CHAPTER VI

MORPHOLOGICAL STRUCTURE

There are many contrasts in function, morphology and forms of metropolises in different culture areas. Indian metropolises are quite complex in origin, function and morphology. They have been well characterised by Deshpande (1941) as lacking in basic unity of layout and function.

Spatial Pattern

Geographers and Sociologists have devised several ways to describe and analyse the spatial arrangements of a metropolis. The most commonly referred to are Burge's (1923) concentric zones, Hoyt's (1939) Sectors, star-shaped configurations and Harris & Ullman's (1945) multiple nuclei models. According to the first view, a metropolitan area tends to resemble a series of concentric zones, differentiated by type of land-use and structure. Growth proceeds as the result of pressure from the centre causes one zone to expand into the next. At the core is the CBD and the adjacent industrial areas. Surrounding it is a transitional zone. It is within this hypothetical circle that many of today's urban redevelopment projects are taking place.
The sector concept is a modification of the concentric zone pattern. Questioning the symmetry or homogeneity of such zones, it holds that growth occurs in sectors which extend radially from the centre towards the periphery of the area. Thus a high rent apartment neighbourhood may develop on one side of the CBD or core zone and a low income residential area inhabited by a racial minority group on the other. In the process of growth each is likely to expand across the concentric zones in the direction in which it started. In the Cannaught Place of Delhi, a somewhat ring formation can be noticed. In the planned city of Chandigarh sector-development is clearly manifested. The star shaped pattern is a further refinement of the sector theory. It views urban growth as a linear development along the main radials - the roads and transportation arteries that converge on the central core. This type of development was first noticeable along the street car routes and the railroad commuter lines that provided the connecting links between centre and periphery. The spatial pattern rejects the notion that the community is uni-centred as the other theories lead one to assume. Pointing out that many phenomena of urban life occur in clusters, it denies that the round of daily life revolves mainly about a single centre. According to this concept, modern forms of transportation and communication have
brought into being a sharply etched multi-centred community pattern. Formerly, semi-independent communities were drawn into close contact with one another as well as with the major centre. Clustered about the core is a constellation of sub-centres. Such centres are common in Calcutta, Delhi and Bombay.

**Standard Models and Indian City Forms**

However, with the passage of time, development of the intervening land has created a high degree of circumferential movement and made all these three patterns less distinguishable. These types of urban growth configurations are not likely to be found in their true form in any existing metropolises of India. One or the other may be more dominant or noticeable in individual areas, but generally speaking the pattern will embody characteristics of each. In fact, most urban agglomerations now resemble great spreading circular or semi-circular masses of land and buildings. All these four theories are useful in analysing metropolitan growth patterns, although the multi-centred concept appears to be the most meaningful and realistic in India. A number of methods are advocated by planners to give direction to ever-growing metropolitan centres. In the Grid Pattern system (Chandigarh) the growth results in the spread of the grid. The radial concentric
pattern or centripetal form consisting of a series of geometric radials are found in parts of New Delhi, (near Ring Road) as designed by Sir Edwin Lutyens.

The examples of these typical theoretical patterns as postulated by western geographers are far to seek in India. On the contrary, a majority of Indian metropolises have checkered historical antecedents. They grew as politico-economic centres of kingdoms or principalities of local chiefs. Owing to the fear of invasion they were built on commanding situations, on defensible sites, on the river banks. Houses were huddled together in a compact manner and in many cases the cities were fortified with walls (Delhi, Hyderabad), resulting in greater compactness and irregular pattern of streets, structure and activities. Their original function was to control neighbouring territory. Gradually it was bound to perform other functions like trade, commerce etc. The ancient cities like Benaras, Allahabad, Calcutta and Delhi, located on the bank of the holy Ganga and Jamuna are centres of great religious importance and contain a large number of population devoted to religion. Religious sentiment and tradition have favoured their continued growth in modern times.
Brush (1962) has studied the morphology of Indian cities in detail. His findings are also applicable to the metropolises of India. From his study, it has been clear that every metropolis in its pre-British days shows a striking contrast between the indigenous part and the non-indigenous or European part. It contains a congested old section, adjacent to which may be found carefully planned and often spacious sections dating from the British period. The port cities of Calcutta, Bombay and Madras exhibit a remarkable blending of Indian and European traditions, producing a modified kind of European townscape in which Indo-British culture was evolved and still continues to flourish.

Indigenous Pattern

The old cities of distinctly Indian character usually exhibit a number of common features, some of which derive in part from SWrn Asia through Muslim influence. The general appearance of the older part is complex. These parts have checkered histories with various cultural and economic foci at different periods. The domes and minarets of mosques and pinnacles of temples are prominent in their skylines. In the central part may be found some old sarai (tourist home) or a high mound marking the site of an old fort.
The streets are irregular in pattern, narrow, crooked. The main vehicular thoroughfares are rarely more than 30 or 40 feet wide, often without sidewalks. In the 'chaux', the adjoining streets are wider than usual, the facades are modernistic, with a lavish display of colored concrete and there is probably a clock tower and perhaps a statue or two of doubtful political tact and esthetic quality. For the rest, the heart of the Indian city is a maze of narrow streets, made narrower by the encroachment of open shop fronts and booths, the blocks of buildings traversed by narrow block lanes, unspeakably fetid, serving for the collection of refuse. Outward from the business centre, streets degenerate into ill-kept lanes and alleys. Traffic in these cities is one of the major problems. Bullocks and cows quietly cross the main roads. Rickshaws, buses, handcarts, bicycles, cars, carriages, trucks create immense traffic problems. The roads overcrowded and narrow already in the city centre, become still more so by protruding wooden and bamboo constructions put in front of the more permanent shops. Racks of goods are hung against the walls, the roads are full of people offering their cheap articles displayed right on the pavement or on small folding tables or carrying them on a tray or in their arm. The urban spaces of our cities are just corridors, a maze of ill-kept lanes and alleys, too dark even in a clear day.
One or two-storey construction is predominant, although lofty buildings of three, four or even five stories may exist along the main streets. The common types of masonry construction are of brick, stone and plaster and roofed tiles and mud walls with thatch roofs are found in the peripheries. Historic places of Hindu or Muslim rulers often rise on a nearby hill or stand by the river. The outer fringe is usually revolting, a chaos of mud or matting huts, market gardens, stables, cowsheds, muddy ponds and waste ground, the dusty breeding place of clouds of flies, the haunt of snakes and scorpions and half-starved cattle.

