PATTERN AND TREND OF URBANIZATION IN THE RIVER CAUVERY BASIN: 1961-91

Dissertation submitted to the Jawaharlal Nehru University in partial fulfilment of the requirements for the award of the degree of

MASTER OF PHILOSOPHY

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INDIA
1997

JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI

21st July 1997

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT
SCHOOL OF SOCIAL SCIENCE

CERTIFICATE

This is to certify that the dissertation entitled ***PATTERN AND TREND OF URBANIZATION IN THE RIVER CAUVERY BASIN 1961-91****, submitted by* ***P. DEVARAJ*** *is in partial fulfilment of six out of twenty four credits required for the award of the Degree of Master of Philosophy (M. Phil.) of this University is his original work and may be placed before the examiners for evaluation. This dissertation has not been submitted for the award of any other Degree of this University or any other University to the best of our knowledge.*

We recommend that this dissertation may be placed before the examiners for evaluation.

Prof. Sudhesh Nangia
(Chairperson)

Prof. Aslam Mahmood
(Supervisor)

PREFACE

Nothing changes more rapidly in spatial distribution of a phenomena than the urbanization since it is affected by all kinds of economic, political, social, physical and human forces. New developments, new techniques changing political grouping all affects the process of urbanization and distribution of urban settlements. Therefore help to change the human and economic geography of various regions. the world since Industrial Revolution has seen tremendous changes in the levels of urbanization.

The rivers all over the world have played a vital role in the evolution and development of civilization . The mighty rivers like Indus and Nile have provided the cradles, in which civilization have been nursed for several years.

This study is an attempt to present the salient aspects of urbanization in the river Cauvery Basin from a geographical point of view. It is hoped that through this study the forces acting across the space irrespective of political boundary on the various aspects of urbanization could be dealt in detail. The river Cauvery Basin, is taken as a study area on the assumption that the forces of urbanization act in a systematic way in a natural region, than the man made administrative or political region.

The initial chapter deals with introduction and the survey of literature dealing with various aspects of urbanization mostly in natural or physical regions. The objective and the hypothesis formulated in order to achieve those objectives are explained.

The Second Chapter briefly explains the various methods. Namely near neighbour analysis, rank size role, indices of primacy, functional classification, hierarchy, and

construction of potential surface of interaction. It also includes data base and it sources.

The third chapter gives the River Cauvery Basin's geographic background briefly.

The fourth chapter then turns to the process of urbanization in the Cauvery basin which is detailed in 7 different sections. The sections includes rural urban composition, trend of urbanization, size-class distribution, growth of city and town population, metropolitan system, spatial organization, economic structure, central places and the distribution of population potentials.

The final chapter seeks to interpret the urbanization process that characterized different socio-political dimensions in the Cauvery basin between 1961 to 1991. The major findings are summarised and a brief conclusion given. Thus the Cauvery urbanization is seen as being driven by both a technological and a social dynamisms.

ACKNOWLEDGEMENTS

I am indebted to many people for their timely help in the making of this study. In particular I wish to acknowledge my supervisor Prof. Aslam Mahmood for his valuable critical reviews and painstaking modification of earlier drafts of the manuscript that ultimately became this dissertation. I express my sincere thanks to my supervisor for his constant support and encouragement.

I am grateful to Computer Aided Cartographic Laboratory (CACL) of my centre CSRD for providing facilities to draw maps and diagrams. Mr. K. Varghese and Mr.Madan Mohan, as our ambassadors to the computer, they brought the solution to endless problems encountered in the making of illustrations.

In addition, I thank Mr.Rajagopalan who contributed his technical skills for many hours in typing the manuscript.

Financially, much is owned to the Council of Scientific and Industrial Research-University Grants Commission (UGC-CSIR) for its support to my academic career in the form of Junior Research Fellowship (JRF).

A final and special word of thanks must go to my Parents, brothers and sisters. I owe to Soni, who has helped me for making this study possible.

Jhelum Hostel
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July 1997

Devarajan

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"To Appu, and Pappo"

CHAPTER I

INTRODUCTION

The levels of urbanization in India is fairly low. It has been 10.84% in 1901 and it reached 25.72% in 1991. The of level of urbanization is not so rapid, though the urban growth was significant. Urbanization shows a large spatial inequality. It is in some areas as low as 8.7% and in states like Maharashtra it is 38.7% is highest[1]. Therefore studying urbanization as a single entity will not be serving the purpose. It has to be studied on a regional basis.

Cauvery Basin of Karnataka, Kerala, Tamil Nadu and Pondicherry is one of the highly urbanized region especially its southern part. The largest cities and towns of respective parts found in this region. There have been many studies of analyzing urbanization in different non-administrative divisions:- Godavari - Krishna Delta (Reddy, 1969 and 1970), Ganga valley (Singh, 1955, 1965 & 1966), Cauvery delta (Gopalakrishnan, 1973) Mandakini valley (Kumar, 1973), Sutlej - Yamuna Doab (Jauhari, 1962) Suryapur Plain (Srivastava, 1979) and lower Damodar valley (Lahiri, 1986). It has been surprising cauvery basin as a whole has not been given due importance. The basin is highly potential for agricultural and industrial development. It is therefore, an attempt has been made to study the various patterns of urbanization.

Although city as a form of human settlement dates back to the beginnings of civilization, definition of urban is still under debate. Meanwhile new urban functions have modified and sometimes supplanted those that were originally formative. Urbanization is the process of expansion of entire system of interrelationships by which a population maintains itself in its with habitat[2]. The most evident consequences of the process, and the most common measure of it

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[1] Census of India 1991 Provisional Population Totals : Rural -Urban Distribution.

[2] Hawley, A. H.1981: Urban Society : An ecological approach, New York: Wiley

is an increase in the number of people at points of population concentration, an increase in the number of points of at which population is concentrated or both[3]. Theories of urbanization attempt to explain how human settlement patterns change as technology expands the scale of social systems.

Technological regimes, population growth mechanisms, and environmental contigencies change over time and differ in different regions of the world, variation in the pattern of distribution of human settlement can generally be understood by attending to these related process. In the literature on urbanization, interest in organizational forms of systems of cities is complemented by interests in how growth is accommodated within cities themselves through changes in density gradients, in the location of socially meaningful population subgroups and in patterns of urban activity. Although the expansion of cities has been the historical focus for describing the urbanization process, revolutionary developments in transportation, communication and information technology since 1950s have expanded the scale of urban systems and focused attention on the broader system of organization within which cities emerge and grow.

Much of the research on the urbanization process is descriptive in nature, emphasizing the identification and measurement of patterns of change in demographic and social organization within a territorial frame of reference. Territorially circumscribed environments employed as units of analysis which include administrative units - villages, cities, countries, states, nations, population concentrations - places, agglomerations, urbanized areas and networks of interdependent neighbourhoods, metropolitan areas, daily urban systems, city systems and earth. A city is an administratively defined unit of territory containing "a relatively large, dense and permanent settlement of

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[3] Tisdale H. 1942 " The Process of Urbanization Social Forces 20:30-316

socially heterogenous individuals[4]. Urban refers to a set of non agricultural specialized activities that are characteristic of, but not exclusive to, city dwellers. A ruling class with a capacity for taxation and capital accumulation and writing and its application to preditive sciences, artistic expression and trade for vital materials are the kinds of specialized activities necessary to the definition of the emergenic of a truly urban place[5].

Many residents inhabiting uncontrolled developments on the fringes of emerging mega-cities in less developed countries are practically 'isolated' from the urban centre and carry on much as they have done for generations. Over one-third of population of largest cities in India was born elsewhere, and maintenance of rural ways of life in the cities is common due to lack of urban employment, maintenance of village kinship ties, and seasonal circulatory migration to rural areas. And although India has three of 10 largest cities in the world, it remains decidedly rural, with 75% of the population residing in agriculturally oriented villages.

Measurement of the rate at which urbanization takes place is confounded by the fact that concentrations of population do not correspond to administrative definitions of a city. Although data on population change for cities is widely reported and quite useful for administrative purposes, the relatively fixed boundaries of political units make them less useful for examining change. The concept of an urbanized area is based upon a density criterion.

The urban system is marked by both sub-urbanization and deconcentration. One measure of sub-urbanization is the ratio of rate of growth in the ring to the rate of growth in the central city over a decade[6]. Widespread use of the automobile,

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[4] Wirth, L., 1938 "Urbanism as a way of life" American Journal of Sociology. 44:1-24

[5] Childe, Gorden 1950 the urban revolution town platining review 21:4-7

[6] Schnore, L.F., 1959, "the timing of metropolitan decentralization", Jr of American institute of planners 25: 200-206.

inexpensive energy, efficient production of materials for residential infrastructure and housing policy allowed metropolitan growth to be absorbed by sprawl rather than by increased congestion at the centre. The index of Dissimilarity measures the degree of segregation between two groups by computing the percentage of one group that would have to reside on a different city block in order for it to have the same proportional distribution across urban space as the group to which it is being compared.

A related process, the deconcentration, involves a shedding of urban activities at the centre and is indicated by greater growth in employment and office space in the ring than in the central city. Deteriorating residential and warehousing districts adjacent to new downtown office complexes are being re-habilitated for residential uses by childless professionals or gentry. The process of gentrification or the invasion of lower status, deteriorating neighbourhoods of absentee-owned rental housing by middle to upper status home or condominium owners is driven by the desire for accessibility to nearby white collor jobs and cultural amenities as well as by the relatively higher costs of suburban housing pushed up competing demand in these rapidly growing metropolitan areas.

The pace and direction of urbanization process are closely tied to technological advances. As industrialization proceeded in Western Europe and United States over a 300 year period an urban system developed that reflected the interplay between the development of city centered heavy industry and requirements of energy and raw materials from regional hiterland. The form of city systems that emerged has been described as rank size. Cities in such a system form a hierarchy of places from large to small such that the number of places of a given size decreases proportionally to the size of the largest place. City systems that emerged in less industrialized nations are primate in chraracter. In primate system, the largests cites absorb far more than their share of societal population growth. Sharp breaks exist in the size hierarchy of places, with one or two very large, several medium sized and many very small places. Primate city develop

with an orientation towards export of raw materials to the industrialized world than toward manufacturing and development of local markets. As economic development proceeds, it occurs primarily in large cities with very low rates of economic growth in rural areas.

Mega cities of over million are a very recent phenomenon, and their number is increasing rapidly. Their emergence can be understood only within the context of a globally interdependent system of relationships. Convergence theory[7] suggests that cities throughout the world will come to exhibit organizational forms increasingly similar to one another, converging on the North American pattern, as technology becomes more accessible throughout the global systems. Divergence theory[8] suggests that increasingly divergent forms of urban organization are likely to emerge due to differences in timing and pace of urbanization process - differences in the position of cities within the global system and increasing effectiveness of deliberate planing of urbanization process by centralized government holding different values and therefore pursuing a variety of goals for the future.

LITERATURE REVIEW

Singh[9] (1955, p68) analyzed the evolution of settlements in the middle Ganga Valley. The study focuses from human settlements during pre-historic times, long before the Aryan occupation. The author feels that Indus valley civilization was based on urban culture. The Aryan settlement was first established in Punjab plain. The author analyzed the settlement growth by vedic, Buddhist,

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[7] Young F & R. Young 1962 The sequence and direction of community growth: Across Cultural generalization'. Rural Sociology 27: 374-386.

[8] Berry BJL 1981. Comparative Urbanization: Divergent paths in the Twentieth Century. New York: St. Martins Press.

[9] Singh, R.L. 1955, Evloution of settlements middle Ganga valley, National Geographical Journal of India (NGJI), 1(2): 69-76

Muslim periods. In case of village community the mansara shilpsastra describes 8 types - Dandak, Sarvatobhadra, Nandyavarta, padmaka, Swastica, Prastara, Karmuka and Chatusmukha. Singh evaluated the settlement patterns in each of sub plain namely Gangapar, Ganga Khadar, Ganga-Ghaghara doab, Ghanghara-Khadar, Suryapur plain, Vindhyan Plateau, Son gorge and Sonpar hill region separately. He found that pattern is greatly influenced by physical setting. Of all factors the rivers have played the greatest roll in the selection of sites for human settlement habitations since early times. Changes in course of river have resulted in modification of distributional pattern of settlements. In case of rural settlements he identified compact, semi-compact or hamleted cluster, semi-sprinkled or fragmented or hamleted and sprinkled or dispersed type.

Jauhari[10] (1a62, p.2) studied the growth of early urban settlements in the sutlej - Yamuna divide during pre-historic and early historic periods. The divide contains quite a few towns whose history goes back to several thousand years. Not only this some of the earliest urban centres have completely decayed and now represented by mere mounds rising to varying heights. Chronologically these settlements can be divided into 3 periods.

1. Early pre-historic or Harappa 2500 BC -1500 B.C.
2. Early vedic 1500 BC - 500 BC
3. Iron Age 500 BC - 647 AD.

The divide which serves as a corridor between the Ganga system in the east and Indus system on the West had two major routes from very early times and process of urban growth compelled urban settlements to come into existence along them.

Jauhari investigated the urban settlements of the Sutlej - Yamuna Divide c.647 A.D. to c.1947 A.D. He analysed it through five period.

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[10] Jauhari. A.S., 1962 The growth of early urban settlements in the sutlej-Yamuna divide during pre-historic and early historic periods NGJI 8(1) : 1-24.

1. 647 A.D.- 1192 A.D.
2. 1192 A.D. - 1707 A.D.
3. 1707 A.D. 1803 A.D.
4. 1803 A.D. 1881 A.D.
5. 1881 A.D. 1943 A.D.

The author analysed the details of towns with cultural and political phases. In his another study[11] "post partition expansion of pre-existing towns in the Sutlej-Yamuna Divide a study in the Development of urban fringe and suburbs," analysed the impact of partition on small towns in the Divide.

The partition has been instrumental in bringing about vast expansion of new existing towns and cities. Though a small scale outward expansion of the towns built up area has been a normal feature of all developing towns of the Divide, yet the post partitional area expansion of the pre-existing urban habitat has been especially rapid in the fringe areas of a large number of towns and took the form of residential, industrial, civil and commercial sub-urbs largely on planned basis.

Singh's[12] (1965: p3) distribution and character of cities of the Ganga plain reveals that most cities are riverine towns standing either on Ganga or its tributories. The most striking feature of the distribution of the cities in Ganga plain is the great urban concentration at its eastern and western margins of which culcutta and Delhi excert greatest pull. The most dominant activity of the cities in the plain are trade and commerce, transport, manufacturing and service centres.

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[11] Jauhari A.S., 1962, Post partition expansion of pre-existing towns in the Sutlej-Yamuna Divide a study in the development of urban fringe and suburbs", NGJI, 8(2): 114-135.

[12] Singh U, 1965, "Distribution and character of cities of the Ganga plain" NGIJI,11(1): 1-12.

Singh[13] (1966, p 218) studied the spatial patterns of central places in the middle Ganga valley. He compared those with south West Wisconsin and southern England as obtained by Brush & Bracy. The study revealed that highly underdeveloped economic and transport patterns that interchange between the few urban centres and widely seattered rural settlement is neither close nor frequent. The centrality score or Index based on commerce worked out. The author tried to investigate the relationship between population size and centrality index and grading them into various sizes and order. The study concludes by saying that evolutional aspect of settlement pattern in general is the key factor behind the parallism of spatial patterns of service centres. The comparative study has brought out almost analagous spatial patterns in the regions although recognizably the three regions have diverse socio-economic and cultural patterns.

Reddy's[14] (1969, p65) a comparative study of the urban rank size relationship in the Krishna - Godavari Deltas and South Indian states revealed that the pattern of variation in the size relationship of urban settlement of a region reflects the characteristics of urbanization of the region. The pattern of changes in the urban rank-size relationship of the region for ten decennional census years beginning from 1871 to 1961 were focused. Incidentally the study seeks to investigate to what extent the primate cities of the region as well as those of South India maintain primacy.

The delta region shows some regularity in the urban rank-size for the settlements of population between 10,000 to 100,600. The same for South-India, somewhat regular for the towns of less than 200,000 population. For big cities of over 200,000, the rank size distribution is rather haphazard. The cities

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[13] Singh K.N., 1966 "The spatial patterns of central places in the middle Ganga valley" NGJI 12(4): 218-226.

[14] Reddy N.B.K., 1967 "Comparative study of the urban rank size relationship in the Krishna - Godavari Delta and South Indian states" 15 (2) : 63-90.

of Madras, Hyderabad and Bangalore displays primate distribution. Thus log-normalcy in city size relationship is not evidence in any outstanding degree.

In his another study "urban revolution, growth pattern and urbanization trends in the Krishna-Godavari delta"[15] he brought out salient features of spatial and temporal variation of various urban factors such as urban population, degree of urbanization, urban-rural ratio, progress of urbanization and the number of urban settlement. Inter comparision of Krishna and Godavari delta revealed that Krishna Delta because of its superior location which it attained after construction of road and railways lines, has a well concentrated urban population. The Krishna delta had shown a higher degree of urbanization than the Godavari delta.

Vasantha Devi[16] (1969, p2) in her study "functional classification of towns in Tamil Nadu" studied the functions and tried to relate them to geographical factors. One of the distinguishing characteristics of a town or a city is the fact that its work is divorced from the soil. Its people are not primarily food producers. The author used the method of H.J. Nelson who classified the American Cities. Four degrees of variations from the mean were recognized and the towns grouped in their appropriate categories.

The degree of specialization varied with size categories of town. Towns with a population of 100,000 and below 5,000 are the least specialized. Towns with 5,000 to 50,000 population show maximum specialization. The author further examines the functions in the different categories of towns viz.

(1) Municipalities which satisfies the eligibility tests
(2) Municipality which do not satisfy
(3) Non-municipalities satisfy
(4) Non-muncipalities do not satisfy the eligibility tests.

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[15] Reddy N.B.K. 1970, NGJI 16 (3 & 4) : 270-287.

[16] Devi V, 1969. Functional classification of towns in Tamil Nadu, Indian Geographical Journal (IGJ) 44(3) : 1-14

Moment analysis and centrographic study was used by Reddy[17] (1970, p14) for area, urban settlement and population of Krishna-Godavari delta. By means of moment analysis, a centrographic study of the spatial distribution of urban settlements and their population with reference to geographical centre of Krishna and Godavari delta is contemplated. The distributional changes of the urban settlements and their population is reflected by their locational changes through the previous ten decennial years beginnings from 1871 to 1961.

The study has revealed that the locational divergences which reflect the distributional disparities were not serious in case of urban settlements and urban population of the region. The centre of population has moves away from the Godavari delta to the Krishna delta since 1931 pointing out that the Krishna delta had surpassed the Godavari delta in urbanism since 1931. The mode centre has shown how it moved from port towns to deltaic head towns.

A comparative analysis of the growth and functional characteristics of the towns of Ganga-Yamuna Doab, was attempted by Singh and Dabral[18] (1970, p40). The concept and definition of the towns adopted in this study based on Ashok mitra. The towns of Ganga-Yamuna Doab are of diversified economic structure. The authors concluded after noticing that the towns of very high growth rate are mostly of monofunctional character. The second characteristic notices that town of class I and II have a very high percentage of growth rate as compared to other categories of towns. The low growth of population of towns are mostly of poly-functional.

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[17] Reddy N.B.K., "Moment analysis and centrographic study for area, urban settlement and population of Krishna-Godavari delta", IGJ 45 (1 & 2) : 14-27.

[18] Singh R.P. and M.P. Dabral 1970 "A comparative analysis of the growth and functional characteristics of the towns of Ganga-Yamuna Doab" IGJ. 45 (1&2) :40-46.

Evolution of cities in Maharashtra an analysis of the phases urbanization was studied by Dikshit[19] (1970, p53). He grouped the early urban centres of Maharashtra into

1. Capital cities
2. Port towns
3. Coastal and inland cave settlements and
4. Inland transport route settlements.

The growth of medieval towns was guided by considerations not quite similar to those that gave rise to old towns. These towns were

1. Regional headquarters
2. Fort towns for the purpose of defective
3. Small trade centres

The latest phase in the urban development of Maharashtra is associated with an increasing emphasis on industrial activities. Industrialization accentrated the urbanization in two way : the process of rural - urban migration and creation of new and enlargement of existing towns.

Growth pattern and hierarchy of urban centres in Mysore was studied by Viswanath[20] (1972, p1). The urban expansion in Mysore during 1961 classified into four groups

1. Methopolies with more than 1 million population
2. City with 100,000 to 1 million population
3. Towns ith 20,000 to 100,000 population
4. Small centres with less than 20,000 population.

The availability of some of economically important mineral and location of some industry either accidentally or as a result of purposeful planning helps in the growth and areal expansion of cities. The contignous area surrounding the city

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[19] Dikshit K.R., 1970 "An analysis of the phases urbanization" IGJ 45 (3&4): 53-65.

[20] Viswanath. M.S., 1972 "Growth pattern and hierarchy of urban centres in Mysore" IGJ 47 (1&2) : 1-13.

may also be studied with industries having easy access to financial resources and skilled labour. This becomes the urban area or metropolitan area. The author deleaned 7 urban tracts. The growth pattern of centres, whose population does not exceed 20,000 have been taken for consideration. The centrality index used to divide into urban centres and rural markets. The availability of some fundamental amenities are considered for the determination of the order of hierarchy of the centres. Three central order were formed. Urban, Rural markets and small village markets.

Patterns of population in Mandakini valley dealt by Kumar[21](1950) The valley is tributory basin of Alaknando. The distribution of population in chamoli district of U.P. The running mean used to decipher the trend of pattern of population densities - arithmetic, physiologic and agricultural. He concluded by saying that the density pattern decreased towards source region because of more cultivated and irrigated area and less population.

Murtons[22](1973, p55) spread of village settlements in interior Tamil Nadu before 1750 A.D. throws light on the agricultural village settlements in Salem district. The author feels that the resultant combination of interactions between peasants and new physical environments, migratory peasants and tribal peoples, different peasant groups i.e. Tamil, Telugu and Kannada peasants and continuing inputs of information beyond South India, produced the distributional pattern of agricultural villages in south India during 1750 A.D. The paper approaches the question of village settlement processes by examining their workings from historical and spatial perspectives in interior Tamil Nadu prior to British rule. The human settlements in Tamil Nadu dates back to late stone-age. During Sangam age the Tamil Nadu have developed two types of

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[21] Kumar K 1973 "Patterns of population in Mandakini valley" IGJ 48 (2) : 50-55.

[22] T. Murton B.J. 1973 "Spread of village settlements in interior Tamil Nadu before 1750 A.D. IGJ 48(I) : 55-69

settlements. Scattered in hilly forests and sedentary peasant type. After 300 A.D. coastal Tamil Nadu and by 900 A.D. the plain between deltas of Krishna - Godavari and Cauvery had become a uniform region of village settlement.

The author points out that the village settlements in Salem district before 900 A.D. was sparse. During 900 to 1350 A.D. numerous villages with tank irrigation facilities were founded along the rivers. The period between 1350 A.D. and 1550 A.D. was period of great unrest due to the decline of Chola, Pandya, and Hoysala dynasties and invasion of Deccan by muslims. After 1550 A.D. due to rise of Vijayanagar Empire, the growth of urban centres took place rapidly. Of these most common was town fort complex[23]. Granted villages were common during Chola times.

The author tried to develop an model of colonization based on Byland's analysis of settlement in inner North Sweden. The mean information field developed to create the conceptual model. The assumptions were that migratory peasants established settlement nucleii and spread of settlement from the initial centres were the result of a distance-decay function.

Evolution of settlements in Cavery delta by Gopala Krishnan[24] (1973, p70) throws in sight into the nature of settlements in one of oldest settled area. He analysed the settlement evolution in chronological order. The legendary period, Sangam, Pallava, middle Hindu, Vijayanagar, Maratha, British and post - Independence period. The study traced out the influences of various cultural heritage and physical elements over the settlements.

During chola period most of settlements developed as administrative centres. During this period river Cauvery played an important role in the development of

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[23] Chottopadhya. B.D. 1974, Trade and Urban centres in early medieval India, Indian Historical Review 1(2) :203-219

[24] Gopala Krishnan. K.S., 1973 "Evolution of settlements in Cauvery delta" IGJ 48 (2) : 70-71

settlements. Another important feature was temple's role as centres of urbanization[25]. A good number of settlements have developed as temple oriented villages. The caste system influenced the morphology of village.

Three types of villages existed in the area during the later chola period. They were Brahmadeya, devadana and trade centre villages. The trading village had a suffix word of 'puram' and 'nagaram' and mostly grew at cross roads and along communication lines. The study clearly pointed out that the settlements have developed as administrative centres, temple oriented settlements and defence and nodal points from early historical period to the present day.

The hierarchy of settlements in Coimbatore metropolitan area analysed by Swaminathan[26] (1974, p 78). The concept of hierarctical order of central place is principally based on Christallers theoretical model of spatial distribution of urban centres. The study attempted to establish a functional hierarchy of settlements based on the order of importance with regard to the central functions in the Coimbatore metropolitan area.

By using principal component analysis and the distance cluster analysis it is found that there is a overwhelming importance of Coimbatore, which is a regional city as a major servie centre. It is followed by Singanallur and Kurichi in the order of importance. In the third order the functions are distributed almost equally. In the last but one order the central functions are not distributed rationally. The author proved that the structure of settlements in the Coimbatore metropolitan area closely follows the rule of K=3

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[25] Heitzman 1987. Temple urbanization. Journal of Asian Studies 46 (4):862.

[26] Swaminathan. E. 1974 "The hierarchy of settlements in Coimbatore metropolitan area" IGJ 49(2) : 78-86

The study has shown that there is a intra-regional diversity in the distribution of urbanism especially between Krishna and Godavari delta, upper and lower portions of delta and inner and outer wings of delta. As there is no or les variation in economic conditions of the region, it might not have contributed too much to the intra-regional diversity of urbanism.

Hierarchy of towns in the umland of Allahabad analysed by Misra[30] (1971, p 34). The towns situated within the spatial network of regions work as growth foci and by propelling the development waves usher in an area of socio-economic transformation within the region. The author used Sven Godlund's formula of retail trade to functional centrality index. The administrative status and central functions were used for hierarchy of towns. The four order centres were formed. The near neighbour analysis used to explain the pattern of settlements. The hierarchical structure of urban settlements in the umland doesnot confirm perfectly to any of the theoretical principles of k=3, k=4 and k=7. However it appears that it resemblance with christallers k=3 principle.

Distributional pattern and classification of market centres in Suryapur plain by Srivastava[31] (1979, p 516). The northern part of it is known as Tarai which is forested. The author used near neighbour analysis to assess distributional pattern. The density, means of transportation influences the location of market centres. Factors more intimately connected to market characteristics i.e. market periodicity, behavioural and social aspects of market visitors, consumer preferences etc may provide a better interpretation of distributional pattern. In addition, distributional characteristics of market centres further evaluated in context of their average attendence on a market day and market periodicity because these are indirect reflections of population characteristics. The author

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[30] Misra.H.N., 1976, "Hierarchy of towns in the umland of Allahabad" Dec. Geog. 15(1):34-47.

[31] Srivastava.V.K. & H.O. Srivastava : 1979, "Distributional pattern and classification of market centres in Suryapur plain" Dec. Geog. 17(1) :516-523

classified market centres based on market size and periodicity. Based on size 5 types and based on periods 4 types suggested. The distribution, centrality, and hierarchy of central places in the Indrayani Basin and the impact of physical and economic factors analysed on the distribution and growth of settlements in the region. The centrality of a place worked out by using the number of persons engaged in trade and commerce and other services. In the hierarchy of settlements, Christallers model values of K=3 were compared. Nature of terrain and accessibility are the important variables which influence the size of service areas served by different centres. The study brought out that regular gradation exists only if physical and economic conditions are uniform throughout the region.

Centrality and Ranking of settlements: A comparative study of Hills and Tarai-Bhabar region of Himalayas in by Tiwari et. al.[32] (1983, p 391) in a distinct physiographic region. The authors used composite index as calculated from principal component Analysis for ranking it. They shown that physio-climatic diversities play a crucial role in determining the emergence and growth of central places over a region.

A theoritical verification of urbanization was conducted in upper Assam[33] (1968, p1) for the year 1961. The geographical region of upper Assam was examined to establish rank size relationship and to determine the 'q' value for an urban measure of the region. The study suggested that it essential to elevate some of rural central places to small size urban centres to bring up a balance in urban hierarchy which would lead to an equalization of the forces of unification and diversification in the region as essential quality of healthy urbanization.

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[32] Tiwari.P.C. et. al 1983 "Centrality and Ranking of settlements A comparative study of Hills and Tarai-Bhabar region of Himalayas. Deccan Geographer 21(1) : 391-398

[33] Singh D.K. & M.K. Bandopadhya 1968. Urbanization in upper Assam. Geographical Review of India 30(2) : 1-5.

The functional bases of cities in Maharashtra (Sawant & Nabole 1997, p39)[34] in general are not seats of production. The large/medium towns have considerable industrial and commercial importance.

The study hierarchy of market centres in lower Silabati Basin[35] (1978 p175) focused on the nature of market centres - daily and weekly. In the peasant sociaties mostly, markets are periodic because the percapita demand for goods sold in market is small. The market area is surrounded by undeveloped transport system. The periodicity of market is depends on density and communication network. The study analysed the location of markets as it is found in 3 points - centre of comand area, nodal point or densily populated region. The study divided hierarchy of markets into 5 orders or levels which are distinguished by assessment of daily average attendance and quality and qualitity of agricultural goods arrived in the market.

In another study, the hierarchy of settlements in lower Silabati Basin[36] (Jana and Bagchi 1978, p 356) analysed. To determine the hierarchy, the centrality scores of a place worked out by considering the all functions performed by the settlement of the region.

The functions considered were education, communication, trade & commerce, finance, extention services, retail services and industry. The threshold population of each service worked out for degree of importance.

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[34] Sawant & Nabole 1977, "The functional bases of cities in Maharashtra" Geographical Journal of India 39 (2) : 89-96.

[35] Jana.M.M., 1978. "Hierarchy of market centres in lower Silabati Basin" GRI 40(3) :175-81.

[36] Jana.M.M. & Bagchi 1978. "Hierarchy of settlements in lower Silabati Basin" GRI 40(4): 356-99.

The occupation structure of the urban units in the lower Damodar valley[37] (Basu 1991, p19) which is housing two largest industrial conurbations - the Hooghly and Asansol - Durgapur complex. The entire region is strongly centred around primary but secondary and tertiary occupations flourished in urban units. The study points out that occupation structure of region reflects somewhat immature economic profile. The study also focused on unemployment, high dependency ratio and social conflicts.

Hierarchical classificaton of service centres[38] (Khan, 1986 p49) in Trans-Ghaghara plain analysed through Grove & Huszar's, Godlund's, Ulman's, Berry and Garrison's and Davies' method. The hierarchy of settlement is based on hierarchy of functions. The study justified the Davies method of hierarchical classification of service centres.

The nature of urbanization in the lower Damodar valley[39] (Lahiri, 1986) explained in the backdrop of the socio economic peculiarities of the region which has a very old urban tradition supported by a rich resource base. The two industrial complexes - Hooghly and Asansol - Durgapur seperated by a vast agricultural tract. The new towns of the tract, engaged in tertiary activities. The author unable to find a model to explain urbanization of lower Damodar valley.

