in 1971 the city had spread in all directions covering almost the whole 4 km radius. While in the north the bulge extended beyond 5 km radius. By 1991 the city has spread almost equally in the east, west and southern portions covering fully the 4 km radius. Except for in the northern portion the bulge along the Anupshahar road had spread up to 7 km radius along the Ramghat road and GT road (Kanpur). But just after 5 years, rapid urban growth was seen. The city covered the 6 km radius in the eastern side along the GT road, on the western side along the main Northern Railway line (Kanpur) and along the Mathura road. Little development was observed along the Gonda road and Khair road. The bulge in the north, along the Ramghat road increased up to 7 km radius. Along the GT road (Delhi) it has spread up to 8 km. The city developed in a dispersed and low-density pattern leaving pockets of vacant lands or undeveloped land. While along the Anupshahar road rapid growth was observed. So it was observed that the urban growth intensified along the main transportation corridors i.e. along the GT road (Kanpur), Mathura road, Northern Railway line (Barielly) and Ramghat road almost in all directions. Urban growth was apparent along the Anupshahar road and Ramghat road in the north. Least growth has taken place in the southeast part along the Mathura road. The development along the main transportation lines has created wedges within the built up area with vacant lands, where the process of intermittent infilling occurs leading to contiguous urban expansion over a period of time (Singh, 2012).

A perusal of table 1.3 reveals that the population growth during all the decades has been stable ranging between 30 to 50 per cent, but there was a sudden drop (27.16 per cent) during 1971-1981 decade and a high increase (49.75 per cent) during 1981-1991 decade due to normal growth and migration from outside the city due to industrialization and other economic reasons. Table 2.3 shows that the city’s built up area which was 11.05 sq km in 1951, increased to 36.70 sq km by 1991. The decadal growth rate of area shows that highest growth (99.09 per cent) in area was during 1951-1961 decade but a sudden drop was observed during decades 1971-1981 (1.79 per cent) and 1981-1991 (7.78 per cent). The Aligarh Municipal Board was established in 1865 and the Aligarh Development Authority in 1991. This has
helped in bringing other developed areas and the municipal limits under an administrative control (Singh, 2012).

1.2.2 Expansion of Aligarh city during the years 2000, 2007, 2009

The expansion of Aligarh city (2000, 2007, 2009) was mapped (figures 1.8, 1.9, 1.10, 1.11; Singh, 2012) with the help of,

(i) Survey of India Topographic map on 1:50,000, 1971
(ii) IRS- 1D Satellite imagery on 1:125,000 scale acquired in 2000
(iii) IRS- P6 Satellite imagery on 1:94,000 scale acquired in 2007
(iv) Google Earth Satellite imagery of 2009

Two satellite data sets were used IRS 1D LISS III MSS data of 2000, band 2 green (0.52-0.59 µm), band 3 red (1.55-1.70 µm), band 4 near infrared NIR (0.76-0.86


Fig. 1.7
µm) and band 5 short wave infrared (SWIR, 1.55-1.70 µm); IRS-P6 (Resourcesat-1) LISS-IV MSS of 2007, band 2 green (0.52-0.59 µm), band 3 red (0.62-0.68 µm), band 4 near infrared NIR (0.76-0.86 µm). Digital classification technique was used on these data sets for preparation of land use/land cover map of 2000 and 2007. NRSA (1995) classification scheme level 1 was adopted for making six major landuse classes i.e. (i) built up land, (ii) agricultural lands, (iii) waste lands, (iv) water bodies and urban, (v) open space and (vi) others (uncultivated land). The area of interest (AOI) was subset from the entire scene from both satellite data. The satellite data were enhanced before classification using histogram equalization for the better interpretation and to achieve good classification accuracy. The images were geo-referenced with the help of survey of India toposheets at a scale of 1:5,000, using Universal Traverse Mercator (UTM) projection/coordinate system, zone 44. IRS ID satellite data was re-sampled to 6 spatial resolutions using nearest neighborhood re-sampling technique in Erdas Imagine software to make it comparable to IRS – P6 data which has 6 m cell size.

The supervised classification was performed using maximum likelihood algorithm (MLC) on the two satellite data sets of 2000 and 2007. The classified data was recorded to remove the spectral mixing and it was validated using Google Earth image for about 35 locations covering the whole study area, where there were doubts about the classification.

