



Transformation of Chennai City as Nucleus of Regional Development through the Emergence of Sub-CBD's

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Abstract: Chennai, the biggest industrial, commercial, cultural, economic and educational center in South India is the capital city of the state of Tamil Nadu. Birth of this city dates back to 1639 when the English, established Fort St. George and built George Town in its vicinity which today stand as the Central Business District (CBD) of the city. Sub-CBDs have emerged in the Southern, Western and Northern Part of the city due to rapid Urbanization and enormous population explosion. This change in the character of the settlement pattern, clearly establishes the transformation of the city from the Burgess model during 1940's which depends on a single CBD as its core, to the sector model in 1970's which shows the change in the pattern of development due to the growth of Public Transportation and in 1970's the Multi Nuclei Model, where certain specific localities emerge as sub CBD's in certain specific category to assist the Main CBD. The city shows this transformation in almost all aspects but not to 100% as mentioned by the authors who formulated these theories. This paper is an attempt to establish the relationship between the CBD and Sub CBD's in the light of ecological models.

Keywords: Central Business District, CBD, Sub CBD's and Chennai City

1. Introduction

For centuries, cities have been the heart, the lifeblood of various civilizations and the epicenter of economic, political & artistic activities. Cities exert an increasing attraction on people worldwide and the population tends to concentrate in big cities. In developing countries, cities contribute more than 2/3rd of the country's Gross Domestic Product (GDP).

2. Settlement Pattern

A city is not a work of a day or a decade. It takes generations and generations to build a city. According to Victor (2012), a settlement initially starts as pedestrian oriented with streets in primitive stage, and the boundaries are limited by the distance one could walk in a reasonable period of time. C. A Doxiadis (1964), too agree with this reasons, as he points out that in the olden days the size of the towns are restricted to 2 km by 2 km which one could walk within a reasonable time and the population not more than 50,000 inhabitants. And he further elaborates to say that major capital cities cannot be restricted to this size, and it has to grow much beyond to accommodate the population of more than one million where the size could be restricted to not more than 6 Km by 6 Km.

Victor (2012), further says that with the advent of Industrial revolution and migration of population towards the cities to work in the industries, paved way for the settlements to expand with the development of radial suburban rail corridors, along with few streets.

These rail corridors were initially part of intercity rail tracks. Tram lines were developed and service's

extended along certain corridors, shaping the city into a better organized and developed urban area, with concentration of activities at the city center.

As Commuter rail traffic started to grow, an outward spread of population were visible, as suburban areas started to emerge at a distance from the city center. Further concentration of population occurred along these rail corridors. New roadway arterials were formed radially between the radial railway lines. As city matures into a metropolis, radial and circumferential grid forms with some of the traffic corridors being rail based and the rest road based. This enhancement of connectivity accelerates the expansion and growth of the city. Chennai city is also one such city which developed in this manner. All the above said stages of development of a city are shown in Figure 1.

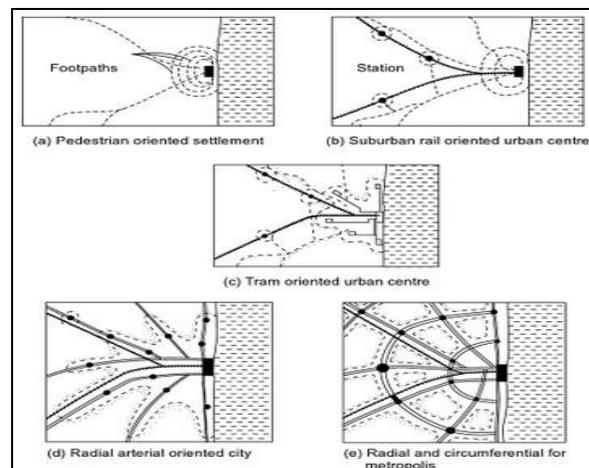


Figure 1 Typical pattern of urban growth

According to Victor (2012), the city's population density will be highest in the Central Business District, and as the distance increases the density decreases, which is due to the concentration of economic and commercial activities as part of agglomeration economics. This is diagrammatically shown in Fig: 2.