Rank-size distribution of urban settlements in West Bengal (Sarkar[40] , 1987 p.1 and Bose, 1987 p47)[41] seems to be invalid as Zipf's rule not fit to explain the distribution. The rank-size analysed from 1901 to 1981 and indexes of primate

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[37] Basu. 1991. "The occupation structure of the urban units in the lower Damodar valley" GRI 53 (4) : 19-25

[38] Khan.S. 1986, "Hierarchical classification of service centres in Trans Ghaghara plain" GRI 48(3): 49-53.

[39] Lahiri 1986, "The nature of urbanization in the lower Damodar valley" GRI 48(4):1-4.

[40] Sarkar 1987 "Rank-size distribution of Urban settlements in West Bengal" GRI 49 (4): 1-12

[41] Bose 1987 "Rank-size distribution of Urban settlements in West Bengal" GRI 49 (4): 47-55.

class-I cities found non-conforming to the observed rules. The curve forms somewhat S-shape. Culcutta and Haora have maintained their positions as first and second ranking cities. The studies proved that the size relationship of urban centres comes closest to a primate distribution.

The Nearest Neighbour Analysis technique used in the urban settlement pattern of Karnataka[42] (Karennavar, 1976, p 78) the study analysed the settlement pattern in districtwise and classified it under seven different headings. Bangalore and Mysore have random distribution due to its physical and cultural features of urban development. Coorg is the only district where clustered pattern is found and they indicate the close spacing of settlements. The dispersed patern found it in Tumkur, due its geographical conditions. By using 'Rn-statistics' the delimitation of urban concentration done. The 'E' i.e. distance of seperation used conveniently to delineate.

The index of population concentration and temporal redistribution in the Brahmaputra valley[43] (Mitra & Singh, 1987, p 15) aims at quantitatively pointing the percentage of over or under population. The geographical divisions of valley taken as units.

Spatial distribution of market centres in the umland of Kanpur metropolis[44] (Dixit, 1983 p 391). The market centres plan a vital role in socio-economic development of a region and perform the functions of service centres. The distribution of market centres does not related to any of the factors such as population, area, density and inhabited villages.

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[42] Karennavar 1976. Patterns of urban settlements in Karnataka. GRI 38 (1) :78-84.

[43] Mitra. S. & D.K. Singh, 1971. "The index of population concentration and temporal redistribution in the Brahmaputra valley" GRI 33(1): 15-22.

[44] Dixit 1983. "Spatial distribution of market centres in the umland of Kanpur metropolis" GRI 45(1) : 391-408.

The urbanization of south Konkan[45] (Sita 1980, p 238) is mainly of small towns dominated. The Konkan region is low in levels of urbanization. The trends in urbanization process summarized by the application of centrographic technique and by locating the mean centre of urban population at succesive census periods from 1901 to 1971. The common feature of the South Konkan urbanization proces is stagnation or decline and declassification.

OBJECTIVES AND HYPOTHESIS

The above review of literature, presented in the proceeding section, shows that the sufficient ground work has been done on various aspects of urbanization covering different regions. However the Cauvery basin which is one of the major urbaniszed natural region has not been given proper attention. In this study therefore an atempt has been made to investigate into various aspects of urbanization, of Cauvery Basin. To fulfill this following objectives has been set.

Objectives:

1. To identity the pattern of urban population growth with its rural counterpart from 1961-91 and to to see how the urbanization process manifests itself through various spatial expressions: levels of urbanization, concentration of urban population in cities, towns, urban agglomerations and standard urban areas.

2. To identify the shift in the economic structure of the towns and cities as they grow from 1961-91

3. To identify the spatial organization of urban system in terms of different services provided by it.

[45] Sita.K. 1980, "The urbanization of south Konkan" GRI 42(3) : 238-248.

4. To correlate the proces of urbanization and economic development in the Basin.

The following are the hypotheses formulated to achieve the above objectives.

Hypothesis:

1. The towns located along the course of river Cauvery and its tributories are dominant in the urban system and act as the urban foci or hearths.

2. The rate of growth highest among large and medium towns than cities, and city growth is dependent upon it.

3. The urban system of Cauvery basin is fairly balanced and therefore conforms to the rank size rule of Zipf.

4. As the economy and urban system is moving in a more balanced way over the time, the primarcy is decreasing.

5. The economic base of cities are industrial or manufacturing oriented and it is acting as stimulant to further urbanization.

6. The towns having larger share of their workers in manufacturing sector show fastest growth.

7. Though the large towns of the basin are the administrative headquarters they are largely manufacturing towns.

8. The process of urbanization induced rapid changes in the economic development of the region.

CHAPTER II

METHODOLOGY

The chapter deals with database and methodology. Before dealing with data base and methodology, the detimitation of study area is undertaken.

The study areais spread about in three states namely states of karnataka, Tamil Nadu and Kerala, and union territory of Pondicherry.

The detimitation of study area is based on the principle that those districts which fall within the basin boundary are considered. But certain destricts are not falling fuly in terms of area, if 50% of area or population is in basin, then it is considered.

The central water commission, census of India, survey of India and National thematic mapping organization whose basin map helped in carring out the study area.

The methodology includes

1. Near Neighbour Analysis
2. Indices of Primacy
3. Rank-size Rule
4. Functional classification (H.J.Nelson Method)
5. Demographic potential or gravity model
6. Centrality and hierarchy of towns. The above stastical techniques are dealt in detail in the following pages.

Near Neighbour Analysis

Since the appearance of Christaller's work, several theories relating to the number, size and spacing of settlements have been formulated. One such important aspect is the pattern of distribution. Initially studied by Clark and

Evans[1] (1954) and later by King (1968). A pattern of equal points has the possible character of clustering. Regular spacing represents repulsion among individuals and therefore, indicates opposite of clustering. A random spacing of individual elements represents no interaction or mutual independence. The nearest neighbour analysis has been used to analyse the pattern of urban settlements in Cauvery region. The model has been used by the plant ecologists, who have pointed out the effective devices for quantifying the distribution and discerning distribution patterns. The distribution of urban centre depends upon both natural phenomena and impact of cultural development on its hinterland.

Qualitative terms such as sparse, dispersed, agglomerated or dense or concentrated, close spacing and random distribution are used. The system of location of urban centres, as pointed out theoretically may form hexagons to squares or equilateral triangles but distribution may be uniform, dispersed or concentrated in any of the systems.

King[2] (1968) has suggested an index for dealing the character of settlement pattern in mathematical terms. The approach is based on modern statistical theory and the notions of probability.

The technique of neighbour analysis is a measurement of distance from an individual to its nearest neighbour irrespective of direction. The model indicates the degree to which any observed distribution of points deviate from what might be expected if the points were distributed in a random manner within the same area. A random distribution of points is difined as a set of points on a given area for which any points has had the same chance of occuring on any sub area as any other point that any sub area of specified size has had the same chance of

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[1] Clark P.J & F.C Evans 1954: Distance to near neighbour as a measure of spatial relationship in population. Ecology 35: 445-453.

[2] King. L.J.A. 1968. Quantitative expression of the pattern of urban settlement in selected areas of U.S. in Analytical Human Geography P.J. Ambrose ed. London : Longman p. 99

receiving a point as any other sub area of that size and that the placement of each point has not been influenced by that of any other point.

For measuring the distances the folowing formula has been used.

$$Rn = \frac{r\,A}{r\,E}$$

Rn	=	the measure of the degree to which the observed distribution departs from random expectation with respect to the distance to nearest neighbour.
r A	=	the mean of series of distance to nearest neighbour.
r E	=	the mean distance to nearest neighbour expected in an infinitely large random distribution of points
r	=	the distance in any specified units of given individual to its nearest neighbour
N	=	the number of measurements of distance taken in the observed sample
Er	=	the summations of the measurements of distance to nearest neighbour
A	=	geographical area.

Hence the ratio of observed mean distance to expected mean distance is termed as nearest neighbour statistic R-wether an area is random uniform or clustered can be decided on the basis of the following Rn - statistic

Rn Statistic		Pattern
0.00 - 0.09	-	Absolute Concentration
0.10 - 0.50	-	High Concentration
0.51 - 0.99	-	Clustered pattern
1.0 - 1.19	-	Random pattern
1.20 - 1.49	-	Approaching uniform
1.50	-	Uniform
1.51 above	-	dispersion.

Since the river Cauvery influences the location and spacing of urban settlements the conventional near neighbour analysis was replaced by Linear near neighbour analysis (L-NNA). The formula is as follows:

$$L\,Rn = \frac{LrO}{LrE}$$

where

LrO is the Linear average distance observed between the individuals

and

LrE is the expected average distance between the individual

LrE calculated through the formula

$$LrE = \frac{2\,Lro\,(n-1)}{L}$$

L = Length of the Linear feature,

n = Number of points.

INDICES OF PRIMACY

Primacy is the degree of lead at the largest city enjoys over the other smaller cities of the region. It is expressed as a ratio in terms of how many times the largest city is bigger than its subordinates.

Jefferson[3] (1939) was the first to introduce the concept of the primate city. According to him primacy is present when the population of the largest city is several times larger than that second in rank. He suggested a primacy index in which he considered the population of the three largest cities of each country as percentage of the value of the highest ranking city.

$$P_1 = \frac{P_1}{P_2 + P_3 + P_4}$$

[3] Jefferson. M., 1939: Law of the Primate city, Jefferson. M., 1939: Law of the Primate city, Geographical Review 29 : 226-32.

Another index of primacy based on larger number of towns also deviced as given by Arriga

$$P_n = \frac{P_1}{P_2 + P_3 + \ldots\ldots P_{12}}$$

P represents the population of n^{th} city.

Berry[4] (1961) using a somewhat similar primarcy index arrived at the conclusion that the countries with the lowest primary indices have rank size distributions and the countries with highest have primate city size distributions. Higher value of Pi and Pii suggest higher degree of primacy.

RANK - SIZE RULE CONCEPT

The urban rank size distribution embraces the most important geographically significant assumption that there is some sort of order or logic underlying the size relationship and spatial distribution of urban centres. It is obviously assumed that settlements do not grow up is a haphazard and random manner and that measurable degree of order is to be found in these size and spacing. It was first noticed by F. Auerbach in 1913 that when same rank numbers are plotted against their respective population a regular relationship generally emerged. This is really a phenomenon which has a very long history and brought to the general attention by Zipf (1949). The relationship can be expressed in more precise mathematical terms. If all the "urban settlements of a region are ranked in descending order of population, the population of the nth town will be one-nth that of the largest one. Expressed in formal way, the rank-size rule is

Pr	=	$Pi.r^{-q}$
r	=	rank of a city
Pr	=	Population of a city of rank r
P_1	=	Population of the largest city
q	=	an exponent which generally has a value close to 1.

[4] Berry, B.J.L. 1961: "City size and economic development", in urbanization and national Development, ed. L. Jakobson and V. Prakash. London:Sage publications.

When the population size is plotted against the rank for every urban settlement the relationship on a logrithmic scale is expressed by a downward sloping line.

According to Richardson the rank size distribution may instead be interpreted as a very general model according to the value of the exponent. If q = 1 implies a rank size rule, q 'more than' unily represents a metropolitan domination while q 'less than' unity stands for an urban system where the intermediate cities are relatively large. The limiting cases, unknown in practice are q equal to unfinity (only one city) and q equal to zero (all cities of same size).

Berry[5] (1973) suggested that as the economic social and political life of a country become more complex its urban size distribution will tend to develop towards a rank-size distribution which represents, the steady state of an urban system. Looked at this way the rank size distribution can be regarded as special case of the "law of allometric growth" (Beckman 1958, Nordbeck, 1971). Zipf attributed the rank size regularitics to the forces of unification and diversification.

Rank-size rule as a log - normal relationship

A rank size distribution may also be shown as a log normal distribution. This may be done by plotting the cumulative percentage of urban centres of different sizes on logarithmic normal probability paper. If rank size rule holds, then the group should form a stright rifle.

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[5] Berry B.J.L. 1973: The Human Consequences of urbanisation. London: Macmillan.

CENTRALITY AND HIERARCHY

The size distribution of lower order towns is of considerable interest. Much discussion has centered around the question of whether there is a gradual and continuous decrease of urban population size with descending rank or whether there are groups of towns of dereasing but approximately equal size and importance. The former situation is referred to as a continuam of urban sizes, the latter as an urban hierarchy.

The term central place is used to describe a settlement providing one or more services for the population living outside it. Such services may be rudimentary or sophisticated and specialized. It may be referred to as low order and high order services respectively. Between these extremes found a wide range or hierarchy of intermediate functions. When a higher order function occur in a town it is normal to find most lower order functions also present.

It will be apparent that the population required to support different functions tends to increase as one goes higher up the hierarchy. The minimum number of people required to support a function or service is called the 'threshold population'. The criteria on which the functional base of cities is disputed one. The studies of Grove & Huszar, Godlund, Ulman, Berry & Garrison and Davies methods of hierarchical classification are some importance to understand the problem of hierarchical arrangement of central places. The problem of assaigning hierarchical rank to a service centre is considerably difficult.

Davies Method

Davies[6] (1967) was also critical of subjective statement and inclusion of certain 'key' facilities. Unlike Berry and Garrison, he is anxious to incorporate some measure of quality of functions in determining the relative importance of status

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[6] Davies, W.K.D., 1967: Centrality and central place hierarchy, Urban studies 4: 61-74.

of a centre by awarding particular weight age to each function according to its degree of importance.

According to him the hierarchical status of a place can be measured by the centrality of a function that exists in it. He argues that the degree of a centrality of a function varies with the total number of establishments of that particular type of function in the study area. It follows therefore that the greater the total number of outlets of any particular function, the lower will be the centrality of each individual outlet, since satisfaction of demand is spread over a number of outlets and vice-versa. Following formula is derived to compute the centrality (termed location co-efficient) of each type of function.

c	=	t /T100
c	=	Centrality
t	=	One outlet of function t
T	=	Total no. of outlets of function t.

The derived location co-efficients are allocated to settlements to produce a measure of functional importance. Thus multiplication of the relevant location co-efficient by the number of outlets of each functional type present in a settlement gives the degree of centrality (value) imported to each settlement for every different type of function. Finally a functional index is derived by the addition of all the centrality values attained by any settlement to denote the overall status of a centre.

The underlying concept is that the settlements can be graded and regrouped in the tiers of a hierarchy in any region. The concept of hierarchical clas system in urban geography begins with the theory of central places. The classical central place theory is the result of Christallers theorization. The three basic principle which Christaller selected to distinguish the hierarchical system in a region are

1. Marketing
2. Traffic and
3. Administrative (Politico-economic) principle

The nesting pattern of urban centres for marketing, traffic and administrative as K=3, K=4 and K=7 respectively. Although the hexagonal model of hierarchy was subjected to great criticism when tested under real condition, yet it worked as a tool for further researches. To ascertain the centrality, all such studies examined either the provision of central goods services in a centre or measured the tributory area seaved by it.

To find the centrality, the following the number of facilities in each urban settlement were considered.

Medical facilities

1. Hospitals
2. Dispenseries
3. Nursing Homes
4. Tuber Closis clinics
5. Health centres
6. Family Planning centres

Educational facilities

1. Arts Colleges
2. Science Colleges
3. Commerce Colleges
4. Medical colleges
5. Engineering Colleges
6. Poly Technics
7. Shorthand, typewriting and other vocational institutes
8. Higher Secondary or secondary schools
9. Junior secondary and middle schools
10. Primary Schools.

Recreational and cultural Facilities

1. Cinema Halls
2. Stadia and Parks
3. Auditoria and Drama Halls
4. Public Libraries

Financial Facilities

1. Banks
2. Agricultural credit societies
3. Non-agricultural credit socieites.

The location co-efficient of each facility was find out through Davies method and multiplied with the number of facilities and the cummulatve sum of centrality scores determined the hierarchy of settlement.

FUNCTIONAL CLASSIFICATION

One of the distinguishing characteristics of a town or city is the fact that its work is 'divorced from the soil;' the people are not primarity food producers. But all towns are not alike in their functions, some are basically manufacturing centres, while others are trade, service or transport centres.

One of the ways is which a town could be functionally classified is by measuring the jobs people in them do. All towns are multifunctional although many towns specialise in one or more functions. This means the figure to isolate the special function must be a certain degree of arbitrary for example C.D. Harris[7] has classified the cities of the United states into a categories using certain arbitrary values. According to his classification wholesale cities are those where the number of employers in wholesaling should be atleast 20% of the total employed in manufacturing, retailing and wholesaling and at least 45% of the total employed in retailing.

Another classification of American cities was made by H.J. Nelson[8] who recognized major classes of economic activity as Harris, but by using the mean

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[7] Haris C.D., 1943: A Functional classification of cities in the U.S., Geographical Review 33: 86-99.

[8] Nelson H.J., 1955 : A service classification of American cities, Economic Geography 31 189-210.

percentage of each of nine functional groups and calculating their standard deviation. The most significant function in a town can be determined by comparing the functions importance in that town relating to the functions importance in other towns. The principle is to conceive of an avarage town and to compare the occupational pattern of other towns with this avarage town.

Nelson defined mean or avarage as 'normal' for the whole country and the degree above normal defined by use of standard deviation, a measure of the departure from the mean. Diagnostic occupational groups - manufacturing, retail trade; professional service; transportation and communication; personal service; public administration; wholesale trade, finance, insurance and real estate; and mining. For each occupational or diagnostic group the standard deviation from the mean for all towns is calculated. Any town which shows a percentage employment of more than mean plus standard deviation is said to be significantly characterized by the function diagnosed by the occupation group. This further shows how many times the employment ratio in one town is above the mean for all towns in terms of standard deviation.

R.S. Dick working in Queensland, Australia adopted a similar technique but expressed his results more completely by including the percentage employment as well in the nomenclature of functional bases of cities.

The potential model and potential surface of population

In studies of spatial interaction the ideas of specific geographical complementarities and the friction of distance are brought together in the granity model.

The interaction potential is a general concept and can be applied to marketing, irrigration, Commuting, communication and other kinds of problems. In social science the gravity model has been used to explain much of the variation in data describing movement of people, goods, and ideas, and to suggest insights about geographic structures formerly hidden from view. The gravity model is thus a

valid representation of (p-plane) facts about spatial interaction. Population potential is an index of the intensity of possible spatial interaction between the inhabitants.

But how much interaction should we expect? The concept of potential suggests a measure. Borrowing from ideas of Newtonian physics, we might expect the same kinds if regularities in the attraction between the social units as we observe among the physical units. Any two physical objects in the universe attract each other with a gravitinal force that varies directly with the product of the masses of the objeect; thee larger they are, the greater the attractive force. The attractive force or gravitational potential between two objects diminishes as the (Square of the) distance between them increases.

The logical basis of the gravity model is simply the interaction of two places with each other in proportion to the product of their masses and inversely according to some function of the distace between them. That is

$$I_{ij} = f\left(\frac{M_i M_j}{dij^2}\right)$$

where:

Iij = the number of interactions between i and j during some time period.

dij = the distance between i and j and

M = some measure of the size or mass of the intreacting pair of places[9].

We can apply these gravitational ideas to the towns is in the Basin and derive a measure of interaction potential at each town location. Potential at a point is

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[9] Abler R spatial organisation , p.221.

simply an aggregate measure of the influence of all the distant places on that point.

Within a bounded region containing n points, total potential at one point i is computed as the sum of the separate potentials created by the existence of every point including point i.

In the present study, the U.A.s/towns having a population of 50,000 or more (class-II and above) only considered to a create a potential surface of population. This is taken on the basis of standard urban areas, which presupposes that the surrounding area wil be totally urbanised within two or three decades.

Let us assume that town i located a region with several other cities. In a modern economy of specialized people and places, we can reasonably expect that a town i has some potential for interacting with each of the other towns in its region.

Potential at a point may be thought of as a measure of the proximity of that point to all other places in the system, or as a measure if aggregate accessibility of the point to all the other points in a region. Potential at a point is simply a aggregate measure of the influence of all distant places on that point.

Within a bounded region containing n points total potential at one point i is computed as the sum of the separate potentials created by the existence of every point including point i. The potential p created at i by each point j is equal to the mass at j divided by its distance from i. In symbols.

In the present study the towns having a population of more than 50,000 and above (i.e. class III) are used to construct an .is arithmic map of population potential for Cauvery region. The reference periods are 1961 and 1991 based on census data.

DATA BASE

The present study covers the following four aspects.

1. The analysis of population in general about rural-urban and total population.

   In analysing the rural population the district as the unit used. The urban population dealt at individual town levels and districts.

2. The distance measured between two urban centres in near neighbour and gravity analysis taken from survey of India maps.

3. The data on industrial classification of works into nine category on individual town collected. For 1961 and 1991 from economic tables of census of India.

The facilities found in individual towns - medical, educational, recreational and cultural and financial are collected from town directory volumes of census of India for 1971 and 1991.

The former used for classifying the towns on their economic basis and the latter to construct the centrality index and thus to present them hierarchically.

CHAPTER IV

PATTERN AND TREND OF URBANIZATION IN THE CAUVERY RIVER BASIN

Definition

The census of India has been presenting the demographic data seperately for rural and urban areas. The unit of classification of urban areas is town. The definition of urban place as adopted by Census of India (1991) as follows:

(a) All places with a municipality, corporation, Contonment board or notified town area committee, etc.

(b) All other places which satisfy the folowing criteria:

  (i) A minimum population of 5,000;

  (ii) At least 75 percent of male working population engaged in non-agricultural pursuits; and

  (iii) A density of population of at least 400 persons per sq.km.

Besides, the Directors of Census Operations in State/Union Territories were allowed to include in consultatian with the concerned State Governments, Union Territory Administrations and the Census Commissioner of India, some places having distinct urban characteristics as urban even if such places did not strictly satisty all the certeria mentioned under category (b) above. Such marginal cases include major project colonies, areas of intensive industrial development, railway colonies, important tourist centres, etc.[1]

It may be noticed from the definition that there are two district types of urban units, such as statutory and census towns.

The levels of urbanization is usually measured by an index that is some kind of ratio between the urban population and the total population. Since the total

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[1] Census of India, 1991 provisional population totals : Rural - urban distribution

population contains both the rural and urban inhabitants, the level of urbanization is fundamentally the ratio of the urban population to the rural population.

In symbols, if Lu stands for the urban ratio or fraction, its value is given by

$$Lu = \frac{Pu}{Pu + Pr}$$

Where pu is urban population and pr is rural population.

The level of urbanization can manifest a given change with quite different alterations of the numerator and denominator. It can increase even when the urban population is diminishing (provided the rural population is diminishing faster than the urban); conversely, it can decline even when the urban population is growing (provided the rural population is growing faster).

The present chapter, on the rate of urbanization wil give separate treatment to each part of the urban question.

It wil start with urban fraction, analysing the rise in the proportion of Basin's people living in towns and cities, next it will consider the growth of the urban and city population themselves, apart from any changes in total population. The growth of cities according to these size, the growth of urban population in different size classes are treated seperately.

RURAL URBAN COMPOSITION

Levels and trends of urbanization

The urban population of Cauvery River Basin Region or shortly Basin as per 1991 census is 81,52,466 spread over 157 urban agglomerations/towns. The urban population accounts 28.42% of the total population of the Basin.

The table No.4.1 shows the levels of urbanization in the Basin as measured by percentage of population living in urban areas from 1901 onwards. It also includes the no. of urban agglomerations/towns.

It will be noticed that the number of towns has been increasing stedity till 1961 census. Due to strict application of urban criteria, a large number of towns were declassified in 1971 census and equaly more urban places were added to the numbers. Since then it increases slowly.

Table. 4.1 Trend of urbanization.

Years	No. of Towns	Urban population	Levels of urbanization	urban population growth	tempo of urbanisation (URGD)
1901	92	1117335	11.51		-
1911	87	1137183	11.28	1.78	-2.40
1921	97	1302699	12.12	14.55	8.98
1931	105	1567110	13.75	20.30	16.28
1941	124	2047304	15.64	30.64	18.24
1951	134	2950813	19.37	44.13	32.93
1961	151	3817111	22.13	29.36	20.01
1971	153	5292341	24.92	38.65	19.93
1981	154	6815342	27.12	28.78	13.83
1991	159	8152466	28.42	19.62	7.57

Source : census of India

1. Tempo of urbanization has been worked out by subtracting the annual avarage growth rate of rural population from that of urban population. It may be seen from the Table that the number of towns/urban agglomerations has increased from 92 in 1901 to 159 in 1991. The towns increased its maximum

during 1961 and then declined. Further, despite continuous increase in urban population during the last 9 decades, the tempo of urbanization exhibited a varied trend.

The devastating plague and epidemics of 1911 which spread mainly is urban areas and brought an exodus of urban population to rural areas. The partition of country during the decade 1941-51 responsible for the sudden spurt in urban growth. During the period 1941-51 with the introduction of five year plans, the country experienced rapid industrialization. The decades 1951-61 and 1961-71 therefore showed an upward trend in urban growth. Contrary to national trend, the tempo of urbanization actualy slowed down during 1971-81 period during which urbanization in India considered as over-urbanization. Again it is slow during 1981-91 wich was experienced throughout the nation.

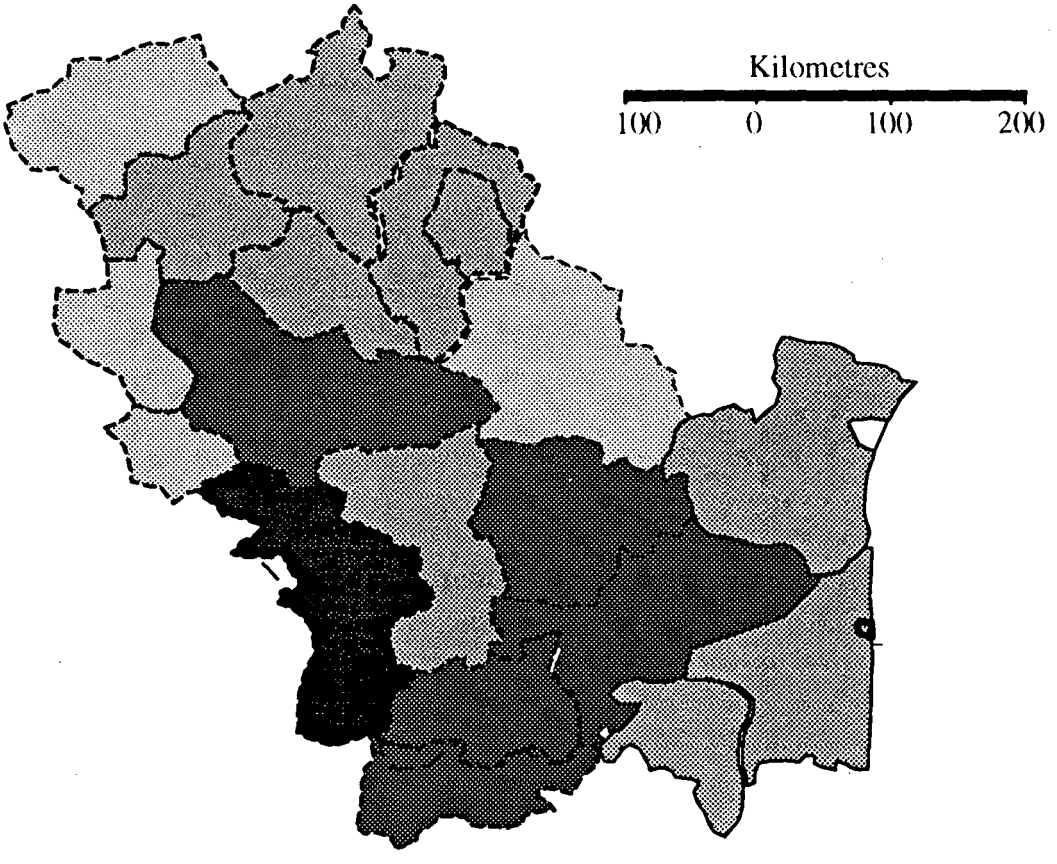
Temporal variation in the level of urbanization.

As per 1991 census the levels of urbanization is 28.42 percent. The level of urbanization started slowly from 11.51 percent in 1901 to 28.42 percent during 1991. This higher level is significant in view of the large number of urban agglomerations / towns found in the Basin. Very interestingly the district headquarters of the all the districts lying in Basin are within the Basin boundary except Kerala state - whose mountainous Western Ghats only found in western margins of the Basin. The basin is highly industrialized and a prosperous agricultural belt. During 1901-1941, the levels of urbanization was slow but 1951 onwards the levels of urbanization increased rapidly gaining about 5-6 percent points in urbanization scale.

Though urban growth showed a reduced rate during 1971-81, the gain in absolute urban population was tremendous in that period. Not only that, the urbanization also showed a very high change between 1971-81 period. (Table 2) - Levels of urbanization - 1901-91.

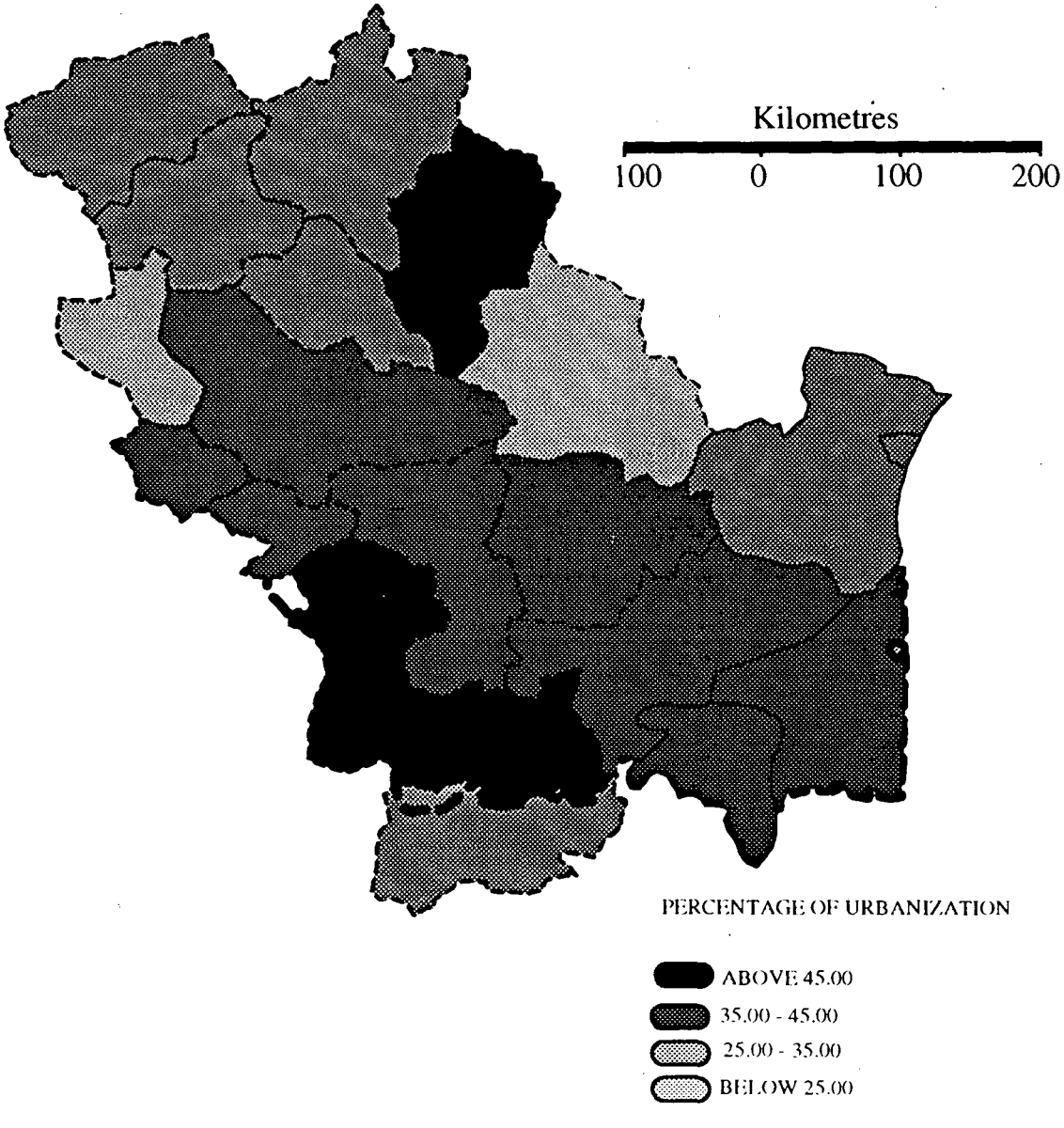
CAUVERY BASIN

LEVELS OF URBANIZATION 1961



CAUVERY BASIN

LEVELS OF URBANIZATION 1991



Spatial variation in the levels of urbanization.