There is usually some evidence of British influence in the form of townhall, the municipal office, an enclosed and roofed central market and the clock tower. Bicycles and automobiles push aside pedestrians and bullock carts. The business section or chauk comprises the general bazar, the specialised bazar such as the grain, vegetable, and brassware markets as well as firms of native bankers. The main bazar is crowded with numberless small retail shops. Groups of competing merchants tend to occupy a particular section. Generally the upper and rear rooms are used as dwelling places by the merchants. The wholesale grain and other bulk-commodity markets are usually to be found nearby.
Surrounding the business section are primarily residential zones with small markets and retail shops scattered in them. There is a high degree of community consciousness and personal identification of the inhabitants with these neighbourhoods. Wards or larger and more inclusive sections of a city called "mohallas" are recognised. They usually take their names from the predominant caste or occupational group, from the founder's name or that of the original rural village on the site, or from a market, a public building, or an old city gate. Industrial areas are not distinct although modern factories are generally, but not always, located on the outskirts of the city.

There is not the clear-cut separation of residential land-use from business or industry which is normal in the cities of Europe and America. The industrial, commercial and residential functions are mostly intermingled. It is true that modern factories are usually on the outskirts, but a great deal of the minor merchandise for the bazaars is still produced by artisans in their own homes, and except in the more modernised sections of the business core, even many of the richer merchants continue to combine offices and shops with a residence. Merchants live in the bazaars. Small shops, service industries and manufacturing of all kinds are located in predominantly residential areas. In some areas, manufacturing,
retail and wholesale trade are carried on in the same establishments.

European Patterns

The former British military cantonments, civil stations, railway colonies and company towns were laid out on preconceived plans with definite functional areas. The tree-shaded streets are broad, metalled or paved and the buildings are of exclusively pucka construction. The inhabitants of these urban areas originally were the British soldiers, officers, civil administrators, businessmen and missionaries. Today the Indian population is strongly dominant.

Military Cantonments: The military cantonments built adjacent to the older part of the town during the British period are quite distinct functionally and morphologically. They are generally characterised by rectangular lay-out of streets. They comprise of barrack blocks with rows of quarters for the soldiers and their families, separate bungalows for the officers, hospitals, churches, clubs, drill grounds, rifle ranges, ammunition depots and military supply warehouses. They were built chiefly during the 19th century and had permanent garrisons in the beginning. Most of them have long since been abandoned for military purposes. According to the functional
requirements cantonments can be classified as follows*:-

(1) Cantonment for training of defence personnel
    both the existing as well as newly recruited.

(2) Cantonment purely for housing the defence personnel.

(3) Cantonment for manufacture of ammunitions and new
    weapons.

In some cases, expansion of the city is restricted by the
unplanned and scattered growth of the cantonment. In other
cases, the rapid growth of the city and its unplanned
sprawl has prevented the growth of the cantonment situated
in juxta-position. Typical examples are provided by Banga­
lore and Kanpur.

Civil Lines: The civil stations with which the canton-
ments now tend to become functionally merged, originally
contained the offices and residences of non-military
branches of government at the district or state level.
They are mainly administrative and residential in func-
tion. The extent of civil lines depends on the size and
administrative importance of the city. The density of
dwelling is low in civil lines as compared to the older
sections of the city. These areas still serve the same

* Puttaswamy, B.E. (1964) - Cantonment Planning, unpubli-
shed, School of Planning & Architecture, New Delhi, p. 40.
functions and usually include the administrative (district magistrate's) headquarters, the tax collector's office and court, the law court, the police barracks and jail. Sometimes there are public institutions like government printing presses, public libraries and mental hospitals. The civil lines have a distinctive but monotonous aspect: broad roads shaded by flowering trees, large gardens, Western-style bungalows adapted to the climate by the omission of chimneys and the addition of verandas and of a carriage porch, necessary in the rains - the skyline is in general flattish, broken only rarely by a church spire or a government building. The bungalows are generally single storeyed with a large open ground in front. The walls of the houses are generally thick and the windows are large. The houses are commonly comprised of tilted roof, verandah with pillars running all round. The roads in these zones are generally well-paved and broad.

**Railway Colonies:** The railway colony, a distinct functional zone in a big city is located outside the confines of the city proper. They (the railway colonies) probably show the highest degree of separation between functional areas and economic classes. The streets, dwellings and all other structures were fully and exclusively controlled by the management. The rail depot and yards, the Company offices, the extensive plants for the manufacture or
maintenance of rolling stock are common features in such a settlement. The most distinctive features are the uniform rectangular grid of streets and the monotonous rows of brick dwellings, graded and rented according to the wage scale and occupational status of the railway employees.

Newly Planned Areas: Newly planned developments have taken place towards the outskirts of the metropolises. The residential neighbourhoods, the labour colonies and industrial colonies have developed on planning principles with sufficient open spaces on Government approved layout plans. The street patterns of these areas are generally rectangular grid patterns. Since Independence, these areas have developed specialised functional zones like business or educational areas, shopping centres, industrial estates etc. Buildings, their types and designs are most modernised and often multi-storeyed.

