Singh (1965) has described that the city structure consists of land activities and infrastructure in which the city exerts influence on socio-economic structure and helps formation of land use patterns. Urban morphology refers to physical arrangement of structure of a town, its pattern of streets, building blocks, individual buildings, their different functions, densities and layouts (Know and Wareing (1976)). Prabhu (1979) evaluated the internal structure of different urban centers. Kulkarni (1979) made a study pertaining to pattern and density of houses in Central Business District areas of Nasik city. The spacious structure of the city is the product of competitive interaction between its people, market facilities, transportation, communication agencies, and type of functions. It tends to follow definite pattern modified by geographic and local cultural conditions. Demographic growth stimulates structural changes through multiplier effects and attracts immigrants. The increasing rapid rate of growth of urban population and uneven nature of its growth have played an important role in altering the nature, structure, morphology and pattern of urban centers. He focused on functional grounds of the city on the basis of its morphology. He carried out study on Bangalore city. During the pre-industrial society there was structural unconformity and slowly in the post industrial society there is a slow transportation development in the urban structure. According to Prakasa Rao (1983) the structure, pattern of the urban sprawl and population density is influencing the morphology of an urban area. Anirudha Sharma (1985) discussed on impact of urban morphology and growth patterns of selected Indian cities. Abrol (1986) studied the urban morphology of Katra town of Jammu Kasmir. Pathan et al., (1989) has mapped the urban land use of Bombay metropolitan region using Remote sensing data. Pathan et al., (1991-a) has studied the urban land use of Calcutta metropolitan development.
authority area using Remote sensing techniques. Similarly Pathan et al., (1991-b) has studied the urban land use of Ahmadabad urban development authority area using Remote sensing data. Kammar (1995) has studied the morphology of industrial town Dandli. The study of urban morphology is concerned with the ground plan of streets, forms and materials of buildings and functional structure of the town. The arrangement and the layout of buildings influence the morphology of the urban area. The internal structure of the city is complex and it is essential to study the basic dimensions of variations with in a city. Madavi Lata et al., (2001) have studied the urban sprawl of Hyderabad city. The role of Remote Sensing and GIS in urban land use planning of Ahmadabad city and its surrounding environs has been described by Pathan (2002). The spatiotemporal growth of cities is possible through Remote sensing and Geographic information system techniques (Sudhira et al., 2003). Nanda Tina (2005) has studied the urban sprawl and occupational change of Raipur city. Anji Reddy (2006) described that the GIS is a decision support computer based system which has wider application in urban studies. Ramachandra and Jagadish (2007) have concluded that Remote sensing and GIS techniques are highly useful on urban sprawl studies. Mallikarjun S.Kurani (2007) has made an attempt to bring out the urban growth and its impact on environment of Belgum city. Lakshmanan (2009) stated that the Science and Technology of Remote sensing play a crucial role in studying and monitoring morphological changes in the urban areas. Illangovan (2009) described that Remote sensing techniques has a wider application in urban studies particularly in land use and land cover classifications. Awol Akmel Yusuf (2010) studied the urban sprawl and urban growth of Addis Ababa city of Ethiopia through Remote sensing and GIS data. Land use and land cover studies could be carried out through image
processing in which satellite imagery is subjected to image restoration, image
enhancement and image transformation.

Hindupur Municipality is located at 13° 15' N latitude and 77° 30' E longitude
at an altitude of about 624 meters above mean sea level on the broad gauge section of
south western Railway connecting, Bangalore and Hyderabad cities. The Municipality
spreads an area of about 3,816 hectares with a population of about 1,25,074 in 2001.
Out of this 64,132 are male, 60942 are female. The people in Hindupur Municipality
comprise Hindus of about 67%, Muslims of about 29%, Christians and others of about
4%. Out of the total population schedule caste and schedule tribe people constitute
11,923 and 1,089 respectively. The other category population is about 1,12,062. There
are about 30 wards in the Hindupur Municipality. There are about 42 notified slums
with a population of about 42,024. People in notified slums constituting 34% of the
total population of the Municipality as per the 2001 Census.