The of urbanization is very old phenemena in the Basin. The first migration stream settled along major river valleys and Cauvery is one of the important site of settlement. The southermost important route ends in cauvery delta[2]. The some of very old urban settlement are the former capital and Port cities of ancient dynasties/kingdoms. The notables are Uraiyur, Thanjavur, Gangaikonda Cholapuram, Cauverypoompattinam in Tamil Nadu part of Basin and Mysore, Halebid, Srirangapatna in Karnataka part of Cauvery Basin. During British period, the emergence of small towns accelerated. The agricultural processing villages - especially in plantation areas grow into major modern settlements.

At the beginning of the century only Nilagiris district had its population substantially in urban places. The level of urbanization[3] was 24.03 percent which is the level of urbanization of India in 1991. Similarly the districts of Bangalore, Thanjavur and Mysore had its 26%, 16% and 15% of its population in urban centres respectively. (Table).

In the subsequent decades the population living in urban places increased considerably in the districts of Bangalore, Nilgris, Mysore, and Coimbatore. The notable change occured in Coimbatore district which increased its level of urbanization during the period 1901-1951 from 8.05 percent to 28.15% in the above period.

In 1961, the districts of Salem, Tiruchirappalli, Thanjavur of Tamil Nadu, Mysore of Karnataka and Karaikal of Pondicherry had about quarter of their population in urban places. The half of population lived in urban places in Bangalore, Nilgiris and Coimbatore. The districts of Coimbatore and Nilgiris of

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[2] Subba Rao, Personality of India.

[3] In the analysis of urbanization, the districts of Kerala was not included owing to the reason that not even a single class-IV town found in the part of Basin. It is only mountainous western ghats.

Tamil Nadu drastically improved their levels of urbanization to 47.71 and 49.24 percent from 40.03 and 43.94 percent during the decade 1961-71 respectively

The decade 1971-1981 referred as a period of overurbanization in India, owing to the rapid growth of urban population without much progress in levels of urbanization. In the Basin as a whole, the growth of urban population was slowing down since 1961 onwards with a reduction in urban-rural growth differential which indicates the slowing down of face of tempo of urbanization. Though the growth of urban population and URGD declined during 1971-81 considerably, the gain in absolute urban population was highest in that decade.

In the districts of Salem, Dindigul Tiruchchirappalli, Thanjavur of Tamil Nadu and Mysore of Karnataka and Karaikkal of Pondicherry, the general level of urbanization was about 25 - 35% during 1991. The districts of Coimbatore (50.46%), Nilgiris (48.85%) and Bangalore (64.54%) recorded a higher levels of urbanization in the Basin. In 1991, the tempo of urbanization and urban population recorded a decline, which reflected in all size classes of towns and levels of urbanization.

The level of urbanization manifested in the Basin with much variation. The most urbanized districts are Coimbatore (52.59%), Nilgiris (49.76%), Dindigul (36.84%), Salem (29.16%). Tiruchchirappalli (26.61%), Periyar (24.71%) and Thanjavur (22.94%) of Tamil Nadu and Bangalore (68.68%), Mysore (29.71%) of Karnataka and Karaikal (42.42%) of Pondicherry.

The least urbanized district is Dharampuri, where only one person out of 10 people live in urban places. This district throughout the century remained least urbanized and no class-1 cities found. Dharmapuri and Kodagu (Coorg) were only two districts where no class-I cities reported. Pudukkottai, South Arcot, Chickmaglur, Hassan, Kodagu, Mandya and Tumkar were medium urbanized with a level of 15-17%. URGD which shows the tempo of urbanization was very much favourable during 1961-1951 but since then it declined very rapidly.

The table shows the ratio of urban population living in cities (100,000 or more inhabitants) and towns (less than 100,000). Since 1901-1961, more than 60 to 90 percent of urban population lived in places designated as towns. Only from 1971 - onwards the urbanization is taking the shape of city-based one.

The 55 percent of urban population by 1991, are able to live in cities. (Class I towns) and thus the urbanization is largely citified. The redistribution of urban population is common in India, and other less developed regions. 1901-1961, the urban growth was by and large three towns that of rural growth only after 1961, the difference narrowed down.

Table 4.3 URGD.

Year	1901-11	11-21	21-31	31-41	41-51	51-61	61-71	71-81	81-91
URGD	0.24	0.9	1.63	1.82	3.3	2.0	2.0	1.4	0.76

The urban-rural growth differentials.

The URGD which indicates the tempo of urbanization, which increased rapidly till 1951 and slowly decreased to 1921 level in 1991. The URGD at 1991 was 0.89 increased to 3.3 in 1951 and gradually attained the 1921 level i.e. 0.76 in 1991. The rigid application of census definition resulted in declassifying large number of existing towns and re-classifying a lot of new towns. (Table). The rural urban ratio is given in Table 4.4.

The urban-rural ratio (number of rural persons per 1 urban person) shows that the districts of Coimbatore, Nilgiris and Bangalore which are most urbanized one. On the other hand Dharmapuri, Kodagu, Mandya and Tumkur are moderately urbanised, save Dharmapuri, which is least urbanized.

The district of Thanjavur is maintain its level throughout the century. It is one of most productive regions of south India. Known as 'Rice bowl' of Tamil Nadu, it is charactered by some of oldest settlements formed during ancient time.

The district of Thanjavur is having a large number of medium and small towns. Out of 26 UAs/towns 16 are small and 5 medium towns in 1991. In 1961 22 were small towns out of 28.

It would be seen from Table , that people living in places classified as urban is more than matched by the people still living in places classified as rural. Since the overwhelming majority is this huge final population, the urbanization process is largely city concentrated.

During 1961, the large number of rural places were re-classified as urban centres resulting in net decrease in rural population. But in 1971, the large number of towns were declassified thus restored the rural population. This is cause of decreased rate in 1951-61 and subsequent increase in 1961-71.

Both rural and urban growth rates were highest during 1961-71.

Growth of Urban Population

In terms of sheer urban population increase, what strikes is the rapid expansion of urban population and in rural population and whereby total population also. Between 1971-1991 the total urban population added was 4.2 million. The largest gain in absolute urban population was during 1971-81, which was period of slackened urban growth in the Basin.

The Basin's city population has grown rapidly than the urban population as a whole.

Table 4.5. Rate of growth of city population and urban population: 1901-91 (% per decade)

Period	1901-11	11-21	21-31	31-41	41-51	51-61	61-71	71-81	81-91
City	16.09	-3.19	247.41	34.82	67.87	35.39	75.50	38.62	30.99
Urban	7.8	14.6	20.3	30.6	44.1	29.4	39.0	28.8	19.6

During 1911-21 the city population showed negative growth owing to devastating plague epidemic of 1911 which spread mainly in urban areas and brought an exodus of urban population to rural areas.

Distribution of urban population by size-class

The census of India, categorised the urban units into the following size classes of cities/urban Agglomerations/towns.

Size-class	Population	
I	100,00 & above	cities
II	50,000 - 99,999	large towns
III	20,000-49,999	medium towns
IV	10,000 - 19,999	small towns
V	5,000 - 9,999	small towns
VI	less than 5,000	small towns

The class-I urban units are generally refered to as cities. In other words, all urban Agglomerations/urban units with 100,000 and more inhabitants are called cities.

Number of towns in the basin

	i	ii	iii	iv	v	vi
1901	1	6	4	18	30	33
1911	1	5	6	20	25	32
1921	1	6	7	23	29	31
1931	4	2	10	23	35	31
1941	5	4	13	28	46	28
1951	6	5	24	33	41	25
1961	6	9	23	40	53	20
1971	9	11	30	52	33	18
1981	11	15	32	48	40	8
1991	14	17	38	48	31	9

Distribution of towns in the basin 1961

	i	ii	ii	iv	v	vi
tamil nad	5	8	15	27	31	3
karnataka	1	1	7	13	22	17
pondicher	0	0	1	0	0	0
basin	6	9	23	40	53	20

Distribution of towns in the basin 1991

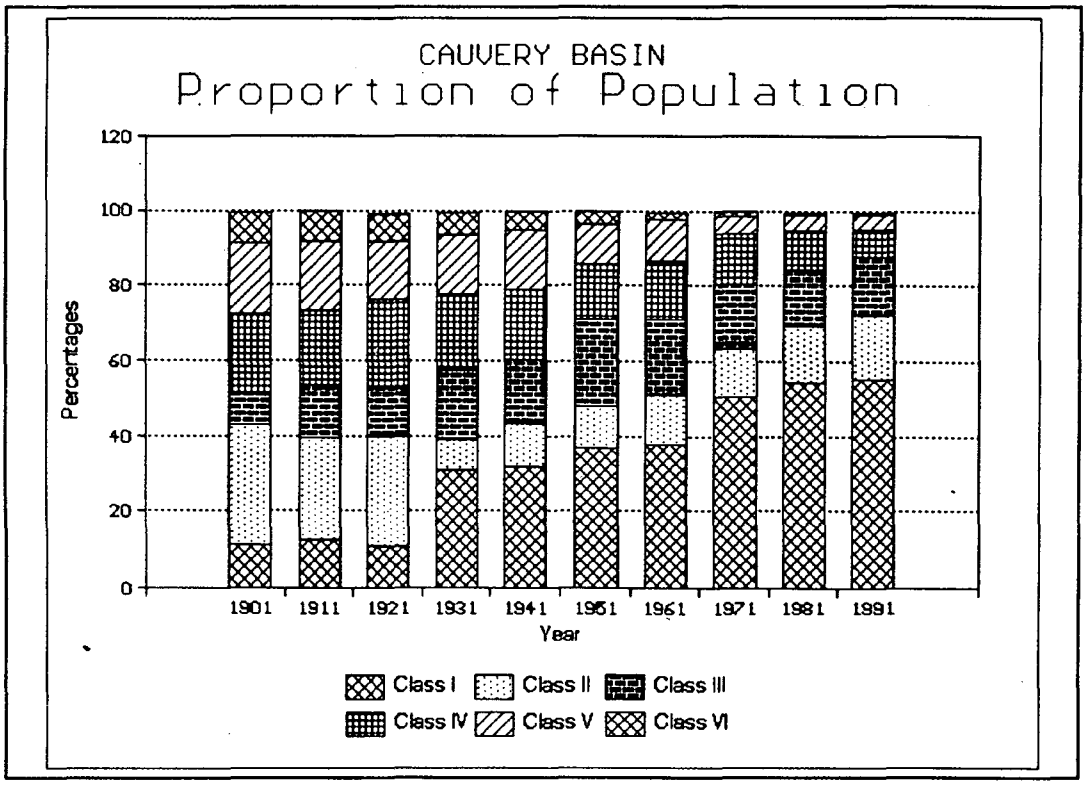
	i	ii	ii	iv	v	vi
tamil nad	10	12	2	35	17	0
karnataka	4	4	16	13	14	9
pondicher	0	1	0	0	0	0
basin	14	17	38	48	31	9

Share of the urban population and the towns-1961

	pop	towns	proportion (%) pop	towns
tamil nad	882939	69	23.08	40.4
karnataka	2921026	89	76.34	58.94
pondicher	22352	1	0.58	0.66
basin	3826317	151	100	100

Share of the urban population and the towns-1991

	pop	towns	proportion (%) pop	towns
tamil nad	2109765	60	25.88	38.22
karnataka	5980897	96	73.36	61.15
pondicher	61804	1	0.76	0.64
basin	8152466	157	100	100


CAUVERY BASIN
Proportion of Population
120
100
80
60
40
20
0
Percentages
1901
1911
1921
1931
1941
1951
1961
1971
1981
1991
Year
Class I
Class II
Class III
Class IV
Class V
Class VI

Cauvery basin

year	i	ii	iii	iv	v	vi
1901	127760	366545	92996	249838	214114	94540
1911	148311	315615	166704	229923	211488	95914
1921	143575	386315	173864	314895	205226	101977
1931	498787	129206	296816	327569	255185	98147
1941	672508	244921	361638	397324	336827	105378
1951	1128905	345899	714338	448759	330091	105632
1961	1528422	551810	822203	623831	464025	72734
1971	2682323	693991	922815	714156	253916	58936
1981	3718316	1036967	1042857	720330	307918	25307
1991	4547408	1400595	1283417	596611	341833	33628

Cauvery basin

Proportion of poulation in the size classes

	i	ii	iii	iv	v
1901	11.1504	31.99051	8.1163	21.805	18.68697051
1911	12.6983	27.02287	14.2732	19.686	18.10754695
1921	10.8289	29.13711	13.1134	23.75	15.47880156
1931	31.0633	8.046658	18.485	20.4	15.89234669
1941	31.7431	11.56053	17.0697	18.754	15.89859511
1951	36.7288	11.25378	23.2409	14.6	10.73947236
1961	37.6178	13.58126	20.2362	15.354	11.42067794
1971	50.3615	13.02991	17.3262	13.409	4.767357655
1981	54.2686	15.13446	15.2204	10.513	4.494041255
1991	55.4326	17.07316	15.6448	7.2726	4.166920624

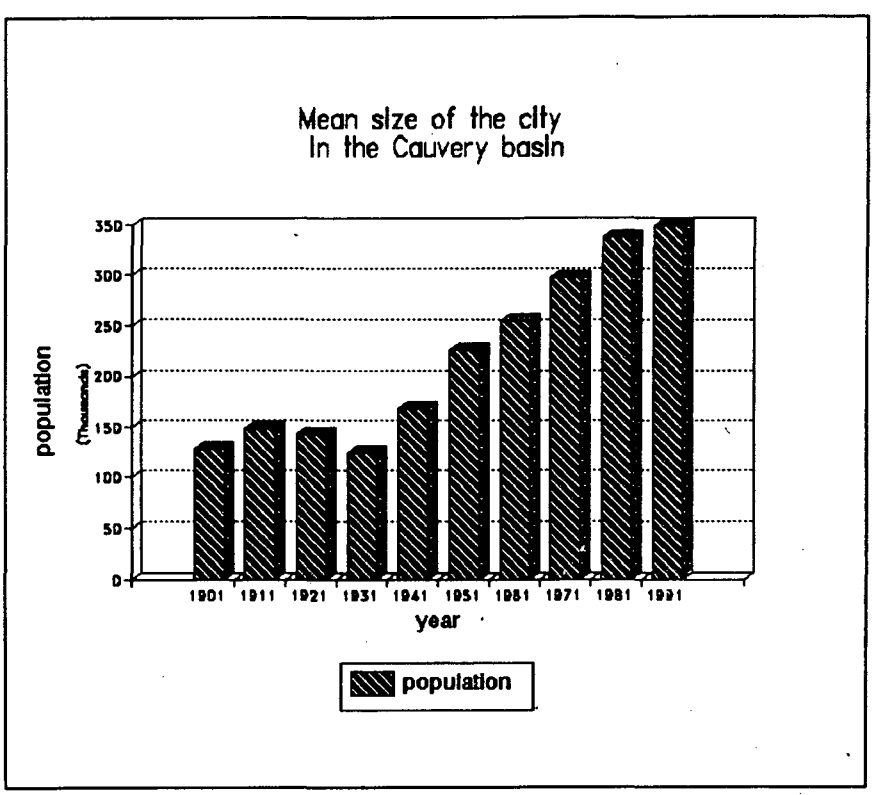
Cauvery basin

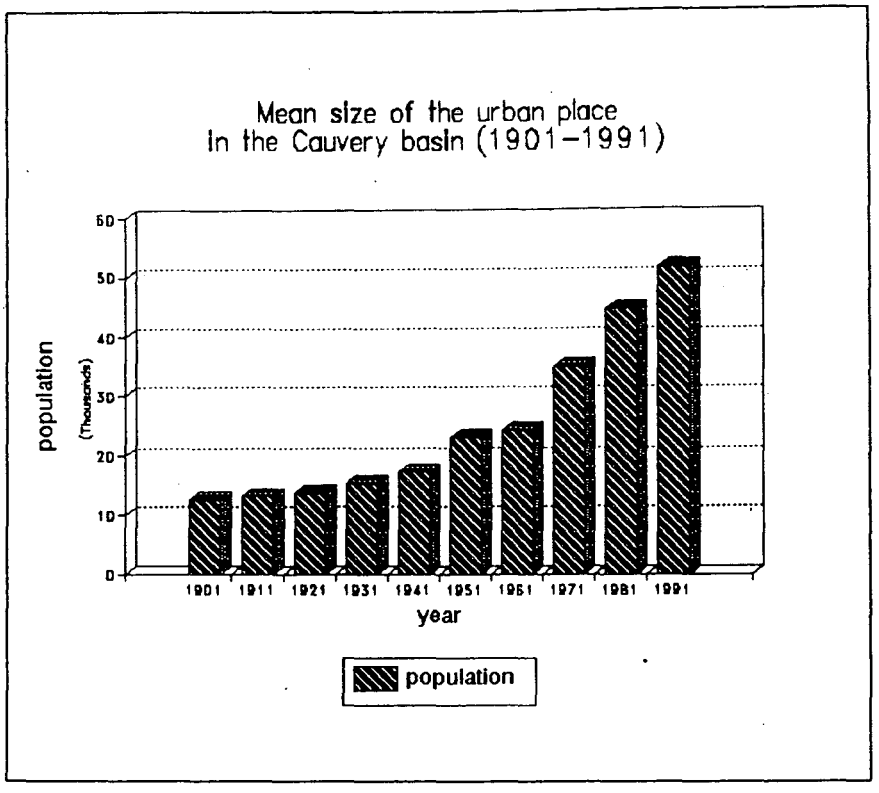
Proportion of poulation in the size classes

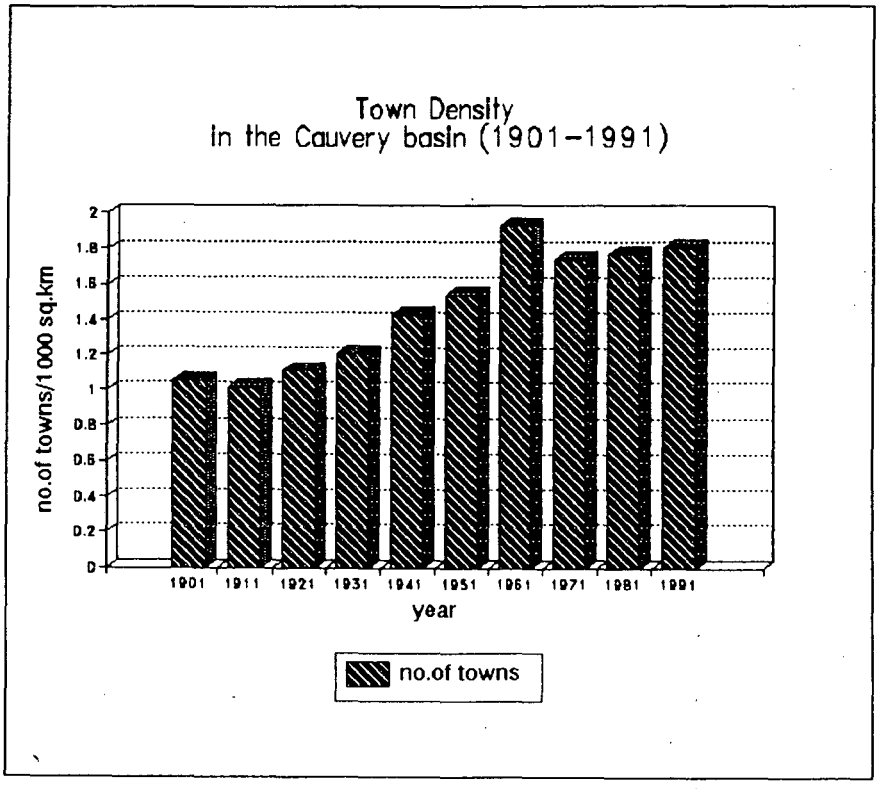
	city	large	medium	small
1901	11.1504	31.99051	8.1163	48.743
1911	12.6983	27.02287	14.2732	46.006
1921	10.8289	29.13711	13.1134	46.921
1931	31.0633	8.046658	18.485	42.405
1941	31.7431	11.56053	17.0697	39.627
1951	36.7288	11.25378	23.2409	28.777
1961	37.6178	13.58126	20.2362	28.565
1971	50.3615	13.02991	17.3262	19.282
1981	54.2686	15.13446	15.2204	15.377
1991	55.4326	17.07316	15.6448	11.849

mean size of city

year	mean size of city
1901	127760
1911	148311
1921	143575
1931	124697
1941	168127
1951	225781
1961	254737
1971	298036
1981	338029
1991	347891




Mean size of the urban place
In the Cauvery basin (1901-1991)
population
(Thousands)
60
50
40
30
20
10
0
1901
1911
1921
1931
1941
1951
1961
1971
1981
1991
year
population


Town Density
In the Cauvery basin (1901-1991)
no.of towns/1000 sq.km
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1901
1911
1921
1931
1941
1951
1961
1971
1981
1991
year
no.of towns

Similary class-II urban units are referred as large towns, class-III urban units as medium towns and the lower three classes constitute (less than 5,000 to 19,999) small towns.

The number of urban places and urban population by size

The Tables 5.1 and 5.2 gives the number of urban agglomerations/cities/towns and their population under each size-clas from 1901 to 1991 census periods.

As may be seen from table 19, the urban units in the Basin, consist of on an average 6 class-I urban Agglomerations/towns, 9 class II urban Agglomeratins/towns, 19 Class III urban Agglomerations/Towns, 33 Clas IV urban Agglomerations/towns and 24 class VI towns, making in all 128 urban Agglomerations/cities/towns.

The distribution of urban units among the states and Union territory is quite uneven. The Union Territory of Pondicherry had only one town (Karaikal - 22,352) in 1961 as well as in 1991 (61,804 in 91).

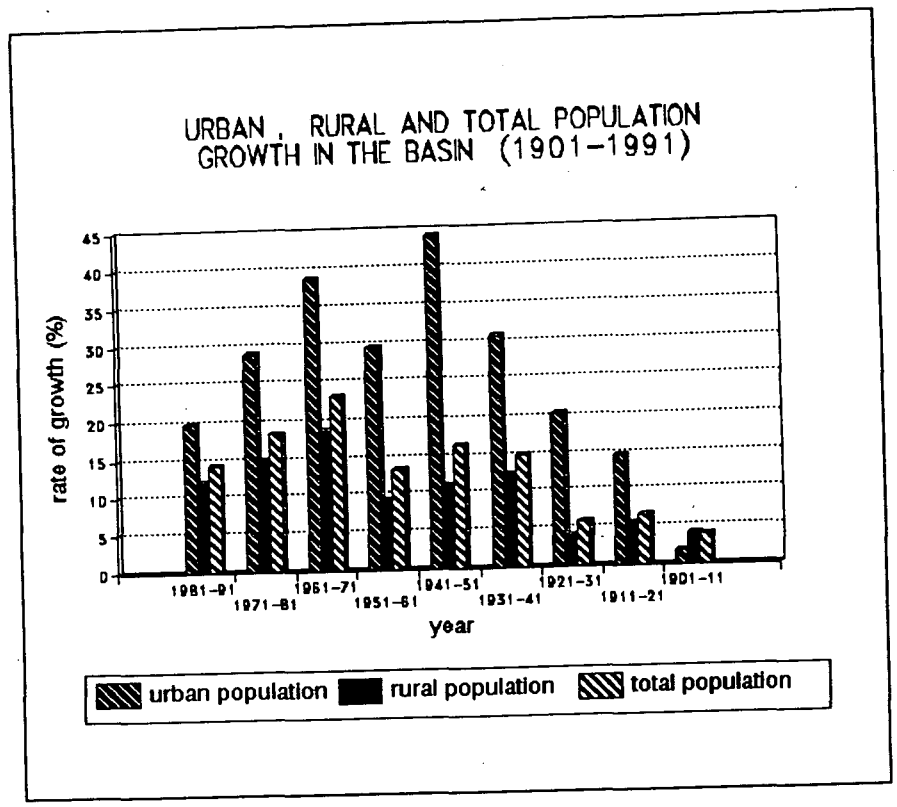
Average size of the urban centre of the Basin 1901-1991

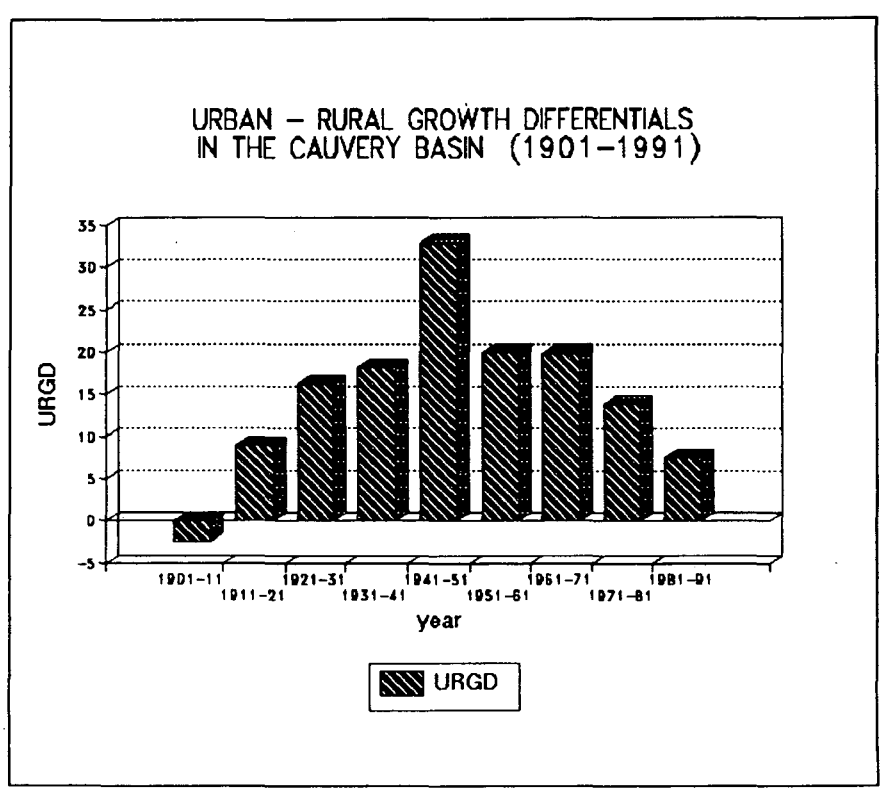
Year	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991
pop. size	12454	13123	13669	15293	17086	22938	24185	34811	44492	51621

Town density in the Basin 1901-1991

Year	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991
density	1.06	1.02	1.11	1.21	1.43	1.54	1.93	1.74	1.77	1.81

In 1961, 6 cities had about 38 percent of urban population, 9 large towns had 13 percent, and 113 small towns had meagre 29 percent of total urban


URBAN , RURAL AND TOTAL POPULATION
GROWTH IN THE BASIN (1901-1991)
rate of growth (%)
45
40
35
30
25
20
15
10
5
0
1981-91
1971-81
1961-71
1951-61
1941-51
1931-41
1921-31
1911-21
1901-11
year
urban population
rural population
total population


URBAN - RURAL GROWTH DIFFERENTIALS
IN THE CAUVERY BASIN (1901-1991)
URGD
35
30
25
20
15
10
5
0
-5
1901-11
1911-21
1921-31
1931-41
1941-51
1951-61
1961-71
1971-81
1981-91
year
URGD

population. The situation undement a drastic change, or worsening for small towns. The clas-I cities with a number of 14, are able to maintain large share of about 55 percent, and 88 small towns had only 12 percent of urban population.

The distribution of urban Agglomerations/towns in the Basin are given in Tables 6.1 and 6.2 for 1961 and 1991 respectively. During 1961, the Karnataka part of Basin had under representation of cities, large and medium towns. Only one city (mysore) and one large town reported (Hassan) from Karnataka part. Whereas the clas-VI towns, out of 20, only 3 were found in Tamil Nadu part of Basin. Pondicherry part of Basin had are medium town (Karaikal). No urban unit found in Kerala part of Basin[4].

The distribution of cities/U.A/towns during 1991, revealed in Table 5.4 and 5.5. All the districts which were falling in Basin, were having cities, though all cities might not fall in Basin boundary, except Dharmapuri, Kodggu and Karaikal districts, where no city found. All the cities and most large towns are located along the river banks.

No town was reported from Tamil Nadu part of Basin whereas out of 9, 4 were found in Kodagu and 2 in Hassan district. Kodagu district is a maintainous district dotted with mostly small towns.

The distribution of population among size classes reveals the same trend as in 1961. The cities which constitute about 9 percent, contains 55 percent of total urban population, whereas the small towns had only 12 percent of population but their share in urban units was 56 percent.

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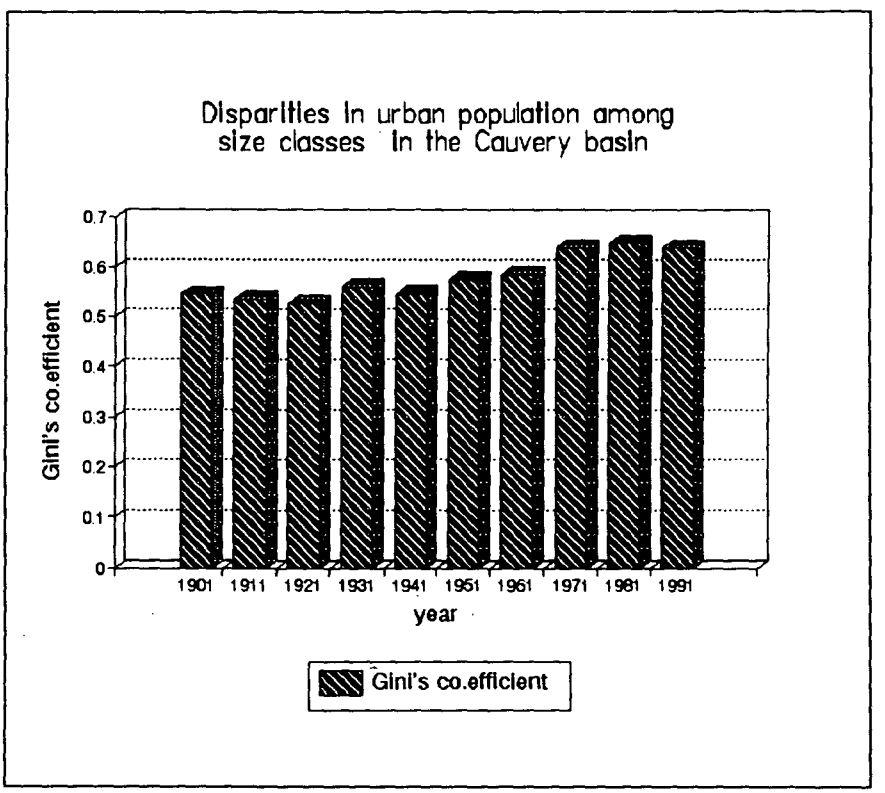
[4] The cauvery Basin comprises of four parts - Karnataka, Kerala, Tamil Nadu and Pondicherry. NO urban unit was reported in Kerala part. In analysis of urbanization it is omitted.