Existing Metropolitan Structure

Population Distribution: Extremely high densities occur in both the indigenous inland centres and the Indo-British seaports. Another feature is the sharp density difference between wards in the central or old urban areas and the peripheries, particularly where there are suburbs (e.g., Calcutta) or cantonments and civil stations (e.g., New Delhi). In general it appears that only in Bombay and
Calcutta are the central business districts (CBDS) less densely populated than the surrounding residential areas, as is almost always true in American cities. In the commercial centre of Bombay the large business blocks of the Fort and the open spaces of the adjacent Esplanade bring down the density of this immost zone of the city to 19,200 persons per sq. mile. A similar lessening of density occurs in downtown Calcutta around E.B.D. Bag, below Howrah Bridge and north of Fort William and the park area of the Maidan. The causes of such extreme concentration and abrupt gradients of population density are protection, prestige and proximity.

Forts and trading factories were established at Madras, Bombay, and Calcutta as British influence grew at the expense of the Portuguese, Dutch, Danes and French. In Madras, the concentration was in George Town on a narrow land. On Bombay island, the earliest concentration was in the Fort. Urban development had, however, spread outside the Fort. In Calcutta, the water barrier of the Hooghly river was reinforced by a ditch. Within this area, the commercial core of the city and some elite residential sections are still found. During the 19th century, as the power of native rulers declined in India, and the need for such military defenses was outmoded, proximity remained the chief advantage for city dwellers
proximity to central bazar, trading factories and to the amenities of European life. In 20th century, poverty is an added cause of urban congestion. There are unsanitary and degraded living quarters in the Bombay chawls and the Calcutta bustees. Housing conditions are equally appalling in certain jute-mill towns along the Hooghly near Calcutta and in the places of temporary refugee concentration in Delhi.

Central Business Districts: The central business districts, familiar in Europe and U.S.A. in which large retail and wholesale trading establishments are located along with banking, insurance, hotel, entertainment and communication industries can hardly be said to exist, except in the Indo-British seaports of Calcutta, Bombay and Madras. The lack of central services can be accounted for by the tastes and traditions of the people, by the low income of a vast majority of the inhabitants and by the development of separate business areas in the British-built cantonments and civil stations. In reality, most of the metropolises functioned as dual entities during the British period and still do so. The Connaught Circus in New Delhi and Chandni Chauk in Old Delhi are examples of a binuclear commercial pattern. Polynuclear patterns are described in Bangalore by Gist (1958), and in Poona by Joshi (1952). The central bazars in the
metropolises are supplemented by neighbourhood bazars. In the context of Indian metropolises, the CBD is usually the oldest part of the city though not centrally located in the present frame of the townscape. The concept of CBD here differs in many respects from the concept defined by Murphy and Vance (1965). The CBD's of Indian cities generally contain not only the administrative and municipal government offices, but at the same time contain residential areas. The central business district derives its functional significance because of its location and growth in the most convenient and easily accessible areas with reference to the city and its suburban region. The multiple business structure, convenience of various services and accessibility are the three most important elements of Indian CBD's. They are subject to change with the more accessible points. The recent trend is the development of multi-storeyed structures to accommodate more people and services in the existing business centre.

Shopping Centres: The growth of shops along the principal roads has created bottlenecks to the uninterrupted movement of traffic. The topmost rung in the ladder of shopping is the city centres. These centres accommodate specialist shops such as cloth shops, readymade garment shops, leather goods shops, sports goods shops etc.
These specialist shops offer wide choice and competition. Sometimes, shops dealing in particular goods are concentrated in one street, for example book shops of College Street of Calcutta. Such zoning has the advantage that one can select a required item without having to walk a long distance. Another kind of segregation is that the shops dealing in high class goods tend to concentrate in one area where the atmosphere is relatively quiet and amenity value high, for example, the shops of Park Street in Calcutta.

Transformation in the Morphological Zones: The fragmentary remains of older cultures, the partial superimposition of modern technology, the gross economic inequalities of the Indian metropolises combine to produce a complex mosaic of ill-assorted elements never static, always swarming with life. This complexity goes on increasing as new functions are added with the economic growth. The major functional units in a metropolis are:

(1) Residential
(2) Trade and commercial
(3) Industrial
(4) Transportational
(5) Recreational
(6) Public and semi-public services and others
(7) Multiple functions
These zones vary in area from one metropolis to another, according to the nature, size and functional character of them. (Fig 7)

For example, it may be noted that Ahmedabad comprises about 51.2% of the total developed area under the residential use while Calcutta claims for 53.0% under the same head. Kanpur reflects more towards

**Table 3.7**

Proposed land use pattern of selected metropolises in 1971

<table>
<thead>
<tr>
<th>Cities</th>
<th>Total developed area (in acres)</th>
<th>Land use categories (as p.c. of the total developed area)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Residential use</td>
</tr>
<tr>
<td>Calcutta</td>
<td>18,607</td>
<td>53.0</td>
</tr>
<tr>
<td>Bombay</td>
<td>15,273</td>
<td>33.7</td>
</tr>
<tr>
<td>Delhi</td>
<td>35,781</td>
<td>20.3</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>25,201</td>
<td>53.0</td>
</tr>
<tr>
<td>Bangalore</td>
<td>11,517</td>
<td>34.2</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>15,984</td>
<td>51.2</td>
</tr>
<tr>
<td>Kanpur</td>
<td>21,328</td>
<td>32.6</td>
</tr>
</tbody>
</table>

Source: Town & Country Planning Organization, Govt. of India.

the industrial use. As part of the urban system of India, the metropolises perform varied specialised functions such as manufacturing, business and concentration of every conceivable services including residential and administrative functions. In the latter case, some of the metropolises are regional metropolises and
regional capitals while others like Bombay, Delhi and Calcutta are national metropolises, occupying the uppermost level in some kind of hierarchical arrangement.