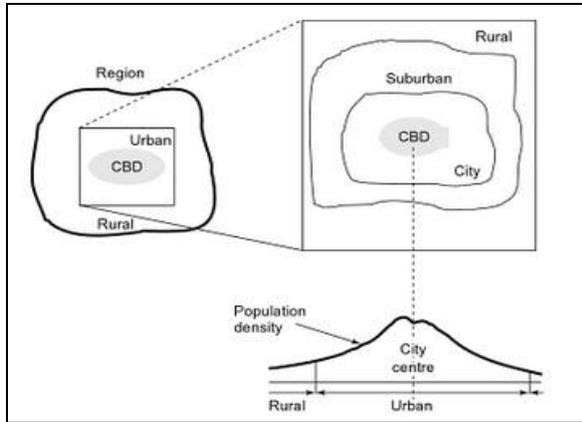


Figure 2 Schematic Diagram of Urban Area in Regional setting

As the city grows to become a metropolis, the pressure on the CBD increases, which will lead to other problems like traffic congestion, distance between the CBD and sub urban area increases, and so on. So, all these factors will force the emergence of sub CBD's within the metropolitan region, which will have better accessibility and other needed infrastructure facilities. This sub CBD's comes in all the directions at a considerable distance from the CBD. The distance between the CBD and Sub CBD depends on the population and the extent of the Metropolitan area.

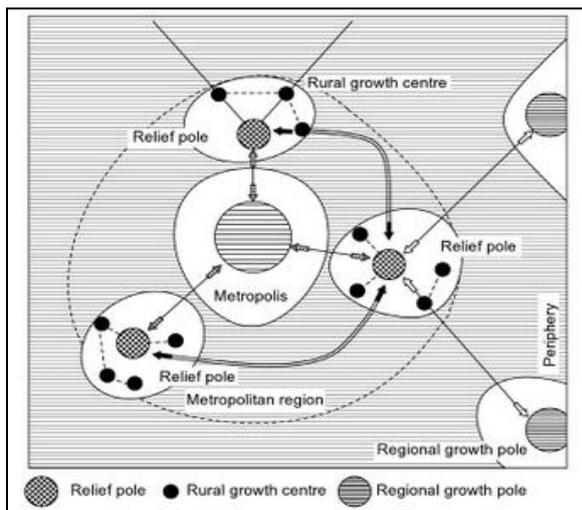


Figure 3 Emergence of Sub CBD's as relief poles

3. Indian Port Cities

The development of port cities of Mumbai, Kolkata and Chennai as a prominent urban center and major metropolis of India is the work of the English, who

wants to establish settlements in the coastal region for their trade related activities. These three cities have, in turn, worked as nuclei for the development of Maharashtra, West Bengal and Tamil Nadu states respectively, which are, at present, the most industrially advanced states of the country.

Here an attempt is made to study the relationship between the classical ecological models with the city of Chennai, travelling through its growth history from 1940's to till date.

4. Chennai

The pre-eminence of Chennai in the urban scene of Tamil Nadu is discernible from the fact that the next biggest agglomeration of the state, Coimbatore and Madurai each hardly account for more than one fifth of the total population of Chennai Urban Agglomeration. According to Census of India 2011, the city had 4.68 million residents, making it the sixth most populous city in India; the Metropolitan Area, which comprises the city and its suburbs, was home to approximately 8.9 million, making it the fourth most populous metropolitan area in the country.

As per Census 2011, the population of Chennai Metropolitan Area (CMA) is 8.9 million i.e., 12.3 % of the population of Tamil Nadu. This proportion has steadily increased from 8.51 %, 9.51 %, 10.42 % and 11.28 % during the years 1971, 1981, 1991 and 2001 respectively. The Second Master Plan for CMA, 2026 has projected that the population will increase to 11.19 million in 2021 and 12.58 million in 2026. Today, total extent of CMA is less than 1 percent (0.914 percent) of the total extent of the Tamil Nadu state but accommodate more than 12 percent of its population.