Disparities in urban population among size classes in the Cauvery basin
Gini's co.efficient
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1901
1911
1921
1931
1941
1951
1961
1971
1981
1991
year
Gini's co.efficient

Tables 5.6 and 5.7 and 25 represents the distribution of urban population and U.A/towns during 1961 and 1991 respectively, for the three sub-divisions of the Basin-namely Karnataka, Tamil Nadu and Pondicherry.

Though Tamil Nadu has 60% of the towns present in the Basin, it has 76% of the total urban population, whereas Karnataka with 40% of towns had only 23% of urban population during 1961. In 1991 the situation changed slightly. Tamil Nadu with 61% of towns had less proportion of urban population (73%) Karnataka with a reduced share in towns, it infact increased its urban population, as compared to 1961 period. The Karaikal part with 0.66% towns had 0.58% of population in 1961 and 0.64% towns had 0.76% of urban population.

The table 5.21 shows the disparities in the distribution of urban population in towns. As seen from it the co-efficient in increasing i.e. the disparities in distribution is increasing.

Disparities in the distribution of urban population among size classes

Year	Gini's co-efficient
1901	0.55
1911	0.54
1921	0.53
1931	0.56
1941	0.55
1951	0.57
1961	0.59
1971	0.64
1981	0.65
1991	0.64

Size and city/town's growth

The preceeding section dealt with changes in the size-classes of towns as the classes were found at each date in 1901-1991. Now let us turn to a different question of the growth of cities in intervening decades according to their size at

the start of each decade. This question can be answered only by the "individual city" method of analysis, because it requires that we follow each particular town during the period under consideration. For this reason, all towns are studied. Further the question of town growth according to initial size is one that concerns only the population not the number of cities, because the number of cities remains the same during the given decade. In other words, if we take all size classes of city in 1901 and study growth of each class during 1901-1911, the number of cities/towns in each class must necessarily remain constant because they are the same cities throughout. In a few instances, cities at one data are "absorbed or merged" in other cities during the decade, but we do not for this reason lose track of their population; also some cities drop out of the class category by falling below 5,000 or declassified by census during the decade, but we take their populations into account anyway for purposes of ascertaining growth according to initial size.

Table 5.11 & 5.12 give the growth of population in the Basin's cities/towns when they are classified by their size at the start of each decade. Contrary to the impression given by the expansion of size classes grouped by the 'curent class method', these table demonstrate that the Basin's cities did not grow much faster than the towns. Instead the difference is not much betwen the growth rates of large town, medium, small towns and cities, except in 1991. The small towns grew much faster than its counterparts in 1911-21, with a growth rate of 23.4 percent per decade. Similarly during 1921-31 large towns grew more rapidly at rate of 28.4 percent per decade, followed by cities with a 26.4% percent per decade. Medium towns had their day during 1941-51 when it grew an average 57% percent decade closely followed by cities.

The cities grew more rapidly during 1901-11, 1961-71 and 1981-91. Especially after 1951, the city population grew at a rate which is slightly higher than that of towns. During 1911-1951, a mixed varied situation prevailed, where cities, large, medium and even small town grew very competively with each others and

each ones growth is antagonistic with others. But after 1951, cities took the lead, although marginally.

The growth of large and medium towns were in a competitive space. When one grows rapidly, the other shows slow growth. It can be inferred that the medium towns, grow rapidly in one period and gets transfered to large towns class. Similarly in a given decade when medium towns show highest growth, it gets transferred to large towns in succeding decade and when large towns show it gets transfered to cities in succeeding decade.

A comparison of growth of urban population by current class and city method shows a complete different picture. (Tables 5.12 & 5.14) when urban population grouped into various size classes at end of each decade and when studied its growth, it gave an impression that large cities and towns grow much rapidly than medium towns. Especially the continuous negative growth of small towns is main outstanding trend in class method. The samll towns making a very high negative growth throughout the period 1951-1991. The medium towns remained stagnant in its growth throughout the period from 1901-91, except in 1941-51, duringwhich it grew more faster than other classes.

These differences are removed when it analyzed by individual city method. In tis method, the inter class growth differential are minimized. Above all the small towns which made negative growth in class method, showed opposite trend in city method. It is growing more or less in same fashion as the large and medium towns.

The towns included in the analysis of growth by size, showed a smaller rate of growth at the lower extreme of the size scale. Such a result can be expected on theoritical grounds, because there must be a point at which small urban places behave much like large rural places - that is, they are losing population to larger places by substantial net migration.

The myth that large cities grow faster?

What has just been demonstrated contradicts a popular myth that the larger the city is the faster it grows and small towns decline rapidly. The above myth explained through current class and individual city methods of growth of urban population.

One of the factors responsible for the myth is the confusion between the expansion of size classes as defined at particular dates ('current class' method) and the growth of cities according to their initial size (the 'individual city' method). The kind of information given in Tables 5.11 & 5.12 often leads the unwary leader to fake conclusion that the greater rates of growth or population increase are found in the bigger cities. Tables showing the current class distribution are abundant in the literature because they are easier to assemble than the other kind, and this abundance favours the myth. Of course there is nothing wrong with tables, they show what they purport to show - namely, the size distribution of cities at different dates and changes in the distribution; but the tables tend to be wrongly interpreted.

Although they give the rate of expansion of population in each class betwen two dates, this expansion is substancially due to the entry of 'new' cities into the class. Table 5.17 demonstrate, the new cities constitute between 22 to 50 percent of the number of cities in each decade, and between 5.6 to 15 percent of the population in each decade, on an average. Though new cities contributed about 64 percent of population during 1921-31, because of rapid emergence of 3 cities, it can be treated as exceptional, rather than norm. In fact, the enlargement of the population in each class - as constituted at each date - is highly correlated with the increase in the number of cities in that class.

The contribution in number of cities and population by new cities in class-I category presented in Table 5.17. The emergence of new cities become common

during 1951 and established a strong base from 1971 onwards. The population added in each decade by new cities is of one city size during 1951 and 1961.

The largest gain in urban population in absolute and relative terms occured in 1971 and 1931 respectively. About 4,00,000 was added to urban population by 3 new cities during 1971. The population contributed by new towns in 1971 amounted to 15 percent of total urban population in Class-I category.

Table 5.16 presents the contribution made by old existing cities and new entrants towards total urban growth in clas-I category. As seen from the table, the new cities contribute about 20 to 35 percent of urban growth in city category. The maximum amount of contribution about 89% occureed during 1931 due to addition of 3 cities to the class with a total population of 317,344. The share of new cities in urban growth declined to 20% in 1971-81 but increased to 28 percent again in 1981-91.

No new city emerged in 1911, 1921 and 1941.

Except for the open ended class at the top (i.e. M5 sub-division of class-I category), the contribution of population by new cities to a class is counter-balanced to some extent by the exodus of old cities out of the class. The distribution of growth rates among the size classes will in general be higher, for the top class because the places entering the category of cities from the town classes are included and the general growth of city, enters the higher clas. The reason is that when the urban population is growing, the movement of cities/towns from one class to another and in case of cities from M1 to M5 (called reclassification) affects the open class at the top more than the other classes, because a town can grew into the top class but cannot grow out of it. As a result, one easily falls into the error of duducing that biggest cities grow faster than others. For this reason, the data in Tables 5.13 and 5.14 confirm the fact that, among the Basin's towns, it is the larger and medium towns that are showing the more rapid growth, not cities.

A further reason for the myth of a positive correlation between city size and city growth is the confusion of absolute increase with relative increase. Given any two cities, there nothing to prevent the one with lower growth rate from having the higher absolute gain in population. The absolute gain depends on the starting size as well as the rate of growth. Since the cities by definition, are those that have the biggest sizes to start with, they almost always show the largest absolute gains even when their rates of growth are less than those of smaller cities.

For instance, in Tamil Nadu part of Basin, between 1980 and 1991, one of the fastest growing town was Devarshola U.A of Nilgiris district, which grew 13.32 percent per annum during the decade, while one of the slowest growing city was Coimbatore U.A of coimbatore district, which increased by only 1.96 percent per annum. Yet the number of people added to Coimbatore's population during the decade came to 1,80,391, whereas the number added to Devanshola's population reached only 14,328. From this fact, an unwary person could have drawn the false conclusion that Coimbatore grew at a higher rate.

Why did the Basin's largest cities show the slowest growth?

Having disposed the myth that largest cities exhibit the fastest increase, we still have to explain why the contrary proposition is true. Why is that cities of 5,00,000 or more inhabitants had an average rate of increase that was substantially below that of the cities of lesser size, as shown in Table 5.18[5].

The Table very clearly demonstrates that the cities of 5,00,000 or more had an average rate which is less than that of small cities. The small cities of M1 and M3 subcategory of class I which was growing faster than other sub-divisional

[5] The class-I cities of 1991, were tracked down to 1901 and their rate of growth analysed for this section.

classes. M3 (sub division class of cities) are the fastest growing followed by M1 which is lowest city size.

The expansion of the population in cities of M2 (2,00,000 to 2,99,999) in Table 5.18 is of interest, because it grows in a haphazardly manner. However given the number of cities in it (one city) the change may well be accidental.

The hypothesis that sheer size is a deterrent to further growth is confirmed by the Table 18. As cities became ever larger, feedback mechanisms are triggered which begin to constrict the sources of growth. The presence of lakhs of people in a small area could poison the atmosphere, facilitate infection, induce psychoses and multiply accidents. Or, again, crowding in large numbers could increase the costs of production and distribution and the costs of public health, crime control, recreation, and education - ith the result that migration to the largest cities would be depressed.

The larger the urbanized area, the larger is the proportion of its population residing in the fringe (the area outside the central city) called as outgrowth in Indian census. In most urban agglomerantions, it is the fringe that is most difficult to measure when it changes from one date to next.

In other words, in theory at least, from one decade to next, the oficial metropolitan fringe boundaries tend to remain fixed or relatively unresponsive to actual urban spread and this causes a great understimation of growth with respect to major cities that with minor towns.

Urban Agglomerations determined on a metropolitan area basis rather than urbanized area basis. Since the metropolitan-area type of delimitation involves the use of larger political units and incorporates more rural population surrounding the central city. Urbanized area basis requires precise adjustment to the spreading urban area. Now since it is the larger cities that have the greatest share their population in fringe areas, they can be expected to be the ones most

The social and economic importance of cities is far greater than their ratio of their inhabitants to the total urban population. The reason for this that the influence or power is determined not by the number of people but by their skills and organization, and the city population is better trained and organized than the rural population.

Growth of City and town population

To analyse the changes in the Basin's urban population, it is viewed from the standspoint of the detailed size-classes of the places in which they live is the present task.

One Simply computes the growth rates of the population found in each class between two dates. But the adequacy of the procedure depends on what one utants to know. If one wants to know how the class distribution changed between two dates, the above procedure is satisfactory. Davis called this method as 'class method'[6]. Most people, however are interested in the question of whether the size of a place influenced its subsequent growth. During the period with which we are concerned, did large cities grow faster than small ones? To answer this question, one must follow particular town or cities, regardless of what class they wind up in at the end of the period. Davis called this the "City method"[7] because it calls for a knowledge of each individual town/city.

Since each procedure answers a particular kind of question, both the methods used in the analysis. First, the class method showing the changes in class distribution and to the individual city method, analyzing the growth of cities according to their size at the start of each period.

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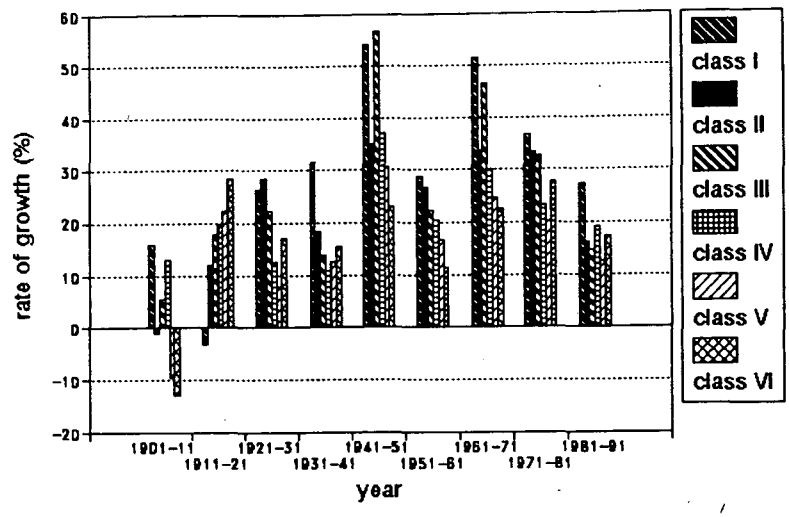
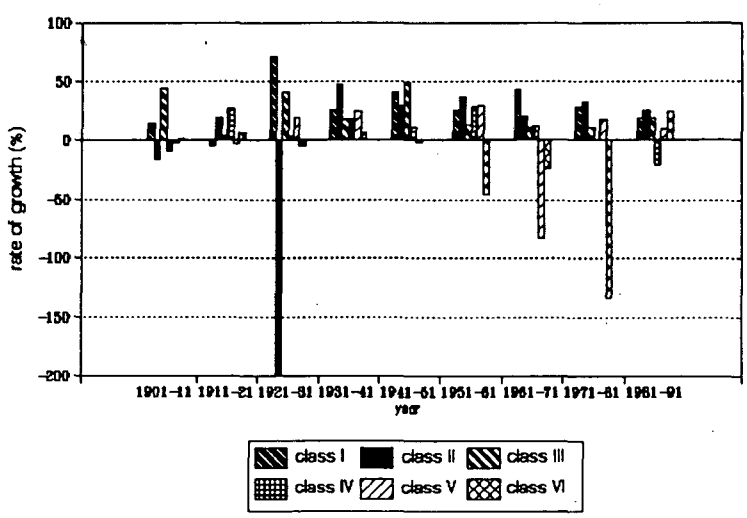
[6] Davis & Casis (1946), Urbanization in Latin America, Milbank Memorial Fund Quarterly, 24:11-12.

[7] Davis (1969), world urbanization 1950-1970, Vol.I Berkeley: Univ. of California, p.84.

Rate of growth of urban population
In the Cauvery basin (1901–1991)



Rate of growth of urban population
In the Cauvery basin (1901–1991)



Cauvery basin

Rate of growth of urban population in size classes

current class method

	city	large	medium	small	combined
1901-11	13.8567	-16.1367	44.2149	-3.53	1.89
1911-21	-3.2986	18.30113	4.11816	10.94	11.91
1921-31	71.2152	-198.992	41.4236	7.83	17.43
1931-41	25.8318	47.24585	17.9246	16.22	24.21
1941-51	40.4283	29.19291	49.3744	9.66	31.07
1951-61	26.1392	37.31556	13.119	-16.77	24.35
1961-71	43.0187	20.48744	10.9027	-40.43	23.72
1971-81	27.8619	33.07492	11.5109	-123.7	22.26
1981-91	18.2322	25.96239	18.7437	-3.48	16.48

Cauvery basin

Rate of growth of urban population in size classes

Individual city method

	city	large	medium	small	combined
1901-11	16.0856	-0.86277	5.67778	-9.122	2.944544188
1911-21	-3.1933	12.25784	17.8302	70.295	24.29752341
1921-31	26.3751	28.40739	22.3093	37.653	28.68624422
1931-41	31.4742	18.27422	13.9219	38.716	25.59655762
1941-51	54.0954	34.8921	56.8622	90.79	59.16000765
1951-61	28.7468	26.61591	22.1304	48.843	31.58398497
1961-71	51.6449	33.5897	46.6066	76.928	52.19233673
1971-81	36.8307	33.24172	32.6424	70.899	43.40340772
1981-91	27.0793	16.11097	14.6015	48.783	26.64366947

affected by measurement lag involved in the widespread metropolitan area-type of delimitation.

In understanding why sheer size does not place an automatic limit on city growth, one must remember how cities grow. They do not grow by adding ever more people to the same limited space. Instead, they grow by expanding the area in which the population of urban community lives. Indeed, the cities of the Basin have been expanding faster in territory rather than in population and have consequently been declining, rather than increasing its overall density. When it expanding territorially the big cities continue to increase their population by absorbing the smaller ones which happen to be in the path of their territorial expansion.

Table 5.1 show the distribution of the all the basin's urban Agglomerations/towns from 1901-91. Here one can see the overwhelming weight of the bottom of the scale.

About half of the all urban places have fewer than 10,000 inhabitants and 75 percent of them have fewer than 20,000 inhabitants in 1961. This situation improved in 1991, where only 26 percent of urban places had fewer than 10,000 and only 56 percent of them have fewer than 20,000 inhabitant.

It follows that the average size of urban place is small. It was found that the mean size of urban place is toward the small end of the size-class hierarchy and the median city is even farther toward it.

The Town and City population

In delineating the degree of urbanization in the Basin, the urban population can itself be dichotomized by seperating into the city population (1,00,000 or more) and the town population (urban units under 1,00,000).

Table 5.9 and 5.10 confirms that the town category accounted for a substantial share of the Basin's urban dwellers - 90 percent in 1910-1921 but lost its share to cities in the subsequent decades.

Table 5.8 shows the distribution of urban population in six size classes and Tables 5.9 and 5.10 shows the proportion of urban population in size classes. A close look at these tables, indicate that the small towns by and large 'donated' about half of its population to other classes, especially to cities since 1901 to 1991.

The proportion of population in cities and towns from 1901 to 1991 shown in Table 5.8 and 5.9. It is clear from it that the cities had only 11 percent of the total urban population whereas the towns had 89 percent. This situation diastically changed by the end of century. Though during 1921 the towns increased their share to a all-time high (90%) because of a significant reduction in city population due to epidemics in that decade in subsequent decade, it lost heavily to cities, about 21 percent.

Again a major reduction in the share of towns occured during 1971, whereby the cities gained a sum of 13 percent from the towns. Since then the share of cities increasing slowly about 2.5 percent per decade on an average. Among the towns, it is small towns which lost their population heavily to cities followed by large towns. The decline in the share of small towns from 1901-91, amounted to 37 percent whereas in large towns it is 15 percent. Medium towns gained urban population by half. The amount of share of urban population gained by cities comes to about 44 percent over the period 1901-91.

The disproportionate distribution of urban population among size-classes can be attributed to the fact that few large cities have a major share of the urban population. The reason could be concentration of economic and political power in few cities generate rapid growth of population in cities.

Urban population expansion in each class

This part deals with changes in size, classes of cities/towns as the classes were found at each date from 1901-1991 (Current class method).

The rate of expansion of urban population shows a varied or irregular rate of growth. There is some tendency for the classes at the bottom of the class to show the slowest expansion, with those at the top showing the most rapid change.

Table 5.8 shows the class-wise distribution of urban population since 1901. The population growth rates in various classes presented in Table 5.11. The urban population in cities grow at a rate faster than overall total urban population but slower than large towns. The highest growth occured during 1921-31 immediately after 1911-plague epidemic. In fact the growth rate in cities contributed by mainly the fast growth of large towns. The cities started registering a slow growth rate after attaining another maximum rate during 1961-71. In the two subsequent periods of 1971-81 and 1981-91, the growth rate was reduced to 28 and 18 percent per decade respectively from 43 percent/decade. This is partially due to saturation of opportunities in urban areas and other socio-economic problems of cities.

Dring 1921-31, the rapid emergence of four cities pushed the growth rate to 71 percent per decade. Generally in cities, (Class-I towns) the 100,000 - 1,99,999 (M1) cities loose their number as well as population to next higher class due to fast growth of its cities. Similarly cities 200,000 - 2,99,999 (M2) give birth to 3,00,000 - 4,99,999 (M3) class cities in subsequent decades.

In the above sub-division of class-I cities, the rapid growth of M1 cities gave rise to M2 city in 1941, M3 in 1961, M4 city in 1971, M5 city in 1981 and M5 city in 1991. The city population grow at a rate slower than large town population after 1931. The city population registered a significant negative

growth rate during 1911-21 due to epidemic in large cities. Table 5.19 shows the growth rate among class-I cities.

The large towns which lost its 2/3 of population to cities during 1921-31, made a biggest negative growth rate of 19.8 percent per annum. Since then it grow more fast than cities except during 1941-51 and 1961-71 periods. In former case, it is due to pertition, accession of princely states to Indian union and Independence of India which favoured large city growth. In latter period, the strict application of urban criteria to delineate an urban place, and merging of large towns with the nearby cities - a process known as urban couurbation followed in 1971 census.

The medium towns of Basin had a growth rate of 23.2 percent per decade on an average. During 1921-31 and 1941-51, the medium towns had a largest growth rate of 45 percent per decade. The fast growth of some lower order towns which got transferred to this class in subsequent census is the main caue of their rapid growth.

The small towns by and large are losing their population to next higher classes and thereby growing at a negative rate. The slow emergence of new towns at the bottom class made the small towns, to loose their share of urban population. During the period 1901-11, they grown at a negative rate of -3.5 percent per decade. They improved their growth during 1911-51, with a growth of 11.2 percent per decade. But after 1951 onward the growth of small towns were sluggish and negative growth become norm of that clas. They lost their share of urban populationfrom 48.75 percent in 1901 to 11.86 in 1991.

The fact that the population in rural areas expanded more slowly than that of any urban class is understandable. The rural class is residual category, with slowgrowth of general population and rapid growth of urban centres, many rural places cease to be rural, being reclassified as urban in lower classes at some moment between one census and the next. Doubtless a smilar drift affects

the places in classes under 5,000-9,999 and so on. In fact, the effect of a rapid growth of urban population is to upgrade the entire scheme. The rural population is by far the largest, the fact that it grew during 1901-1991 at a rate much slower than the total population means that other classes grew faster than the total. In fact, with few exceptions, all of the size-classes above class 5,000-9,999 grew more rapidly than the total population of the Basin as a whole.

Cities, Metropolises in the Basin

Out of 151 cities/U.A in 1961, in 6 cities/U.A the population exceeded 100,000 or more inhabitants. The number cities rose to 14 by 1991 with a million city (Coimbatore 1100746). These cities have accounted for more than 15 percent in 1901 to 55 percent during 1991.

Table 26 Cities/U.A in the Basin (1901-1991)

Census	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991
No. of cities/U.A	1	1	1	4	4	5	6	9	11	14

The concentration of proportion of urban population indicates the[8]process of citification or metropolitization'; For purposes of easy reference, class-I Urban Agglomerations/cities are further sub divided into five size classes as under:

Size Class	Population
M1	100,000 - 199,999
M2	200,000-299,999
M3	3,00,000-499,999
M4	5,0,000-999,999
M5	1,000,000 and above

[8] Census of India 1991 : Rural-urban Distributor (Prov. pop. Totals) paper-2 of 1991.

Table 6.1 & 6.2 gives the distribution of these cities/U.A since 1901 and their population by different size classes. The growth rates and proportional distribution of cities/U.A's population also given in Tables 6.3 & 6.4. The range of variation in the population of these cities/U.A.s not so high being 1.10 million in Coimbatore U.A and 100,687 in Coonoor U.A during 1991. The average (mean) size of city is table 6.5

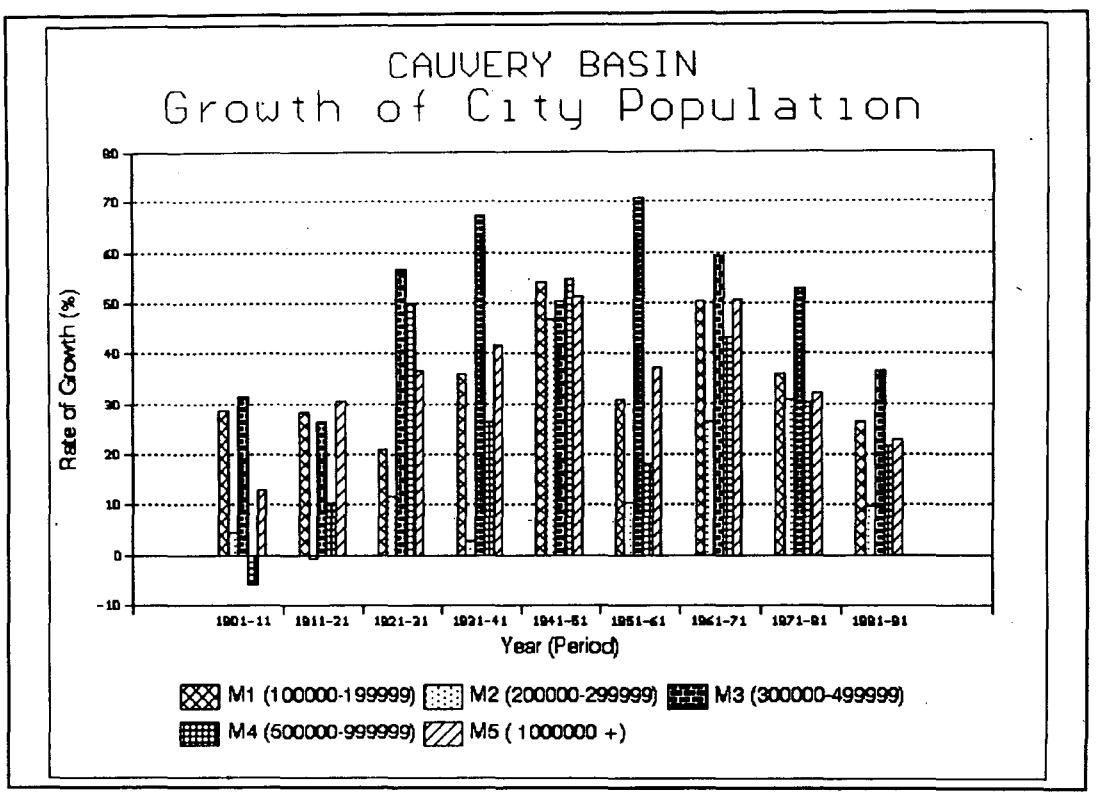
Table 6.5 mean size of city/U.A. 1901-91.

Year	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991
Size	127760	148311	143575	124697	168127	225781	254737	298036	338029	347891

A further breakup of the population of cities into subdivision indicates that a majority of the population in clas-I cities /U.A lives in cities of 3 lakh and above (i.e. M3, M4 and M5 class). M3 cities/U.A accounts for 52 percent of urban population but lost in share in 1991, in which M4 & M5 classes together accounted for 62.5 percent, though they are only 4 cities. Coimbatore a (M5 class) alone accounted for 23 percent of total urban population during 1991.

The growth rates of population of cities/U.A during 1901-91 are shown in Table 99. These are growth rates of individual cities in Class-I category worked out from 1901 to 91. After 1921, the emergence of cities was rapid. In 1931, 3 new cities emerged due to its fast growth - (Coimbatore, Mysore and Salem). Before 1931, the only class-I city was Tiruchchirappalli U.A. It was largest city of of Basin from 1901 to 1951, but due to its slow growth, Coimbatore which was second largest city since 1931 emerged as largest city in 1961 and remained till 1991.

The cities of Mandya, Hassan, Tumkur, Mysore Tiruppur and Erode were grew very rapidly throughout the period. During 1981-91, the fastest growing cities


CAUVERY BASIN
Growth of City Population
Rate of Growth (%)
80
70
60
50
40
30
20
10
0
-10
1901-11
1911-21
1921-31
1931-41
1941-51
1951-61
1961-71
1971-81
1981-91
Year (Period)
M1 (100000-199999)
M2 (200000-299999)
M3 (300000-499999)
M4 (500000-999999)
M5 (1000000 +)

Number of new cities and its population

year	towns old	towns new	population old	population new
1901-11	1	0	14831	0
1911-21	1	0	143575	0
1921-31	1	3	181443	317344
1931-41	4	0	672608	0
1941-51	4	1	1028225	100680
1951-61	5	1	1425180	103242
1961-71	6	3	2283112	399211
1971-81	9	2	3519361	208955
1981-91	11	3	4549408	323062

Number of new cities and its population

year	towns old	towns new	population old	population new
1901-11	100	0	100	0
1911-21	100	0	100	0
1921-31	36.3769	63.62315	25	75
1931-41	100	0	100	0
1941-51	91.0816	8.918377	80	20
1951-61	93.2452	6.75481	83.3333	16.667
1961-71	85.117	14.88303	66.6667	33.333
1971-81	94.3955	5.604541	81.8182	18.182
1981-91	93.3696	6.630354	78.5714	21.429

Number of cities in the basin

year	m1	m2	m3	m4	m5	total
1901	1					1
1911	1					1
1921	1					1
1931	4					4
1941	3	1				4
1951	1	4				5
1961	2	2	2			3
1971	5		3	1		9
1981	5	2	1	3		11
1991	7	1	2	3	1	14

Population of cities in the basin

year	m1	m2	m3	m4	m5	total
1901	127760					127760
1911	148311					148311
1921	143575					143575
1931	498787					498787
1941	468854	202654				671508
1951	100680	1028225				1128905
1961	214314	526999	787082			1528395
1971	709371		1236749	736203		2682323
1981	698867	491650	479081	2E+06		3613094
1991	936221	202013	667992	2E+06	1100746	4955490

Rate of growth city population in the basin Rate of gr

year	m1	m2	m3	m4	m5	total
1901-11	16.08563	0	0	0	0	16.08563
1911-21	-3.19329	0	0	0	0	-3.19329
1921-31	247.4052	0	0	0	0	247.4052
1931-41	-6.00116	0	0	0	0	34.62821
1941-51	-78.5264	407.38	0	0	0	68.1149
1951-61	112.8665	-48.747	0	0	0	35.38739
1961-71	230.9961	-100	57.1309	0	0	75.49933
1971-81	-1.48075	0	-61.2629	163.99	0	34.70018
1981-91	33.96269	-58.911	39.43195	5.4038	0	37.15364

Proportion of urban population in the cities of the basin

year	m1	m2	m3	m4	m5	total
1901	100	0	0	0	0	100
1911	100	0	0	0	0	100
1921	100	0	0	0	0	100
1931	100	0	0	0	0	100
1941	69.82106	30.1789	0	0	0	100
1951	8.918377	91.0816	0	0	0	100
1961	14.02216	34.4805	51.49729	0	0	100
1971	26.44614	0	46.10739	27.446	0	100
1981	19.34262	13.6075	13.25958	53.79	0	100
1991	18.8926	4.07655	13.47984	41.338	22.21266	100

are Tumkur (66%), Hassan (52%), Tiruppur (42%), Mysore (36%) and Erode (31%). The slowest growing cities are Thanjavur (9.78%), Connoor (9.16%) and Kumbakonam (6.17%)[9].

