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**A SPATIAL ANALYSIS OF INDUSTRIES
IN
COCHIN AND ENVIRONS**

BALAGOPALAN, T. S.

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A dissertation submitted in partial fulfilment
of the requirements for the Degree of Master of
Engineering (Civil), Town Planning, of the
University of Poona.

By

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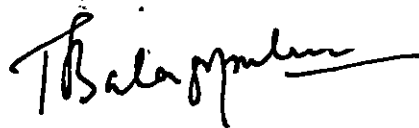
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Poona-5.



(Balagopalan T.S.).

Submitted to :


The University of Poona
Poona-7.

To My Mother

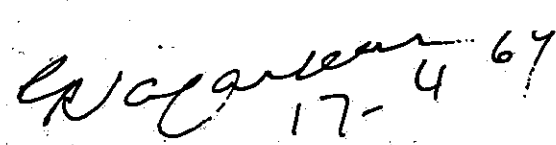
C E R T I F I C A T E

This dissertation entitled "A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS" is the bonafide work done by Shri Balagopalan, T.S. in the Town Planning Department of the College of Engineering, Poona. It has been completed under my guidance. This work forms a part of the requirements for the Master of Engineering Degree in Civil, Town Planning.

Date: 14, April, 1969.


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(Balagopalan T.S.).

C O N T E N T S

<u>Chapter No.</u>	<u>Title</u>	<u>Page</u>
	Introduction ..	1
	<u>Part-I</u>	
I	Brief Study of Kerala State ..	1
II	The Industrial Structure of Kerala State.	10
	<u>Part-II</u>	
III.	The City of Cochin and its Environs. ...	17
IV.	Spatial Distribution of Industries in Cochin and Environs. ...	28
V	Industrial Commodity Flow ...	39
VI	Spatial Distribution of Industries in City Zone. ...	49
VII:	Case Study of Fishery Development in Cochin. ...	59
	<u>Part-III</u>	
VIII.	Social Aspects of Industrialization. ...	67
IX-	Industrialization & Urban Growth. ...	76
	Summary of Conclusion. ...	86
	Tables. ...	94
	Appendices ...	110
	Selected Bibliography ...	113

List of Tables.

<u>Table No.</u>		<u>Page</u>
1	Growth of population in Kerala and India (1961). ..	94
2	Distribution of agrébased industries in Kerala, districtwise as on 1966. ..	95
3	Distribution of non-agrobased industries in Kerala, districtwise as on 1966. ..	96
4	Total traffic handled at Cochin port 1956-57 to 1965-66. ..	97
5	Principal imports of Cochin port. ..	98
6	Principal exports of Cochin port ..	99
7	Traffic handled at the major ports of India 1960-61 to 1965-66 ..	100
8.	Proportion of workers in small, medium and large factories in Cochin and environs by type of industries (1966). ..	101
9.	Traffic generated by different types of industries in Cochin and environs (1965). ..	102
10.	Traffic requirements and mode of transportation of commodity for the industries located in the peripheral Zone. ..	103
11.	Total marine fish landing in India (1964-65). ..	104
12.	Growth of engineering and technological institutions in Kerala. ..	105
13.	Percapita earnings of factory workers of different States in India. ..	106
14.	Percapita earnings of workers in different types of industries in Kerala. ..	107
15.	Willingness of workers to shift to factory quarters as per the survey of T.P.Deptt. in the environs of Cochin. ..	108
16.	Population growth of Ernakulam, Mattanchery & Fort Cochin municipalities. ..	109

List Of Figures.

<u>Figure No.</u>		<u>Page</u>
1	Land Utilization in Kerala. facing	3
2	Occupational pattern of workers and employment seekers in Kerala "	8
3	Distribution of factories in Kerala according to size of employment (1966) "	12
4	Traffic handled at Cochin Port 1956-57 to 1965-66 "	20
5	Growth of traffic of the major ports of India. "	21
6	Distribution of factories in Cochin and environs according to size of employment (1966) "	29
7	Proportion of workers in small, medium and large factories in Cochin and environs by type of industries 1966 "	31
8	Distribution of factories in City Zone according to size of employment (1966) "	50
9	Distribution of factories in City Zone according to size of employment (1966)- (Logarithmic Scale) "	55
10	Organization of Coir industry. "	56
11	Organization of fishery industry "	62

List of Maps

<u>Map No.</u>	<u>Page</u>
1. Administrative districts, natural divisions and climate of Kerala .	Between 16 & 17
2 Minerals, power generations and power consumption.	" 16 & 17
3 Roads, railways, waterways and air ways .	" 16 & 17
4 Manpower studies	" 16 & 17
5 Urbanization and economic regions	" 16 & 17
6 Industrial structure of Kerala State	" 16 & 17
7 Growth of Cochin City	" 27 & 28
8 Land use pattern of Cochin & environs	" 27 & 28
9 Transportation system in Cochin & environs"	27 & 28
10 Power supply system in Cochin & environs "	27 & 28
11 Distribution of industries in Cochin and environs (1966)	" 38 & 39
12 Distribution of industries in Cochin and environs (1961)	" 38 & 39
13 Distribution of industries in Cochin and environs (1956)	" 38 & 39
14 Types of industries in Peripheral Zone (1966)	" 38 & 39
15 Industrial commodity flow	Facing 45
16 Commutation of workers in Cochin and environs.	" 74
17 Distribution of industries in Cochin city (1966)	Between 51 & 52
18. Types of industries in Cochin city (1966).	" 51 & 52
19 Impact of industries on urbanization in Cochin and environs.	Facing 81

List of Photographs

<u>No.</u>		<u>Page</u>
1	The National Highway 47 has only 12 feet width...	Between 25 & 26
2	The Inland waterways are unique of its kind ...	" "
3	Waterways have perhaps more problems.	" "
4	Stake nets are used for coastal fishing ...	" 66 & 67
5	Country crafts are used for marine fishing. ...	" "
6	Fishermens settlement shows nucleation...	" "
7	Need for collective action during fishing activity...	" "
8	Mechanized fishing is of recent origin in Kerala ...	" "
9	Processing factories show spatial preference to the shores of backwaters. ...	" "
10	Many boat building yards work in temporary sheds...	" "

I N T R O D U C T I O N

There is almost universal agreement at the present time that industrialization has a major role to play in the economic development of the developing countries and is one of the most effective ways to eliminate their economic handicaps, to achieve a substantial growth of output and to raise the level of living of their population.¹ Industrialization can, however, cause varied social and spatial problems in any community. In urban communities particularly, proper analyses of these problems are necessary preconditions for perspective planning.

1. United Nations, New York (1965) : Report of the Inter-regional Seminar on Social Aspects of Industrialization p.1.

Kerala is a typical case of a backward or stagnant economy, with all the characteristic features of excessive dependence on land and agriculture, low income, poor capital formation and hardly any economic growth with vast unemployment and under-employment.² During the plan periods attempts have been made for the development of traditional industries and setting up new industries in both private and public sector. The spatial distribution of these establishments have certain characteristic features with regard to location, structure and growth pattern.

Fast Growing Industrial Areas :

The industrial establishments are apparently spread throughout the length of Kerala in a haphazard manner. However there are certain regions which have registered comparatively more rapid industrial development. In the southern part of Kerala, Kundara and Quilon, located in Quilon district, form the most important industrial centre. This has been so for two decades as far as Kundara is concerned and a still longer period in the case of Quilon. While processing of cashew, saw mills, manufacture of cotton textiles, silk, electrical goods etc. constitute the chief items of the industry in Quilon, Kundara has equally large

2. Government of Kerala (1967) : Industrial Policy Statement.

variety of industries comprising of ceramics, aluminium cables, rods and conductors, enamel goods, starch, electrical goods etc.

In the northern parts, Calicut-Kallai area is the growing industrial centre. Kallai is the second biggest timber yard in the world³ and has prospects for many timber-based industries. Calicut has varied industrial establishments like hydrogenation factory, oil and soap factory, rayon pulp factory, a re-rolling mill etc.

The most important industrial region, however, is the city of Cochin and its environs, lying in the middle part of Kerala. This is the area uniquely blessed with the location of industries like fertilizers and chemicals aluminium, glass, D.D.T., tiles and ceramics, cotton textiles, machine tools, rayons, oil mills, refineries, mineral oil installations, coir factories, fisheries, boat building yards etc. The location of the second ship building yard at Cochin will give impetus to a series of ancillary industries in and around the city of Cochin, making it the industrial capital of Kerala.

Problems Defined :

Cochin city and its environs form the study-area of this dissertation. The fact that this region has

3. Census of India 1961 Vol.VII Kerala Part IV A, p.83.

shown spectacular development pattern which will influence the entire industrial economy of Kerala state is the prime reason for the selection of this area. Proximity to the major port of Cochin distinguishes this area from Calicut-Kallai area and Quilon-Kundara area, although, in many other respects the three areas are identical in character. However, the methodology adopted for the analysis of industries in the city of Cochin and environs may be suitable for the other areas as well. The study proposed here is to cover the following main points :

1. What is the role of Cochin and environs in the economy of Kerala and India?
2. How this area came to be developed as an industrial centre?
3. What are the characteristic features of the spatial distribution of industries in this area?
4. What are the factors which have influenced this pattern?
5. What are the impacts of industrialization on the socio-economic aspect of the people?
6. Is it possible to deduce some guide lines for the future planning of industries in this area?

Limitations of the Work :

The writer spent considerable time in the study area collecting data from various sources and having on the spot inspection of some industrial locations.

Apart from a few published reports by the various departments of the State Government, and a compilation of papers read in a seminar on Greater Cochin development organised by All India Manufacturers Organization and Cochin Chamber of Commerce and Industry in 1967, the writer has drawn information and data from the Cochin Regional Office of the Town Planning Department of the State. However much of the useful data collected by a survey of industrial establishment was in the process of tabulation and could not be obtained in full. Lack of time ruled out a detailed survey of industrial establishments by the writer. Hence reliance had to be placed mostly on published reports of the Bureau of Economics and Statistics and the Industries Department of Kerala State. Within these limitations, an attempt has been made to develop a technique for the spatial analysis of industries in Cochin and environs and to reach certain conclusions in the following chapters.

Organization of the Work:

The work is divided for convenience into three parts. Part I is a summary of the back-ground study regarding the economy of the Kerala State and the industrial structure that has developed therein. This summary is meant to fix the role of the region wherein the study area falls. Part II is the attempt to analyse the growth of Cochin City, the structure and distribution

of industries in the city and the environs. The analysis and the technique developed is meant to emphasise the various factors of the problem, much useful for planning. Part III is devoted for discussing the social aspects of industrialization and the impact of industries on urban growth pattern, and to derive certain conclusions based on the analysis attempted in Part II. Each part is also divided into various chapters.

Some Words Explained :

The boundaries of legal city and natural city often are different. While much of the information may relate to the legal city, peripheral expansion of physical entites like industry, commerce and residence, will necessitate a larger area to be considered for spatial analyses. The word 'environs' means adjacent districts, peripheral fringes, neighbourhoods or suburbs. For a city to what extent the environs continue is a problem of research by itself. For a city of population more than one lakh, the urban influence is assumed to extend upto a circle of 24 k.m. radius.⁴ This assumption however is only arbitrary. For the present study an area much larger than this limit is taken so that the analysis will evolve a specific area as environs.

4. Census of India (1961) - Volume VII Kerala. Part IX, Census Atlas, Map 38, Degree of Urbanization - See explanation of the map.