Table: 1 Growth of population and population density in Tamil Nadu, Chennai City, Chennai urban Agglomeration and CMA during 1961 – 2011

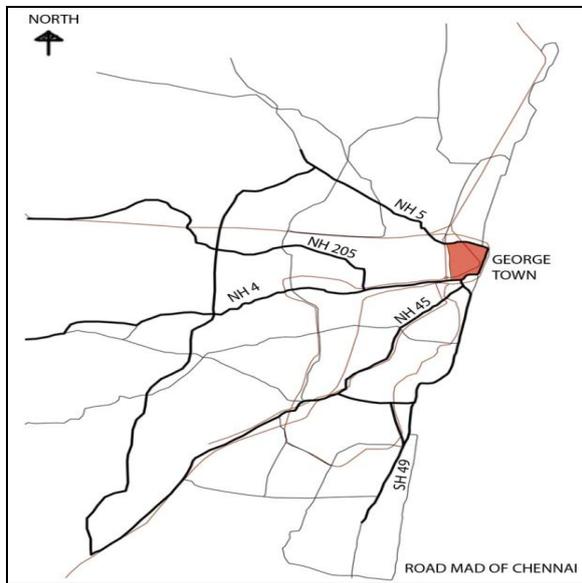
Description	Year					
	1961	1971	1981	1991	2001	2011
Tamil Nadu						
Population (In Lakhs)	336	411	484	558	624	721
Extent (sq. km.)	130069		130050			
Density (persons per sq.km.)	259	317	372	430	480	555
Decadal growth rate (percentage)	...	22.	17.5	15.3	11.7	15.6
Chennai city						
Population (In Lakhs)	17	24	32	38	43	46
Extent (sq. km.)	128.83		176			
Density (persons per	13.5	19.1	18.6	21.8	24.6	26.9

sq.km.) (In Thousands)						
Decadal growth rate (Percentage)	---	41.1	32.6	17.2	13.0	7.8
Chennai Urban Agglomeration						
Population (In Lakhs)	19	31	42	54	64	86
Decadal growth rate (Percentage)	...	63.0	35.3	26.4	18.4	35.3
Chennai Metropolitan Area (including Chennai City)						
Population (In Lakhs)	...	35	46	58	70	89
Extent (sq. km.)	...	1189	1189	1189	1189	1189
Density (persons per sq.km.)	...	2948	3870	4894	5921	7500
Decadal growth rate	31.2	26.4	21.0	26.6

Source: Census of India and Second Master Plan for Chennai Metropolitan Area 2026

Density in the CMA is as less as 75 persons per hectare as per Census 2011, which indicates huge scope for accommodating higher population densities as against the already denser (269 persons per hectare) Chennai city, which is shown in detail in Table: 1.

5. Evolution of Chennai



Map 1 Road Map of Chennai

In the early 16th century, Chennai was basically a group of small villages which were self-contained and had their own agricultural production & household industries for its survival. These villages were mostly planned around a temple, which forms its identity. The prominent villages were Mylapore and Triplicane, one a saivite and another an vaishnavite

settlement. It is widely believed that Saint Thiruvalluvar lived in Mylapore.

The foundation for the development of the Chennai was laid in 1639 as a British settlement and later expanded as a new town around Fort St. George. During 17th century, important roads of communication like the Poonamallie High Road, Santhome High Road and Lal Bagthadur Sashtri Road, where established which actually linked these small villages. The population, which was 19,000 in 1646, expanded to 40,000 in 1669 and the surroundings of the Fort area covering 16 hamlets were constituted as the City of Madras in 1798.

In the 18th century, Mount Road was established, which still functions as the major arterial road connecting the city to the southern districts of the state. In the 19th century, establishment of the railway line, and harbor close to the George Town (CBD) helped the city to develop itself as a major commercial center in south India. Pattern of radial roads were development from the George Town in three principal directions connecting the northern, southern and western region and ring roads were development to enhance the connectivity, which is shown in Map: 1. The Eastern side was not developed, due to the presence of Coromandel Coast.

6. Emergence of Chennai as Major commercial center in South India (1940's)

In the early 20th century, George Town established itself as the main business centre but still substantial parts of it were used for residential purposes. Both sides of Mount Road, radiating from George Town upto a distance of 5 to 6 kms were occupied by large business houses, clubs and hotels; industries were few and were located in George Town and Perambur which is located in the northern part of the city. Bungalows started to come up in Kilpauk, Nungambakkam and Chetpet. By 1941 Chennai city had developed itself into a provincial metropolis enjoying the best of both worlds i.e., urban amenity and rural atmosphere. During this period, city established itself as a major commercial, military and administrative centre for the entire South India.