Residential areas play most important role in the morphology and sustenance of the metropolis. The percentage of residential area is the same in Calcutta and Hyderabad (53%), but the total developed area of Hyderabad is more than that of Calcutta, indicating that Calcutta is more congested. The total developed area is maximum in Delhi where residential area covers only 20% of the developed area whereas land under public and semi-public uses share 28% of the developed area. It indicates that Delhi started developing in a planned manner. So is the case with Bangalore where parks and playgrounds also share a considerable percentage (15%) of the total developed area of the metropolis. The open spaces of parks and playgrounds are now being realised as the lungs for the congested urban organ. In all the metropolises there are some common open places for recreational use. In the newly developed, planned extensions of the metropolis the percentage of area of parks and playgrounds has increased with a better future. In Ahmedabad they share 11% and in Bangalore 13% respectively. At Calcutta, they are, however, not properly developed and maintained and the open lands are often left
as the dust bowls or nuisance centres. While considering the industrial land use it has been found that Bombay (14%) and Bangalore (12%) have the larger share than others. Land under business is maximum in Bombay (9%) and minimum in Hyderabad and Bangalore (1% each). It is moderately developed in Calcutta, Ahmedabad, Delhi and Kanpur. From analysing the data it can be concluded that Bombay is a developing metropolis in the sense that it gains prosperity both in business and industry. Kanpur, Ahmedabad, Bangalore and Hyderabad are more industrial than business oriented. Delhi is the most administrative one for lands under public and semi-public uses share more acerages than residential areas even. In Calcutta an even distribution of land use can be marked from which one can say that the city has developed to its maximum capacity and the most mature one.

**Shape of the Metropolis:** Various physical and cultural factors play an important part in developing the outer shapes and forms of the metropolises. The river sites, levees or high grounds along the flood plains and along with the pull of dominant transport arteries are the main causes for elongated and rectangular shape of Calcutta, Madras, Ahmedabad and Kanpur. When some centrally located nucleus is effective, the original elongated shape takes
rather rectangular form like Delhi, Calcutta and Madras. The other metropolises like Bombay, Bangalore and Hyderabad do not conform to any geometrical pattern. The unequal pull of various roads according to the commercial connection of the city with the surrounding region, the position of the railway station and the aerodrome, the administrative section and the location of market places are the factors which are responsible for this amorphous shape.

**Outlook of the Future Pattern:** A series of changes are expected in the morphological set up of the metropolises in the coming decades. These changes are specially apparent in Calcutta, Delhi and Bombay where broad regional plans have been taken up.

The pattern of landuse is fast changing in Calcutta where mini-skyscrapers are coming up within a half mile radius of Park Street-Lower Circular Road area. The entire hinterland of the Dalhousie Square is fast developing as office and shopping areas. In the residential areas of the south, a sophisticated modern infrastructure is being built. Moreover, changing industrial contours of the metropolis and changing pattern in industrial function would have its impact on the structural pattern of the metropolitan configuration. The Calcuttans are benefited from
the CMDA programme which has meant less waterlogging, increased water supply, less disease, speedier travel through widened roads and new bridges, increasing number of trams and buses. As a result of their activities new areas have been opened up all over the metropolitan area and within the next four years, when the Eastern Metropolitan Bypass and the Barrackpore-Kalyani Expressway and Kona Expressway are complete, vast areas in East Calcutta and West Howrah will be developed. The completion of the second Hooghly Bridge and the underground rapid transit (Tube Railway) will help in the formation of the new image of this city.

In Bombay, the plan will arrest further deterioration of existing conditions and reduce congestion and overcrowding in the primate city and will improve the infrastructure to the required standard. New township facilities are being provided in areas where employment base has already been created and is likely to be created. This will contain, co-ordinate and integrate the development of the emerging urban agglomerations like Thana and Kalyan-Ulhasnagar complex. The industrial plan suggests several measures for augmenting the infrastructure facilities in the periphery of Bombay whereas the first step of decentralization, a large number of industries have already been established.
In Delhi, the recent activities include large commercial multipurpose projects launched in 1965 and a massive beautification drive which will add new dimensions to the city morphology. The projects include new shopping centres, hotels, office buildings, cinema halls, multi-storeyed garages and a subway - many of which are yet to be undertaken. When completed, congestion of the Connaught Place commercial area may be considerably minimised. About 700,000 people living in slums in Delhi had been shifted to 25 new settlements in just about 12 months.

The economic programme (popularly known as 20-point programme) chalked by Sh. Indira Gandhi, Ex-Prime Minister of India, gives a particular emphasis on the reduction of inter-personal and inter-regional disparity in the country. The metropolises are being planned at a level where human considerations, physical constraints and social patterns are in keeping with the high standards required for the metropolis of a developing country like India with its growing importance in the national and international arenas. The future hope lies on evolving urban renewal plans as an integral plan for the city and the region and their subsequent implementation.

To sum up, as a result of the fragmentary remains of the past cultures and a partial superimposition
of modern aspects and the gross economic inequalities of
the inhabitants, Indian metropolises are complex func­
tionally and morphologically. In some respect, East and
West live side by side, but there has been no marriage
of cultures between the two.