The words 'industries', 'industrial establishments', and 'factories' are used synonymously in the present study. These are institutions registered under section 2 m(1) and (ii) and section 85 of Indian Factories Act 1948. For this work only the former category is considered. The relevent Section reads thus :

2(m) "factory" means any premises including the precincts there of -

(i) where on ten or more workers are working , or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on with the aid of power, or is ordinarily so carried on, or

(ii) where on twenty or more workers are working , or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is carried on without the aid of power, or is ordinarily so carried on, -

but does not include a mine subject to the operation of the Mines Act, 1952 (XXXV of 1952), or a railway running shed.

Again the classification of industries into small, medium and large sized units is arbitrary. No classification is attempted based on performance standards due to lack of data.

PART - I

CHAPTER -I.

A BRIEF STUDY OF KERALA STATE

1.1. Although Kerala has come into lime light on account of its political turmoils, the basic problems which the State faces are primarily economic in nature.* Its acute unemployment (Kerala 4.2 %, all India 0.6 %) and under employment (Kerala 9.6 %, all India 6.0 %) is agravated by increasing population pressure and highly limited scope for extension of cultivable area. In such a case the solution to theeconomic problems of the State can be attempted only by technological improve- ment and further industrialization. A brief study of the State given here is an attempt to understand the preconditions of industrialization existing therein, which will aid the spatial analysis.

* Lokanathan P.S. Preface, Techno Economic Survey of Kerala, NCAER, New Delhi (1962).

Location :

1.2. Kerala lies between 8°-15'N latitude, and 74° 50'E and 77° 30'E longitude. Its boundaries touch the State of Mysore in the north and that of Madras in the east and south. It is the smallest state in the whole of India excluding Union Territories. It is a narrow strip of land along the west coast having an area of 38,585 square kilo metres and a coast line of 560 k.m. The breadth of the State varies from 30 to 120 k.m. as one moves from the extreme north to the middle. For administrative purposes, Kerala is divided into nine districts.

Physical Features :

1.3. The State territory may be broadly classified into three natural divisions. The Low Land in the western coastal fringe with sandy soil is below 25 feet above M.S.L. This forms 10.1 percent of the total area and is inhabited by 26.5 percent of the population, making it the most thickly populated region. It is covered by coconut palms and fishing villages as well as most of the urban centres. The Mid Land is the undulating region of laterite soil lying between 25 feet and 250 feet above M.S.L., covering 48.7 percent of area and inhabited by 59.7 percent of total population. This area is rich in agricultural produce like paddy, tapioca, spices, cashewnut etc. The High Land is the mountaneous and rocky terrain

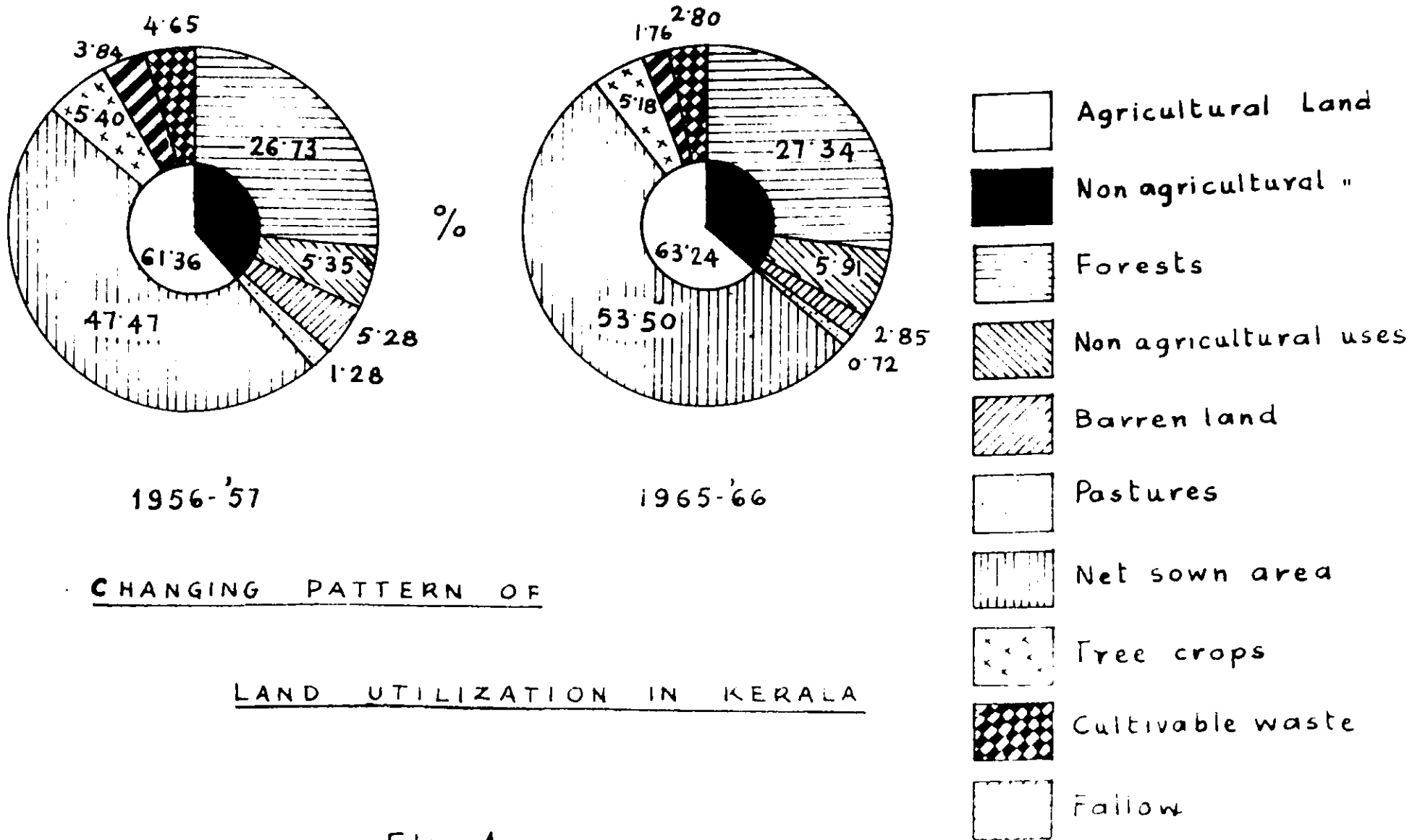


FIG. 1

beyond 250 feet above M.S.L., extending upto the western boundary of the State. Covering 48.7 percent of total area and inhabited by 13.8 percent of total population, this division is thickly forested and interspersed with plantations of tea, rubber and cardomom.

Climate and Rainfall :

1.4. The same diversity which characterises the physical features of the State also occurs in the case of climatic conditions. Whereas high land has a cool and bracing climate throughout the year, the plains are hot and humid. However the range in variation of the temperature is very narrow, the normal limits being 80°F and 90°F. The average level of rainfall is quite high (2500 mm). Since Kerala is fortunate in getting precipitation both from South West and North East monsoons, the rainfall is fairly spread out through out the year. January to April are practically the only months which are completely dry. Moreover annual variation in rainfall also is comparatively low. Draughts are naturally rare (See Map -1).

Land Utilization :

1.5. Figure 1 gives the land utilization pattern of the State in 1956-57 and 1965-66. Analysing the pattern in 1965-66, it is seen that 63.24 percent of the

area can be classified as agricultural land. The crops raised are mostly paddy, tapioca, coconut, plantain etc. The cultivable waste is only 2.8 percent of the total area and has been reducing year after year. 36.76 percent of the area can be classified as non-agricultural land. The major portion of this is the forest and plantation area. Per capita availability of land is only 0.57 acres and excluding forest it is only 0.28 acres. This shows that the pressure on land is intense and more workers cannot be absorbed in agriculture.

Fisheries :

1.6. With almost 12 percent of the coast line of all India and vast backwaters, Kerala holds unique position in the development potential of fishery industry. Fish has been one of the staple items of food in Kerala houses for long. Of late it has figured prominently in the export items of Cochin port. This has caused setting up of many freezing and canning factories in Cochin. In terms of employment and future prospects fisheries are very important in this region.

Minerals :

1.7. The process of industrial development generally involves a shift from industries based on primary raw materials like agricultural or forest produce to more technologically advanced industries

using higher content of metallic minerals. But Kerala's mineral resources are marked by the absence of any of these basic minerals viz. coal, iron, copper etc. The important minerals of the State are beach sands comprising of ilminite and monozite, China clay and tile clay. Graphite, iron ore, mica and lime stone are also found in small quantities. The economic diversification necessitates the exploitation of even these small quantities. The example of the cement factory in Kottayam using lime shells found in back waters is an example of this exploitation. The discovery of iron ore near Calicut is of importance to the State in this respect.

Power System :

1.8. Kerala is in an advantageous position having been favoured with abundant water resources which could be tapped for the generation of electric power. The hydroelectric potential of the State is estimated at 2.2 million k.w. at 60 percent load factor as against 40 million k.w. for all India. At present power is purchased from neighbouring state to meet the demand. The completion of Idikki and Sabarigiri projects is expected to make the State surplus in power. 75 percent of the total power consumption is by industries (Refer Map 2).

Transportation Network :

1.9. In the context of developing economy, the transportation system has a special role to fulfil. Apart from opening up the country and linking all areas with each other, it has to meet the growing demand for the movement of raw materials and finished products of industries. The transport system of the State consists of 892 k.m. of railways (333 k.m. metre gauge and 559 k.m. broad gauge), 17182 k.m. of roads, and 1885 k.m. of inland waterways, 111 statute miles of air ways and 13 ports including the major port of Cochin and two intermediate ports of Alleppey and Calicut. The rail length per lakh of population (1961) in Kerala is only 5 k.m. while that of India is 15 k.m. However this is offset by an effective net work of roads having an average road length of 44 k.m. per 100 sq.k.m. as against the all India average of 23. Practically there is no village without access to the road throughout Kerala. The inland navigation system however is the unique of its kind. With a total navigable length of 1885 k.m. this is roughly 20 percent of the total water transport milage of India. The west coast canal system starts from Trivandrum and stretches upto Horsdurg for a length of 555 k.m. (Refer Map 3).