**Historical growth of Hindupur Municipality**

The town was formed part of Vijaya Nagara empire during 14th century. It was
under the influence of Kuthubshahis in 1589 A.D, Moghals in 1687 A.D and Nawabs
of Kadapa. The town was occupied by Palegar of Bellary in 1753 A.D. The place was
under the position of Hyder Ali in 1775 A.D. and was under the control of Tippu
Sultan in 1792 A.D. The British occupied the Hindupur territories in 1800 A.D. and
was in the jurisdiction of Anantapur district. Sir Thomas Manro was selected first as
Collector of the Anantapur District. After the country’s independence on 15th August,
1947 the National Government took over the India’s administration from British. In
1953 the states were reconstituted on linguistic base and Hindupur became the part of
Anantapur district of Andhra Pradesh in November, 1956. The Hindupur received its
name from a Maratha chieftain Morari Rao. It is widely believed by scholars and
historians that the name itself was taken from that Chieftains’s father Hindoji Rao. Hindupur town was called after his name. The town has an average literacy rate of 62%. Telugu, Urdu, Kanada are widely spoken. This town is located at about ten kilometers north of Karnataka state. Hindupur is a major health center and attracts patient from Gorantla, Penukonda, Pavagada and Madhugiri, Hindupur is known for famous goods like silk sarees, jaggery, tamarind and red dry chillies. Majority of the people in Hindupur are engaged in trading and selling activity of silk, jaggery, tamarind and red dry chillies. Huge trucks, iron work and automotive body construction industries exist in Hindupur. Hindupur is a good trade and commerce center. It is known for its jewellery business also and many gold merchants can be found along the main bazaar of the Hindupur town. The growth of town during the Vijaya Nagara period, Kuthubshahis, Moghals, Nawabs, Nizams, Hydar Ali, Tippu Sultan and British period was not recorded. However in 1920 the Hindupur Municipality was confined to a contiguous development in the old town area with an area of about 60 hectares.

In 1901 the total area of Hindupur Municipality was 12 hectares. Out of these 6 hectares was under residential, one hectare was under commercial, one hectare was under public and semi-public offices, 2 hectares was under Transport and Communications, one hectare was under water body and one hectare was under Agriculture and vacant land.