6.1 Burgess Model

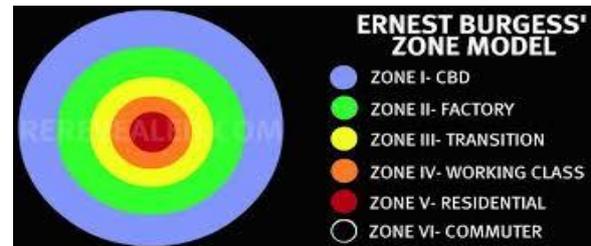


Figure 4 Burgess Model

According to Park (1925), Burgess Model assumes a relationship between the socio-economic status (mainly income) of households and the distance from

the Central Business District (CBD). The further from the CBD, the better the quality of housing, but longer the commuting time. Thus, accessing better housing is done at the expense of longer commuting times (and costs).

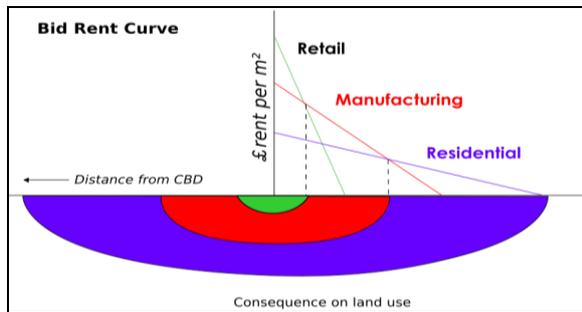
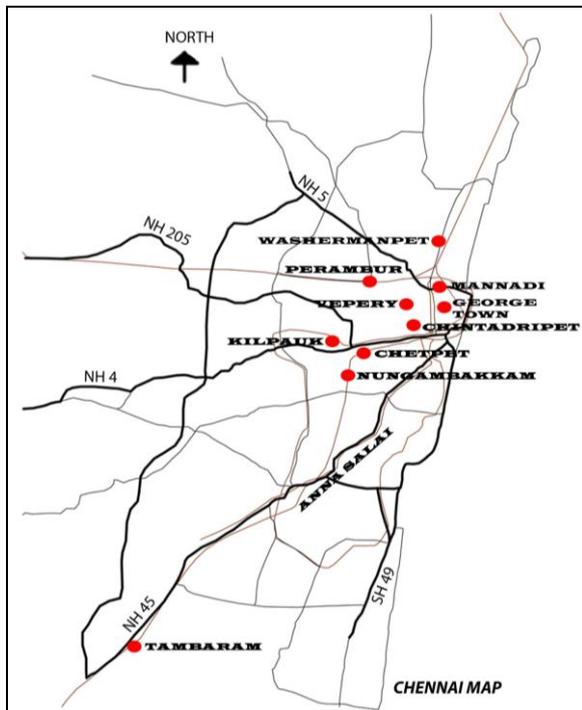


Figure 5 Bid Rent Curve

Burgess model is based on Bid Rent Curve, which assumes that the Value of the land is based on the profits that are obtainable from maintaining a business on that land.



Map 2 Superimposition of Burgess Model in Chennai during 1940's

According to this model, a large city is divided in six concentric zones:

6.1.1 Zone I: Central Business District (CBD)

Business activities, i.e., tertiary employment are located and urban transport infrastructure is converging, making it the most accessible. George Town – CBD of Chennai city is the place where all major business activities are performed and NH4, NH5 and NH45 converges from the northern, western and southern directions.

6.1.2 Zone II: Factory

Many industrial activities located to take advantage of nearby labor and markets. Most transport terminals (port sites and rail yards), are located adjacent to the central area. Chintadripet & Perambur locations are the one where industries started to come up and some are still running even today. It is very close to the harbor and railway stations. It also has many residential settlements nearby as labor market.

6.1.3 Zone III: Transition

This zone is gradually been reconverted to other uses by expanding manufacturing / industrial activities. It contains the poorest segment of the urban population, (notably first generation immigrants) living, in the lowest housing conditions. Mannadi, an residential settlement very close to George town and perambur, established in 1940's to take advantage of the industrial revolution, but still exist as the same. The public infrastructure in this neighbourhood is very much lower than what is needed today.

6.1.4 Zone IV: Working Class

Dominated by the working class, those who were able to move away from the previous transition zone (often the second generation immigrants). Advantage of being located near the major zones of employment (I and II) and thus represents a low cost location for the working class. Vepery, a residential community is one of the finest examples. This area is famous for its schools, and other infrastructure facilities which is much better when compared to the transition zone.