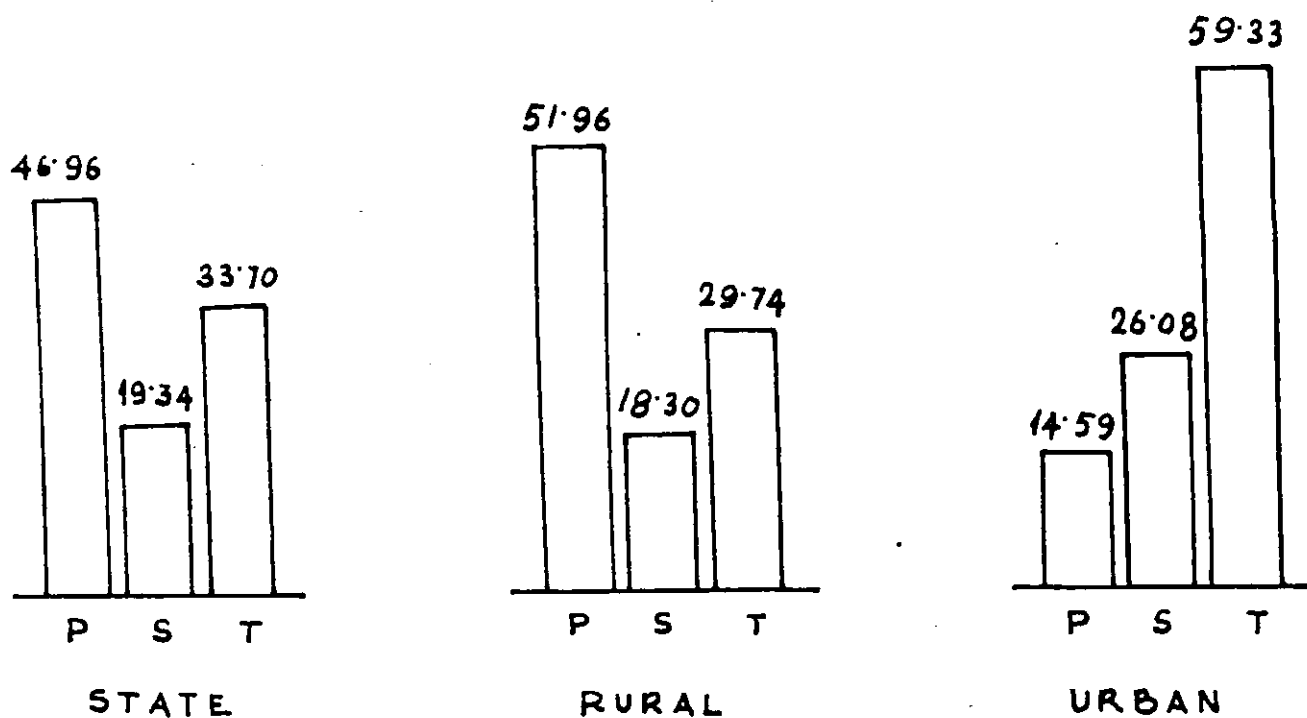
Manpower Studies :

1.10. Manpower is a necessary precondition in the exploitation of resources particularly in a developing area. The very wealth of a nation lies in its people. It has now been established that even regarding purely manual labour in modern industry, the productivity of an educated worker is distinctly higher than that of one not so educated. In Kerala an abundant reservoir of educated trained man power has been a characteristic for a long time. The fact that this manpower is ever on the increase and cannot be absorbed in the existing employment sector is seen from the number of persons in the live register of the employment exchange.

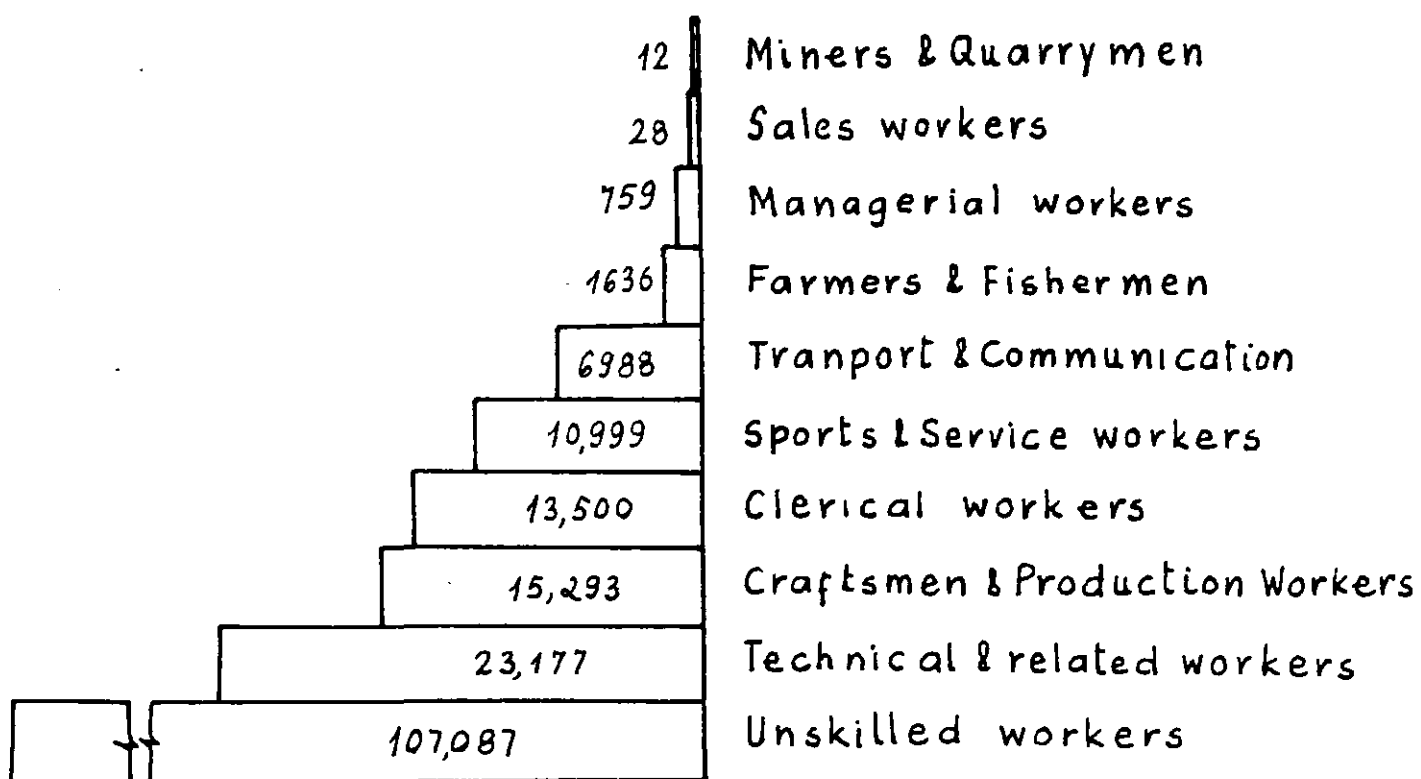
Growth of Population :

1.11. Map 4 gives the pattern of population growth in Kerala State. While India's population has not doubled in 60 years Kerala's population has been almost doubling every forty years since 1901. The percentage decade variations over the last six decades have been always more for Kerala than all India. Between 1951 and 1961 the decennial percentage growth of Kerala State is 24.8 percent while that of all India is 21.51 percent (Refer Table 1).

SECTORS: P- PRIMARY, S- SECONDARY, T- TERTIARY



OCCUPATIONAL PATTERN OF WORKING-POPULATION IN KERALA, 1961 (%)



OCCUPATIONAL DISTRIBUTION OF EMPLOYMENT SEEKERS (1967)

FIG. 2

Age Group Distribution :

1.12. An interesting demographic feature of the Kerala State is that the population is bound to increase for the next few decades. The reason is not far to seek. The age group distribution of the population clearly show a pyramidal pattern. Those between the age group of 0 to 14 constitute 42.63 percent of the total population. These between 15 to 59, the active group is only 52.52 percent. The rural urban split up does not show any distinct difference in this pattern.

Occupational Pattern :

1.13. One-third of the total population of Kerala has been enumerated as workers in 1961 census. Fig.2 gives the percentage distribution of workers in the primary, secondary and tertiary sectors. The secondary sector takes 19.4 percent of the total working force in Kerala as against 9.4 in all India. In rural and urban areas the proportions are 18.3 and 26.1 respectively. These workers are mostly employed in the enterprises like coir and cashewnut with low productivity. So even with large proportion of workers in the secondary sector, the capital formation is poor and consequently the economy weak. Again the large number of workers in the tertiary sector in a highly developed industrial economy can mean upward economic trends. In Kerala it means only disguised unemployment and under-employment. The

occupational distribution of employment seekers is again worthy of consideration. Next to unskilled workers, the most abundant reservoir of manpower is of technical and related workers. The nature of the existing industries is such that they don't need this group of workers, as the operations are mostly unmechanised.

Urban Concentration in the State :

1.14. Map 5 illustrates the distribution of the towns and the pattern of urban concentration. It may be seen that major portion of the state has an urban population below 10 percent, if Thaluk-wise urban population is considered. There are six distinct zones of high urban concentration in the coastal region and one around Palghat in the east. At this stage it will be of value to study the economic development of the area where these urban centres lie. A synthetic map has been drawn in Census- Atlas of Kerala by working out a synthetic index based on twelve economic indicators. It is seen that Ernakulam district wherein lies the urban nucleus of Cochin city leads all other district in this respect. In the following chapter an attempt is made to see what role of industries have played in pushing this region forward in economic development.

CHAPTER-II

INDUSTRIAL STRUCTURE OF KERALA.

2.1. Large scale industrialization is yet to make an impact in the economy of Kerala. A humble beginning for industrialization had been made during the pre-independence days on the Governmental initiative. Most of these industries were located in the erstwhile Travancore State. The private enterprises were limited to textiles, oil mills, cashew, coir, and tile and brick factories. In the technologically advanced industries, private entrepreneurship is yet to develop.

2.2. After independence, the plea for industrialization has come to the foreground with the Second Five Year Plan. A few large scale industries were started after 1961. Though they have been unable to reduce the unemployment to any considerable extent,

this has marked the beginning of earnest industrialization in the State. The industries existing already have formed the nucleus about which many of these new establishments have come up.

Structure of Industries :

2.3. The distribution of factories in Kerala according to employment size is given below :

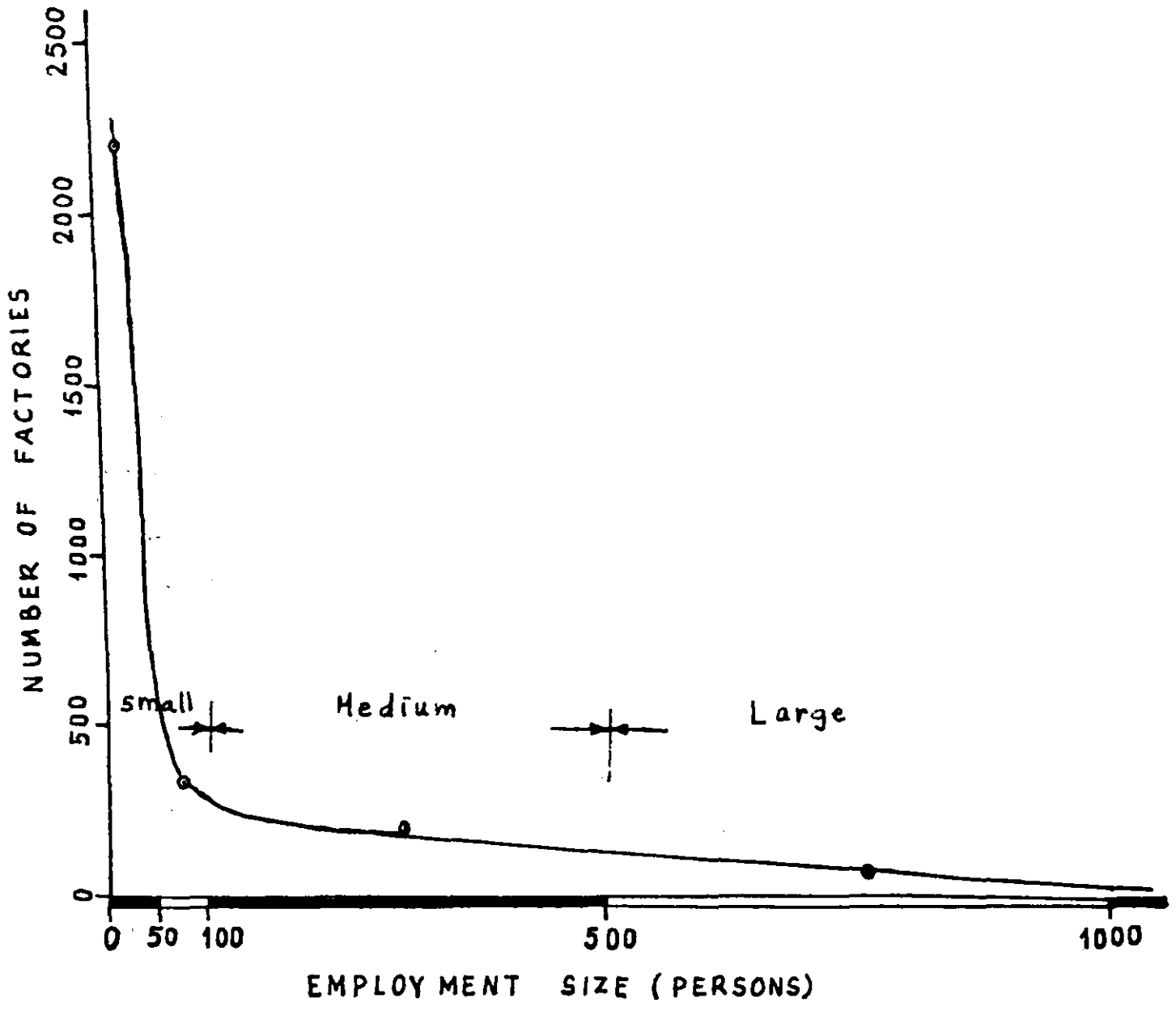
Distribution of factories in Kerala
according to employment size as on 31st Dec.66. *

<u>Employment Size</u>	<u>No.of factories.</u>	<u>No.of Employees.</u>
1 to 49 workers	2,208	35,881
50 to 99 "	331	21,834
100 to 499 "	277	65,120
500 to 999 "	83	55,538
1000 and above"	12	20,092
Total	2,911	1,98,465

* Source : Bureau of Economics & Statistics, Trivandrum.