Changes in the Morphological Pattern and Land Use

Calcutta (Fig 8)

Calcutta had its origin as a trading centre and
even after more than two and a half centuries of growth,
the conduct of trading operations still continues to be
the dominant occupation of its citizens. Originally, a
cluster of villages, the origin of this city might be
traced symbolically to August 24th 1690 when Job Charnok,
the agent of the English Company decided to set up
a factory at Sutanuti in preference to the Nawab’s
invitation to settle further downstream at Hooghly.
Thus to quote Kipling, "from this midday halt of the
meek trader grew up a city". The three villages of
Sutanuti, Kalikata and Gobindapur were formally pur­
chased by the Company on 10th November 1698 and in 1700
the directors agreed to create a separate Presidency
of Bengal at Calcutta. This was the humble beginning
of the city which was then just a collection of mud­
walled and thatched hovels set on marshy and swampy soil.
A geographical examination of the site reveals that the three villages performed specific functions of trade in cotton yarn at Sutanuti, fishing at Govindapur and pilgrim centre at Kalighat. The subsequent growth of Calcutta was marked in phased development. From 1700 A.D. to after the Battle of Plassey, the East India Company with their Indian business partners developed trade of salt, cotton yarn, textiles and other raw materials. In the 19th century, when trade became the monopoly of the East India Company and the British became the political rulers and administrators of the territory, scope was opened in the profession of law and in many spheres of governmental activities. Meanwhile, the construction of the Fort William had started a shift towards the south and the immigrants from the surrounding districts began to concentrate around the pilgrim centre of Kalighat. During the late 19th century continuous migration from the then East Bengal took place creating the middle class worker which forms today the matrix of the whole community structure of the city.

The Town Expansion data from 1706 to 1901 reveal that the urban part contained cluster of houses and their adjacent areas and the bazar areas. The Report of the First Land Use Survey in 1707 revealed the
contemporary land use pattern and according to which the real urban formation is found in the Bazar & Town Calcutta. The growth of residential area around Laldighi (Tank Square) known as white town contained residences of the English, Portuguese and Armenians. As prosperity of the region increased, the increasing rush of influx accommodated at Sutanuti pushed the original weaver communities towards Sutanuti bat and bazar. By 1717 several villages had sprang up in the adjacent spaces (e.g., Salkeia, Howrah, Ultadanga, Sealdah, Tangra etc.). Sutanuti became attractive for residential use while Gobindapur remained a small growing village. From 1742, the urban formation began to assume a growing phenomenon with increasing numbers of pucca and kutcha houses and also the built up streets, lanes and byelanes. The Pilgrim Road was obviously the main thoroughfare of the town - majority of the large and small roads at the time branched off from it. Before the fall of Calcutta (1756), European quarter penetrated southward outside the town through Esplanade, Dharamtala to Chowringhee area. The Plassey affair was much instrumental to render Calcutta a permanent shape towards town construction. The places were being gradually interweaved together with common economic ties and close interrelationships were noticed between economic and physical characteristics.
of the adjoining places. Calcutta became the capital of the entire British Empire. The administrative and the judicial bodies were set up and the city assumed enormous growth potential that extended far beyond the limits of trade. The opening of the 19th century saw Calcutta a modernised city with broad streets and magnificent buildings. The survey of the city in 1847 shows that 63% of the total surveyed land is under residential use. Bose (1964) has studied the evolution of the metropolis and change in its landuse character. He has employed 16 categories of land-use which have undergone changes during 1911-to 1961. The change-over process is complex but it is indicative of the growth of urban activities. So far as the growth is concerned, the satellite and suburban zones grew rapidly during 1901-31 while the core area grew rather sluggishly. During the metropolitan phase of 1951-61 the growth of the core showed a declining trend and the dormitory towns and refugee settlements registered an unprecedented rate of growth.

Table 38

<table>
<thead>
<tr>
<th>Categories of use</th>
<th>P.C. of the total area 1911</th>
<th>1961</th>
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</thead>
<tbody>
<tr>
<td>Residential</td>
<td>41.72</td>
<td>62.18</td>
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<tr>
<td>Administrative</td>
<td>4.11</td>
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<tr>
<td>Industrial</td>
<td>0.82</td>
<td>2.25</td>
</tr>
</tbody>
</table>
LAND USE IN THE CALCUTTA METROPOLITAN DISTRICT

INDEX

- Residential
- Industrial
- Institutional
- Transportation
- Recreational
- Commercial
- Not yet organized but having potentialities for future urban growth

--- Major Roads
--- Railways
_triangle_ Administrative Centre
_square_ Community Centre (Large)
_circle_ Community Centre (Small)
_circle_ Major Local Park

Fig 8
Table 38 (Contd)

<table>
<thead>
<tr>
<th>Categories of use</th>
<th>P.C. of the total area</th>
<th>1911</th>
<th>1961</th>
</tr>
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<tbody>
<tr>
<td>Commercial</td>
<td></td>
<td>5.50</td>
<td>6.90</td>
</tr>
<tr>
<td>Religious</td>
<td></td>
<td>0.73</td>
<td>0.48</td>
</tr>
<tr>
<td>Educational</td>
<td></td>
<td>2.14</td>
<td>3.94</td>
</tr>
<tr>
<td>Slums</td>
<td></td>
<td>15.20</td>
<td>6.24</td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
<td>1.55</td>
<td>2.34</td>
</tr>
<tr>
<td>Park and other Recreational</td>
<td></td>
<td>1.39</td>
<td>3.16</td>
</tr>
<tr>
<td>Burial grounds</td>
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<td>0.98</td>
<td>0.74</td>
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<tr>
<td>Others</td>
<td></td>
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<td>6.58</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Computed from Prof. Bose's table.