6.1.5 Zone V: Residential

Represents higher quality housing linked by longer commuting costs. Alwarpet and Nungmabakkam, a prominent high class residential area during 1940's, but today it has become a mixed residential area. This is the place where many Britishers lived during that time. It is famous for its bungalow type of houses.

6.1.6 Zone VI: Commuter

Mainly high class people with expensive housing in the rural & suburban areas. The commuting costs are the highest. Prior to mass diffusion of the automobile (1930s), most of these settlements were located next to rail stations. Tambaram, a residential suburb, located at a distance of more than 20 Km from the CBD in the southern side of the city.

7. Emergence of Chennai as a Major Metropolis of India (1970's)

After Independence, the population of the city got doubled from one million to two million within a span of 20 years. This sudden increase in population is due to the enormous industrial growth through the five year plans of the central government. This transformed the city into a major metropolis of national importance. The structure of the city was then approximated to a semi-circle with extensions in

all possible directions from George Town and Harbour. Naturally all communication lines led to this centre and these in turn were linked with each other producing a radial and ring pattern of development.

7.1 Sector Model

Hoyt (1939) suggests through his sector theory that urban areas develop in sectors alongside the main transport routes like railroads, highways and other transportation arteries into and out of a city. Various transportation routes represented greater access which makes the cities tended to grow in wedge-shaped pattern or sector. According to this model, the city is divided into five sectors, namely

7.1.1 Central Business District

CBD means higher level of access and highest land value. Hoyt model almost agreed with the Burgess version of CBD as stated in the Burgess Model. In Chennai, during 1970's George Town and its extension towards Mount road in southern direction together constitute the central business district of the City where most of the wholesale trade, specialized retail trade, banking and financial institutions were located.

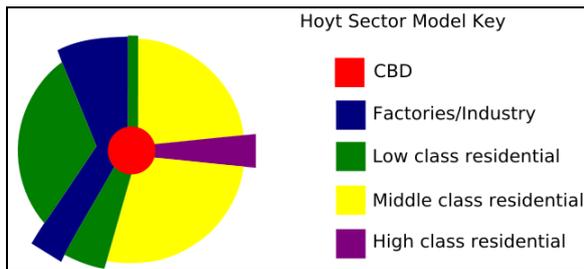
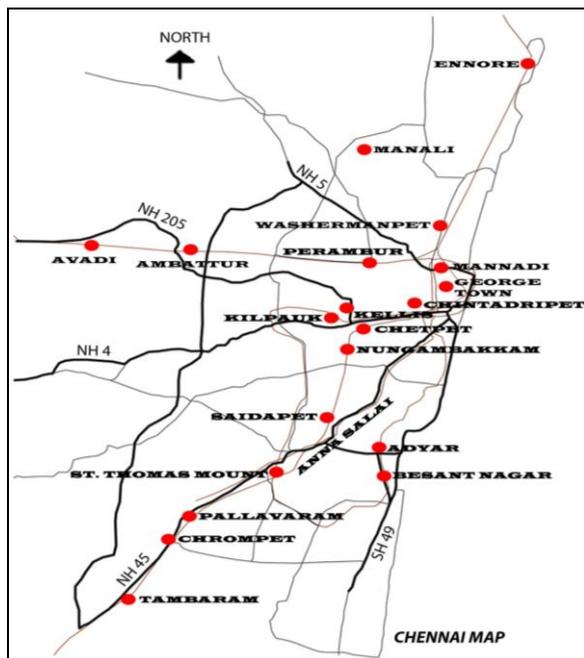


Figure 6 Hoyt Sector Model



Map 3 Superimposition of Hoyt's Model in Chennai city during 1970's

7.1.2 Factories/Industry

Manufacturing functions developed in a wedge shape surrounding transportation routes. In Chennai, Large Scale Industries are located on the northern side of the city, especially at Manali & Ennore, whereas larger industrial estates are located on the west at Ambattur with the Heavy Vehicles Factory located further west at Avadi. Nearly 40 percent of the industrial work places are located on the north and northwestern part of the City. One more Industrial estate located on the southern part of the city planned along with Ambattur Industrial estate for a similar purpose namely Guindy Industrial estate along the Mount Road, today got converted to IT offices and other non-Polluting industries after 1990's.