Thereafter, confusion matrix was generated for accuracy assessment for the classified landuse/land cover map of both 2000 and 2007. The result shows an overall accuracy (78.94 per cent), user accuracy (75.64 per cent), producer accuracy (77.56 per cent) for classified map of 2000 and overall accuracy (81.91 per cent), user accuracy (73.64 per cent), producer accuracy (78.96 per cent) for classified map of 2007. Both the landuse maps were then overlaid on one another in Arc GIS software to assess the urban expansion in Aligarh district and then the statistics were generated using attribute tables of the landuse/landcover maps.

Urban expansion for the years 2000 and 2007 are shown in figures 1.8 and 1.9. Another map has also been prepared (fig. 1.10) to show the expansion from the city municipal boundary both for the years 2000 and 2007. The urban area of Aligarh city consists of the old thickly populated core constituting the ancient/old part of the city (Achal Tal and Upper Kot area) which was in existence even before the Aligarh Master Plan (1981). This part is fully covered the densely populated and congested area. There is no vacant land for any kind of development. Increasing population is the most
significant driver of the expansion of the city. Individuals leave the countryside in pursuit of better quality of life and economic security, so basic necessities have to be provided. As a result there has been pronounced expansion beyond city’s municipal boundary. Upto 1971, the urban area of Aligarh city was confined within the municipal limits and by 1991 low density sprawl was observed whereby the growth of the city took place along the margins of the core area necessitating piecemeal extension of basic urban infrastructures (water, sanitation, electricity and roads).

Fig. 1.10 shows that urban expansion beyond the city’s municipal boundary. Much of the development has occurred in a spontaneous, haphazard and unplanned manner. What were initially rural villages have now been transformed into suburbs having residential colonies, commercial and industrial complexes. The pattern of growth has changed from low density to high density ribbon sprawl as it evident from fig. 1.8 of 2000. High density expansion could be seen also along the wedges of Ramghat road and GT road (Kanpur) and Agra road. Fig. 1.9 is showing the urban expansion in 2007. This figure shows the extensive ribbon expansion particularly along Ramghat road. The city has expanded upto Harduaganj, a small urban centre lying 15 km away from the city. Field surveys revealed continuous development of residential colonies, educational institutions, commercial and industrial complexes. Hardly any patch of vacant land could be seen along this road. Another extensive expansion could be seen along GT road (Kanpur), GT road (Delhi) and along Anupshahar road. Very high density expansion could be observed along the wedges of Ramghat road and GT road (Kanpur), Ramghat road and Anupshahar road, GT road (Kanpur) and Agra road, Anupshahar road till the Northern railway line and between Khair road and Gonda road. This shows that many surrounding villages have been swallowed. Leapfrog development could be observed mainly in the eastern, northern and southern portions of the city. Fig 1.10 is showing the city expansion in 2000 and 2007. Ribbon sprawl along the Ramghat road and GT road (Kanpur) has increased in length and width, but there has been substantial low/high density development along the eastern fringe of the city. Leapfrog development could also be observed along the eastern part (Singh, 2012).

Measuring expansion provides an overview of where growth is occurring and where it is likely to develop in future, this will help in the identification and assessment of threats that confront the environment and natural resources.
Observation of figures 1.7, 1.8, 1.9, 1.10, 1.11 and table 1.7 helped in throwing light on the following facts:

- The urban area of Aligarh in 1971 measured 17.32 sq. km and comprised mainly of the ancient core lying almost entirely within the then municipal limits. This is borne out by an appraisal of the SOI topographic map of 1920-1921. The only additions over the 1921 limit are the small ribbon expansion which is evident along the Delhi, Khair, Ramghat and Anupshahar roads. These are less than 2 km in length and constitute a total area of about 1 sq. km population density in 1971 was 14,500 persons per sq. km.

- By 1991, the urban area had increased by about 18.07 sq. km. The growth was mainly on the northern, eastern and southeastern side. This represents an average growth rate of 0.45 sq. km per year. About 9.05 sq. km of the urban area extended beyond the municipal limits. Population density increased to about 16,500 persons per sq. km.