The largest cities Coimbatore,Salem and Tiruchchirappalli grew slower than small cities.

In the Table 6.4, the emergence of new cities in next higher class depended on the rapid growth of its lower class cities. In fact, the new cities of 1931 (M2 class), 1961 (M3 class) 1971 (M4 class) and 1991 (M5 class) had succeded earlier very high rates of growth in its respective lower classes of preceding decades.

Table 5.18, gives the average growth rates of individual cities since 1901, as per its status in 1991. By and large the M3 and M4 classes grew rapidly and had highest rates of growth since 1901. The fast growth of population in M3 cities in a period pushes it to M4 class in subsequent census periods as revealed by the table 18. The lesser growth rates of M2 class may be attributed to its number of cities in it (only one city - Thanjavur).

By 1991, the cities established their lead in concentration of urban population, and as economic and socio-political nodal points. Most of cities are administrative Headquarters of the districts, which lies within the Basin boundary. Of 14 cities, only 3 cities (Tiruppur, Kumbakonam and Coonoor) are non-district Headquarters. This indicates the power of administrative, economic, political, social and cultural important of cities in the Basin.

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[9] decadal growth rates in percentages.

The metropolises of the Basin.

The 14 cities of the Basin are distributed among the M1 sub-divisions of class I as follows.

Division & Population	No.	Names of cities
M1 (100,000-199,999)	7	Coonoor, Hassan, Kanur, Mandya, Kumbakonam, Tumkar, and Dindigul
M2 (2,00,000 - 2,99,99)	1	Thanjavur
M3 (3,00,000 - 4,99,999)	2	Tiruppur & Erode
M4 (5,00,000 - 9,99,999	3	Salem, Mysore, Tiruchchirappalli
M5 (1,000,000 & above)	1	Coimbatore

Source : Census of India, 1991.

Indices of population growth, taking 1901 as the base i.e. 100, for all the 14 cities are given in Table 6.5 & 6.6.

Urban Agglomerations

At the 1951 census, the concept of 'Town Group' was used for the first time, to obtains broad picture relating to urban spread. This was followed in 1961, and refined in 1971 with the concept of 'Urban Agglomerations' to obtain better feedback in regard to urban contiguity, processes and trends of urbanization and other related matters.

A U.A. forms a continuous urban spread and normally consists of a core city/town and its adjoining urban outgrowths (OGs), or two or more physically contiguous towns together with contiguous were recognized outgrowths, if any, of such city/towns. A place is identified as an outgrowth as follows:-

In several areas around a core city or statutory town fairly large well recognized railway colony, university campus, port area military camp, etc. might have

come up. Even if such places are lying outside the statutory limits of corporation, municipality or cantonment, etc. in most of the cases it fall within the reenue limits of the village or villages which is or are contiguous to the town. Since such areas are already urbanized it is not considered realistic to treat such areas lying outside the statutory limits of a town as rural units, although a few of them may not satisfy some of the prescribed eligibility tests to qualify themselves as independent urban units. Such areas have been termed as outgrowths (Ogs) and reckoned alongwith the town. Each such town/city together with its outgrowth(s) is treated as integrated urban area and is designated as an 'urban agglameration'. An urban Agglomeration therefore constitutes:

(i) A city or a town with a continuous growth, the outgrowth being outside the statutory limits but falling within the boundaries of the adjoining village or villages; or

(ii) Two or more adjoining towns with their outgrowths, if any, as in (i) above; or

(iii) A city and one or more djoining towns with or without outgrowths all of which form a continuous spread.(Census of India, 1991)[10].

Table 6.7 gives the number of urban Agglomerations since 1951 in the Basin. An urban Agglomeration is treated as one continuous urban spread for the purpose of overall size classification and analysis of urban data.

As seen from Table 6.7, the UAs were common in Medium town category (clas-III 20,000-49,999) during 1951 and 1961. The scenario changed in 1971 & 81 where cities and large towns category had equal UAs.

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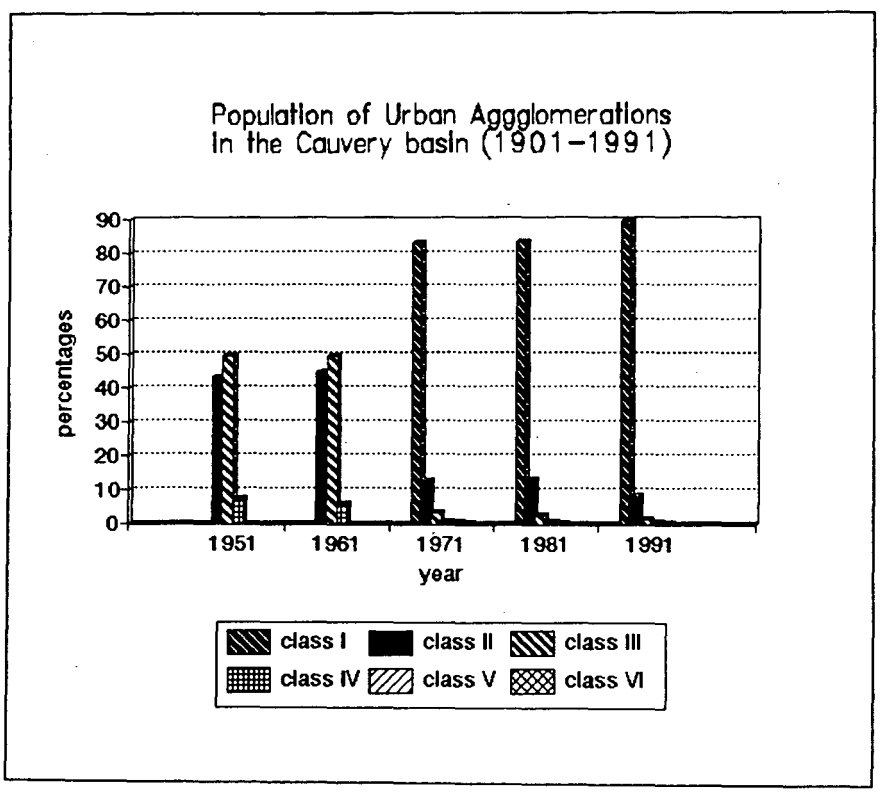
[10] Rural urban Distribution. Provisional population Totals. Paper 2 of 1991.


Population of Urban Agglomerations
In the Cauvery basin (1901-1991)
percentages
90
80
70
60
50
40
30
20
10
0
1951
1961
1971
1981
1991
year
class I
class II
class III
class IV
class V
class VI

Number of Urban Agglomerations in the basin

year	i	ii	iii	iv	v	
1951	0	2	6	2		
1961	0	3	7	2		
1971	6	5	3	1		1
1981	6	7	3	2		1
1991	11	5	2	2		1

Urban Agglomerations
Population of Urban Agglomerations in the basin

year	i	ii	iii	iv	v	
1951	0	149497	171474	25753		
1961	0	208801	230887	27120		
1971	2057662	310847	78457	15371		9502
1981	3164243	488016	106218	28634		5667
1991	4365715	398612	72094	31180		6367

Urban Agglomerations
Proportion ofpopulation of Urban Agglomerations in the basin

year	i	ii	iii	iv	v	
1951	0	43.117	49.4555	7.4275		0
1961	0	44.72952	49.4608	5.8097		0
1971	83.0784	12.55049	3.16771	0.6206	0.383644673	
1981	83.4281	12.86698	2.80053	0.755	0.149415547	
1991	89.5721	8.178388	1.47916	0.6397	0.130632782	

Urban Agglomerations
Growth rate of U.As population

year	%ages
1951	-
1961	34.63
1971	430.58
1981	53.01
1991	28.61

Urban Agglomerations
Proportion to total urban population

year	%ages
1951	11.75
1961	12.23
1971	46.8
1981	55.61
1991	59.79

The rapid emergence of 11 U.As in city class and subsequent decline of U.A in larger and medium towns which were transferred to city class are all helped in increasing the number of U.As in city class.

The spatial distribution of U.A is very uneven. In both the priods 1951 and 1961 out of 10 & 12 UAs respectively only one U.A was found in Karnataka part of the Basin. Of all 17 UAs reported in 1971 and 19 in 1981 and 21 in 1991 census periods.

At the disaggregate level, the majority of them found in Nilgiris and Salem districts, which had 4 U.As each in 1991. The districts of Periyar, Coimbators, Thanjavur, and Tiruchirapalli had 2 U.A each in 1991.

Table 6.8 gives the distribution of U.A's population in classes and its proportional distribution is given in Table 6.9. As seen from Table 6.9, the two periods 1951 and 1961 was very different from its subsequent census decades. The class II and III UAs had almost equal proportion of population in the two above decades. But by 1971 the fast emergence of UAs in class-I had taken a lion's share i.e. about 83 percent of U.As population. This lead to heavy reduction in the share of other all size class U.As. Finally in 1991, the U.As in city class had 90 percent of total U.A. populaton.

The proportion of population in U.As to the total urban population was about 12 percent only in 1951 and 61. But in the very next decade 1971, it increased to 47 percent to 60 percent in 1991. This shows the magnitude of increasing concentration of urban population in large urban Agglomeration especially of Class-I type. (Table 6.10).

The rate of growth of population in urban Agglomerations is double the rate of total urban population. During 1951-61 it grew at a rate of 3.5 percent per annum, but in subsequent decade, due to fast emergence of or city U.A it grew at a rate of 43.1 percent per annum. In 1981-91, the rate came down to 2.9 percent per annum from 5.3 percent per annum in 1971-81. (Table 6.11)

Standard Urban Areas

A new concept that had been developed for the 1971 census for the tabulation of certain urban data was the Standard Urban Area.

The standard urban area (SUA) to have a fixed area covering a large town as well as the adjoining areas, which will be kept constant for atleast three decades so that comparable data for such area would be made available and it could be put to good use for urban developmental planning.

It was therefore decided that an attempt should be made to delineate the contiguous rural and urban areas which are at present under intensive influence or which are likely to be under intensive influence of all towns and cities with population of 50,000 and above.

Such areas were designated as standard urban Areas and includes all areas which had any or all of the following characteristics:

(a) Predominant urban land use

(b) Intensive interaction with the urban centres as reflected in commutation for the purpose of work and secondary education facilities; extension of city bus services; sale of commodities, like milk, dairy products, vegetables (other than those transported by rail or truck-haul and purchase of food-grains, clothes, and general provisions etc. by the consumers directly.

(c) Anticipated urban growth as a result of locational decisions relating to industry, market, transport and communication, administrative and service functions.

(d) Existence of big villages with a large proportion of working force engaged in non-agricultural industrial categories.

The essentials of a standard urban area (SUA) are

(i) it should have a core town of a minimum population size of 50,000

(ii) The contiguous areas made up of other urban as well as rural administrative units should have close mutual socio-economic links with the core town and

(iii) The probabilities are that this entire area will get fully urbanized in a period of two to three decades[11].

The idea is that it should be possible to provide comparale data for a definite area of urbanization continuously for three decades which would give a meaningful picture to study.

The standard urban areas of the Basin are given in Tables 6.12-6.15. The Tables 6.12-6.15 gives number, population, proportion of population of standard urban areas in rural and urban constituent towns in Karnataka, Tamil Nadu parts seperately and the rates of growth of population, in Karnataka and Tamil Nadu parts of the Basin separately, during the year 1971 and 1991 for the Basin as a whole seperately the Karnataka and Tamil Nadu parts of the Baisn. The total population in SUAs were 3.6 million in 1971 which increased to 4.8 million in 1981 (Table 6.13)

The number of SUAs during 1971 were 14 and it increased to 16 in 1991 with the addition of Hassan and Mandya SUAs. The Tamil Nadu part of Basin had 12 SUAs in both the periods.

The proportion of population in rural and urban constitnent units of SUAs given in table 6.14 for 1971, Karnataka part had more of its population in urban units (91.4%), than that of Tamil Nadu (83.1), but in subsequent decade its share in

---

11

Number of Standard Urban Areas

states	1971	1991
karnataka	2	4
tamil nadu	12	12
basin	14	16

Population in the standard urban areas (SUA)

population		1971	1991	proport 1971
karnataka	total	466375	875704	100
	rural	426161	759070	91.38
	urban	40214	116634	8.62
tamil nadu	total	3148287	3910972	100
	rural	2615466	3311673	83.38
	urban	532821	599299	16.92
basin	total	3614662	4786676	100
	rural	3041627	4070743	84.15
	urban	573035	715933	15.85

Population in the standard urban areas (SUA)

proportion		1971	1991
karnataka	urban	14.01	18.65
tamil nadu		85.99	81.35
karnataka	rural	7.02	16.29
tamil nadu		92.98	83.71
karnataka	total	12.9	18.29
tamil nadu		87.11	81.71

Standard Urban Areas

Growth rates		1971-1991
karnataka	total	87.77
	rural	78.12
	urban	190.03
tamil nadu	total	24.23
	rural	26.62
	urban	12.48
basin	total	32.42
	rural	33.83
	urban	24.94

urban units come down to 87% whereas in Tamil Nadu part, the urban units increased their share of population marginally. For the Basin as a whole, 85 percent of population in SUAs live in urban units in the two decades 1971 and 1981.

Table 6.14 shows the proportion of population in SUAs, among the two parts of Basin, with its rural and urban break-up. The share of urban and rural population in Tamil Nadu part of the basin came down to 81 and 84 from 86 and 93 percent during the period 1971 to 1991.

The rate of growth of population in SUAs during 1971-81 was 3.3 percent per annum. The urban population grew at 3.4 percent per annum and rural population grew slower than urban population with a rate of only 2.5 percent per annum. (Table 6.15).

The rates of growth of urban and rural population in Standard Urban Areas of the Basin shows very high variation in its two parts - Karnataka and Tamil Nadu. In Karnataka part of the Basin, both urban and total population growing at a rates of 7.8 and 8.8 percent per annum during 1971-91. The rural population grew at 19 percent per annum during the same period. This may be attributed to the energence of Hassan and Mandya as new SUAs with their huge share of rural inhabitants in 1981.

As a whole Tamil Nadu part, shows a opposite picture. Here rural population grew at a rate of 1.3 percent per annum but urban population grew at a rate double of the rural population 2.7 percent per annum. The total population grew at moderate rate of 2.4 percent per annum.

URBAN SETTLEMENT SYSTEM

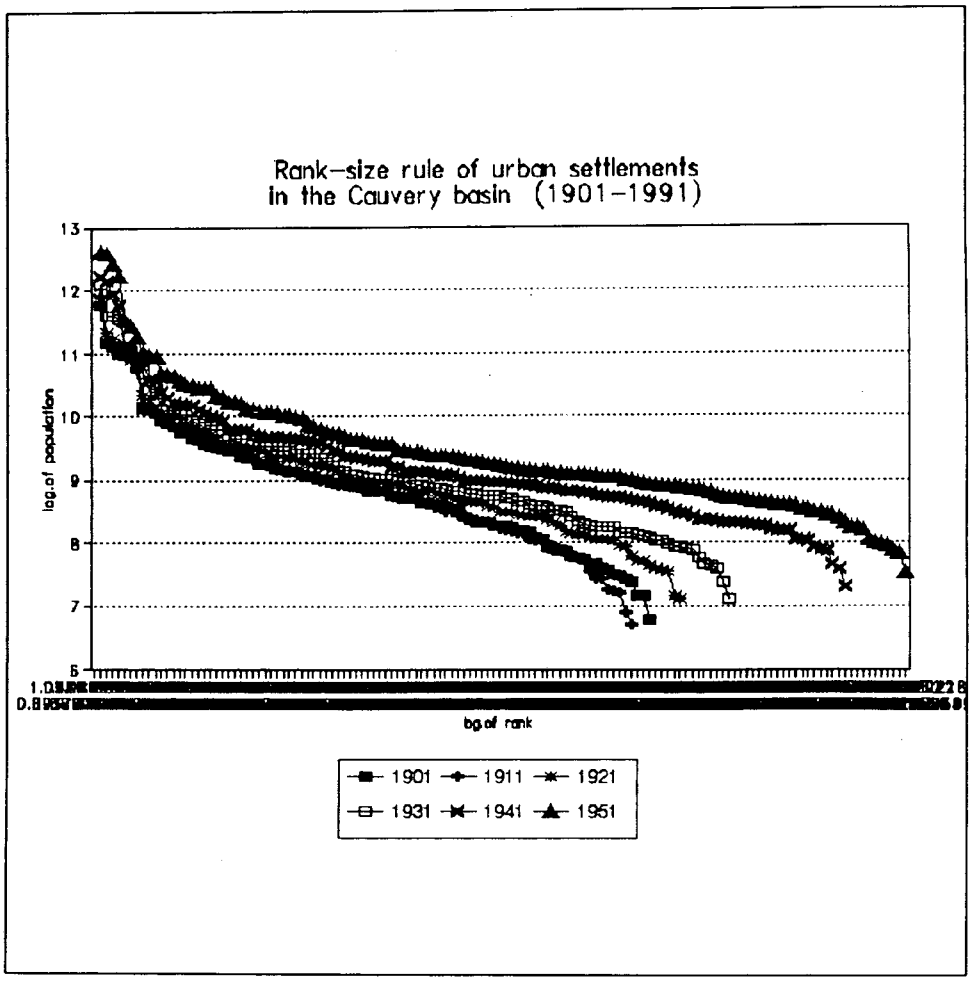
Perhaps the most effective way to recognize how urban settlements are organized is to consider the urban hierarchy. The hierarchy is then like a pyramid; the few large and complex cities are at the top, and the many simpler

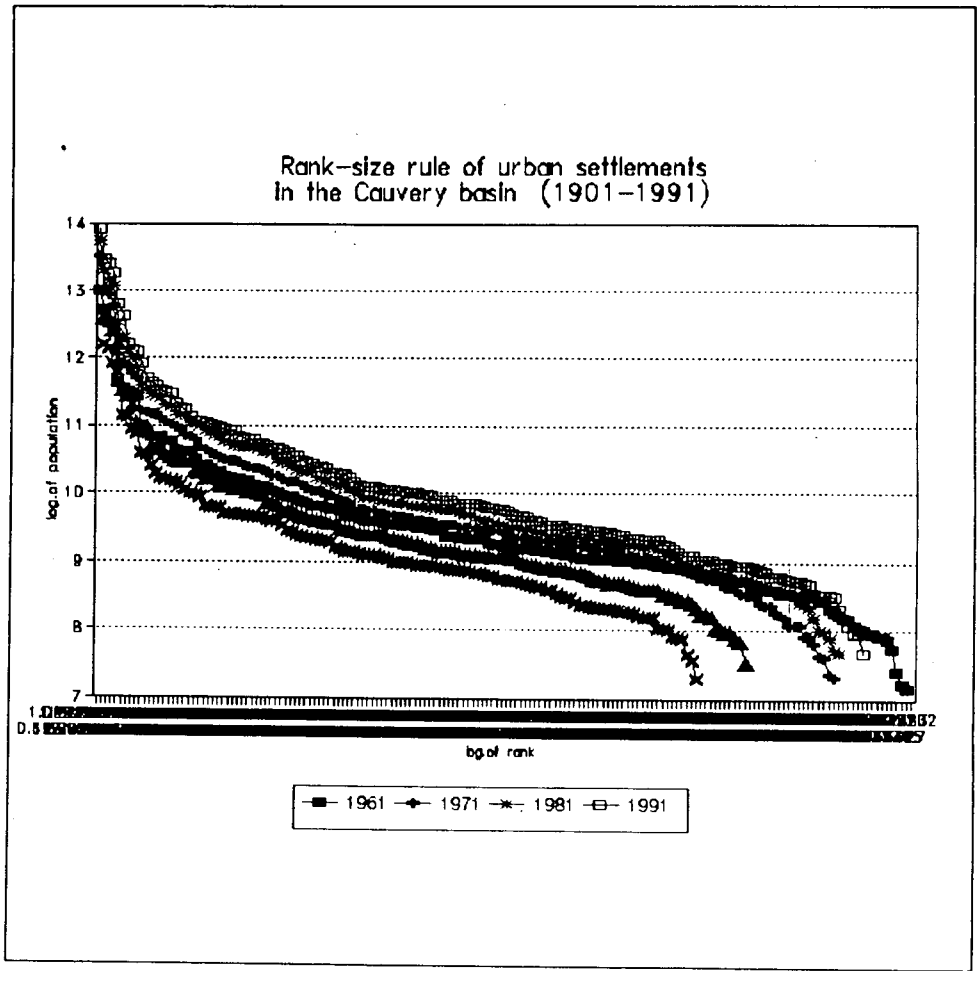
ones are at the bottom. When spatial dimension is added to the hierarchy, it becomes clear that a spatial system of metropolitan centres, large cities, small cities, large and small towns exists. The cities of a given level in the hierarchy are not independent but interrelated with cities of other levels in the hierarchy. Together all cities and towns at all levels in the hierarchy constitute an urban system.

The settlement hierarchy is summarized by the rank-size rule. As defined by G.K. Zipf, who first identified it, a rank size distribution arises if, when cities/towns are ranked in decreasing order of size and plotted in a graph prepared on double logarithmic paper with population on one axis and rank on the other, the plot forms a straight line. Thus the rank-size rule helps in hierarchical arrangement of cities. This describes the size patterning of cities/towns in complex economies where urban history is long and urbanizing forces are many and widely distributed.

The Basin is a natural region where rank-size rule can be applied. It has three features normally associateed with this pattern: a fairly large population, a long history of urbanization and a complex economic structure.

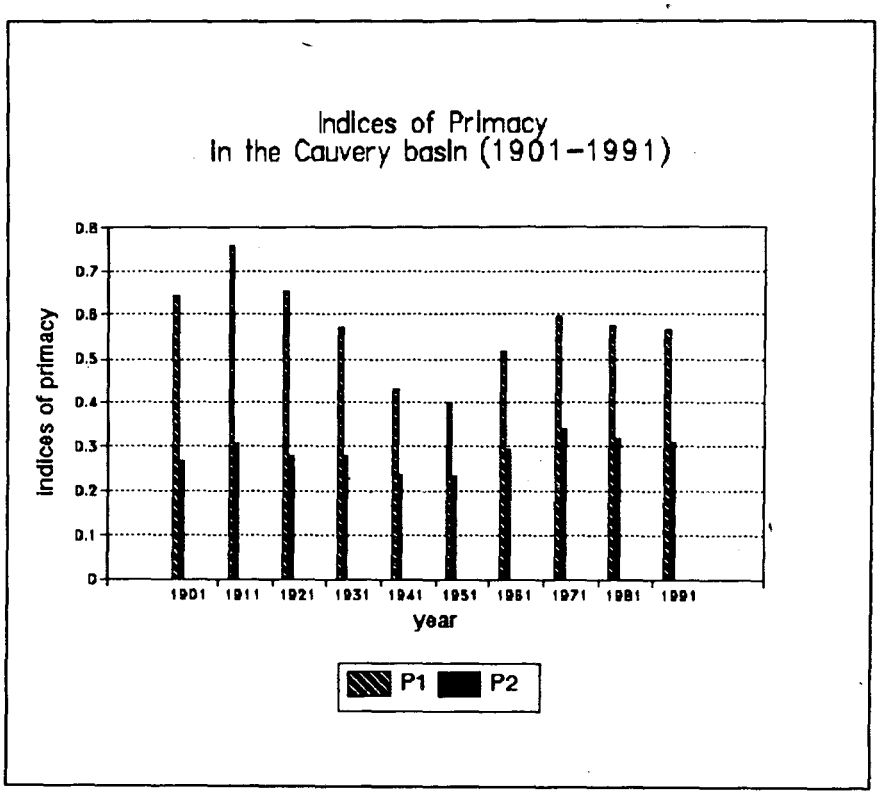
When the Basin's urban centres are arranged by their population sizes and plotted on a double logarithmi graph the Basin falls into an intermediary position between the idealized conditions of rank size and primacy. Coimbatore, the national metropolis has vied for absolute dominance over the course of its history and is effectively very large in size. It is followed by a group of significantly medium size district headquarters - Tiruchirappali, Mysore, and Salem, which are also roughly comparable in size. The rapid growth of in 1901-91 resulted in a completely new set of dominant cites emerged in the end of twentieth century, occupying the the rank immediately below the above mentioned cities.


Rank-size rule of urban settlements
in the Cauvery basin (1901-1991)
log of population
log of rank
1901
1911
1921
1931
1941
1951


Rank-size rule of urban settlements
in the Cauvery basin (1901-1991)
log of population
log of rank
1961
1971
1981
1991

Indices of Primacy 1901-91

year	P1	P2
1901	0.6439	0.2665
11	0.7556	0.3075
21	0.6522	0.2782
31	0.5718	0.2774
41	0.4313	0.2368
51	0.4009	0.2324
61	0.5176	0.2927
71	0.5953	0.3403
81	0.5726	0.3183
91	0.5664	0.3092.



INDICES OF PRIMACY

Where the population of the largest city exceeds the figure that might be expected on the basis of the rank-size distribution, a condition of 'primacy' said to exist. Colin Clark (1967) uses the additional term 'oligarchy' to describe situations in which the cities (100,000 or more inhabitants) have a bigger share of the total urban population than would be expected from the straight line relationship, but where at the same time, the primacy of the leading city is kept in check[12]. The idea of primacy was initially formulated by Mark Jefferson (1938). He argued that everywhere

'Nationalism crystallises in primate cities... Supereminent.. not merely in size, but in national influence'[13]. He assessed the eminence of cities within countries by taking the ratio of the population of first city to the second and third cites. In the Basin, urban population heavily concentrated in a few large metropolitan Agglomerations. The city, Coimbatore Urban Agglomeration although is the primate city, its primacy is kept under check due to rapid growth of other large cities like Tiruchirappalli, Salem and Mysore. The Table 6.16 gives the indices of primacy (Pi & Pii) As can be seen the primacy appears to be decreasing, especially after 1931 but again in 1961 it increased due to slow growth of seccond city Tiruchirappalli and rapid growth of Coimbatore as primate city. In those decades, where relatively large number of urban agglomerations or metropolitan agglomeration and larger urban population, found the degree of primacy has been reduced.

The rank-size analysis of urban centres identified a type known as 'oligarchy', in the Basin. The presence of several large number of towns/urban Agglomeration,

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[12] Clark. C 1967; population growth and Land use. Machillan.

[13] Jefferson M 1939, 'The law of primmate cities', Geographical Review, 29, pp 236 -32.

frequently sharing the higher level functions of the Basin urban network., is characteristic of 'Oligarchy'

The growth of other urban centrs has been at a rate which significantly reduced the primacy of Coimbatore. Table 16.7 shows the theoritical or optimum size of largest city, observed city and its difference as a percentage to observed city. In fact observed city is smaller than expect city in all through the period.

Cases deviating from the rank size rule or distribution were said to arise from 'over urbanization' of the economies of lesser developed regions because of 'excessive' in migration and superimposition of limited economic development of a colonial type creating 'dual economies' characterised by 'primate cities' that tend to have 'paratytic' effect upon the development of small urban centres to be 'parasitic' in relation to the remainder of the national economy and to be productive of alienation, anomi and social disorganisation.

In fact, the reasons for primacy is straight forward. Instead of development filtering down the urban hierarchy and spreading its effects outward within urban fields, growth is concentrated in the major cities. This is because each increment to the urban economy draws in more migrants, to maintain wages at the subsistence minimums. There is no incentive for growth to de-centralize. Modern enterprise remains concentrated in the major cities. Modernising influences reach the migrants, but in the hinterlands traditional way of life remains in the small towns and villages. Increasing Primacy, is, in turn, a sign that economic growth is taking place and affecting more people.

FUNCTIONAL CLASSIFICATION

Modern cities are performing increasingly a number of functions mining, industrial, trading, transport, and administrative.

Although every urban settlement plays a central role, serving as a market centre for surrounding hinterland, other economic activities are not distributed among

settlements in a regular pattern. Some specialized functions are not distributed uniformly across the landscape but concentrated in particular location. A industry that makes a community unique is known as a basic industry. A collection of basic industries in a particular urban settlement is known as that settlement's economic base.

The basic industries of a community can be examined in a variety of ways. In 1955, an American geographer Howard J. Nelson[14] calssified the cities in the U.S. according to their special functions.

The proportion of the labour force of a U.A./town engaged in performing a activity is perhaps the best means of measuring the distribution of that activity. It is one of few measures that are easily comparable from activity to activity or from year to year. Further the proportion of the labour force actually employed is of much more direct significance to the economy of the city.

The functional classification of urban Agglomerations/towns of the Basin, based on the industrial classification of workers into mine categories analysed for 1961, and 1991[15] census periods.

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[14] Nelson. H.J., 1955: A service classification of American cities. Economic Geography. 3: 189-210.

[15] main workers only considered

The nine industrial categories of workers were grouped into the following five broad economic sectors.

Sector	Industrial	Category
Primary activity	I	Cultivators
	II	Agricultural labourers
	III	Livestock, forestry, Fishing, hunting, plantations, orchards and allied activities
	IV	Mining and quarrying
Industry	V	Manufacturing, processing, servicing and repairs.
		(a) Household industry
		(b) Other than household industry
	VI	Construction
Trade	VII	Trade and commerce
Transport	VIII	Transport, storage and communication
Services	XI	Other services.

After nine categories had been decided upon, the percentages of total workers[16] in each activity group for each if the cities/urban Agglomerantions/Towns[17].

[16] for 1991, only main workers considered

The arithmetic average for each activity group, were computed. Doubts might logically arise at this point. How valid are averages taking in all of these differently sized Cities/U.A./towns. The tables 7.1 & 7.2 shows that there is no constant change or regular change between size of urban centre and its proportion in broad economic group when seen class-wise. Only primary in small towns and service in cities show large variation.

Perhaps the most useful device for our purpose is the standard deviation (SD). Standard deviations from the mean were calculated for each of the five activity groups and precented in Tables 7.2 & 7.4. The cities that are over +1SD from the averages in primary were given a primary 1 (or P1) rating, over 2 SD's an P2 rating over 3 or more SD's an P3 rating. A smilar procedure followed for each activity group.

Some cities do not rank high enough in any service to come under any of the above 5 categories. These are lumped together by Nelson in a single 'diversified[18]', group, although this is a somewhat misleading term. What is meant is that they are simply not unusually high in any activity. We shall call above category as 'multi-functional'.

All cities that were more than one standard deviation the above average for any of the five activity categories were then classified and plotted on maps included cities which awere not outstanding in any category appear as diversified cities.

The tables 7.5, 7.6 & 7.7, shows the functional classification, of the UAS/town or the basin, for the period 1961 and 1991.

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[17] All the urban Agglomerctions in the present study, have been treated at par with towns on the basis of their aggregate population size.