In 1911 Hindupur grew into an area of about 27 hectares. Out of this area 15 hectares was under residential, 1 hectare commercial, 2 hectares was under public and semi-public offices, 3 hectare was under transport and communication, 1 hectare was under water body, 5 hectares was under agriculture and vacant land. In 1920
Hindupur was constituted as grade – III municipality and the election to the first council was held in 1920. The area of Hindupur Municipality was 60 hectares in 1921. Out of the total area 35 hectares was under residential area, 2 hectares was under commercial, 1 hectare each was under industries, recreational and water bodies, 5 hectares was under public and semi-public offices, 10 hectares was under transport and communications and 5 hectares was under agricultural and vacant land. In 1931 the area of Hindupur Municipality was 112 hectares. The growth was almost linear on either side of the major state highway. The total area under residential was 70 hectares in 1931, commercial area was 5 hectares, Industrial area was 3 hectares, recreational area was 3 hectares, public and semi-public area was 3 hectares, transport and communications area was 15 hectares, water bodies was 2 hectares, agriculture and vacant land was 4 hectares. During 1941 the Hindupur Municipality was with an area of about 123 hectares. There is an increase in all categories of land use in Hindupur Municipality from 1931 to 1941. During 1951 Hindupur Municipality was an area of about 178 hectares and Hindupur was upgraded to grade – II municipality in 1952. The eastern and western villages were added to Hindupur Municipality in 1951. Overall there was an increase in the land use categories from 1941 to 1951. During 1956 the new office building for Hindupur Municipality foundation was laid. In 1958 and 1959 the protected water supply was first supplied to Hindupur Municipality. In 1961 the Hindupur Municipality was expanded to 364 hectares and by 1971 the municipality was expanded to 834 hectares with residential area of about 254 hectares, commercial area of about 25 hectares, 10 hectares of about industrial area, 10 hectares of about recreational area, 30 hectares of public and semi-public offices, 80 hectares of transport and communications, 50 hectares of water bodies and 375 hectares of agricultural and vacant land. There was no change in area from 1971 to
It was remained as 834 hectares. Hindupur was upgraded as Grade-I municipality in 1970 and it was upgraded as special grade municipality by 1989 with the merger of 6 panchayats like Mothukupalli, Sadlapalli, Kollakunta, Melapuram, Muddireddipalli and Singireddipalli. Hindupur was expanded to 3,816 hectares in 1989. The merger of 6 panchayat has made the major tanks in north east, south west direction to be part of Hindupur Municipality. The total area of water bodies was expanded to 320 hectares. The total residential area in 1991 was 534 hectares. There was no change in the municipal limits from 1991 to 2009. It remained to be 3,816 hectares. The change is found only in expansion of residential area from 534 hectare in 1991 to 1,195 hectares in 2009. Similarly the growth was found in commercial, industrial, recreational, public and semi public and transport and communications. The water bodies remained as 320 hectares during 1991 and 2009. However the agriculture and vacant land which was 2,652 hectares has reduced to 1,751 hectares due to expansion of residential, commercial, industrial, recreational, public and semi-public and transport and communications areas. About five stages in the morphological growth of Hindupur Municipality was noticed. In stage 1 it was 27 hectares and in stage 2 it was 112 hectares. In stage 3 the Hindupur municipality was 178 hectares and in stage 4 in 1981 the Hindupur Municipality was 834 hectares. In the stage 5 in 1991 the Hindupur Municipality area was 3816 hectares. Morphologically there was a growth from 12 hectares in 1901 to 3816 hectares in 1991. The growth in Hindupur Municipality from 1901 to 1991 was about 318 times. In other words the Hindupur Municipality has aerially expanded from 12 hectares to 3816 hectares. The urban sprawl of Hindupur Municipality is towards north – south direction in 1,2 and 3 stages (Fig 3.1). During the 1st stage the growth was concentrated to ward numbers 6, 7, 8, 10, 11, 15 and 16 in the central zone. In the 2nd stage the expansion of the town was
towards southern and western side. The growth was expanded toward ward numbers 12, 13, 14 parts of 15 and 16. In the 3rd stage the growth of Hindupur Municipality was towards north of ward Numbers 6 and 16. The growth was found in 1, 2, 3 and part of 4 and 17. During the 4th stage the growth of Hindupur Municipality was expanded towards eastern and western side of the core areas. It was expanded to ward Number 4, part of ward numbers 5, 21, 23 and 24. In the 5th stage the 6 panchayats located in the western, southern and northern side of the Hindupur Municipality was merged. The concentration of residential area was high in the ward numbers 1, 2, 3, 6, 7, 8, 9, 10, 11 and 20. Later the growth has taken place towards eastern side consisting of D.B.Colony, Sreekanthapuram, Prasanthan Ramaiah Colony, Laxmipuram, Naneppa Nagar, Rahamathpur and Model Colony. During the same period the R.T.C.Colony, Shanti Nagar, Thyagaraja Nagar, Balaji Nagar, Satyasai Nagar, Gandhi Nagar and Chowdeswari Colony was developed. The recent growths are Aravind Nagar, Shivabalayogi Nagar, Subhash Nagar, Lakshminagar, Prasanthi Nagar, Housing Board Colony, Teachers colony and N.T.R.Colony. The vacant and agricultural land of about 1751 hectares covering 45.88% of the total municipal area is found in the western side, south eastern side, northern side and northwestern side. Presently growth is taking place along arterial roads leading to Anantapur, Bangalore, Parigi and Lepakshi roads.
STAGES IN THE MORPHOLOGICAL GROWTH OF HINDUPUR MUNICIPALITY

Fig 3.1

STAGES OF MORPHOLOGICAL GROWTH

- Stage 1: 1911
- Stage 2: 1931
- Stage 3: 1951
- Stage 4: 1981
- Stage 5: 1991