Bombay (Fog 9)

The Heptanesia of Ptolemy (A.D. 150) with the seven islands made up the metropolitan region of Bombay in course of time. Bombay was leased to the East India Company in 1668. In 1672, Gerald Aungier, the President of Surat transferred his seat of government to Bombay and became the city's real founder. He started work on filling in the creeks, opened a hospital and established
a High Court. Above all, he proclaimed complete religious toleration and this brought in the Parsee merchants who were destined to play a prominent part in the development of the city. L. N. Wadia, a native of Surat came here in 1736 and he superintended the extension of the docks and started a shipyard for the Royal Navy. His enterprise called for men skilled in many trades and thus were sown the seeds of an extensive industry. The trade increased steadily with the elimination of foreign competition. It was between the years 1803 and 1827 that the framework of the Bombay Presidency took its present shape. In 1838, regular communication was established between Bombay and England by way of Suez and Alexandria. Meanwhile, railways were being built and were bringing into the city the raw cotton for its staple industry. Between 1861 and 1865 occurred the famous trade boom when, because of the American Civil War, Bombay held practically a monopoly of the world's cotton trade. C. N. Davar in 1884 started the city's first cotton mill. By 1915 the city had at its disposal an enormous supply of cheap hydroelectric power, on which were based many industrial enterprises. After independence projects for suburban development were steadily pushed on and residential quarters were constructed along the railway and arterial roads. Until 1950, the island of Bombay separated from the rest of
Salsette by the Mahim Creek was the limit of the Bombay Municipal Corporation. Bandra, Khar, Santacruz, Andheri etc. on the Wn railway and Kurla, Chhatkopar etc. on the Central Railway corridor existed as independent urban entities. The ever expanding metropolitan mass has now engulfed these smaller towns within its limits.

Greater Bombay as constituted after the last enlargement of the Corporation's boundaries in 1957 is a closely built up urban mass with very high building and population densities. The eastern shores are mainly occupied by port activity while the most sophisticated residential and commercial complexes have come up along the Wn shores. The portion to the west of the Western Railway line generally consists of good residential neighbourhoods such as Marine Drive, Malabar Hill, Warden Road and Khamballa Hill localities. Areas beyond Worli constitute middle class residential development mixed with industries. The central portion between the two railways is mostly commercial and industrial mixed with middle and low income group residential localities. This consists of congested commercial and bazar areas of Bhuleshwar, Kalbadevi and the textile mill areas and typically middle class residential areas of Girgaum.

The eastern shores are mostly occupied by port activities, warehouses, wholesale commercial areas, heavy industries
and poor class localities. The Sn portion - the Port area constitutes the hub of big business, big finance and key administrative offices. The centre of gravity of Greater Bombay area is located near its Sn tip where almost all the tertiary sector employment is concentrated. This position of the centre in relation to the entire metropolitan mass has created an imbalanced structure, the N-S arteries of traffic become heavily overloaded.

**Delhi**

The origin of Delhi is lost in antiquity. Delhi became the capital of successive generations of rulers and empires. Under the regime of the Sultans, Delhi was the noblest and the largest city in the Islamic world and the poets sang of Delhi as a "twin sister of Heaven, a very paradise on earth". But the city got its due importance under the reign of Shahjahan. At that time the city had wide roads, gracious parks and houses of nobles with large courtyards. The city was planned to meet the community requirements of the times. The city hummed with activity - business flourished and travellers from far and wide came in to partake in the rich cultural life of the city. Because of increasing activities in commerce and trade the city was extended under the reign of the successive Mughal rulers. With the fall of
the Mughal empire, Delhi faced series of calamities, lost much of its glory and left in desolation. Once the British got control, they settled within the walled city in the Kashmere Gate area. The city was extended northwards and an entirely new settlement known as Civil Lines with large and spacious residential plot was set up. With the consolidation of British power, the city continued to flourish. Major and fashionable shopping centre was built in the Kashmere Gate area. A church and a college was also built in this area. After 1857 disturbances (World War I) Delhi started growing faster. In the latter half of the 19th century, Delhi saw the coming of the railways and postal services. Metalled roads were built to link various parts of the city. Some industries came to be located. Commerce also developed. In 1911 the capital of British India was shifted from Calcutta to Delhi. The British Government appointed a committee of architects to plan the new capital. The new city (New Delhi) was located at Raisina, S of Shahjahanabad and E of Indraprastha. The new planned city followed the garden city pattern with wide avenues, having double rows of trees on either side, creating vistas and connecting various points of interest. Towards the NN end was located the fashionable shopping centre called Connaught Place designed around a circular park. To the west of this centre were the lower and middle
income groups residential sector. Whereas to the E and S, larger houses were built to accommodate senior Indian officials. The Sn part was reserved for senior British officials. The area was laid out in hexagonal pattern. Adequate parks and playgrounds were provided in the plan. To the S-W of the new capital the cantonment came into being. During the World War II the sporadic industrial growth and increase in commercial activities attracted more and more people from the neighbouring areas, and the city assumed altogether new dimensions. Communal riots broke out on the eve of Independence and as a result Delhi had to accept about 5 lakhs of additional refugee population. A number of townships sprang up all around the city to rehabilitate these migrants - Lajpat Nagar, Kalkaji, Malviya Nagar, Tilak Nagar, Moti Nagar etc. New commercial areas were also developed and new industries started taking shape. Thus Delhi started expanding in all directions. The Delhi of to-day having a population of more than 2 millions, has arrived at its metropolitan stage of development through the centuries of its chequered history. Almost with every change of dynasty, a new Delhi was born and this led to the present sporadic growth spread over vast areas in all directions.
### Table 39
Existing land use distribution of Urban Delhi, 1970