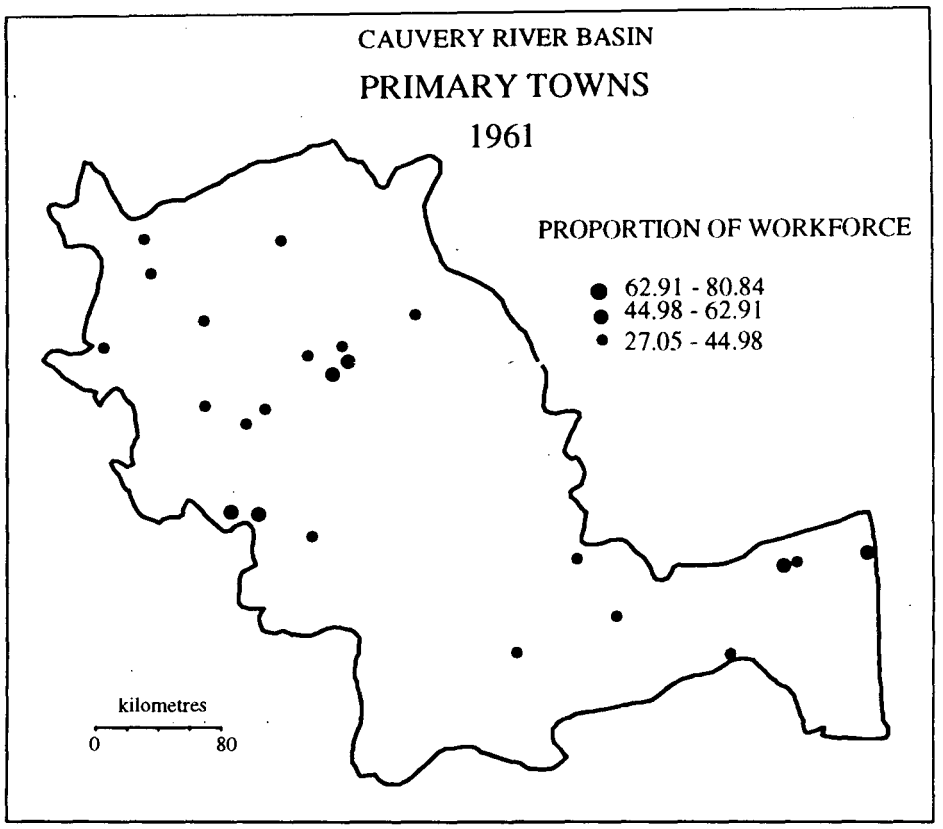
[18] or multi-functional.

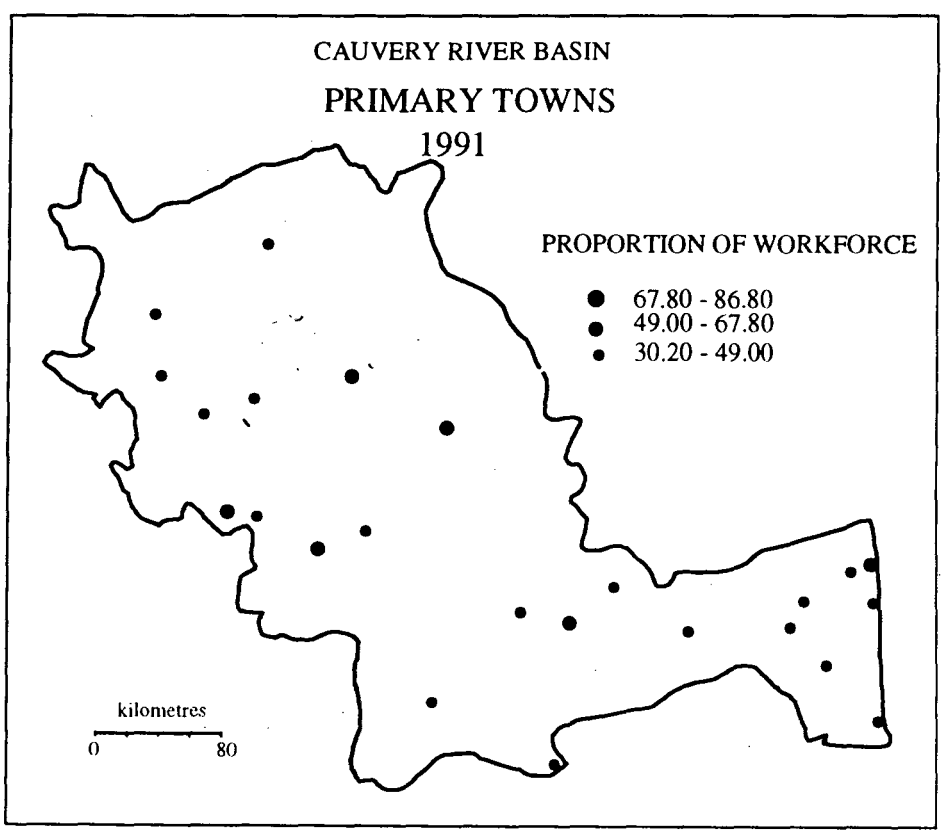
Towns classified accoding to the predominant/leading function

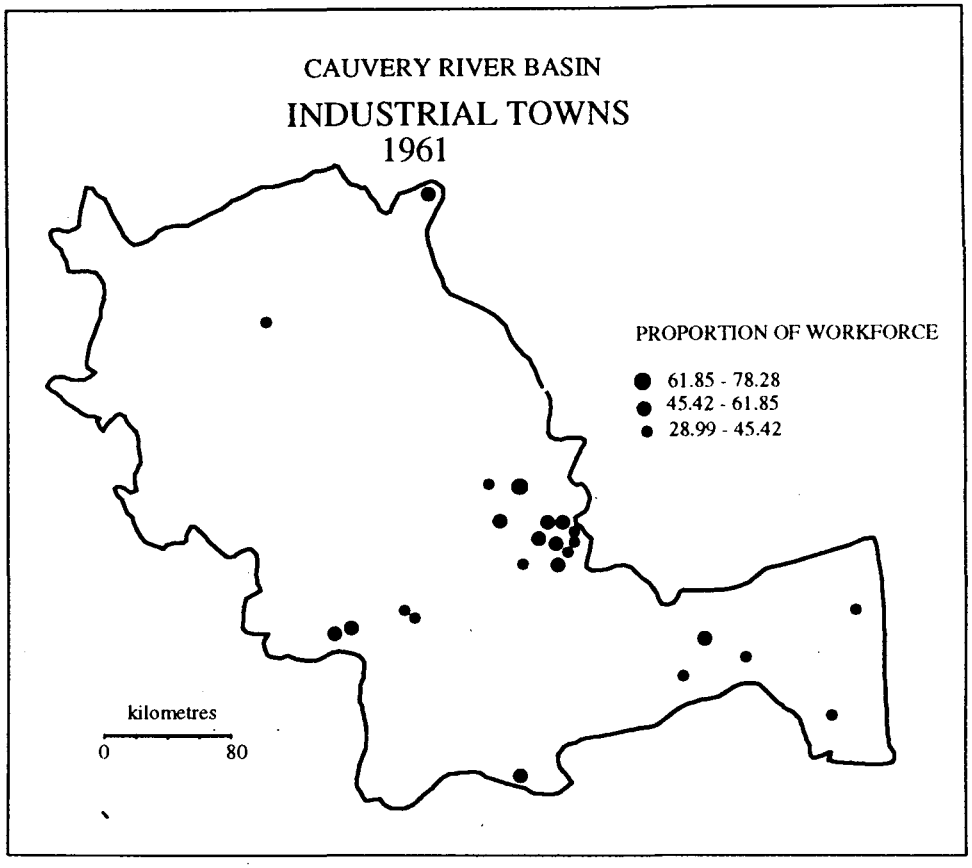
	primary	industri	trading	transpo	service	multifucti
I		1	2	4		1
II		1	4	5	2	
IV	6	7	2	2	1	26
V	10	10	3		7	28
VI	5	2	4		6	6
	22	29	22	17	21	68

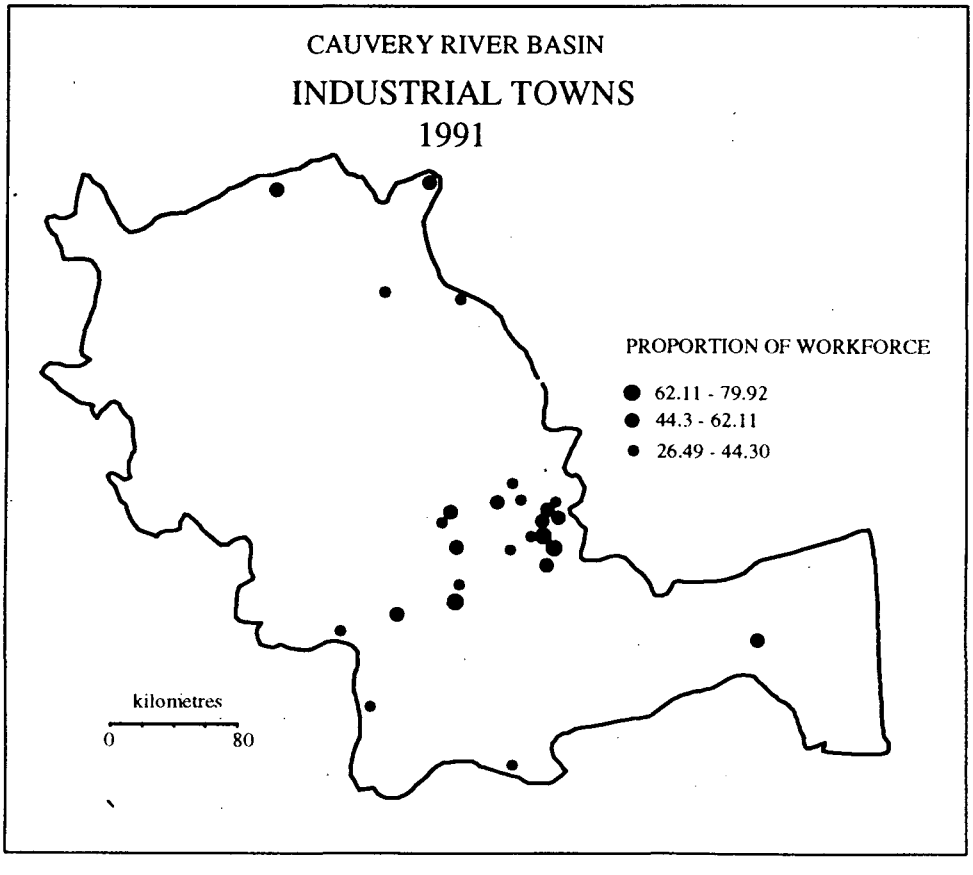
Towns classified accoding to the predominant/leading function

	primary	industri	trading	transpo	service	multifucti
I		3	3	5	3	2
II	1	4	4	5	7	1
III	3	4	4	7	3	22
IV	11	7	3	5	4	22
V	9	7	4		3	7
VI	1		1	2	1	4
total	25	29	19	24	21	57


CAUVERY RIVER BASIN
PRIMARY TOWNS
1961
PROPORTION OF WORKFORCE
62.91 - 80.84
44.98 - 62.91
27.05 - 44.98
kilometres
0
80


CAUVERY RIVER BASIN
PRIMARY TOWNS
1991
PROPORTION OF WORKFORCE
67.80 - 86.80
49.00 - 67.80
30.20 - 49.00
kilometres
0
80


CAUVERY RIVER BASIN
INDUSTRIAL TOWNS
1961
PROPORTION OF WORKFORCE
61.85 - 78.28
45.42 - 61.85
28.99 - 45.42
kilometres
0
80


CAUVERY RIVER BASIN
INDUSTRIAL TOWNS
1991
PROPORTION OF WORKFORCE
62.11 - 79.92
44.3 - 62.11
26.49 - 44.30
kilometres
0
80

primary t 1991

size	monofuncti	bifuctio	trifuncti	total
I				
II	1			1
III	3			3
IV	11			11
V	9			9
VI	1			1
total	25			25

industrial 1961

size	monofuncti	bifuctio	trifuncti	total
I	1			1
II	1			1
III	5	3		8
IV	7			7
V	10			10
VI	2			2
total	26	3		28

industrial 1991

size	monofuncti	bifuctio	trifuncti	total
	3			3
II	3	1		4
III	4			4
IV	6	1		7
V	7			7
VI	-			-
total	24	1		26

trading to 1961

size	monofuncti	bifuctio	trifuncti	total
I		2		2
II		4		4
III	4	3		7
IV	2			2
V	2	1		3
VI	2	2		4
total	10	12		22

Primary activity

Tables 7.8&7.9 shows the number of U.A.s/towns engaged is primary activity. UAs/towns perform primary functions in outstanding numbers are only second to industrial functions, during 1961 and increased as major function of town, alongwith industrial function in 1991. The number of U.A/town found in this category was 22 in 1961 and 25 in 1991. Thus primary functions are performed mostly by small towns which together constitute 96% in 61 and 84% in 91 of total number of towns.

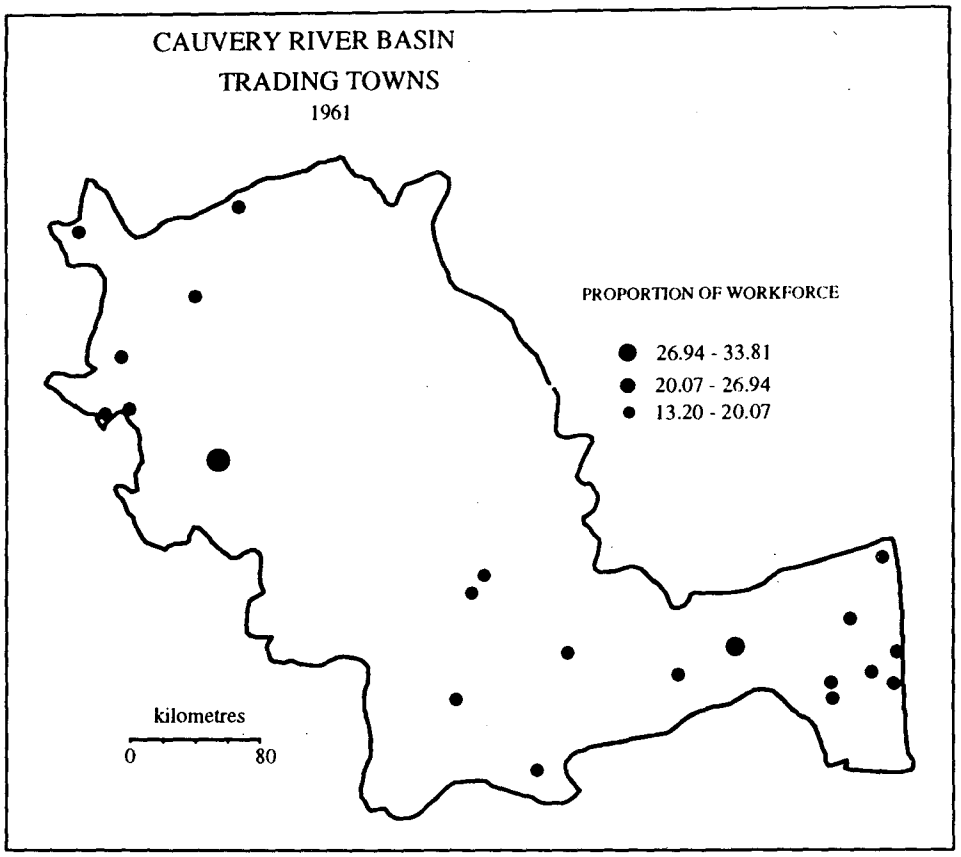
A distinct characteristics of towns performing primary functions in 1961 and 1991, was that all of them are mono-functional. This inspite of fact, to be recognized as primary town, 45% and 49% of its workforce must be engaged in it, respectively in 1961 and 1991. In 1961, UAs/towns whose more than 63% of workforce engaged in it are Devarshola (77.21%), Naduvattam (69.2%) Belakvadi (70.5%) and Talakkad (77%). only Devarshola is a medium town and all others are small towns.

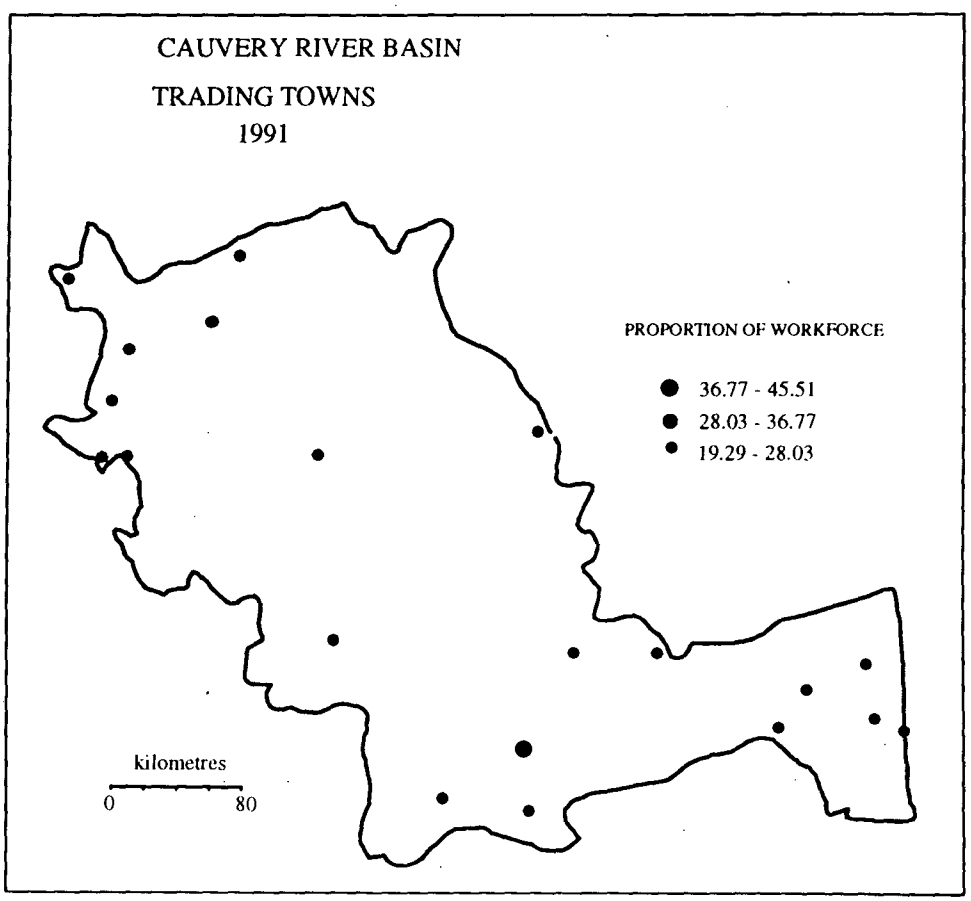
In 1991, Devarshola, had in 86% of workforce in it, Kotaguri (68%), Tirumullaivasal (75%) Kattuputtur (70%) Belakvadi (73%) and Malai Madeshwara Hills (76%). Devanshola (57,549) and Kotagir (38,121) are use and small towns respectively of Nilgiris district.

Those above towns are engaged in tea plantation (Derashola, Kotagiri) and coffee plantation is southern Karnataka.

Secondary or Industrial Activity

Tables 7.10 &7.11 shows the U.A/towns falling under this category.Industrial function is the dominant function of the U.As/towns of the Basin in both 1961 and 1991. 27 out of 162 towns and 25 out of 156 towns were found engaged in industrial activity in 1961 and 1991 respectively.


CAUVERY RIVER BASIN
TRADING TOWNS
1961
PROPORTION OF WORKFORCE
26.94 - 33.81
20.07 - 26.94
13.20 - 20.07
kilometres
0
80


CAUVERY RIVER BASIN
TRADING TOWNS
1991
PROPORTION OF WORKFORCE
36.77 - 45.51
28.03 - 36.77
19.29 - 28.03
kilometres
0
80

transpor 1961

size	monofunc	bifuction	trifuncti	total
I	2	2		4
II	1	4		5
III	2	4		6
IV	1	1		2
V				
VI				
total	6	11		17

transpor 1991

size	monofunc	bifuction	trifuncti	total
I	4	1		5
II	1	4		5
III	4	3		7
IV	3	2	1	5
V				
VI	2			2
total	13	10	1	24

trading 1961

size	monofunc	bifuction	trifuncti	total
I		2		2
II		4		4
III	4	3		7
IV	2			2
V	2	1		3
VI	2	2		4
total	10	12		22

trading 1961

size	monofunc	bifuction	trifuncti	total
I	2	1		3
II	1	3		4
III	1	3		4
IV	2		1	3
V	2	1		4
VI	1			1
total	9	9	1	19

Like primary functions, this group also has the distinction of being mono functional in both the periods. The medium and small towns domnated the scene in 1961 but in 1991 only small towns found more in numbers. In 1961, only Salem (56.5%) in the city class found as monofunctional city and Tiruppur (47.7%) a notable large town.

In 1961, U.As/towns whose more than 62% labour force found is industrial activity were Dod Ballapur (64%) Peelamedu (64.9%), Mallasamudram (64.9%) Chinnalapatti (69.9%) Vennandur (77.7%) and Pillanallur (77.7%).

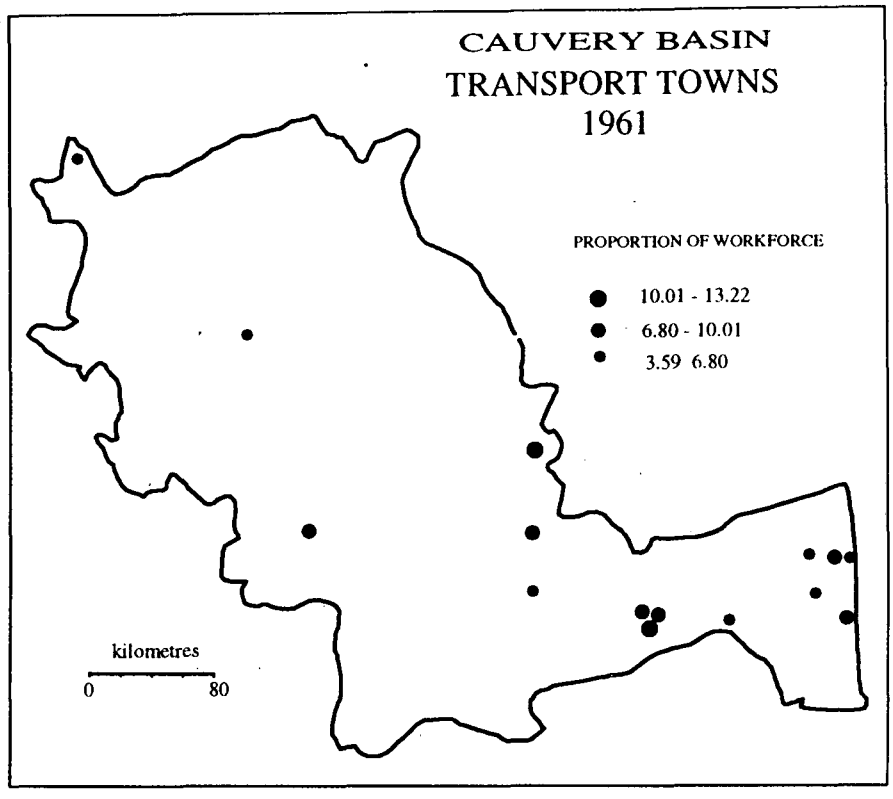
In 1991, class-I cities of Coimbatore (45.4%) a million city (population 11,00,746), Salem (45.04%) and Tiruppur (68.13%), are industrial cities as monofunction. In large town category, Bhavani (68.11%) Dod Ballapur (65.05%) and Ramanagaram (54.07%) are found.

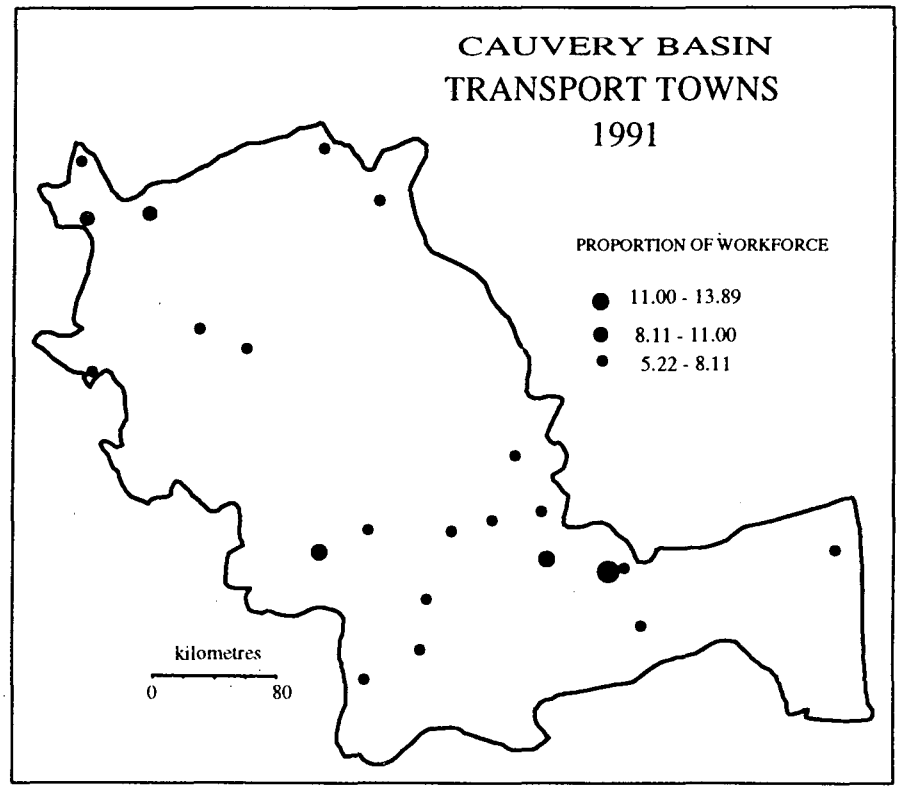
The industrial centres are strongly localized in and around major cities, especially around Bangalore, Coimbatore, Erode and Tiruppur. A large number of large and medium towns found along industrial corridor, has more than 45 perent of labour force in secondary activity.

Trading

Tables 7.12 & 7.13 shows the towns falling under this category. As seen from it 22 out of 179 towns in 1961 and 19 out of 171 UAs/towns provide trade and commerce in the Basin. In 1961, it was reported as second most important function along with primary activity. Whereas in 1991, it was the least found. The UAs/towns of this category has equal numbers in both mono and bi-functional categories.

No city and large town reported as having trade as mono-function in 1961 but in 1991, 2 cities - Dindigul (32.65%) and Kumbakonam (31.33%) and a large town Nagapattinam (30.19%) reportedly as mono functional.


CAUVERY BASIN
TRANSPORT TOWNS
1961
PROPORTION OF WORKFORCE
10.01 - 13.22
6.80 - 10.01
3.59 6.80
kilometres
0
80


CAUVERY BASIN
TRANSPORT TOWNS
1991
PROPORTION OF WORKFORCE
11.00 - 13.89
8.11 - 11.00
5.22 - 8.11
kilometres
0
80

Only one mono-functional town - pallapatti fall into Tc3 category-where the percentage employed in trading is more than 3SD's from the average percentage in trading. It had 62.6% and 73.4% of its labour force in trading during 1961 and 1971 respectively. Other Bi-functional towns falling under tc2 is Sakleshpur (26.65%).

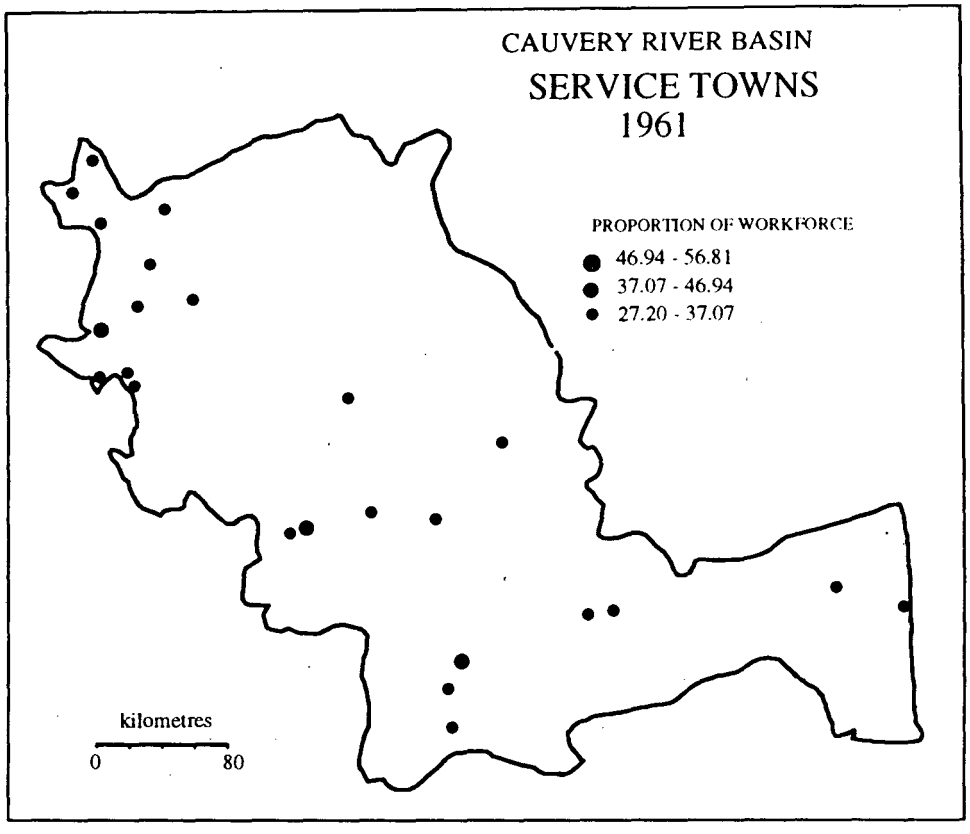
Transport

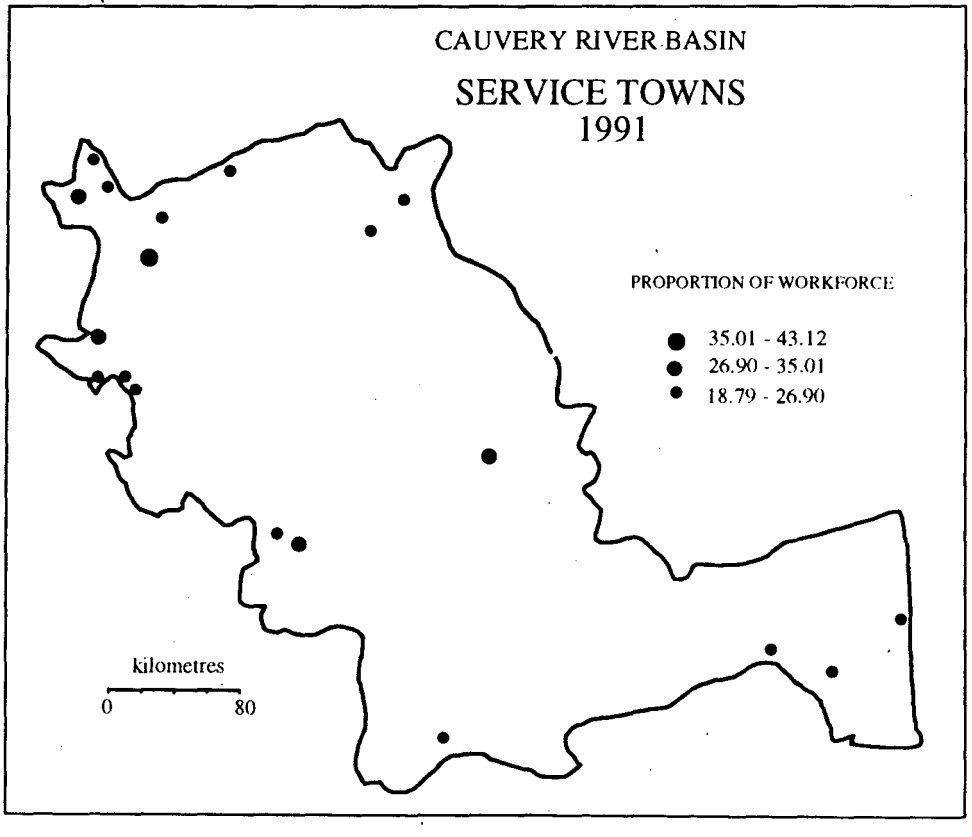
Tables 7.14 & 7.15 shows the U.A.s/towns engaged in transport functions. The UAs/towns performing transport, storage and communication found only in cities, large and medium towns. Out of 179, 17 Uas/towns were found in this category during 1961. In 1991, the number increased to 24 of 156 U.As/towns. The cities, large and medium towns still have their proportion high in transport functions, though small towns constitute 30% of the total number of towns in it.