2538 factories out of a total of 2911 are those employing less than 100 workers. This share is 87.3 percent. However they employ only 29.25 percent of the total workers of the state. Thus the average number of workers per factory is only 23.

9.5 percent of the total factories employ 100-499 workers.



DISTRIBUTION OF FACTORIES IN KERALA

BY EMPLOYMENT SIZE (1966)

FIG. 3

In all they employ about 32.75 percent of the total workers in the State. The average employment size is 235 workers per factory. There are only 93 factories employing more than 500 workers. They employ a total of 75,630 workers giving an average of 800 workers per factory. Thus 3.2 percent of the factories in this size employ 38 percent of the total workers.

2.4. Fig.3 gives a graphical representation of the number of factories in the different employment slabs. It is seen that the curve is approximating to a hyperbola. Factories employing a small number of workers are considerably more. The number of factories start getting reduced rapidly as their employment size increases. We can arbitrarily classify those industries which employ less than 100 workers as small industries and those employing more than 500 workers as large industries. Those employing 100 to 499 workers can be classified as medium industries. Though this classification is only arbitrary, it will be seen in later chapters that this is a very convenient classification for the purpose of analysis.

Distribution of Industries by Type :

2.5. The distribution of industries in Kerala according to type is given below :

Distribution of Factories in Kerala
according to type as on 31st December, 1966*

Type of Industry	No. of Units	No. of Employees
Textiles	254	18,790
Forest based	469	14,660
Other agrobased	1,042	113,649
Total agrobased	1,765	147,099
Chemical based	87	7,528
Mineral based	275	18,109
General Engineering	393	15,115
Miscellaneous	391	10,924
Total non-agrobased	1,146	51,366
Grand total	2,911	198,465

*Source : Bureau of Economics & Statistics, Trivandrum.

It is seen that 61 percent of the total factories are in agrobased sector. They employ 74 percent of the total workers of the state. The textiles have an average of 74 workers per factory and forest based industries an average of only 31 workers per factory. The other agrobased industries have an average of 110 workers per factory. Even though textile mills generally employ a large number of workers a considerable number of factories in the State are ⁱⁿ the handloom

section and hence, the average number of workers per factory is considerably reduced. Timber industries are mostly small sized units. Other agrobased industries not only employ largest number of workers in the State, but also show a higher average of workers per factory. The two main industries in this group are coir and cashew.

2.6. In the non-agrobased sector, there are 39 percent of the total factories in the State employing only 28 percent of the total workers. In terms of number of factories as well as number of workers employed, this sector is thus seen as secondary to agrobased sector. The chemical based industries have an average of 87 workers per factory, mineral based industries, an average of 66 workers per factory, general engineering, 38 workers per factory and miscellaneous type, 28 workers per factory.

Spatial Distribution of Industries in the State :

2.7. Table 2 gives the distribution of agrobased industries in the State, districtwise. It is seen that Quilon district leads all other districts in terms of employment in Agrobased sector followed by Alleppey, Cannanore and Kozhikode. These areas also show regional concentration of specific industries. Out of

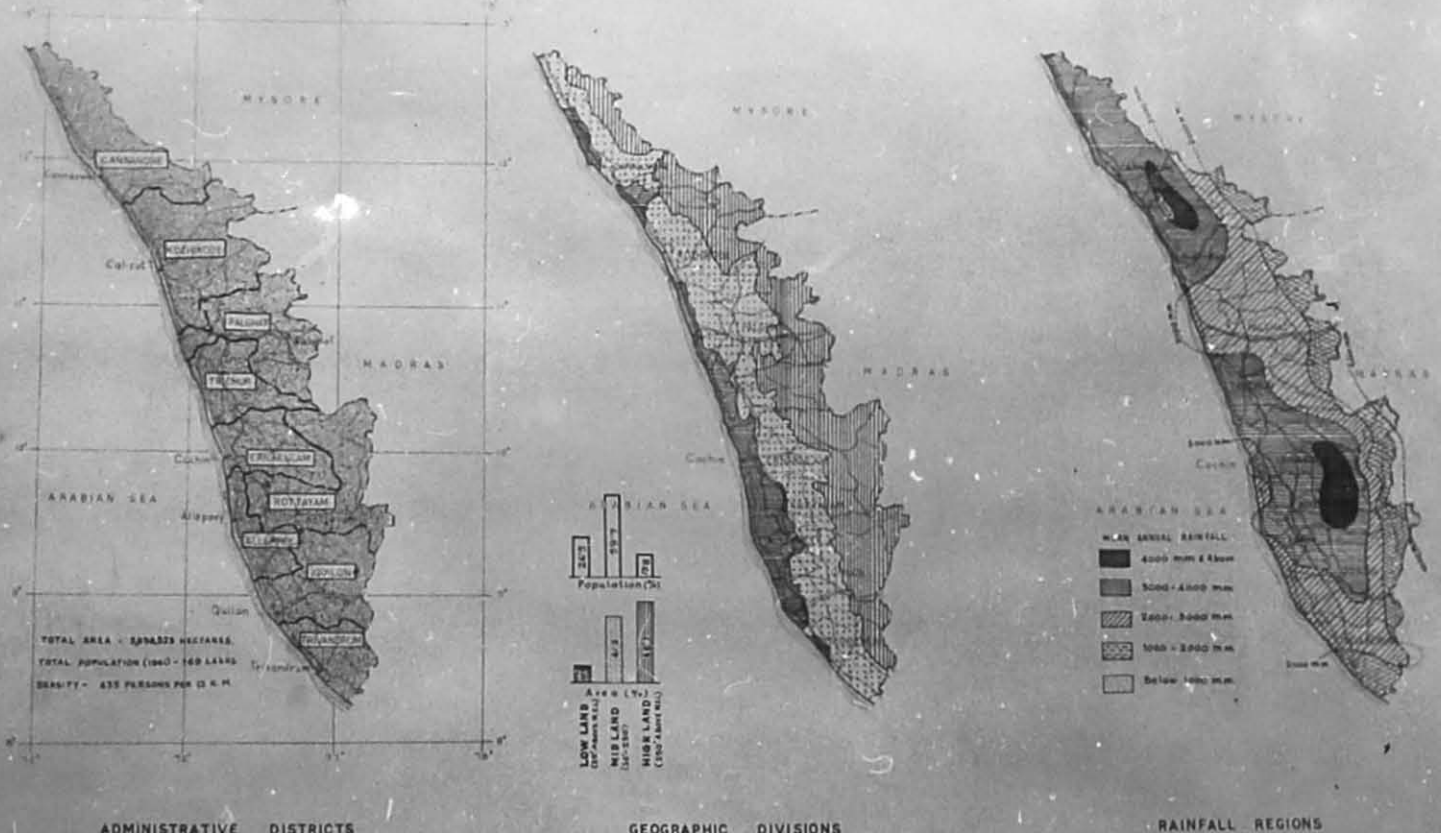
78,249 workers in the Quilon district in Agrobased sector, 74,042 are those working in cashew factories. This share is 95 percent. Clearly this single factor pushes the district to the foremost rank in employment. Out of 291, factories in this sector 178 (61%) are cashew factories. Thus the average factory employment in cashew is 420 workers. Alleppey shows a concentration of coir factories. Cannanore is the centre of textiles. Kozhikode is much more diversified but shows a comparative concentration of forest industries.

2.8. Various reasons have contributed to the tendency of some industries to concentrate in specific areas. While availability of raw materials and facilities for transport and marketing are normal factors influencing such a concentration (as in the case of Alleppey district), history of growth of certain industries also throw light on other reasons. By the mere fact that a locality is pioneer in starting a particular industry, the people of that locality gain more experience in the conduct of that industry. They learn its secret. They also pick up greater skill in that work. The availability of skill and the capacity to run the industry efficiently thus become associated with the locality where the industry has specialised itself. This is the case with cashew industry in Quilon district.

2.9. Table 3 gives the distribution of non-agrobased industries in the State, districtwise. It is seen that Ernakulam District leads all other districts in this sector. In fact 32.5 percent of the total employment in the State is taken by this District, and in all types of industries except in mineral based the employment figures of this district are maximum. It is also seen that the per capita consumption of electric power of this district is 150 units (kilowatt hours) while that of the State is only 30 units, and is exceptionally high when compared to other districts.* This is an index of large scale power utilization by industries. The proximity to the port of Cochin has been the key-factor for the location of many of these industries.

2.10. Map 6 summarises the industrial structure of Kerala State. The industrial economy of the State depends on the shift from the Agrobased to Non-agrobased sector as well as in the use of high technological innovations in the traditional industries. What one can see in Ernakulam district is this shift. The employment in Non-agrobased industries of this district is more than twice the employment in Agrobased industries. The Non-agrobased sector also uses sophisticated technical know-how. This factor together with the economic impetus due to the proximity of Cochin port has helped the environs of Cochin to develop into the foremost industrial centre of the state.

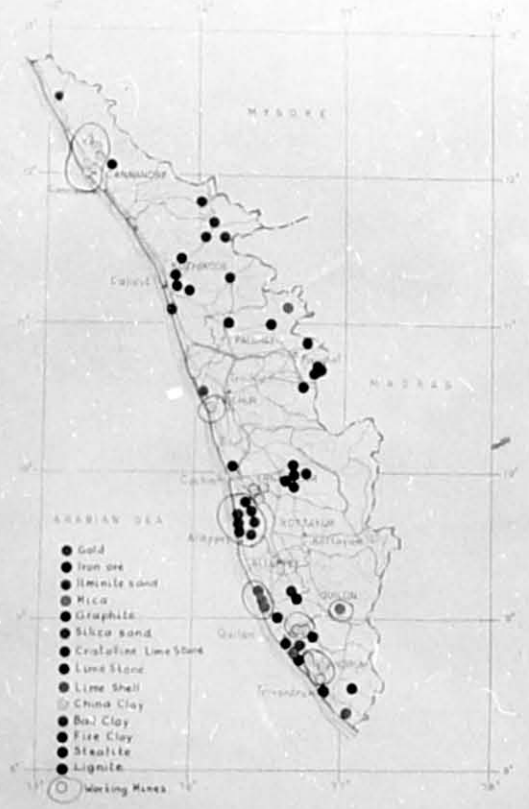
* Census of India 1961 Vol.VII, Kerala Part IX Census Atlas Map 97 per capita power consumption 1961.