<table>
<thead>
<tr>
<th>Planning area (in acres)</th>
<th>Land Use Categories (as percentage of the total area)</th>
</tr>
</thead>
</table>
|                          | Resi-Com-Ind-Govt. | Play-Port | Trans-Agrl-Vac | Roads, Dlv-Str | Rail-
|                          | den-mer-just-offi | tial | cards & semi- | ment | streets |
|                          | ial | facil | tures | |
|                          | ces | |
| A                         | 2639.00 | 33.3 | 7.7 | 3.9 | 2.0 | 5.9 | 12.9 | 11.2 | 0.5 | 2.2 | 20.4 |
| B                         | 4879.00 | 18.5 | 2.1 | 1.5 | 4.2 | 10.2 | 25.0 | 0.4 | 4.6 | 9.8 | 23.7 |
| C                         | 4826.00 | 21.6 | 3.5 | 1.7 | 3.5 | 13.7 | 19.3 | 0.4 | 1.8 | 14.1 | 20.5 |
| D                         | 13931.00 | 24.4 | 2.3 | 0.7 | 7.3 | 13.5 | 11.4 | 1.3 | 4.3 | 12.1 | 22.7 |
| E                         | 1413.00 | 9.4 | 1.0 | 1.9 | 0.1 | 1.2 | 1.8 | 0.6 | 1.9 | 45.6 | 36.5 |
| F                         | 2846.00 | 11.4 | 1.5 | 1.8 | 0.2 | 14.8 | 25.6 | 0.0 | 1.0 | 21.3 | 22.4 |
| G                         | 8482.00 | 5.3 | 1.0 | 2.4 | 37.9 | 1.6 | 2.1 | 24.0 | 3.3 | 11.2 | 11.2 |
| H                         | 455.00 | 32.0 | 6.3 | 37.9 | - | - | 0.3 | - | 13.2 | 10.3 |

Source: Delhi Development Authority.

From the table it is evident that in urban Delhi maximum developed land is meant for residential use, roads, railways and streets, etc., followed by public and semi-public facilities and recreational use.

**Madras**

The city of Madras has grown outward from Fort St. George, formerly the site of the factory established by the East India Company.

The commerce of the entire south was centred around this area in the 18th
and 19th centuries and naturally commercial houses and residences of local people came to be established nearby in what is today known as George Town. All roads diverged from this area into the hinterland - for example, Mount Road towards south-west, Bangalore Road towards west and Calcutta Road towards north. The railways which came subsequently established its termini near the central area. As the city grew in importance, growth occurred along these radial roads and railway lines, assimilating in the process existing small independent settlements. This trend continues even today. There has not been much expansion on the north because of inadequate communication lines and physical obstruction.

The latest available data of land use of Madras city shows that after residential use of developed land, the city gives much importance for transport and public and semi-public uses. (Fig 11)

Table 40
Land use break-up of Madras City, 1964

<table>
<thead>
<tr>
<th>Land use</th>
<th>Extent in acres</th>
<th>% of total area</th>
<th>% to the developed area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>10,571</td>
<td>33.4</td>
<td>38.1</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,025</td>
<td>3.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Industrial</td>
<td>1,198</td>
<td>3.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Public and</td>
<td>3,357</td>
<td>10.6</td>
<td>12.1</td>
</tr>
<tr>
<td>Semi-public</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 40 (Contd)

<table>
<thead>
<tr>
<th>Land use</th>
<th>Extent in acres</th>
<th>% of total area</th>
<th>% to the developed area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open spaces</td>
<td>1,074</td>
<td>3.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Utility and services</td>
<td>274</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>Transport &amp; communication</td>
<td>5,488</td>
<td>17.3</td>
<td>19.7</td>
</tr>
<tr>
<td>Vacant lands</td>
<td>4,766</td>
<td>15.0</td>
<td>17.2</td>
</tr>
<tr>
<td>Non-urban uses</td>
<td>3,943</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31,696</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Sources: Directorate of Town Planning, Tamilnadu.

**Hyderabad**

In its evolution the metropolis of Hyderabad has gone through three quite separate phases - the Qutb Shahi of Golconda, the Asaf Jahi of Hyderabad and the British. The Kingdom of Golconda, with which it originated, was the eastern province of a larger Muslim Kingdom of Bahmani in the Deccan. The Qutb Shahis and their nobles encouraged trade and commerce. The Asaf Jahis came as conquerors and flushed with military success. A change in economy was also brought about by the domination of a nobility which took hardly any part in trade and commerce and whose landed property was the only source of income. These
economic and cultural changes had a profound effect on Hyderabad's morphology. By constructing the city wall and their palaces within, the Asaf Jahis dissociated themselves from Golconda fort and although the Hyderabad of the Qutb Shabis flourished as the walled city, administratively it was separated from Golconda and it had radically changed in its culture and economy. The arrival of the British as traders and their emergence as a political force subsequently introduced new economic factors. The city within its boundaries includes three distinct urban units represented by the ruined fortress town of Golconda, the decaying walled city and the dynamic Char-dagh. These three urban centres were separate in foundation and emotional associations. From 1591 to 1687 Hyderabad fell to the Mughal forces. With the succession of the Asaf Jahi dynasty, Hyderabad was walled and made the capital. There was a complete shift of its administrative and economic activities. With the developments of the railways in the N, new industries started developing and this also accelerated the shift in the focus of economic activities from S to N. The first major industrial area was sited near Secunderabad on the broad and metre gauge railway systems. But, not all parts of Hyderabad are vitally active. While the walled city in the S is reacting negatively to the current cultural and economic changes,
Chaderghat in the N is reacting positively and these are demonstrated in functions, land value trends and patterns of land use. Following a period of political instability (1687-1798) and the initiation of Nizam's rule Hyderabad had been re-emerged as the chief city of Deccan. Within the city walls a phase of urban renewal commenced. With the alliance of Nizam with the East India Company in 1798, a new cantonment has been set up at Secunderabad to perform military functions. With the railway links with Bombay and Madras (1874-1900) and with the initiation of modern industries, the city started expanding round the railway station. Hyderabad has been linked with the port cities and with the raw-cotton producing countries of the Deccan Trap. The period between World War I and World War II is a period of development of metropolitan facilities. Development of suburban rail and bus services accelerated urban functions and urban-growth, and Hyderabad and Secunderabad has been coalesced into one great conurbation. With the partition of India and integration of Hyderabad with other States of India, the political stability and administrative balance has been returned. This led to the creation of a number of public and private sector enterprises within the city and Hyderabad was emerged as a million city. Thus the city of Hyderabad is a socio-cultural unit strongly influenced by political, religious and linguistic factors and it is in this
matrix alone that its patterns of growth can be studied. The functions of the city and the physical distribution of its occupations and residences are markedly influenced by its social and cultural values.