In 1961, Mysore (9.36%) and Thanjavur (8.72%) are the two cities having transport as mono function. Tiruchirappalli (11.7%) and Erode (11.5%) have more than +2SD of its labour force in it with other function as well. The other important Uas/towns are Nagapattinam (11.8%), Myliladuthurai (10.5%) - the large towns; Golden Rock (20.3%) Srirangam (10.1%) Mettupalayam (12.3%) - medium towns; Namakkal (12.6%) Suramangalam (18.2%) - small town. The town group Golden rock and Suramangalam were having a high proportion of their labour force (mean + 5SD) in it in 1991. UAs/Towns having transportation as mono-function increased in number from 6 in 1961 to 13 in 1991.

The cities found in this category are Tiruchirappalli (9.82%) Mysore (9.84%), Erode (8.47%), Tumkur (8.77%) and Hassan (11%) which is a bi-functional city, though its labour force engaged in it is more than mean +2SD.

The large towns falling in this category are Myiladuthurai (8.57%) Mettupalayam (14.1%), Tiruchengodu (9.31%), Chickmagalur (8.12) and Udumalaipettai (9.26%).


CAUVERY RIVER BASIN
SERVICE TOWNS
1961
PROPORTION OF WORKFORCE
46.94 - 56.81
37.07 - 46.94
27.20 - 37.07
kilometres
0
80


CAUVERY RIVER BASIN
SERVICE TOWNS
1991
PROPORTION OF WORKFORCE
35.01 - 43.12
26.90 - 35.01
18.79 - 26.90
kilometres
0
80

service 1961

size	monofunc	bifuction	trifuncti	total
I				
II	2			2
III	1	4		5
IV		1		1
V	6	1		7
VI	4	2		6
total	13	8		21

service 1991

size	monofunc	bifuction	trifuncti	total
I	1	2		3
II	4	3		7
III	2	1		3
IV	2	1	1	4
V		3		3
VI	1			1
total	10	10	1	21

The medium towns are Dharapuram (9.28%), Namakkal (20.1%), Rasipuram (8.98%), Thuraiyur (8.86%) Krishnarajasagara (9.93%) and Karamadai (8.13%).

Small towns - Sakleshpur, (12.3%) Virajpet (8.8%) Veerakkalputtur (9.02%) Nelamangala (8.82%) and Omalur (8.28%).

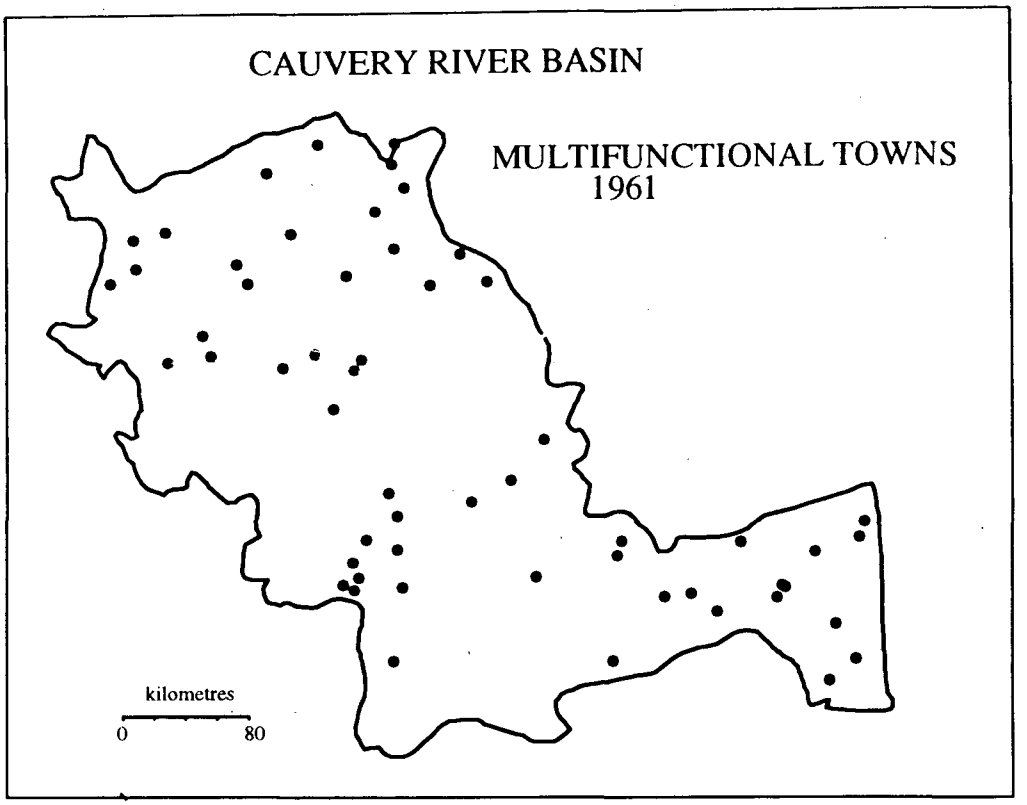
Namakkal had the largest proportion of its labour force engatged in transport function. (more than mean + 5 SD: 20%)

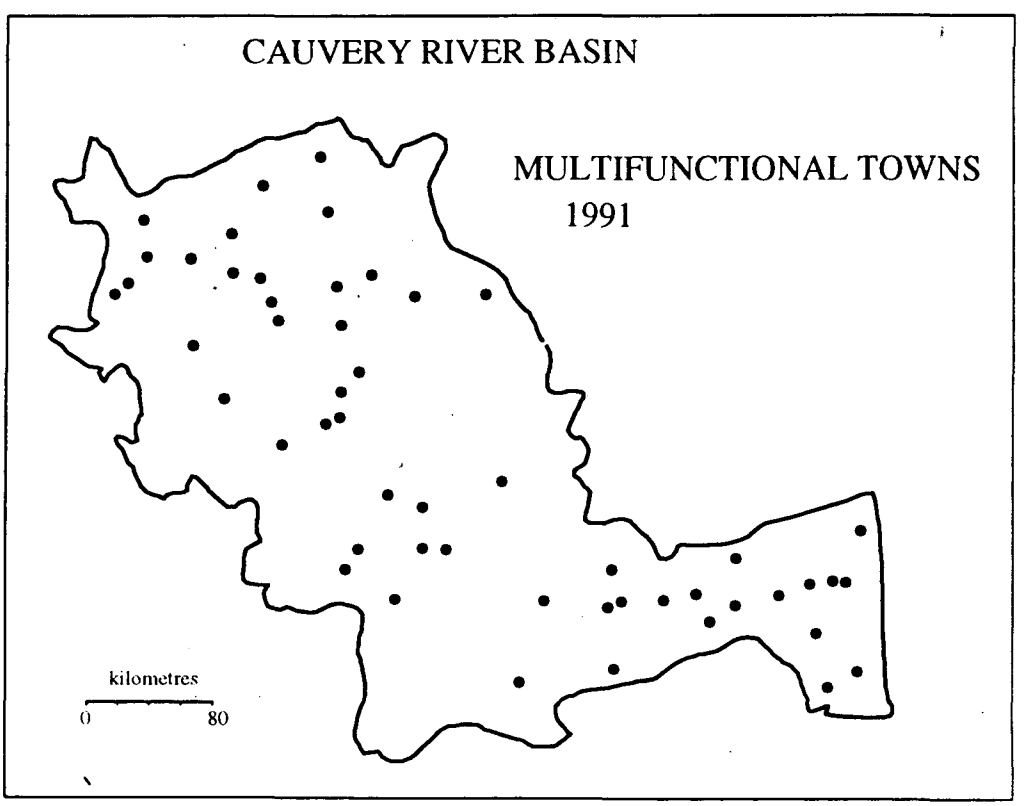
Services

The cities engaged in administrative functions are not reported in 1961, where as 3 cities fall in it during 1991. The number of UAs/towns falling under this category though same in both the periods - 21 out of 179 in 1961, 21 out of 171 in 1991, their share in the functions of U.As/towns increased marginally. (Table 7.16 & 7.17).

In 1961, out of 21 UAs/towns, 2 were large towns --Coonoor (48.8%) and Udhaga mandalam (46.2%), 6 were medium towns - Palani (41.3%), Hassan (40.3%), Chickmagalur (39.2%), Mettur (38.8%), Dharapuram (50.0%), and Karaikal (39%). 14 small towns of which Madikeri (55.5%) and Medigere are (42.6%) notable.

In 1991, Thanjavur (33.09%) Hassan (33.09%) and Coonoor (41.1%) were three cities found in service category. Only coonoor was of mono-functional in character. Other important towns were Udhagamanadalam (37.24%), Chickmagalur (30.96%), Madikeri (42.35%), Gurur (50.72%) and Ponnampet (34.99%). Gorur town has the largest propotion of its workforce engaged in service sector, more than average +3 SD.


CAUVERY RIVER BASIN
MULTIFUNCTIONAL TOWNS
1961
kilometres
0
80


CAUVERY RIVER BASIN
MULTIFUNCTIONAL TOWNS
1991
kilometres
0
80

multifunctional towns

class/year	1961	1991
I	1	2
II		1
III	7	22
IV	26	22
V	28	7
VI	6	4
basin	68	57

Functional diversification of the towns 1961

class	monofunc	bifuction	trifuncti	total
I	3	4	1	8
II	4	8		12
III	13	14	7	34
IV	16	2	26	44
V	28	2	28	58
VI	13	4	6	23
basin	77	34	68	179

Functional diversification of the towns 1991

class	monofunc	bifuction	trifuncti	multifu	total
I	10	4		2	2
II	10	11		1	1
III	14	8		22	22
IV	24	3	3	22	22
V	19	3		7	7
VI	5			4	4
basin	82	29	3	57	57

Tertiarization

The functional classification of U.A.s/towns in the Basin in 1961 and 1991 shown that 60 U.As/towns (33.52%) and 64 U.As/towns (37.42%) of the Basin found having tertiary (trade and commerce, transport, storage and communications and services) as leading or predominant function. The size wise breakup shows that small and medium town (72%) are predominantly tertiary oriented in 1961. The class I cities accounted for 10% (6 cities) and rest by large towns (18.3%).

In 1991, with the number of class-I cities engaged in tertiary functions increased from 6 to 11, their share also increased to 17.2%, the second largest number of tertiary oriented found in large towns. (25%) the notable change was that the share of small towns decreased considerably to 57.8% from 71.67%.

As the percentage of agricultural population decreasees with the increasing level of urbanization, the proportion of the population employed in tertary increases. Teatiary functions is the main activity in medium-sized towns and is overwhelmingly dominant in cities, large and small towns.

Thus urban centres in the Basin are markedly tertiary, specializing in administration - (the buropoli[19]), professional services, trade and commerce, transport, storage and communication and other services.

Multi-functional towns

There are significant proportion of U.As/towns not falling under any of the above 5 mentioned categories. 68 out of 179 and 57 out of 171 U.A.s/towns are not sufficiently high in their proportion of labourforce in any single activity to

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[19] Cori. B., 1984: The National Settlement System of Italy., in Urbanization and Settlement Systems, ed. Bourne et. al. New york: OUP.

Economic structure of towns 1961

class	primary	secondary	tertiary	multifu	total
cities		1	6	1	8
large towns		1	11		12
medium towns	1	8	18	7	34
smal towns	20	19	25	60	124
basin	22	29	60	68	179

Economic structure of towns 1991

class	primary	secondary	tertiary	multifu	total
cities		3	11	2	16
large towns	1	4	16	1	22
medium towns	3	4	14	22	43
smal towns	21	14	23	33	91
basin	25	25	64	57	171

receive a special classification and hence remain as more or less average or multifunctional towns. (Table 7.20).

In 1961, 88 percent (60 towns) of the U.A.s/towns of the diversified group belong to small towns - especially class IV and V. No large town found in this category, only one city, Coimbatore (population 1100746) fall under this category.

In 1991, small towns constituted 58 percent and medium towns constituted 39 percent of the total diversified towns. Thus together accounted by for 97 percent. Only 2 cities - Mandya (pop. 120265) and Karur (pop.113669) and one large town-Chanapatna (pop. 55209) towns in the respective category.

FUNCTIONAL DIVERSIFICATION

(Tables 7.21 & 7.22) In 1961, out of 162 towns, 77 (43.02%) were mono-functional, 34 (19.0%) bi-functional and 68 (37.99%) towns were multifunctional. The higher proportion in mono-functional indicates the specialization of a particular ecconomic activity in the towns. Most of mono-functional towns found in small towns (76%). The monofunctions dominated in primary, industrial activities and services. Bi-functional towns are a common feature of large and medium towns (65%).

In 1991, out of 156 U.A.s/towns 82 (47.95%) were mono-functional, 29 (16.96%) were bi-functional, 3 (1.75%) tri-functional and 57 (33.33%) were multifunctional towns (65%).

The mono functional towns were like 1961, small towns (59%), bi-functional towns belong to large and medium towns 66%. Only one by-functional town found in class IV category and most of multifunctional towns found in medium and small towns (96%).

The tri functional U.A.s/towns are totally non-existence in the Basin during 1961. In 1991, only one small town Virajpet (pop.13092) had its workforce

engaged in all three functions - trade & commerce, transport storage and communication, and services, reported.

The mono-functional cities found generally engaged in primary, industrial transport functions.

CENTRAL PLACES IN THE BASIN

Every town acts as a focus for the surrounding countryside and it is from this role the general functions are derived. Since in acting as a focus the town functions as a central place, the term 'central places' and 'central place functions' are commonly used.

The introduction to the theoritical part of Christallers book is entitled 'Are there laws which determine the number, distribution and size of towns' and the establishment of a duductive theory which reveals the 'ordering principle' in the distribution of town.

Formost among Christaller's assumptions is one that the towns act as central places for the country side, that they come into being to carry out at a central accessible place the tasks which the life of countryside creates. As early as 1916 Gradman had contended that the distinctive role or a town was

> 'to be the centre of its rural surrounding and mediator of local commerce with the outside world' (Gradman, 1916).

The towns also performs collecting and exporting the local products, importing and distributing the necessary goods and services which the countryside demands.

Centrality, the degree to which a town serves its surrending area, can only be measured in terms of the goods and services offered. Each central place is able to offer all the goods of the lower order centres and in addition a distinctive

range of goods related to the increased size of its hinterland. On this basis a distinctive series of ranks emerges which is referred to as the 'urban hierarchy.'

To measure centrality, it is preferable to deal exclusively with the functions the town performs for the tributory area as measured by physical establishments such as hospitals, colleges, and banks. The first stage was that the identification of ranks made more objective by the awarding of the points for certain facilities present so that a score obtained for each town.

Given the consistent problem of subjective decision there much to be said for a simple but effective measure such as that used by Davies in South Wales[20]. A location co-efficient of a single outlet of any functional type was determined by the formula.

$$C = t/T.100$$

where C is location co-efficient of function t, t was one outlet of function t and T is the total number of outlets of t in the whole system.

> 'Multiplication of the relevant location co-efficient by the number of outlets of each functional type present in a settlement gives the degree of centrality (centrality value) imparted to each settlement for every different type of function. A functional index is derived by the addition of all the centrality values attained by any settlement' (Davies, 1961)[21].

By using the Davies method in assaigning the centrality value to a settlement for those facilities/functions existing in each settlement as described in the methodology section, the urban centres were ranked hierarchically as per its centrality values. These were shown in maps for the years 1971 and 1991. The

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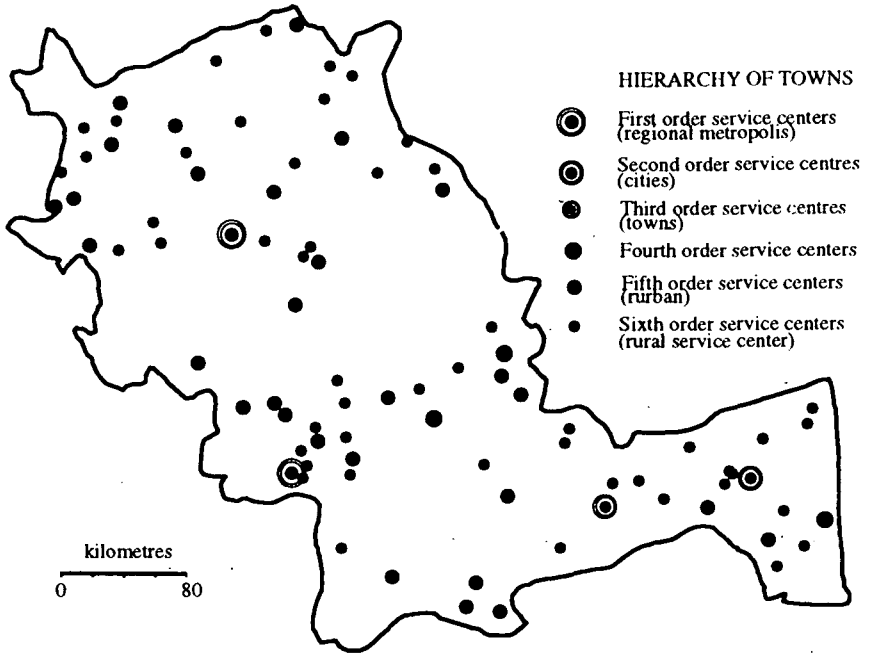
[20] Davies W.K.D. 1967: Centrality and Central Place Hierarchy. Urban Studies 4, p 61.

[21] Davies 1967, ibid. p 63.