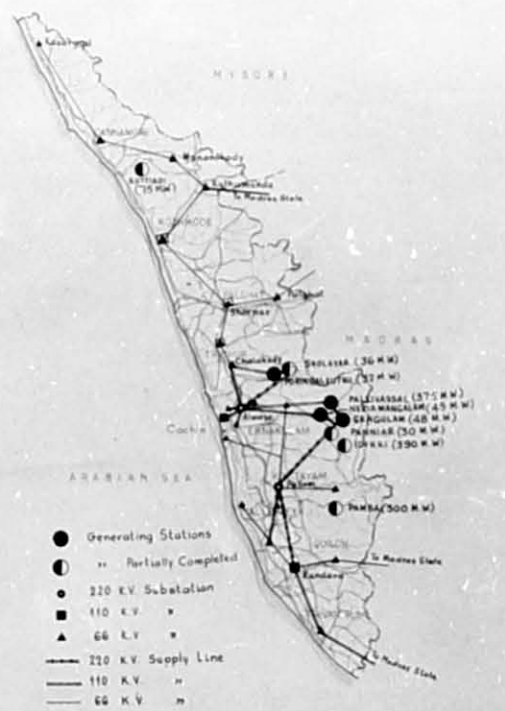
STUDY MAP OF KERALA

A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS

SCALE: 1:50,000
 DRAWN BY: S. S. S. S.
 COLLEGE OF ENGINEERING, POOJA
 1971-72



MINERALS



INSTALLED CAPACITY-360.5 MW, CONNECTED LOAD-626 MW.

POWER GENERATION (1967)



CONSUMPTION PATTERN (1961)

STUDY MAP OF KERALA

A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS

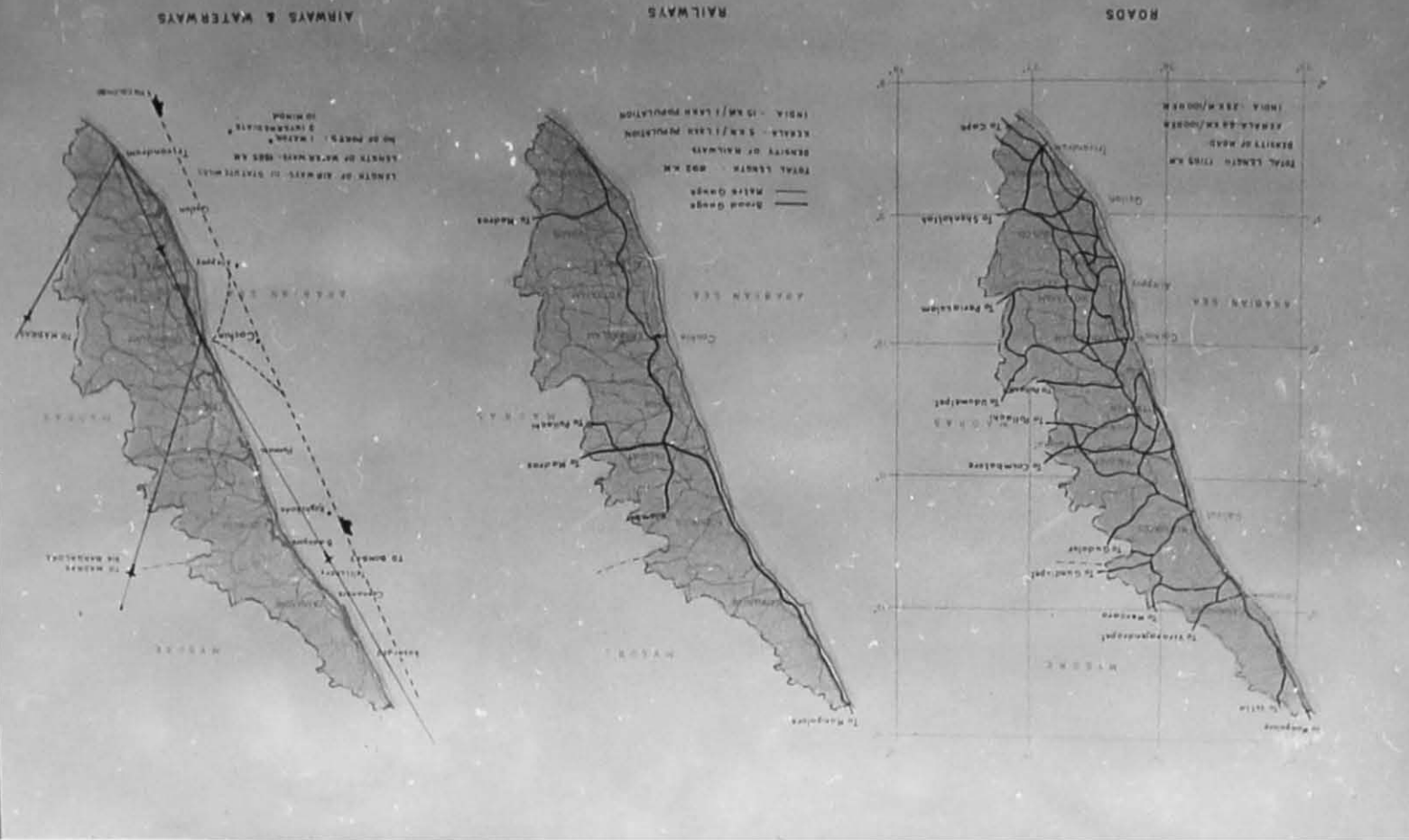
BY AGRICULTURE
 SECOND YEAR P.E.
 TOWN PLANNING DEPT.
 COLLEGE OF ENGINEERING, KOONJIKONDA
 1947-48

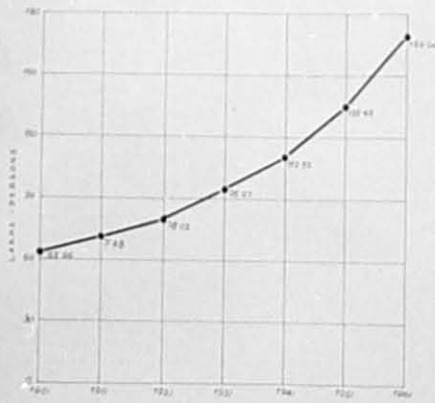
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A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS

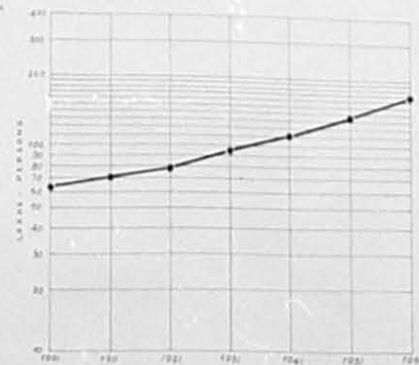
STUDY MAP OF KERALA

3
 DEPARTMENT OF
 GEOGRAPHY
 UNIVERSITY OF MADRAS
 CHENNAI
 1955

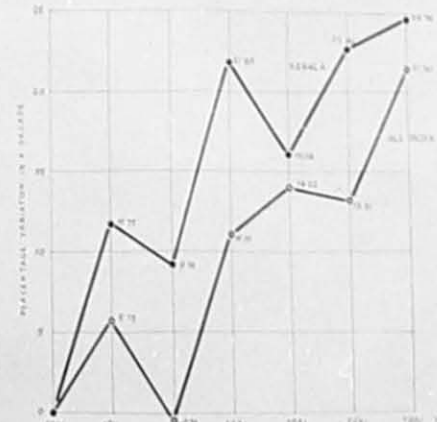




POPULATION GROWTH 1901-1961

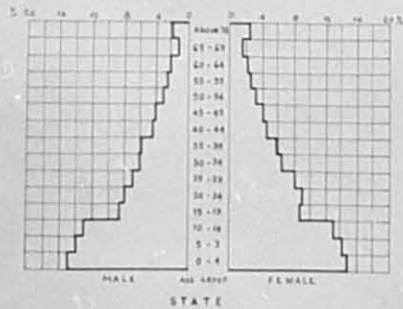


POPULATION GROWTH 1901-1961 (L.A.P. 1961)