- The 10 year period between 1991 and 2001 witnessed a further expansion of the urban area by 11.16 sq. km, mainly along the Delhi, Khair, Gonda and Etah roads, and the northern fringe. This represents a growth rate of 1.12 sq. km per year. The annual average population growth rate for the 1990s was 3.92 per cent per annum. Population density by 2001 increased to about 16,600 persons per sq. km.

- Measurements made in the Quick Bird imagery of February 05, 2006 revealed an increase in the urban extent by 10.26 sq. km. The six year period between 2001 and 2007 witnessed an increase of 1.71 sq. km per year. There has been a rapid development of ribbon sprawl along the Delhi, Etah and Atrauli highways, all of which are major transportation corridors linking Aligarh with Delhi, Kanpur and Bareilly (also Moradabad and Rampur) respectively. Table 2.5 shows the pattern of population growth and extension of the urban area from 1951 to 2007.

- The population of Aligarh city in 2007 has been estimated on the basis of 1991 and 2001 Census data, which works out to an annual average growth rate of 3.36 per cent. The estimated population for 2007 works out to 789,529.
Aligarh City
Urban Expansion in 2000

Northern Railway line to Delhi
GT Road (Delhi)
Khaiz Road
CNG Road
Motihari Road
Agra Road

Source: (i) IRS – 1D, Satellite Imagery, 2000

Fig. 1.8
Aligarh City
Urban Expansion in 2000 and 2007

Source: (i) IRS – 1D, Satellite Imagery, 2000 and 2007
Publishing Corporation, New Delhi.

Fig. 1.10
Aligarh City

Source: (i) IRS-1D, Satellite Imagery, 2000 and 2007
(ii) Google Imagery, 2009

Fig 1.11
Table 1.7: Status of Aligarh city population, total area, urban area and variations (1951 to 2007)

(1) Population and Area

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Urban area</th>
<th>Increase from previous decade</th>
<th>Percentage increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (sq. km)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1951</td>
<td>141,668</td>
<td>11.05</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1961</td>
<td>185,020</td>
<td>13.34</td>
<td>2.29</td>
<td>20.72</td>
</tr>
<tr>
<td>1971</td>
<td>252,314</td>
<td>17.32</td>
<td>3.98</td>
<td>29.84</td>
</tr>
<tr>
<td>1981</td>
<td>320,816</td>
<td>22.10</td>
<td>4.78</td>
<td>27.60</td>
</tr>
<tr>
<td>1991</td>
<td>480,520</td>
<td>29.12</td>
<td>7.02</td>
<td>31.76</td>
</tr>
<tr>
<td>2001</td>
<td>669,087</td>
<td>40.28</td>
<td>11.16</td>
<td>38.32</td>
</tr>
<tr>
<td>2007</td>
<td>789,529</td>
<td>50.54</td>
<td>10.26</td>
<td>25.47</td>
</tr>
</tbody>
</table>

(2) Municipal limits of Aligarh City and urban area

<table>
<thead>
<tr>
<th>Year</th>
<th>Municipal area (sq. km)</th>
<th>Urban area (sq. km)</th>
<th>Area outside municipal limits</th>
<th>Municipal area with no development</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>11.05</td>
<td>11.05</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1961</td>
<td>22</td>
<td>13.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1971</td>
<td>33.45</td>
<td>17.32</td>
<td>0.43</td>
<td>15.43</td>
</tr>
<tr>
<td>1981</td>
<td>34.05</td>
<td>22.10</td>
<td>3.17</td>
<td>7.05</td>
</tr>
<tr>
<td>1991</td>
<td>36.70</td>
<td>29.12</td>
<td>9.05</td>
<td>4.51</td>
</tr>
<tr>
<td>2001</td>
<td>44.82</td>
<td>40.28</td>
<td>14.22</td>
<td>3.21</td>
</tr>
<tr>
<td>2007</td>
<td>62.05</td>
<td>50.54</td>
<td>17.74</td>
<td>2.67</td>
</tr>
</tbody>
</table>