7.1.3 Low class residential

Residential functions would grow in wedge-shaped patterns with a sector of low-income housing bordering manufacturing/industrial sectors due to its traffic, noise, and pollution makes these areas the least desirable. In Chennai, Washermanpet & Mannadi located in the northern and north western part of the city is completely surrounded by Industries on all the sides.

7.1.4 Middle class residential

Middle income households were located furthest away from the industries. Development of residential neighborhoods occurs along the Sub urban rail network. Pallavaram, Chrompet, Saidapet, & St. Thomas Mount which was easily accessed by the sub urban rail network paved the way for the residential development for the growing middle class people.

7.1.5 High class residential

It is unlikely that high class residential housing would be found near to factories or lower quality housing zones, since these residencies exercise a powerful influence on the location of undesirable neighbors. Gopalapuram, Poies Garden and Wallace Garden – all high class residential settlement found very close and accessible to mount road are occupied right now by the second and third generations of super rich people.

High status residential area will also spread out along the lines of the sector by the addition of new belts of housing beyond the outer arc of the city. Besant Nagar, Adyar and Thiruvanmiyur which was planned by the City Development Authorities around 1950's as a residential suburb. But, today these locations house the first and second generations of super rich people, which was the edge of the city corporation when it was planned.

8. Emergence of Chennai as a Major Business center in South Asia

In 1990's though George Town and Anna Salai continued as CBD, Mylapore, Thyagaraya Nagar, Nungambakkam, and Purasawalkam have developed

as Regional Commercial Centres and Adyar, Anna Nagar and Perambur have developed as Regional Commercial Sub-Centres. This is due to the encouragement of growth along the major transport corridors and development of urban nodes at Manali, Minjur, Ambattur, Avadi, Alandur and Tambaram which all forms the outer edge of the city during this period.

Government initiatives like the Relocation of wholesale Vegetable, Fruit & Flower Market and Mofussil Bus Terminus from George Town to Koyambedu, located on western edge of the city corporation limit was an initiative along the development of regional sub CBD's and was completed in late 1990's; Other initiatives like the shifting of Iron and Steel Market to Sathangadu, operation of a separate truck terminal at Madhavaram to avoid the entry of trucks into the city areas, and the development of Satellite town, beyond city limits at Maraimalai Nagar paved way for it.

8.1 Multi Nuclei Model

Harris (1945), in his Multi Nuclei theory states that cities of greater size will develop substantial suburban area and some suburbs, having reached significant size, will start to function as smaller business districts. These smaller business districts acts as satellite nodes, or nuclei, of activity around which land use patterns will be formed. Even though CBD still acting as the major center of commerce, specialized cells of activities would develop according to specific requirements of certain activities, rent-paying abilities, and the tendency for some kinds of economic activity to cluster together.

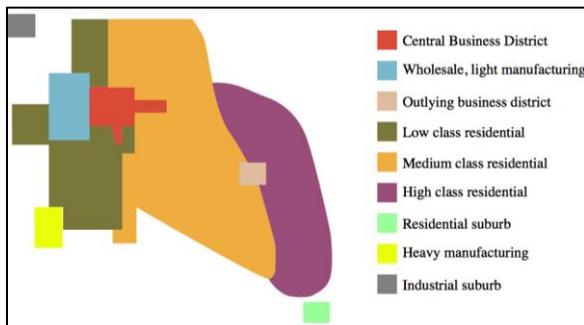
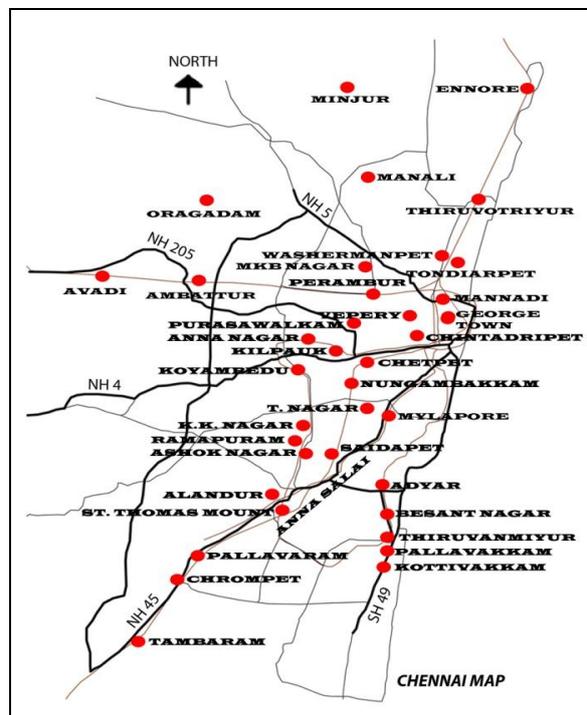