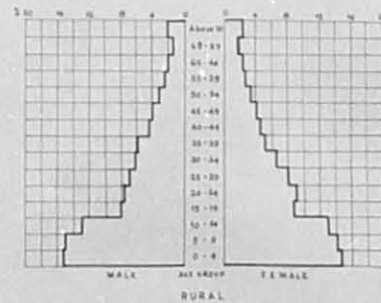


DECENNIAL PERCENTAGE VARIATION

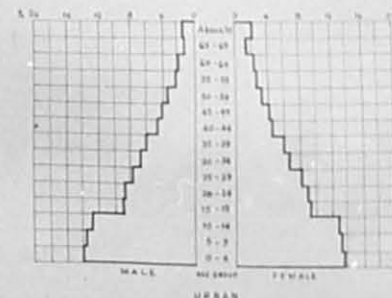
TRENDS OF POPULATION GROWTH IN KERALA



STATE



RURAL

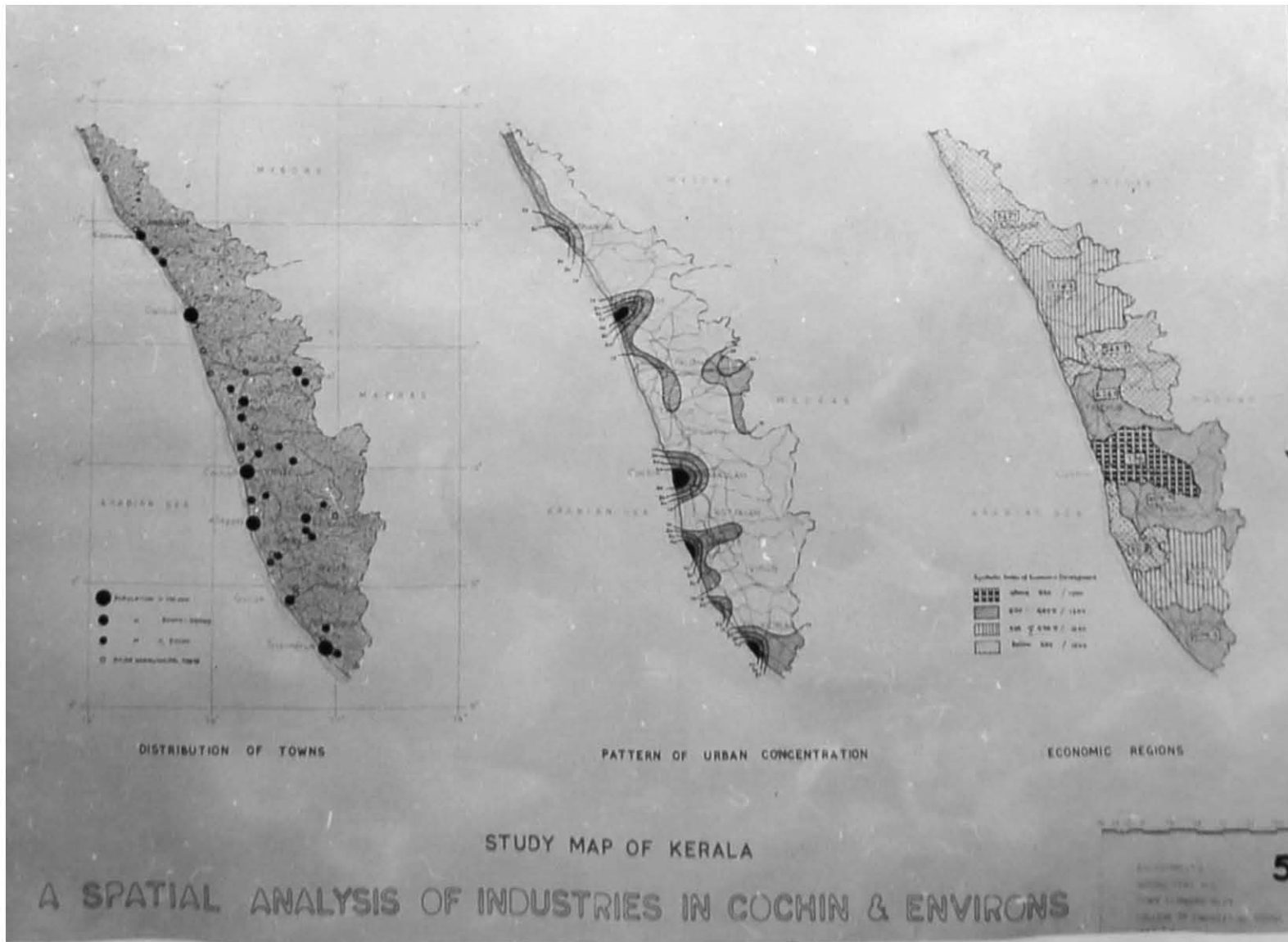


URBAN

AGE GROUP DISTRIBUTION OF POPULATION - 1961

MANPOWER STUDY

A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS



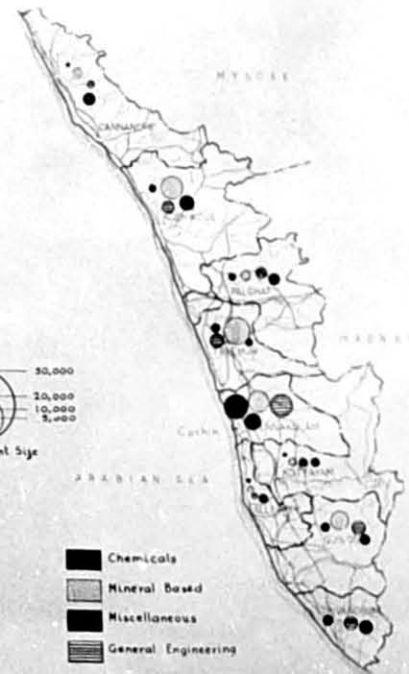
STUDY MAP OF KERALA
 A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS



DISTRIBUTION OF MAJOR INDUSTRIES



EMPLOYMENT IN AGROBASED INDUSTRIES



EMPLOYMENT IN OTHER INDUSTRIES



- Textiles
- Forest Based
- Other Agrobased

- Chemicals
- Mineral Based
- Miscellaneous
- General Engineering

STUDY MAP OF KERALA

A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS

CHAPTER-III.

THE CITY OF COCHIN AND ITS ENVIRONS

3.1. The City of Cochin (Latitude $09^{\circ} 58'$ N and Longitude $76^{\circ} 14'$ E) was born on 1, November, 1967 by incorporating the contiguous areas of three municipalities (Fort Cochin, Mattanchery and Ernakulam), a port administrative area (Wellindon Island), four panchayat areas (Edapally, Vytilla, Vennala and Palluruthy) and a few islands in the backwaters (Gundu island, Vimana Deevu and Raman Thuruthu). It has an area of 83.524 square k.m. and a population of about 3.5 lakhs.

Though each of the constituent areas has its own importance and historical development, the focus of the newly incorporated city is essentially the port of Cochin, one of the seven major ports of India. For centuries Cochin has enjoyed the monopoly trade in spices and other foreign-exchange-earning products like coir, and ships from west and west Asia have laid anchor in the backwaters of Cochin for trade. The fine harbour facilities even in the worst weather conditions have earned this port the coveted name of "the Queen of the Arabian Sea".

Historical Development of Cochin :

3.2. It is believed that Cochin port with its present inlet from the sea into the backwaters was formed only in 1341. The heavy floods in Periyar silted up the mouth of Cranganore Harbour (MUZIRIS) and the surging waters forced a channel past the present Fort Cochin into the sea. The first mention of Cochin¹ so far known at present was made some 60 years after the formation of the harbour by Ma Huan, a Chinese traveller and next by an Italian traveller Nicolo Conti (A.D.1440)² Nicolo Conti recorded that already in 1440 Cochin was a city

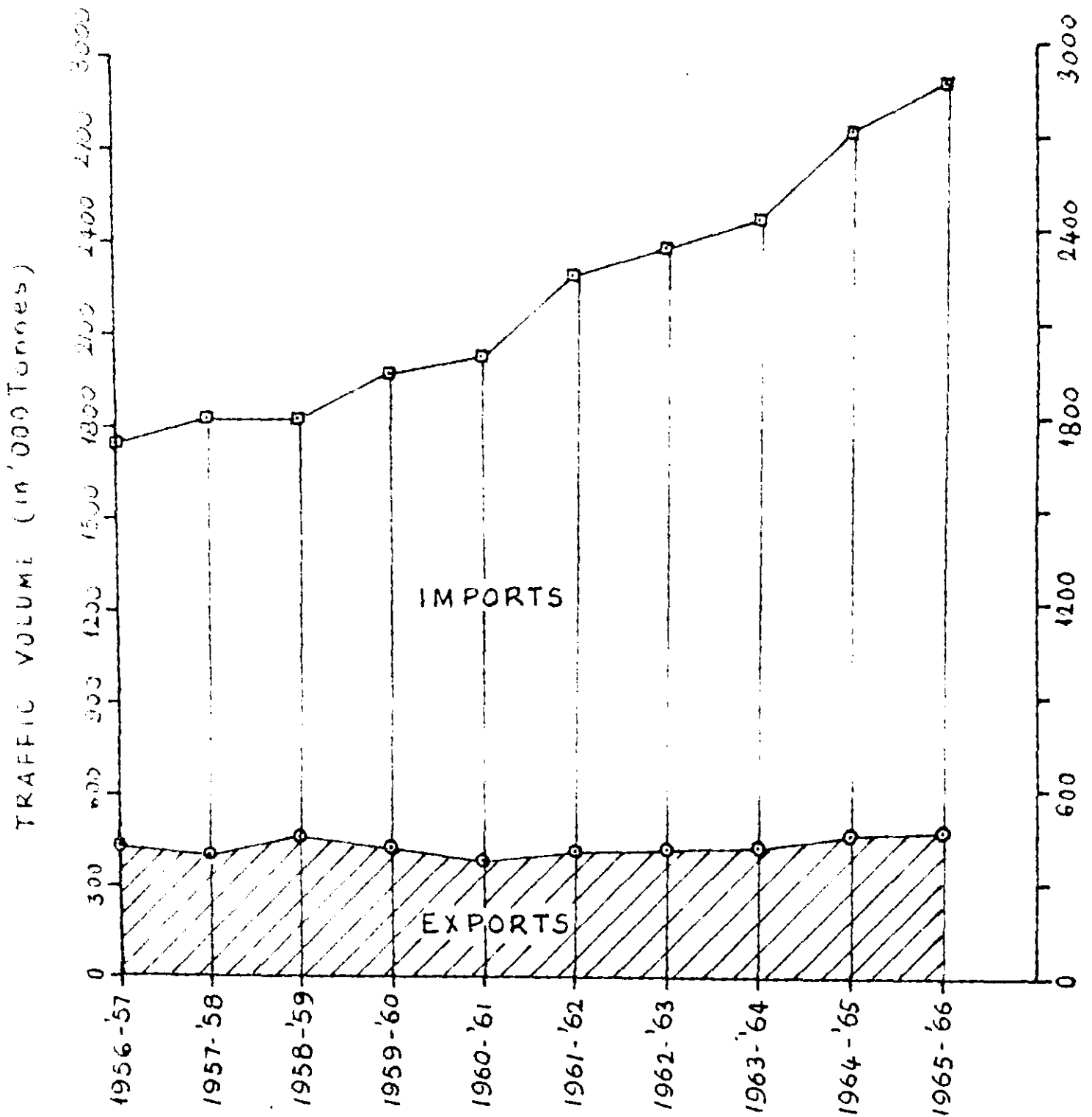
-
1. The vernacular form of Cochin is Kochi, popularly supposed to be a corruption of the Sanskrit word *कोशी*, meaning prosperous with cows or a contraction of Kochashi, the small harbour, as distinguished from the large Cranganore Harbour, which existed till then.
 2. Achyutha Menon, C., The Cochin State Manual, Cochin Govt. Press, Eranakulam 1911, page 2.

five miles in circumference and he also remarked 'China was a good place to make money in and Cochin to spend it', though he never told what the attractions were that drew the gold so easily out of a man's purse³. Chinese and Arabs carried on brisk trade in Cochin till the arrival of Portuguese in A.D.1500 and their establishing the first colonial settlement in India. In 1663 Cochin passed from Portuguese to Dutch and in 1795 British took over from the Dutch and the British Dominion continued till India achieved her independence. The imprint of colonization and trading activities of these foreign nations are still vividly seen in Fort Cochin. The contiguous area of Mattanchery (where exists one of the oldest Jewish settlements in India) is a centre of import and export trade. Facing the harbour mouth in the west lies Eranakulam, the capital of Cochin Maharajas since 1810. These three areas were full fledged municipalities long before the decision to incorporate them into a single city was taken. The Wellington Island was non-existing till the port work began. Map 7 shows the growth of the Cochin city.