(3) Increase in urban area and population

<table>
<thead>
<tr>
<th>Period</th>
<th>Population</th>
<th>Urban area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net increase</td>
<td>Percentage increase</td>
</tr>
<tr>
<td>1951-1961</td>
<td>43,352</td>
<td>30.60</td>
</tr>
<tr>
<td>1961-1971</td>
<td>67,294</td>
<td>36.37</td>
</tr>
<tr>
<td>1971-1981</td>
<td>68,502</td>
<td>27.15</td>
</tr>
<tr>
<td>1981-1991</td>
<td>159,704</td>
<td>49.78</td>
</tr>
<tr>
<td>2001-2007</td>
<td>120,442</td>
<td>18.00</td>
</tr>
</tbody>
</table>

Note: Projections are based on geometric extrapolation method.
Source: (1) Census of India, 2001, Registrar General and Census Commissioner, India (Data from 1951 to 2001)
(2) Aligarh Development Authority, Aligarh Master Plan (2001-2021)
It is noteworthy that whereas the national decadal growth rate of population for 1991-2001 is 21.43 per cent (Census of India, 2001), the growth rate for Aligarh city during the same period is 39.24 per cent almost twice the national growth rate. This is marginally less than that of the national capital, which stands at 46.31 per cent.

1.2.3 Causes of expansion and development of suburbs

The process of urbanization is fairly contributed by population growth, migration and infrastructure initiatives resulting in the growth of villages into towns, towns into cities and cities into metros. This study points towards some of the causes of expansion of Aligarh city and development of suburbs

- Population growth
- Economy
- Proximity to resources
- Infrastructure development especially roads
- Service facilities

Like any other city of India, Aligarh city (average density 18,231 person/sq. km) has high density of population (> 46,665 person/sq. km) especially in core areas which is characterized by lack of open space, congestion and high land prices so people have moved out to the fringe areas (Fig. 1.11). There is growth of residential colonies, educational, commercial, industrial, recreational, and health facilities. People settle in those areas where amenities and facilities are available. So these are the other important associated drivers of urban growth in the suburbs. This has been examined in Chapters III and IV.

Since in the expanded areas land is available at comparatively lower prices and this area is away from city congestion and pollution, some of the neo-rich and upper class people of the city and the migrants have also purchased land from colonizers at reasonable prices and have constructed their homes here. Due to urban growth in these areas planned development has started. Residential homes/apartments are being constructed and people are living here.

The results of field surveys helped in the identification of the causes of urban expansion and development of suburbs,

- Lower land prices as compared to the main city
- Availability of un-built agricultural land
• High rate of urbanization and rapid development of other activities
• Availability of some municipal services in mixed development areas without paying for it
• Lower taxes on industries
• Influence of speculators on the agricultural land owners for selling land to developers
• Results of failure to fulfill the demand of urban infrastructure and services in the city

• Lower land prices as compared to the main city
  Land is available in the suburban/fringe areas at comparatively lower prices as compared to the main city and this area is also away from city congestion and pollution. So some of the neo-rich and upper class people of the city, land owners and migrant labourers from the surrounding villages purchased land from the colonizers/developers at reasonable prices, constructed their homes and are living here.

• Availability of un-built agricultural land
  This area is the outer parts of the villages. So there is availability of uncultivated agricultural land. This open agricultural land is suitable for construction of single homes/apartments, schools, commercial complexes and industries.

• High rate of urbanization and rapid development of activities
  Population of India has increased at a faster rate. The population of Aligarh city has also increased from 0.7 million in 2001 to 0.8 million in 2011 (Aligarh Nagar Nigam, 2011). This tremendous increase in population leads to the high rate of urbanization and rapid development of activities among the people.

• Availability of some municipal services in mixed development without paying for it
  Some municipal services are easily used by the residents living in the suburban areas because they live just beyond the city limits. Although municipal authority provides all the basic services to the residents living within the city limits and the residents paying taxes for it. But the residents living just beyond the city limits use these services without paying taxes for it.
• **Lower taxes on industries**

   It is a well known fact that all kind of taxes are much higher in the city as compared to the rural areas. The industries which developed in the suburban areas are not registered by the city authorities. So the owner of the industry paid lower taxes to the government i.e. at rural tax rate.

• **Influence of speculators on the agricultural land owners for selling land to developers**

   Farmers/land owners are highly influenced by the colonizers/developers. The farmers sell off their land to the colonizers/developers in anticipation of the city growth – population and area are getting higher land prices. But they finally sold their land to the colonizers/developers at throwaway prices.