Figure 7 Multi Nuclei Model

During 1990's Thyagaraya Nagar emerged as the sub CBD for Textile and Jewellery Market. During this period Mint Street and Godown Street which are located in the CBD and doing business for Jewellery & textile Market was also functional but it is truly too little of space to handle the demand of a growing metropolis. The emergence of T. Nagar was also coupled by good accessibility, availability of public transport system and its location which is very close to the Gemini Circle which in 1990's was considered as the center of the city, as the city was expanding very fast on the southern side.

According to this model, city is divided into nine zones. At the center of this model is the CBD, which is still taken care by George Town, with light manufacturing and wholesaling activities located along transport routes like the Kolkata Highway, etc.

Heavy industries would locate near the outer edge of city, perhaps surrounded by lower-income households, and suburbs of commuters like Sriperumpudur, Oragadam & Maraimalai Nagar, which was identified for large scale heavy industrial development, and all these locations were actually located in the adjoining districts of chennai like Kanchipuram and Thirvallur Districts. These locations are actually planned for heavy industries by the government, and they have also provided the necessary infrastructure for the same. This is a planned initiative, and not developed on its own.



Map 4 Superimposition of Multi Nuclei Model in Chennai during 1990's

In these Multi Nuclei cities, some of the nuclei will be pre-existing settlements like T. Nagar, which today is a market for Textile and Jewellery, but it was originally planned as a Brahmin Settlement before independence; and others arising from urbanization and external economies like Adyar, Anna Nagar, which was planned as a residential area after independence, but today it stands as a regional commercial sub centers.

According to Multi Nuclei theory, the numbers and functions of the nuclei differ from city to city, and it marks the city's growth. Each nucleus will vary in size and character, and the importance they exert in cities economic development. Some Nuclei's are large industrial sites while others may be small strip

shopping centers. Each Nuclei acts as a growth pole for a particular kind of land use (industry, retail, or high-quality housing). As these expand, they merge to form a single urban area, which is the phase in which the city is moving today. According to the theory, Creating smaller business districts (or individual nuclei) enable people in the suburbs to have better access to the facilities of the CBD and industrial sectors for commerce and employment.

9. The Future of Chennai City

Tamil Nadu is the second largest software exporter in the country, and 90% of its export is from Chennai city alone, especially from its IT corridor (OMR). A large I.T Park at Siruseri, located at the end of the IT corridor is developed, which housing the TCS's biggest office in the city. Chennai is also a major export hub of South East Asia. International car manufactures have established their manufacturing bases here, which make this city as the Detroit of South Asia. Large Scale manufacturing industrial activities at Sriperumpudur, and Mahindra World city developed over 1700 acres; near Maraimalai Nagar new town are some of the major developments happening today. All these developments are located within a distance of 25 to 35 Km from the CBD and Sub CBD's are already emerged. With these new developments Chennai can emerge as a prominent business headquarters for the whole of South Asia.

But due to these sudden pressures of development and in the process of expansion, the city has engulfed several fishing, agricultural villages and hamlets creating several ecological and environmental challenges that the current governance and administrative machinery is unable to cope up with. Pallikarani Marsh Land is one such location which requires our immediate attention. These IT related activities developed a lot of residential neighbourhoods around the city like Pallavaram, Thoraipakkam, Velachery which have resulted in urban sprawl.

10. Conclusion

Chennai is emerging as a major metropolis of the world, and to continue its dominance in the economic, social, political and cultural front, as a Nucleus of regional development; it's infrastructure, housing and other supporting facilities has to be planned and developed to international standards; also its Administrative machinery and governance system has to be trained and changed to be investor friendly, otherwise the city will lose its importance as the Nucleus of this regions development.

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