Development of Port Works :

3.3. In the earlier decades existence of a sand bar 12 to 18 feet in the sea mouth prevented bigger ships to enter into the backwaters of Cochin. From 1880 onwards

3. Wood, Cock, George, Kerala, A portrait of Malabar Coast Faber and Faber, London 1967, p.141.



TRAFFIC HANDLED AT THE PORT OF COCHIN
(1956-57 TO 1965-66)

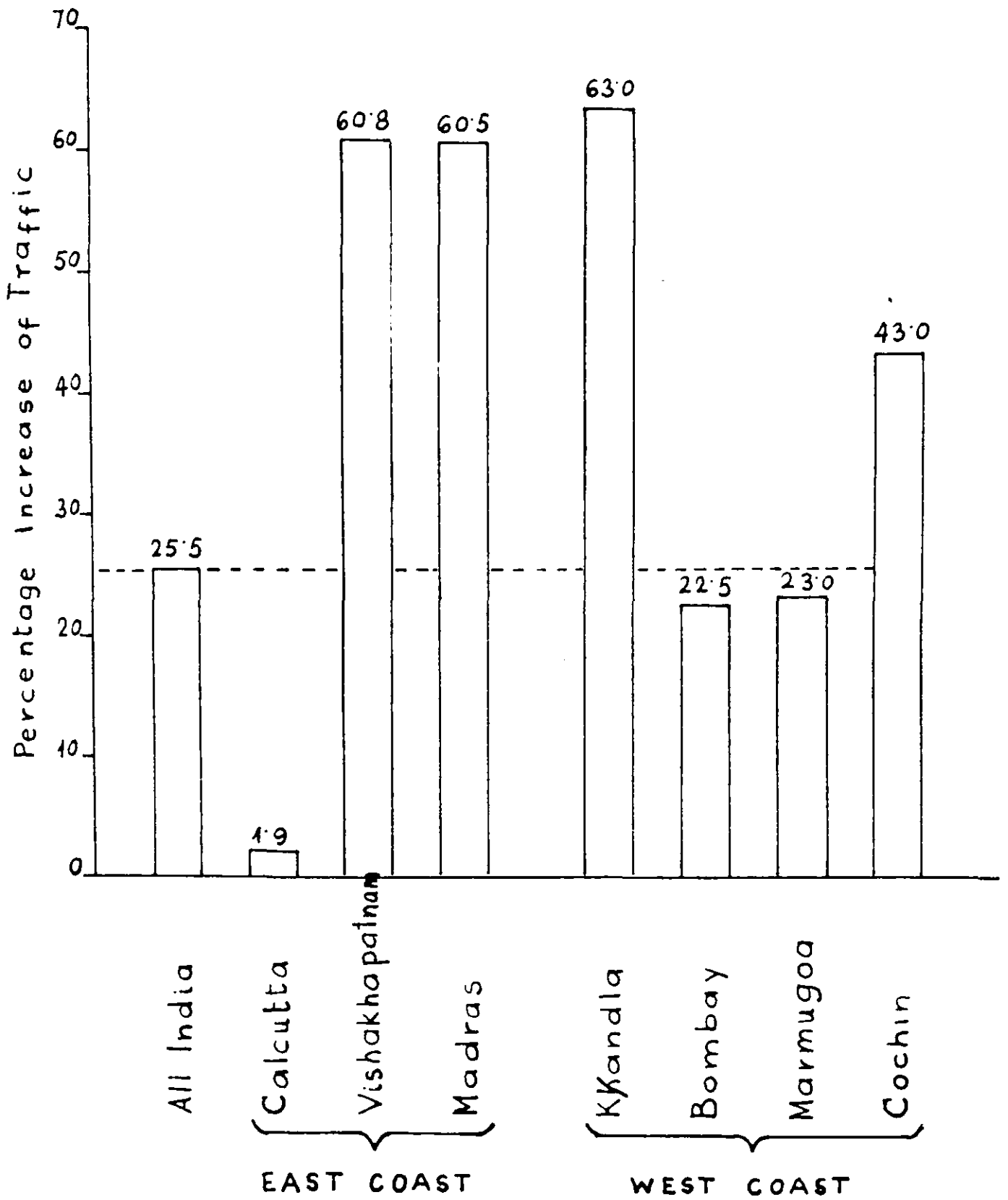
FIG. 4

various proposals were made to remove the bar. It was only about 1920 that work was started. Under the direction of Sir Robert Bristow,⁴ a shipping channel 400 feet wide and 32.5 feet deep was dredged and the spoils of dredging were used to form a new island about 800 acres in extent near Venduruthy island. The road connection to the mainland on the west and road and rail connection to the east as well as other works were completed by 1940, when Cochin was declared a major port by the Government of India. The new island called Wellington Island was separately governed by the Port Administration Authority, till incorporated in Cochin city in 1967.

Growth of Port Traffic :

3.4. Table 4 gives the traffic handled at the port of Cochin from 1956-57 to 1965-66. It is seen that the total traffic both coastal and foreign has shown a steady increase during the decade under consideration. The tonnage of import far exceeds that of the export items (See fig.4). This is due to the nature of the products which are imported and exported. Whereas the main import items have been coal, food grains, manures, mineral oil etc. the major export items remain to be spices, coir rubber, fishery products etc. The principal import and export items of Cochin port are given in Tab.5 and Table 6. The major industries of the environs of Cochin

4. For a detailed account of port works refer Cochin Saga by Robert Bristow, Cassel & Co., London, 1959.



PERCENTAGE INCREASE OF TRAFFIC

OF MAJOR PORTS, 1960-'61 TO 1965-'66

FIG. 5

depends on the raw material shipped through Cochin port to a considerable extent. This tendency is becoming more and more due to lack of indigenous raw materials other than agrobased ones. Even the cashew industry in Quilon depends on cashew nuts brought from Africa and is very much susceptible to the fluctuation in import tonnage.

Traffic of Major Ports Compared :

3.5. It is interesting at this juncture to compare the growth of traffic in the major ports of India and to record the rate of growth of traffic. The base year is taken at 1960-61, when Murmagoa was also declared a major port. Table 7 gives the total traffic of each of the major ports from 1960-61 to 1965-66, as well as the percentage growth during this period and the trade balance in 1965-66. The share of Cochin port in the total tonnage of traffic is 5.7 percent in 1965-66, but it stands second in surplus of earning next only to Bombay with a share of 14.4 percent of the total surplus earning of India. This emphasise the role of Cochin Port in the economy of India. Fig.5 gives the rate of growth of port traffic of the major ports during the six years under consideration. The all India percentage increase is 25.5 percent. On the eastern coast, Vishakhapatnam and Madras have recorded about 61 percent growth in port traffic, while Calcutta has registered on 2 percent increase. On the western coast, while Bombay and Marmugoa

have registered a growth rate slightly less than the national average, Kandla and Cochin have shown considerable rate of increase. The growth rate of Kandla (63%) is attributable mainly to the free trade zone created there and the impetus given by the Government by lower tariffs and other concessions. The fact that inspite of any of these concessions, Cochin port has registered 43 percent growth in traffic is ample testimony to its importance in shipping trade and an indication of the economic activity of its hinter land.

Hinterland of Cochin Port ⁵ :

3.6. On the basis of actual quantity assessment made in 1960-61, of the ports traffic flows, attempt was made to demarcate the 'commodity hinterland' of Cochin port. The total hinterland of the port of Cochin comprises the whole of Kerala and Mysore states and much of the Madras state and is a continuous area of 1,28,177 square miles contributing 95 percent of the entire traffic in the year. Of this the primary hinterland

5. "Problems of prospective planning in the development of Cochin port" by Joseph Chacho K, statistical and research Officer, Cochin port Trust, a paper read in a seminar on Greater Cochin Development (1967) Also refer Pankajakshan T. Economic study of the Port of Cochin, its trade, traffic and working .. Ph.D. Thesis, University of Poona 1962.

consists of the entire state of Kerala, and the industrial districts of Coimbatore and Selem in the Madras state, each district of the primary hinterland claiming more than 2 percent of the total traffic and in all 81.85 percent of the total traffic of the port. The origin and destination survey in the Ports hinterland also revealed that 58 percent of the import was destined to centres in Kerala and 76 percent of export originated from therein. While each of the districts had its share in the total traffic, the three districts of Ernakulam, Alleppey and Quilon may be considered as the core of the ports hinterland, accounting for 40 percent of the total traffic of the port.

The Environs of Cochin :

3.7. For the present study, the immediate environs of the city of Cochin, covering the low land and part of midland of Ernakulam district is considered. Since the environs do not form a finite delineated zone, an area of about 400 square miles is taken and analysed with special reference to the spatial distribution of industries. In addition to Cochin city the area contains the smaller urban centres of Alwaye, Parur, Perumbavoor, Narackkal and Trippunithura. The settlement pattern of the area has certain characteristic features. The villages bear little resemblance to the tight squalid settlement in northern India called Abadis or Caothans.

The dwellings are scattered and a broad ribbon of settlements run broken only by a few stretches of wasteland.

In such a humanised landscape urban characteristics have filtered and made the country side semi-urbanised. The towns by a compensatory logic, are semi-rural and surprisingly in such an over crowded land, they are very loosely populated.⁶

Land Use Pattern of Cochin and Environs :

3.8. In such a settlement structure, the conventional classification of urban and rural land use becomes difficult and illogical. Map 8 gives the existing land use pattern of the environs. It may be seen that no attempt is made to classify the area into urban and rural. Instead areas are marked depending on the gross residential density. According to a study by Don J. Bogue (The structure of the Metropolitan Community, University of Michigan 1949) all cities of the United States of America, of more than 1,00,000 population had an average density of more than three families per gross acre.⁷ Taking this as a measure of urbanism, the area is marked into that with a residential density of more than three families per gross acre and that with a residential density less than three families per gross acre. In the

6. George Woodcock, Kerala, a portrait of Malabar Coast, Faber and Faber, London 1957 pp.44-48.

7. James A Quinn, Urban Sociology, Eurasia Publishing House Pvt.Ltd., New Delhi 1, 1967.

city of Cochin the density is seen to go upto a maximum of 200 persons per acre. The neighbouring areas on the Vypeen island are quite dense but not included in the city limits due to lack of infra-structure. The land-use pattern also show the major industrial area.

Infra-structure of Cochin and Environs :

3.9. Map 9 shows the different transportation routes of the area. All the three important modes of transportation radiate from the port. The area is uniquely blessed with a net work of roads including National Highway 47 which passes right through the city. The city has connection to the north by broad gauge railway and to the south by metre gauge railway. The facility of the excellent natural harbour is further enhanced by the net work of back waters and navigable canals, with stretches of them accessible to motor boats. It may be seen that the industrial area has the full benefit of all these modes of transportation. However none of these transportation routes are perfectly conducive of enhancing smooth flow of traffic. A number of factor reduce the maximum economic usefulness of the roads. Most of the roads are of single lane width; even the National Highway has only 12 feet width along more than 80 percent of its length passing through the city. The road surfaces have only a crust thickness of 9 to 10 inches quite inadequate for heavy duty vehicles. There



The National Highway 47 has only 12 feet width....



The Inland Waterways are Unique of its kind....



Waterways have perhaps
more problems

are missing links and unbridged crossings on both the state and district roads. Regarding railways, there is a break of gauge at Ernakulam, involving transshipment of goods and passengers. The inland waterways, the unique of its kind in India have perhaps more problems. It is estimated that normally 2.7 million tonnes of goods are moved over the waterways of Kerala annually. Out of this 65 percent passes through the backwaters of Cochin.⁸ Hence the efficiency of the entire inland navigation routes of the state will have an effect on the movement of materials to and from Cochin. The canals, however, require dredging in many places to allow bigger crafts to operate through them. Lack of proper landing places is yet another impediment.