• **Results of failure to fulfill the demand of urban infrastructure and services in the city**

   Due to rapid increase of city population, main city becomes congested, polluted and municipal authority could not fulfill the demand of their residents. So the residents migrated from the main city, constructed their houses in the suburbs and managed all the urban infrastructure and services according to their need.

**Summary**

This chapter forms the background of the study. It throws light on the process of urbanization and expansion (from 1951 to 2009) of Aligarh city and its causes. It shows that,

• Urbanization of Aligarh city started from the ancient period with a Buddhist Settlement in 1500 B.C. and continued during the medieval and British periods. During the ancient period growth took place around the Achal Tal areas which has the most ancient development of settlements around Achaleshwar temple. During the medieval period development took place around Balai Qila or Upper Kot on the great mound. During the British period development took place on the eastern side of the railway line. This was a new area which developed further away from the old area which developed during ancient and medieval periods. Chronologically speaking the ancient area was
dominated by Hindus, the medieval area by Muslims and the modern area was inhabited by a mixed Hindu and Muslim population.

- A similarity existed between the process of urbanization and the morphology of the city. Morphologically the city is divided into four parts – (i) Achal Tal area, (ii) Upper Kot area (in the old part of the city, located on the western side of the Delhi-Kolkata railway line) and (iii) Civil lines area (in the new part of the city, located eastern side of the Delhi-Kolkata railway line) and (iv) the peripheral ring area (developed around the city both in the old and new part). Achal Tal and the Upper Kot areas are the most ancient areas having high population density and is congested. The Civil lines area which was having open spaces but is now becoming congested.

- Aligarh, according to its population is a class I city but due to its area it is called as a medium sized city. Aligarh city’s population increased to be 0.8 millions in 2011, from 0.7 millions in 2001 and 0.4 millions in 1991. The average density of city population was 18,231 person/sq. km in 2009. The density in the different wards of the city varied, it ranged between > 46,000 to < 20,000 person/sq. km. The core areas have the highest density > 46,000 person/sq. km.

- The urban landuse of Aligarh city shows that the city covers an area of 44.82 sq. km of which only 67.48 percent was developed while rest of the area is lying undeveloped. Rapid increase in total developed area particularly the residential area was observed. The developed area of the city increased from 50.76 per cent in 1951 to 52.42 per cent in 1971, 60.90 per cent in 1991 to 67.48 per cent in 2001. It has been expected that by 2021 about 114.71 sq. km will be developed. Area under urban landuse shows that the residential area has increased very rapidly from 43.85 per cent in 1951 to 45.16 per cent in 1971, 49.10 per cent in 1991 and 51.14 per cent in 2001. Future projection shows that by the year 2021, 53.42 per cent of the developed city area will be used for residential purposes. Area under other uses like transportation, commercial, industrial and recreational purposes has remained almost the same (1971 to 2001).

- Urban expansion and development of suburbs beyond the city municipal boundary is conspicuous and much of the development has occurred in a
spontaneous, haphazard and unplanned manner. The rural villages have now been transformed into suburbs where residential colonies, commercial and industrial complexes have developed. The pattern of growth has changed from low density to high density expansion along the roads and along the wedges especially along Ramghat road and GT road (Kanpur) and Agra road. The extensive ribbon sprawl was seen particularly along Ramghat road. The city has expanded upto Harduaganj, a small urban centre lying 15 km away from the city. Continuous development of residential colonies, educational institutions, commercial and industrial complexes could be observed. Hardly any patch of vacant land could be seen along this road. Another extensive expansion could be seen along GT road (Kanpur), GT road (Delhi) and along Anupshahar road. Very high density sprawl could be observed along the wedges of Ramghat road and GT road (Kanpur), Ramghat road and Anupshahar road, GT road (Kanpur) and Agra road, Anupshahar road along the Northern railway line, between Khair road and Gonda road. This shows that many surrounding villages have been swallowed.

- Field surveys helped in identifying the causes of urban expansion. These are lower land prices, availability of un-built agricultural land, high rate of urbanization and rapid developmental activities, availability of some municipal services in mixed development areas without paying for it, lower taxes on industries, influence of speculators on the agricultural land ownership for selling land to developers and results of failure to match demand of urban infrastructure and services.