**Bangalore**

During the regime of Vira Ballala (1172-1219) Bangalore's birth came to light. From this time, till the beginning of the 16th century, it went into oblivion until Kempe Gowda attained power in 1513. The Pettah or the old town was formed during this period. Owing to its strategic importance and flourishing trade and commerce, Bangalore became a target of Muslim invasion and was besieged in 1638. When Hyder Ali acquired power in 1758, the old fort was conferred as a jagir and Hyder established a military garrison to the E of the fort and named the area as Lal Bagh. The city witnessed many changes after it was captured by Lord Cornwallis in 1791. The presence of British troops inspired the growth of Civil and Military Station. The importance of the city was further enhanced when it became the capital of the State in 1830. Various administrative offices came up. In the latter half of the 19th century the City Municipality was formed and the city was divided into eight wards. The laying of the broad gauge railway line in 1864 brought new impetus to the trade and industry of Bangalore.
In 1889, a committee was set up for the improvement of the city and five main streets and a few cross-roads were planned. The development of the city is also manifested in the installation of the big factories like Binny mills, Maharaja mills, Hindustan Aircraft factory, Indian Telephone industries etc. A large number of workers have been attracted by them and thus there has been a ribbon development along the so-far forsaken streets which link the factory sites. The oldest residential area, the Pettah forms the core from which the city spread in the form we find today. It is the most congested part. The residential areas of the city can be grouped as Aristocratic, high middle class, medium middle class, low middle class, and low income group. The city flourished well in business and commerce during the Muslim and earlier periods. In the present century, it has become one of the biggest commercial centres in South India. With the change of time and expansion of the city, the business and commercial areas have shifted from place to place within the city. The commercial activities of the city are mainly concentrated in the two central Business districts, showing a ribbon development - along the Avenue Road and along the commercial street and the Cavalry Road. The industries developed first in the old Pettah as small-scale industries. Now, they are distributed throughout the city and there is a marked tendency of their
concentration in certain areas. The administrative portions roughly form a pentagon in which the buildings are scattered and far apart. Almost all the important offices are located within this area.

Table 41
Proposed land use of Bangalore

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area in acres</th>
<th>% of the total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>27,845</td>
<td>44.30</td>
</tr>
<tr>
<td>Commercial</td>
<td>2,219</td>
<td>3.50</td>
</tr>
<tr>
<td>Industrial</td>
<td>10,000</td>
<td>15.93</td>
</tr>
<tr>
<td>Public and semi-public</td>
<td>4,518</td>
<td>7.20</td>
</tr>
<tr>
<td>Parks, playgrounds and recreation areas</td>
<td>6,443</td>
<td>10.25</td>
</tr>
<tr>
<td>Transport</td>
<td>2,604</td>
<td>4.13</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2,604</td>
<td>4.13</td>
</tr>
<tr>
<td>Unclassified</td>
<td>6,641</td>
<td>10.56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62,874</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Source: Bangalore Metropolitan Planning Board, 1970.
Kanpur

Montgomery (1848) traces the growth of Kanpur from the time of East India Company and locates its nucleus in a small village called "Kampoo Kanpur". Historical evidences proved that Kanpur had a much earlier origin. The actual growth of the city started after the Faizabad Treaty of 1773 when the East India Company felt the need to raise and maintain their armies in the area. The presence of a large army created the demand for a variety of goods which led to the growth of several types of industries like leather and textiles. In 1801 Kanpur was made the headquarters of the district. The 1852 morphological map of the city showed that the townscape was then characterised by three distinct types of developments - the cantonment, the civil lines and the city proper. The main city with a population of more than 85,000 (1847) occupied a very small area of 270 hectares while the cantonment with a population of 49,000 extended over a much larger area of 2592 hectares. When the Company got possession of the Lower Ganga plain, some indigo factories and cotton ginning works were established, between 1812-1819. The G.T. Road connecting Allahabad and Kanpur was completed at the same time. The Lower Ganga Canal which was completed in 1832, afforded ample facilities of transport and this led to the establishment of many new forms and dimensions in the city. In 1857, the
Britishers were subjected to severe ordeals by the nationalist rebels. The whole city was badly destroyed and the population declined. This movement brought in its wake several changes in the city's morphology. The whole city was re-built. Most of the important administrative offices sprang up. Military accommodations were shifted to the cantonment. Most of the changes in the townscape took place in the three main divisions of the city - the cantonment, the civil lines and the city proper. The first rail link with Kanpur was established in 1859 by E.I.R. This provided a direct link between Calcutta and Kanpur. It was followed by Kanpur-Etawah line in 1861. In 1867 the Oudh-Rohilkhand railway established closer links with the Mn hinterland. The Ganga bridge was completed in 1875. Thus by the end of the 19th century, most of the important centres of the country were connected with Kanpur through railways. Both the growth of trade and industry and the expansion of the city were highly influenced by the development of these transport network. The government with a view to providing permanent jobs to the rebellions made a direct and definite policy to make Kanpur "an industrial centre of the North-Indian Plain. Thus after World War I, a number of industries throbbled up. All the essential commodities for army needs were produced at Kanpur. In 1864, the first Cotton mill in the city started functioning. After the completion of the Ganga bridge some
Important railway links were constructed and this led to the establishments of new textile mills and leather factories. These developments greatly influenced the fortune and features of the city. The built up area in the civil lines and the city proper was much extended. The whole business area of the city was modified with business-cum-residential buildings. The haphazard growth of the city focussed the need for planned development and the Improvement Trust and the Development Board were established for this purpose. After independence several planned residential colonies grew up in the western part of the city.