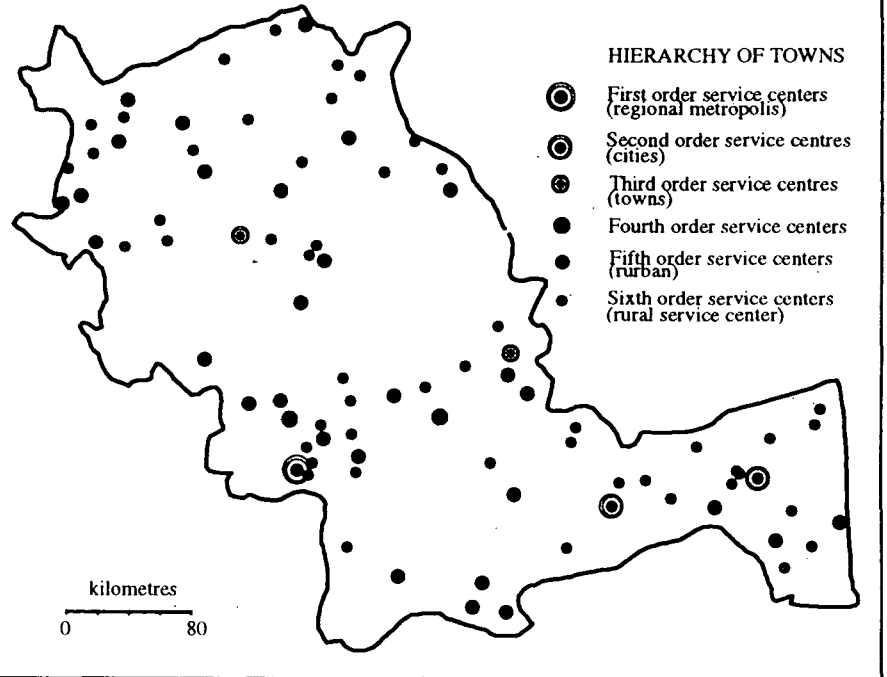
CAUVERY RIVER BASIN

MEDICAL FACILITIES 1971



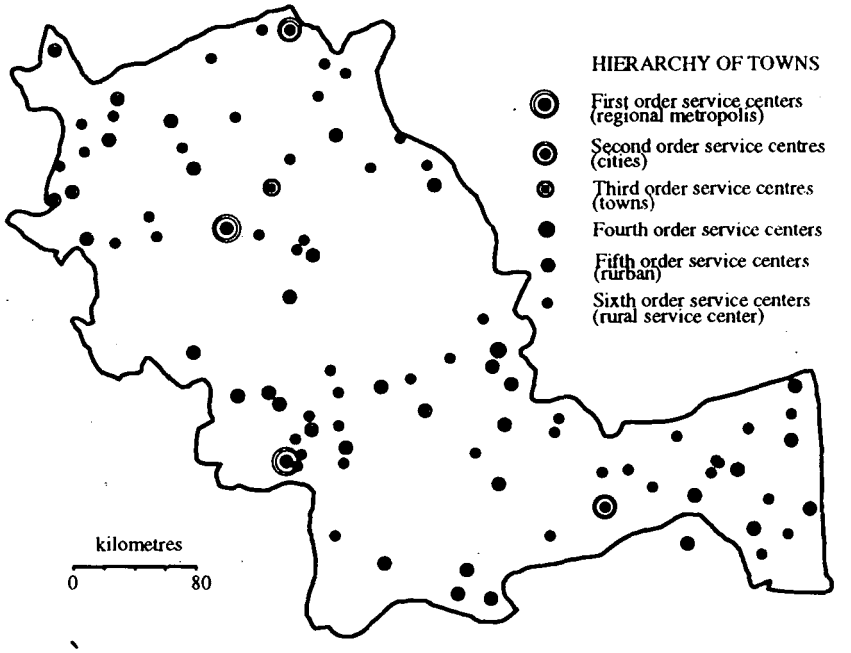
CAUVERY RIVER BASIN

MEDICAL FACILITIES 1991



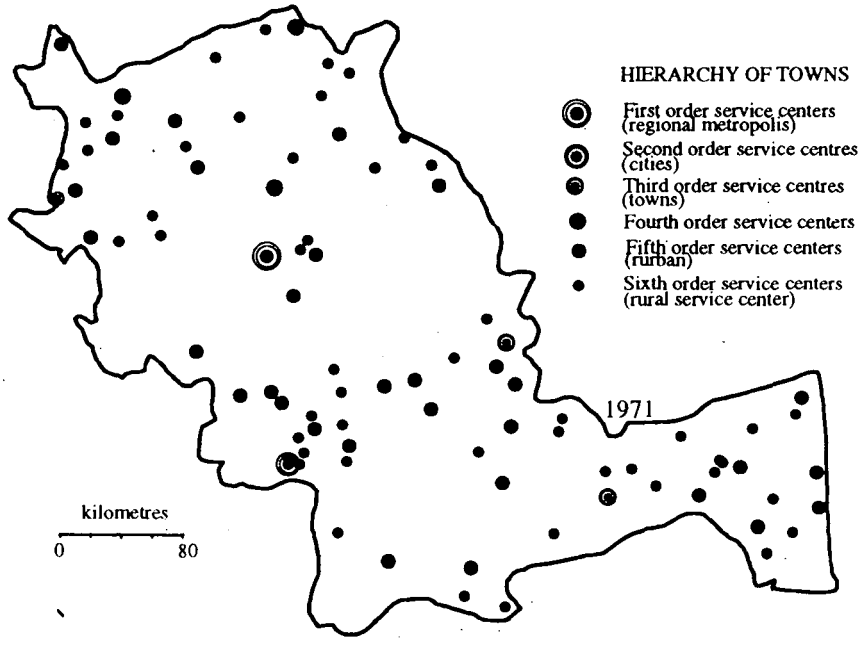
CAUVERY RIVER BASIN

EDUCATIONAL FACILITIES 1971



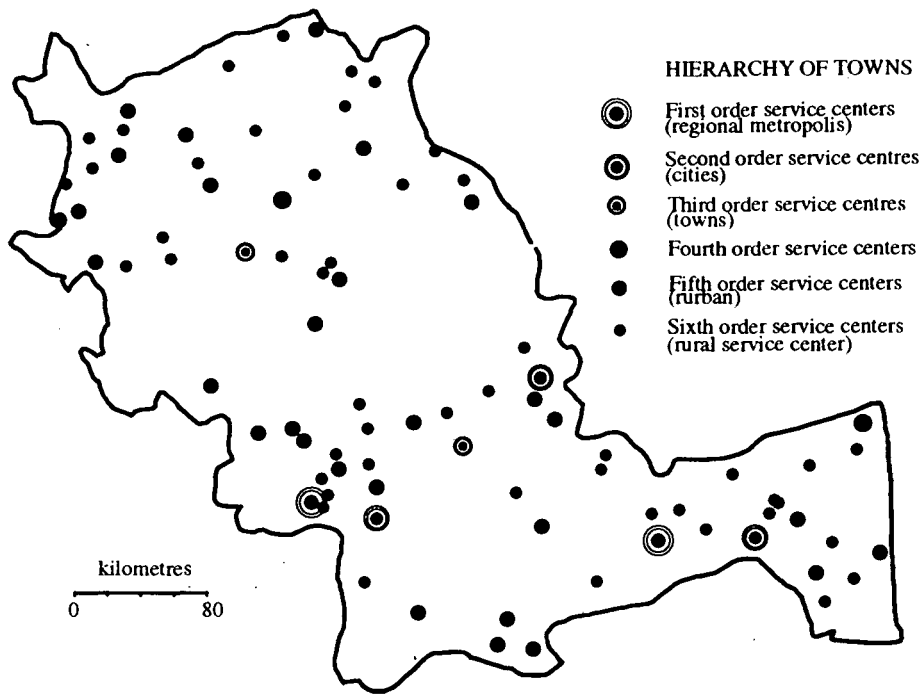
CAUVERY RIVER BASIN

EDUCATIONAL FACILITIES 1991



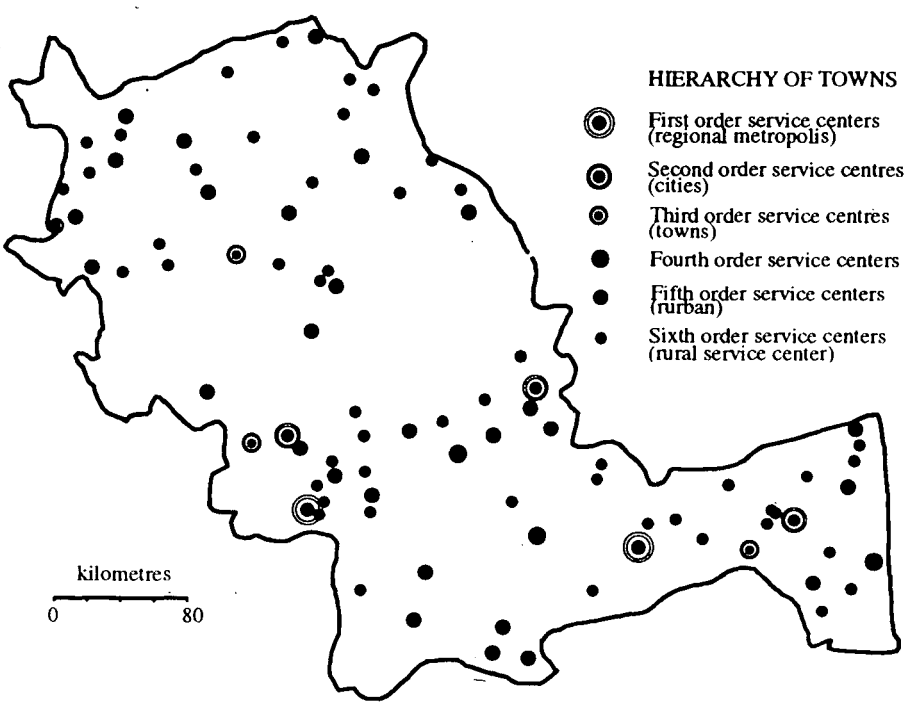
CAUVERY RIVER BASIN

RECREATIONAL FACILITIES 1971



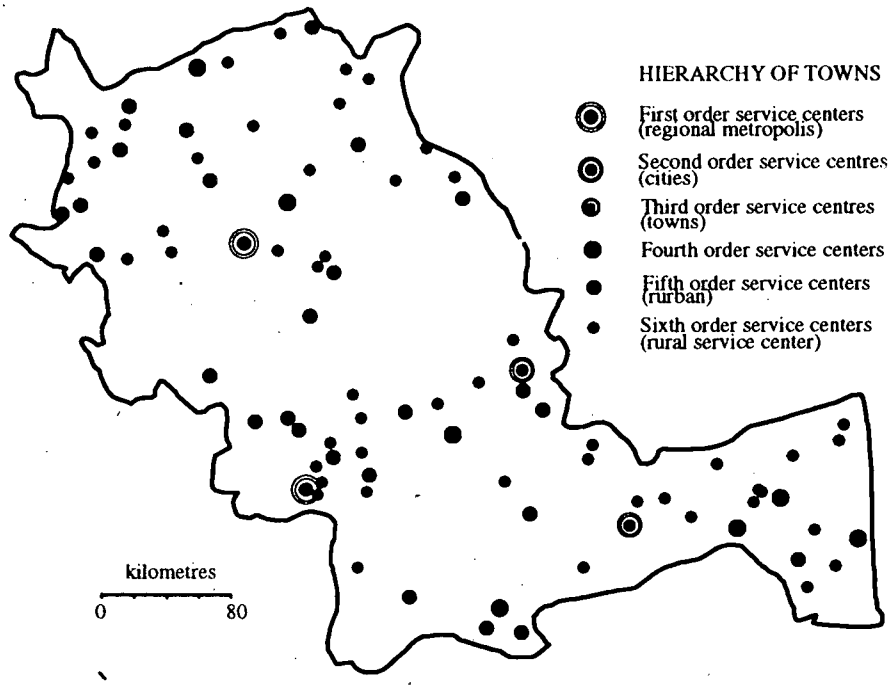
CAUVERY RIVER BASIN

RECREATIONAL FACILITIES 1991



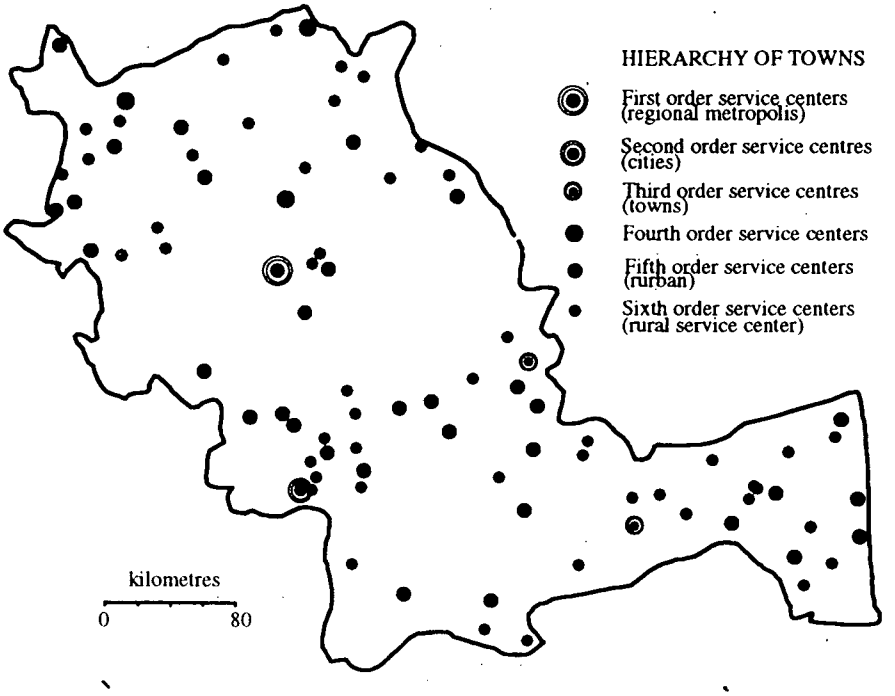
CAUVERY RIVER BASIN

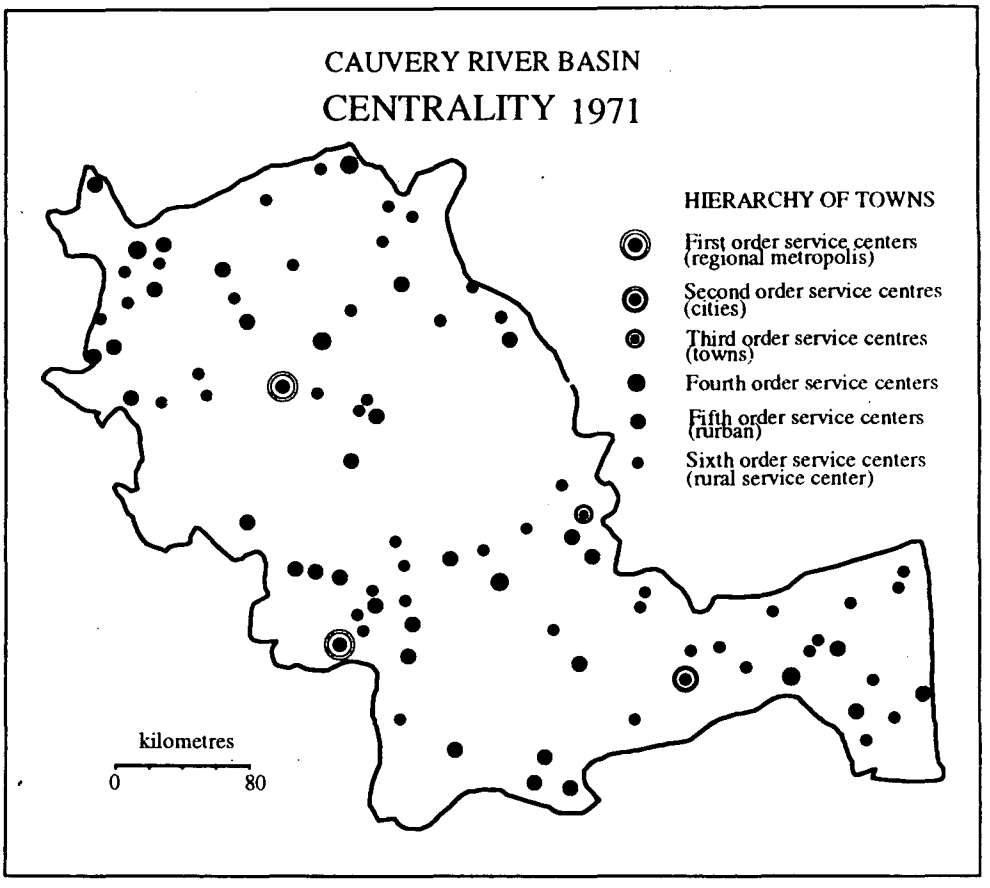
FINANCIAL FACILITIES 1971

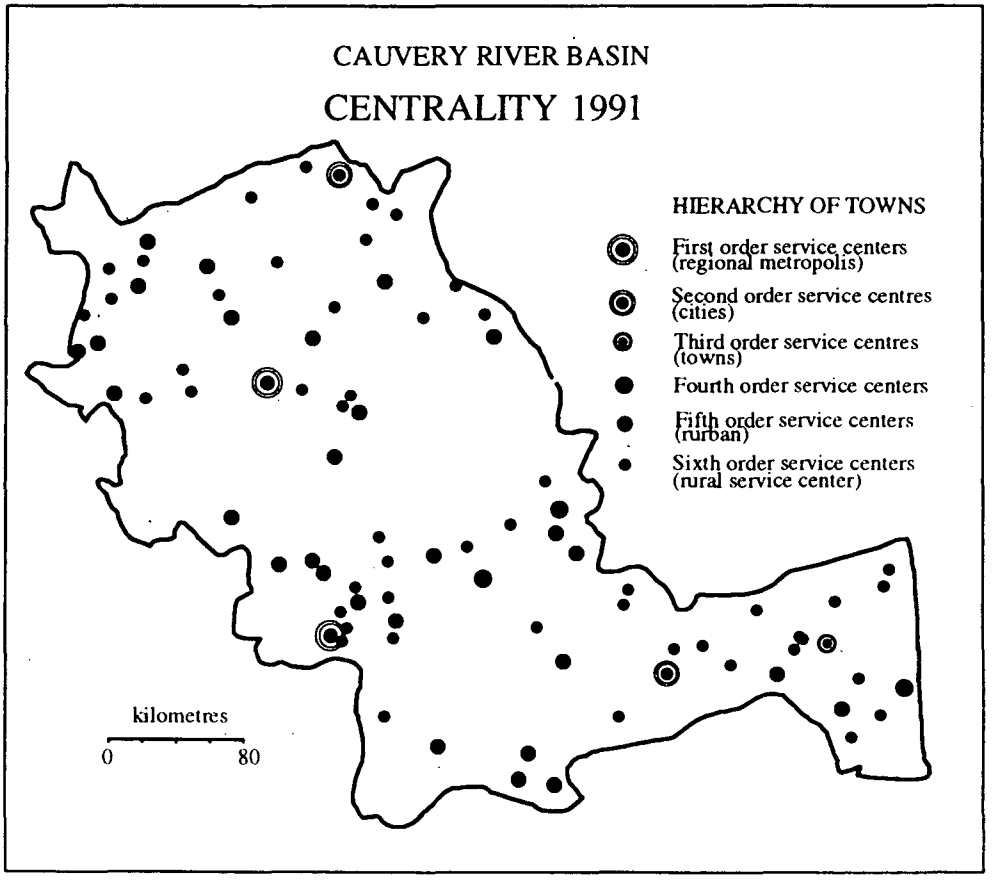


CAUVERY RIVER BASIN

FINANCIAL FACILITIES 1991




CAUVERY RIVER BASIN
CENTRALITY 1971
HIERARCHY OF TOWNS
First order service centers (regional metropolis)
Second order service centres (cities)
Third order service centres (towns)
Fourth order service centers
Fifth order service centers (rurban)
Sixth order service centers (rural service center)
kilometres
0
80


CAUVERY RIVER BASIN
CENTRALITY 1991
HIERARCHY OF TOWNS
First order service centers (regional metropolis)
Second order service centres (cities)
Third order service centres (towns)
Fourth order service centers
Fifth order service centers (rurban)
Sixth order service centers (rural service center)
kilometres
0
80

functions were grouped according to its association such as educational, medical, recreational, and financial services.

Medical services : In 1961, the cities of Mysore and Coimbatore with their highest scores indicates the concentration of medical services in it. (Map.)

In 1991 Coimbatore and Tiruchirappalli had the largest scores and thus the concentration of facilities. (Map.)

Educational facilities : Mysore and Coimbatore in both periods has the highest scores.

Recreational facilities : In both the periods i.e. 1971 and 1991, the cities of Coimbatore and Tiruchirappalli had its largest concentration of the recreational facilities.

Financial facilities : These were largely concentrated in the cities of Coimbatore, Tiruchirappalli, Mysore and Salem in 1971. The financial Centres were totally shown a different hierarchy. Mysore, Salem, Tiruchirappali and Coimbatore, was the order which was just opposite during 1971.

The hierarchy of towns on their cumulative functions indicates that during 1971, Mysore, Coimbatore, Tiruchirappalli, Tumkur, Salem and Mandya were most important central places with their highest concentration of function which serving their surrounding area. Interestingly the order of ranked cities in 1971 were totally different.

Similarly in 1991, Mysore, Coimbatore, Tiruchurappalli and Salem were the most important cities in their cumulative facilities. Like 1971, the order of cities in their population size in 1991 was different. This as explained by Carter[22] (1994)

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[22] Carter. H., 1994: Urban Geography, London: Longman.

'the significance of this role (central place) cannot be measured by the population of a town for whereas size might be a measure of 'importance', it is not a measure of centrality' (Carter, 1994)'.

SPACING OF URBAN SETTLEMENTS

The technique of near neighbour analysis is a measurement of distance from an individual to its nearest neighbour irrespective of size and direction. The model indicates the degree to which the observed distribution of urban centres deviation from what might be expected if the points were distributed in a random manner within the same area.

The near neighbour stastic (Rn) for the Basin measured for the period 1971 and 1991. It came to 0.1207 during 1971 and 0.12101 during 1991, indicating that urban settlements pattern in the cauvery Basin is a concentrated one. The increase in the Rn statistic shows that the urban settlements in the cauvery basin moving slowly towards clustered pattern.

The cauvery Basin, especially its upper portion is mountainous and rugged topography. This has detracted the location and growth of settlements. Moreover most of settlements found along the river.

The concentrated or clustered pattern of urban settlements in the cauvery basin, in due to concentration along river valleys and in delta region of Tamil Nadu. In fact, the validity of the nearest neighbour technique[23] depends upon:

(a) Whether the study area has significant spatial differences in terrain, population density, and so on.

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[23] Ramachandran R., 1989: Urbanisation and Urban Systems in India, New Delhi: OUP, p.230.

Rn-Statistic
Near Neighbour Analysis

year	rA	rE	Rn
1961	1.448	12.0017	0.1207
1991	1.468	12.0416	0.1219

Linear Rn-Statistic
Linear Near Neighbour Analysis

year	rA	rE	Rn
1961	1.448	1.139503	1.65
1991	1.468	1.083106	1.59

(b) whether in the study area, there are strong linear alignments of settlements, as in Coastal areas and along rivers and roads. In both the cases the technique has severe limitation (Ramachandran, 1989). Thus due to doubtful validiity, this may represent the real pattern. Thus Linear near neighbour analysis[24] (L-NNA) used which is on that the settlement pattern is clustered type influenced by the Linear feature (river Cauvery)

POTENTIAL SURFACE OF POPULATION

In studies of spatial interaction the ideas of specific geographical complementarities and the friction of distance are brought together in the granity model.

The interaction potential is a general concept and can be applied to marketing, irrigration, Commuting, communication and other kinds of problems. In social science the gravity model has been used to explain much of the variation in data describing movement of people, goods, and ideas, and to suggest insights about geographic structures formerly hidden from view. The gravity model is thus a valid representation of (p-plane) facts about spatial interaction. Population potential is an index of the intensity of possible spatial interaction between the inhabitants.

But how much interaction should we expect? The concept of potential suggests a measure. Borrowing from ideas of Newtonian physics, we might expect the same kinds if regularities in the attraction between the social units as we observe among the physical units. Any two physical objects in the universe attract each other with a gravitinal force that varies directly with the product of the masses of the objeect; thee larger they are, the greater the attractive force. The

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[24] Singh R.L. 1979: Elements of practical geography., New Delhi, Kalyani Publications. p.246.

attractive force or gravitational potential between two objects diminishes as the (Square of the) distance between them increases.

The logical basis of the gravity model is simply the interaction of two places with each other in proportion to the product of their masses and inversely according to some function of the distace between them. That is

$$I_{iij} = f\left(\frac{M_i M_j}{dij^2}\right)$$

where:

Iij = the number of interactions between i and j during some time period.

dij = the distance between i and j and

M = some measure of the size or mass of the intreacting pair of places[25].

We can apply these gravitational ideas to the towns is in the Basin and derive a measure of interaction potential at each town location. Potential at a point is simply an aggregate measure of the influence of all the distant places on that point.

Within a bounded region containing n points, total potential at one point i is computed as the sum of the separate potentials created by the existence of every point including point i.

In the present study, the U.A.s/towns having a population of 50,000 or more (class-II and above) only considered to a create a potential surface of population. This is taken on the basis of standard urban areas, which presupposes that the surrounding area wil be totally urbanised within two or three decades.

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[25] Abler R spatial organisation , p.221.

CAUVERY RIVER BASIN

DISTIBUTION OF POPULATION POTENTIALS 1961

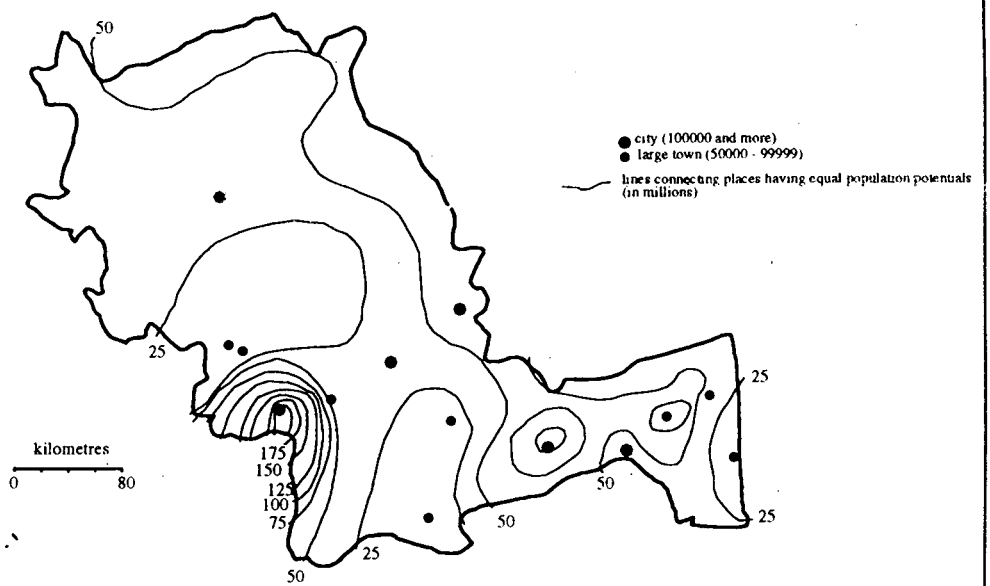

Fig.No.

CAUVERY RIVER BASIN

DISTRIBUTION OF POPULATION POTENTIALS 1991

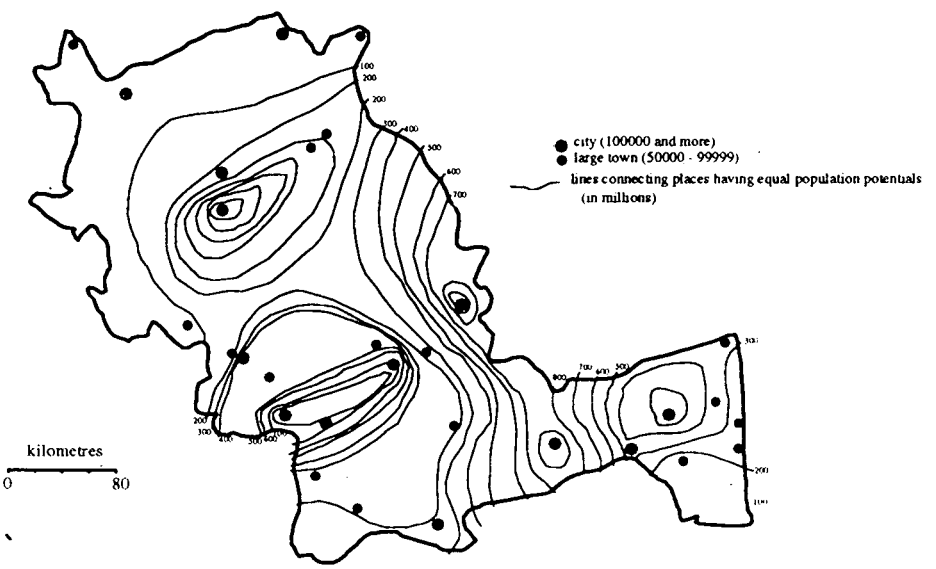

Fig.No.

:1961 potential population

s.no	city	poulatio	potential population
1	coimbatore	448201	2E+02
2	tirucuchi	338881	109.8816
3	salem	273134	70.18518
4	mysore	253865	27.24402
5	tanjavur	111099	46.1318
6	erode	103242	41.85936
7	tiruppur	97965	44.71754
8	kumbakonam	96746	92.7372
9	dindigal	92947	19.64317
10	nagapattin	59063	19.76241
11	coonoor	52992	17.47064
12	mayiladutu	51393	46.11545
13	karur	50564	18.08897
14	udhagamand	50140	11.2009
			767.3592

:1991 cities

s.no	city	poulation	potential population (in millions)
1	coimbato	1135459	2712.52
2	tirucuch	711120	882.237
3	mysore	652246	728.77
4	salem	573685	947.67
5	erode	357427	3330.14
6	tiruppur	305546	715.753
7	tanjavur	200216	386.203
8	dindigal	182293	202.401
9	tumkar	179497	163.107
10	kumbakon	150502	556.917
11	mandya	119970	181.268
12	karur	110605	174.811
13	hassan	108548	86.3746
14	coonoor	99615	432.791
15	nagapatt	99024	276.627
16	bhavani	97020	846.435
17	udhagama	81726	181.468
18	mayiladu	77042	308.322
19	palani	75948	134.101
20	chidamba	68819	302.14
22	tiruchen	63217	235.679
23	karaikal	62903	212.295
21	mettupal	61875	156.172
24	chickmag	60814	35.7105
25	udumalai	58643	109.581
26	deavrsho	57258	97.0108
27	mannargu	56563	130.829
28	channapa	55210	314.527
29	dodballa	54468	42.8475
30	ramanaga	50411	279.075
			15163.8

Let us assume that town i located a region with several other cities. In a modern economy of specialized people and places, we can reasonably expect that a town i has some potential for interacting with each of the other towns in its region.

Potential at a point may be thought of as a measure of the proximity of that point to all other places in the system, or as a measure if aggregate accessibility of the point to all the other points in a region. Potential at a point is simply a aggregate measure of the influence of all distant places on that point.

Within a bounded region containing n points total potential at one point i is computed as the sum of the separate potentials created by the existence of every point including point i. The potential p created at i by each point j is equal to the mass at j divided by its distance from i. In symbols.

In the present study the towns having a population of more than 50,000 and above (i.e. class III) are used to construct an is arithmic map of population potential for Cauvery region. The reference periods are 1961 and 1991 based on census data.

The potential surface of population constructed for 1961 and 1991 periods shown in maps . As seen from the maps the population potential highest along two belts: (1) between Coimbatore - Tiruppur - Erode (ii) Tiruchirappalli - Thanjavur - Kumbakonam - Mayiladuthurai. The other minor nodals occur around Mysore, Dindigul and Coonoor during 1961. In 1991 the highest potentials occur along three major belts, two minor and few nodal regions.

The most important region is a belt between Coimbatore - Tiruppur - Erode - Bhavani and its northwest limb - Mettupalayam, Coonoor, Udhagamandalam and Devarshola. The second belt is between Tiruchirappalli and Karur. The third belt occurs between Thanjavur - Kumbakonam - Mayiladu Thurai - Chidambaram. It has a coastal extention along Karaikal and Nagapattinam.

The secondary belts occur around Mysore, Channapatna --Ramanagaram, and Palani-Dindigul.The other important potentials but small in size found around major cities of the Basin. These are Salem, Tumkur, Chickmagalur, Mandya, Hassan and Dodballapur.

The peak of the potential surface was at Coimbatore in 1961 and if shifted to Erode in 1991. Population potential is a measure of the nearness of the poeple to one another in the aggregate. Each individual in a country contributes to the total potential at any place i by an amount equal to the reciprocal in his distance away from it. Population potential is an abstract, macroscopic variable measuring the relative position of each place with respect to all other places in the region. Potential represents a force underlying interaction among places.The table 9.3 & 9.4 shows the population and potential population of UAs/towns in 1961 and 1991.

SUMMARY AND CONCLUSION

The analysis of urbanization in the Cauvery Basin during 1961-91 thrown insight on the diverse aspects rural-urban composition, urban pattern, trend and urbanisation growth of city and town population, Urban Agglomerations (UA) and Standard Urban Areas (SUA), The economic structure, organisation of urban settlement system, hierarchy and the spatial distribution of potentials for further urbanization are some of the major aspects dealt in detail.

The of urbanization is slow because of urban-rural growth differentials which slowed down due to the slow growth of urban population.

The rate of growth of city and town population has shown a very interesting trend. The gradual shift in the concentration of urban population from towns (places of less than 100,000) to cities (places of more than 100,000) over the decades, has resulted in the emergence of large number of cities.

The rapid growth of medium and large towns is held responsible for fast emergence of new cities in the Cauvery basin.

The small towns generally grow at a negative rate due to lack of new town emergence. The class-IV towns negative growth is not due to the fact that it is growing slowly. In fact the rapid growth of its towns got transferred to the next higher class. The fact is that the new reclassified urban place are few in number and decreasing over the years. The difference when it came to light through the two methods current class method and individual city method.

In the analysis it is proved that the largest cities grow at a rate lower than the small cities. The cities of Coimbatore, Tiruchirappalli, Mysore, Salem and Thanjavur grew at lesser rate. Whereas the next lower order cities grew faster.

The spatial variation in the levels of urbanization is very uneven. The Tamil Nadu part of the Basis is highly urbanized and industrialized. In Karnataka part of basis only Bangalore and Mysore districtsare must urbanized. The belt between Udhagamandaham- Coimbatore-Tiruppur-Erode and Bhavani and around Salem city are the two most urbanized zones in the basin. The emergence of Comibatore as a million city is the evident for this fast emerging zone.

The levels of urbanization in the Cauvery basin, is 28.42 percent in 1991, which was higher than the national average. This higher levels of urbanization is due to the fact that the larger number of cities found in this region. The Tamil Nadu part of the basin is one of the highly urbanized region in India.

The tempo of urbanization as measures by urban-Rural growth differentials shows that the pace is getting slower. This is due to mainly the slow growth attained by urban population. The urban growth is highly fluctuating over the decades than its rural counterpart and total population. In fact the slowness in tempo of urbanization could be attributes to the fact that urban growth is slow. Because rural and total population maintained its trend over the year consistently.

The number of UA/towns in the basin increased from 92 in 1961 to 157 in 1991. The largest number of towns declassified were during 1961-71 in which 12 UAs/towns with a total population of 100826. This is due to the strict applications of the definition of urban place is classification. The large number of UAs/ towns, reclassified during the periods-1931 and 1961. The share of new town's population to the total urban population declining very rapidly since 1961.

The proportion of population in size classes shows a typical third world urbanization. A few cities occupying a major share of urban population whereas the large number of small towns has a meagre proportion. The top class over the period ought to get more proposition because the large and medium towns grow and enter

this class, and remain there only. Since it doesn't have the upper limit, the growth and proportion of population in large class would be high generally.

The urban places at the lower extreme of the scales show a smaller rate of growth. such a result can be expected on theoretical grounds, because there must a point at which small urban place be have much like large rural places.

The average size of urban place in the Cauvery basin increased from 12,454 in 1961 to 51,621 in 1991. The mean size of urban place, being in large town category indicates the observe of many small towns. The large number of cities and large towns increased the mean size of the urban place. The positive skewness in the mean size urban place mean size is result of above factor.

The town density also shown a vast network of nature settlements. The highest density attains during 1961 but since then the increase in town density very slow. This is because, as mentioned earlier, of less emergence of new towns.

The proportion of urban population in size-classes had shown a drastic change in its distribution. The disparities as measured by Gini's co-efficient indicates that the disparities is increasing over the decades. It was 0.55 in 1901 and it reached to 0.64 in the Gini's scale. The increased co-efficient is attributes to the fact that the cities in 1991 have 55 percent of total urban population, although the proportion of cities in the total towns is only 8.94 percent.

The class-I towns when sub-divided into its sub-categories (i.e. M class), the share of urban population among its constituent cities are interesting. The only one city in M-5 Coimbatore has 22% of the total urban population of class-I. The two classes M4 and M5, (i.e. 5,00,000 and above) together contain 63 percent of total urban population found in class-I.

This huge concentration of urban population in class-I cities increased the mean size of city. In 1901 the size of the mean city was 1,27,760 which those to 3,47,891 in 1991.

The spatial aspect of urban unit namely Urban Agglomeration and Standard and Urban Areas has more role in the process of urbanization of the basin. The urban Agglomerations are the new emerging forces in spatial extent in Indian urbanization. During 1951 and 1961, the share of large and medium UAs were shared equally and these together comprised the total Urban Agglomeration. But in 1971 the scenario changed altogether, the class-I UAs took 83 percent of total Uas urban population . By 1991, the share in city UA increased to 90%.

Similarly the proportion of UA's population in total population was about 12% only in 1951 and 1961. But by 1991 their share in total urban population increased to 60 %. This shows the increasing concentration of urban population in large Urban Agglomerations especially of class-I type.

The next important aspect is Standard Urban Areas. The population in SUAs increased very significantly. Most of the SUAs found in Tamil Nadu part of the basin. The 87% of urban population is SUAs found in Tamil Nadu part only.

The settlement system of basin analyzed through rate -size rule and indices of primary. Through the rule did not fit exactly, the basin falls into an intermediatory position between the idealized conditions of rank-size rule and private distribution. The pattern could be called as 'oligarchy'. The pattern is dominated by cities which have a bigger share of the total urban population.

But at the same time, the primacy of the leading city is kept under check as revealed by the two indices of primary (Pi and Pii) and the expected size of leading city as per straight line-relationship. The both the indices of primacy showing a

declining trend, which mean the 2nd order cities are growing at a rate which are able keep the primacy of leading city under check.

The long history of urbanization a well developed society, and industrialization and complete economic system all favoured the basin to get a balanced urban settlement system. Thus the absence of primacy in the region is due to historical and economic factors.

The economic base of the towns as analyzed was of industrial or manufacturing and followed by tertiarization especially of services. The class-I towns are dominant forces of industrialization in the basin. The class-I towns are acting as growth centres of the basin. Manufacturing is dominant activity of the basin. The number of cities engaged in manufacturing increased considerably between 1961 to 1991.

The large towns mainly engaged in trading and transport functions in 1961. In 1991, the industrial activity also found in place in large towns. The service sector is more pronounced in it. The medium towns exchange especially industrial function, followed by trade and transport. The medium towns are in fact have multi-functional roles. This medium town are primary town too, especially of plantation (tea in Nilgiris, Coffee in Kodagu districts.)

Small towns are largely primary oriented followed by manufacturing activities. Some lower order towns (class V and VI) perform service functions. There are mainly rural service centres providing educational, medical, financial, credit, and marketing, lower order administrative services facilities to the surrounding rural areas.

Tertiarization is not pronounced significantly, although one third of town are found performing tertiary functions. In 1961, the majority of the medium and small towns found engaged in tertiary activities. But in 1991, the large towns and small town picked up the thread. Since this region is industrially very active, this

might be expected. Most towns engage in manufacturing activities the tertiarzation is not found deeply in the basin.

There are towns which did not fit in any of the above functions. Simply they are not unusually high in any function. There are termed as 'multifunctional' towns. They are 67 towns and 57 town in 1961 and 1991 respectively. No multinational towns reported from large towns. Small towns constituted about 88% in 1961 but in 1991, the share of small towns decreased to 58%. The new category which took over from it is medium towns which constituted about 40 %. Only one city (Coimbatore) in 1961 which increased to 2 in 1991. (Mandya & Karur), in city category.

Functional diversification is taking place slowly in the basin. The increased share in mono-functional category (43% in 1961 to 48% in 1991) shows that the towns are building their economic structure through specializing in a particular function.

The central places in this Cauvery basin arranged hierarchically based on four services namely medical, educational, recreational, and financial services. The composite hierarchy reveals that the hierarchy based on population size and hierarchy based on centrality are largely differ. As Carter pointed out that the significance of the central place role cannot be measured by the population of a town for whereas the size might be a measure of importance , it is not a measure of centrality.

The spacing and organization urban settlements as revealed by Linear-Near Neighbour Analysis shared that the urban settlements predominantly found along the course of main river and it tributaries. This a further proof that the settlement system in Cauvery basin is largely influenced by the rivers, the settlement pattern in the basin is found to be concentrated or clustered pattern.

The potential surface of interaction in the Cauvery basin created for 1961 and 1991 periods. The maximum zones of interaction found where the size and number of towns found more. The peak of interaction potential found over Comibatore city in 1961. The secondary but small in size nodes occur at Tiruchirappalli and Kumbakonam.

But in 1991, the city of Erode had the peak potential interaction. It is a belt stretching from Bhavani-Erode-Tiruppur and Coimbatore and its northwest ward extension Mettupalayam, Udhagamandalam and Coonoor. The secondary peaks occur at Mysore, Salem, Tiruchirappalli and Kumbakonam.

Thus the major trends, pattern of urbanization, economic structure, hierarchy of settlements, size and spacing, and potential surface of interaction in the Cauvery basin dealt in detail.

The urbanization in the river Cauvery basin, focused on the pattern, and trend shown that the basin is fast changing. Given the rate of urban rural growth differentials and slow growth of rural population could then pave the way for rapid urbanization in the basin.

The large number of cities and UAs/towns especially along rivers is a witness that settlement system in the basin is largely river based and river promoted. The growth and development of urban settlements in the area as analysed through the rank-size rule, near neighbour analysis and indices of primacy, shows that due to more or less even development of the basin, the rank size nearly achieved. The absence of primacy city and strong alignment of nature centres along the major tributaries, indicates the dominant influence of the river basin as a natural region.

The urban centres and industries are mostly concentrated together. The secondary industrial regions-Hassan, Tumkur and major industrial regions-Comibatore-

Tiruppur, Bhavani-Erode, Tiruchirappalli, Salem, Nagapattinam and Thanjavur are located in Tamil Nadu part of the basin.

The functions most predominant are tertiary and secondary though primary and secondary put together equals to tertiary. The population engaged in territory is large. Because most tertiary towns are class-I cities, whereas primary functions are carried out mainly by small towns.

Industrial activity though not less important in the basin. In fact it is increased over the years. Terrorization is not predominant. Only 33 and 37% of towns engaged in it, in 1961 and 1991 respectively.

The growth of large and medium towns and it share in the urban population increased. The rapid growth of small towns got transferred to the above category. The increased concentration of urban population in cities and metropolises witness to rapid economic progress taking place in urban centres.

The arrangement of town along the river and in further growth as important urban centres are predominant in the basin. The potential interaction surface found mostly along the main river. The future urbanization thus depend on size and economic base of the urban centres on the course of the river.

This study attempted to analyse the process of urbanization and urban systems in a natural region like Cauvery river basin, although it might suffer from few drawbacks owing to the reason of difficulties in the necessary database.

Nevertheless the present study largely analysed the various aspects of urbanisation in the river Cauvery basin.

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