Power Supply System :

3.10. Map 10 show the power supply system in the area. The Kalamassery Sub-station is a 220/110/66 KV substation, power power being supplied from Pallivassal, Sengulam and Neriamangalam generating stations. The Sholayar and Poringal generating stations are also on the grid connected at 110 KV. The major portion of the supply is transmitted at 110 KV to the power intensive industries in Eloor. 66 KV supply comes directly from Pallivassal to Alwaye, Kothamangalam and Mattanchery. The non power

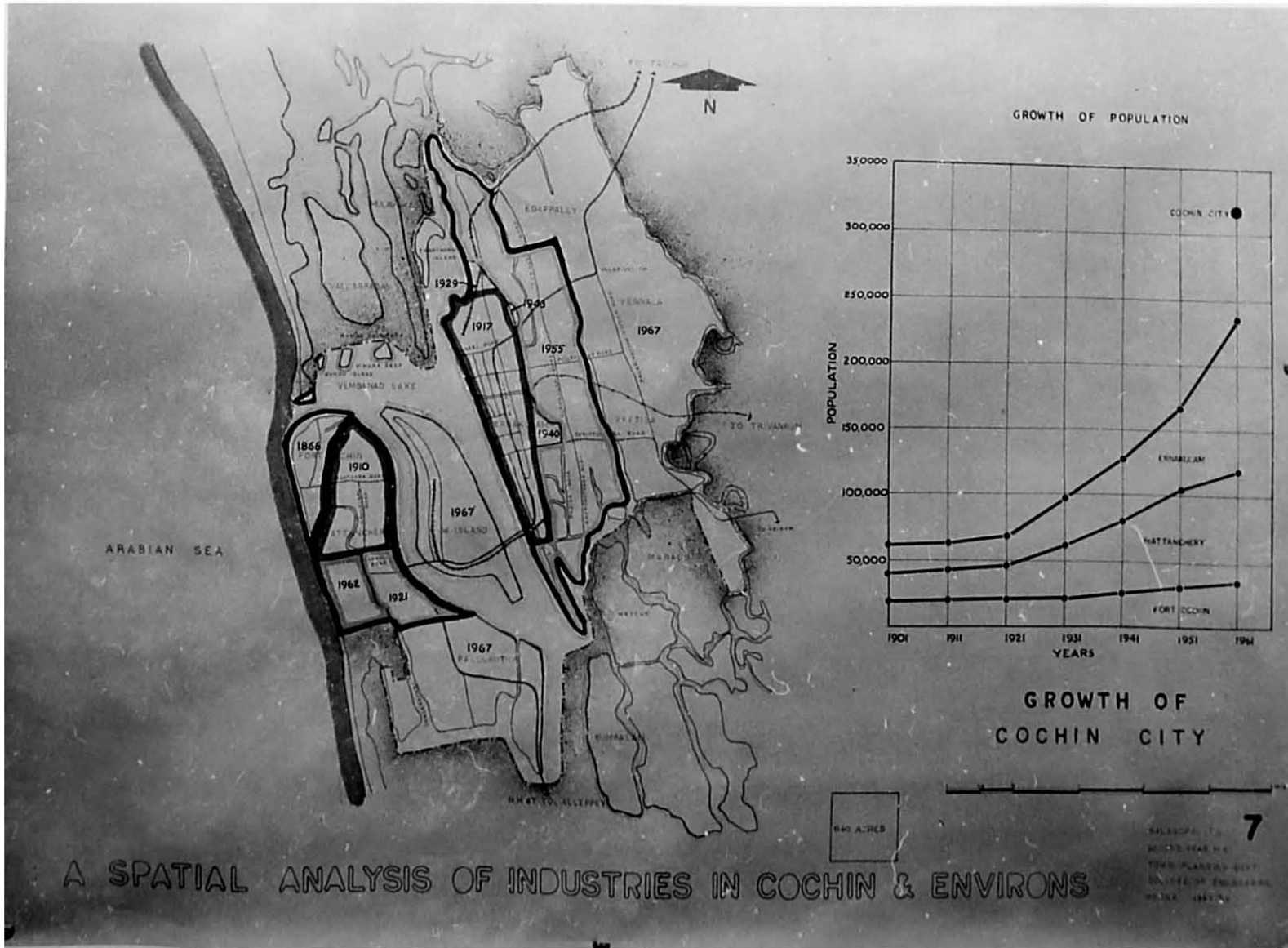
8. Transport & Communications, a paper read in the Seminar on Greater Cochin Development by Cheeran V. Mathews, Deputy General Manager, F.A.C.T.Ltd.(1967).

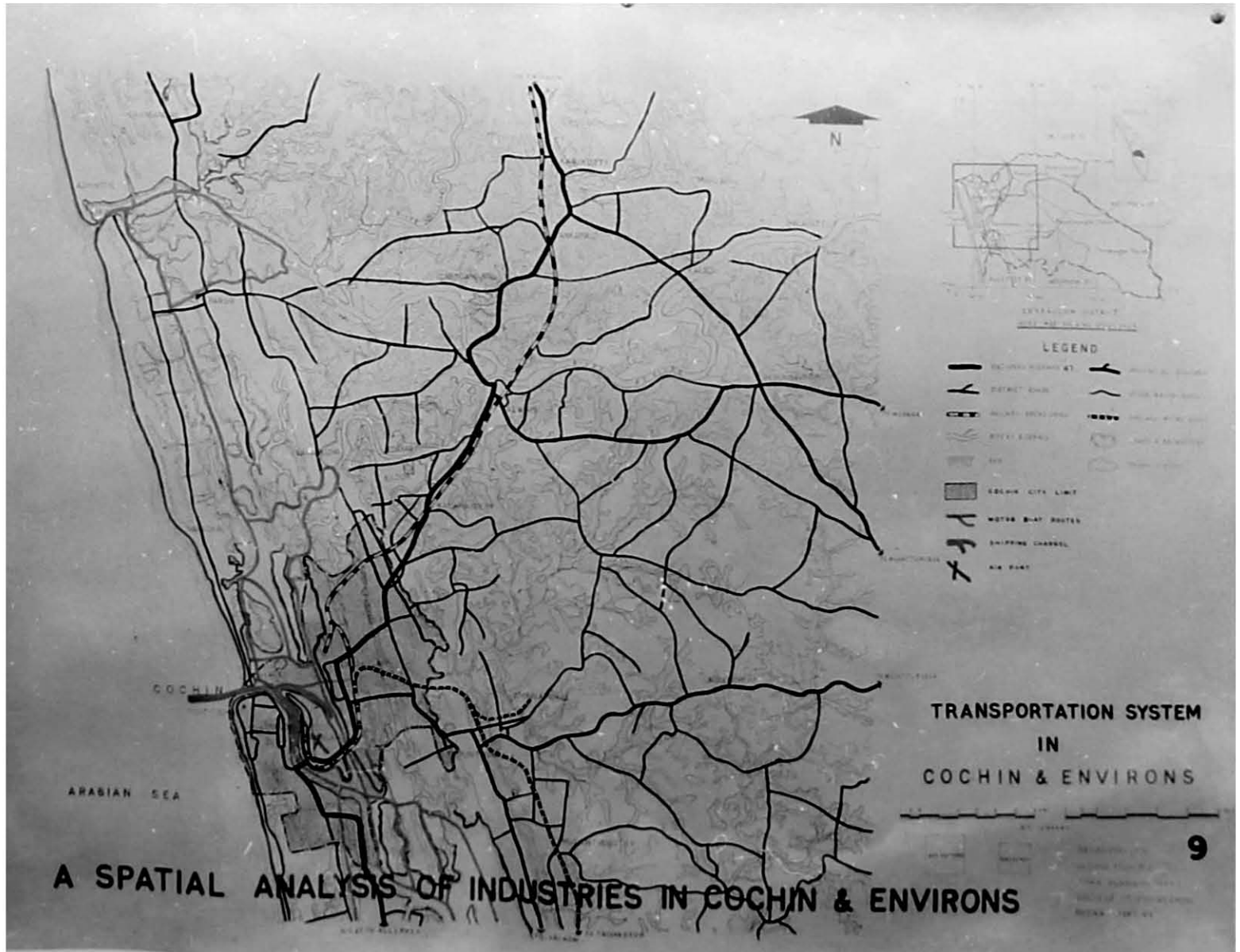
intensive industries receive power at 11 KV from Kothamangalam.

Water Requirements :

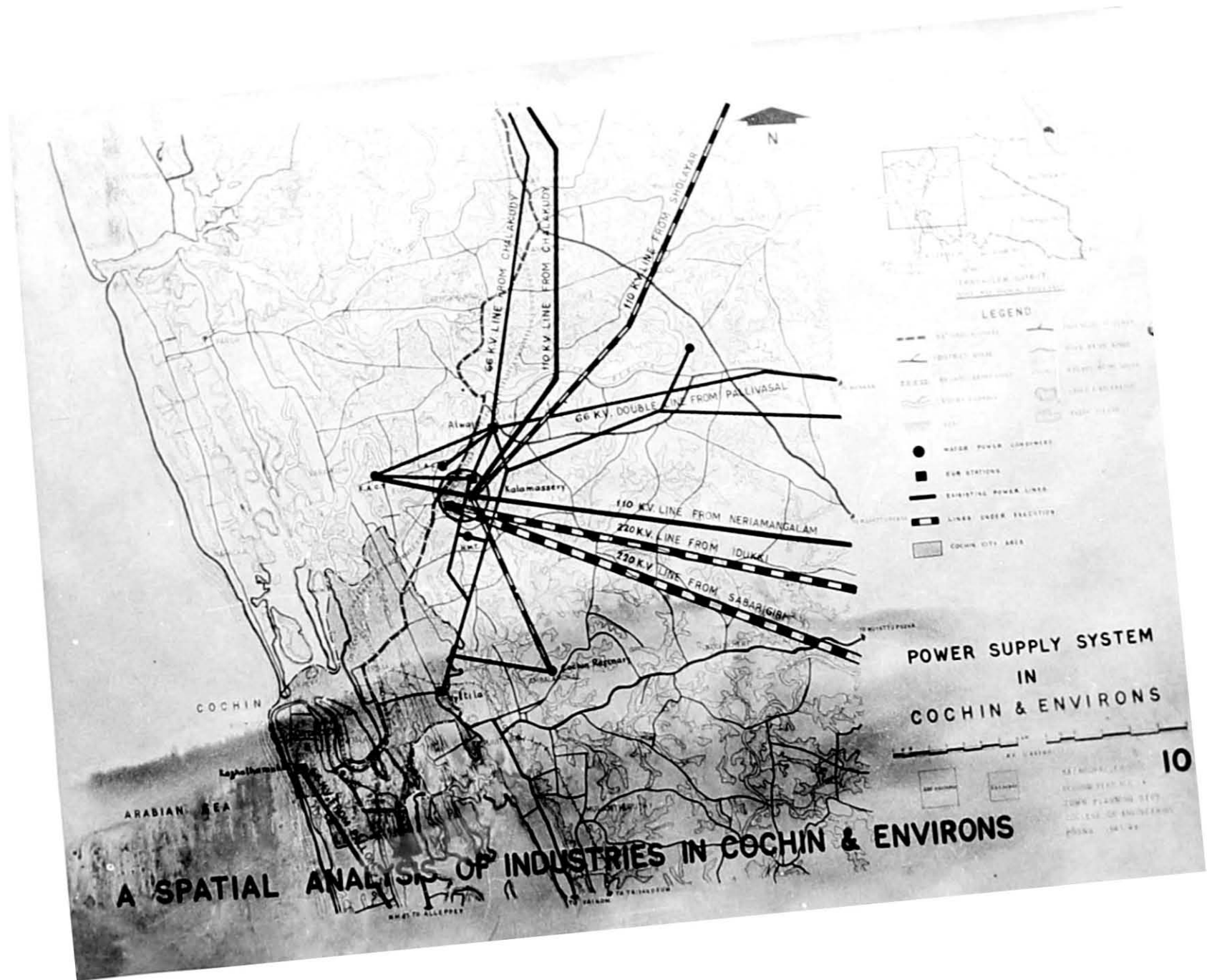
3.11. Because of the fact that the area of Cochin city is mostly water logged and that there is not much level difference between the city and the hinterland, water supply essentially becomes a problem. Cochin gets its water from the headworks in Periyar river near Alwaye. Other municipal centres have their own protected water supply system. Major industries draw their supply from Periyar directly and are thus advantageously located on the banks of the river. However the intrusion of salt water into the river estuaries causes difficulties. It is estimated that by 1971 the industrial requirement of water may be as much as 50 M.G.D. The existing summer flow of Periyar is not enough to cope up with this requirement. It is believed that after the commissioning of the Idikki hydro electric scheme the tail water will be diverted to Periyar and may alleviate part of the difficulty. Projects for tapping subterranean water and desalting sea water are studied by experts. It is feared that the shortage of water will be an impediment in the industrialization and the urban growth of this area.

How industries are established in this area, what is their structure and how they are spatially distributed can be seen in the following chapters.





A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS

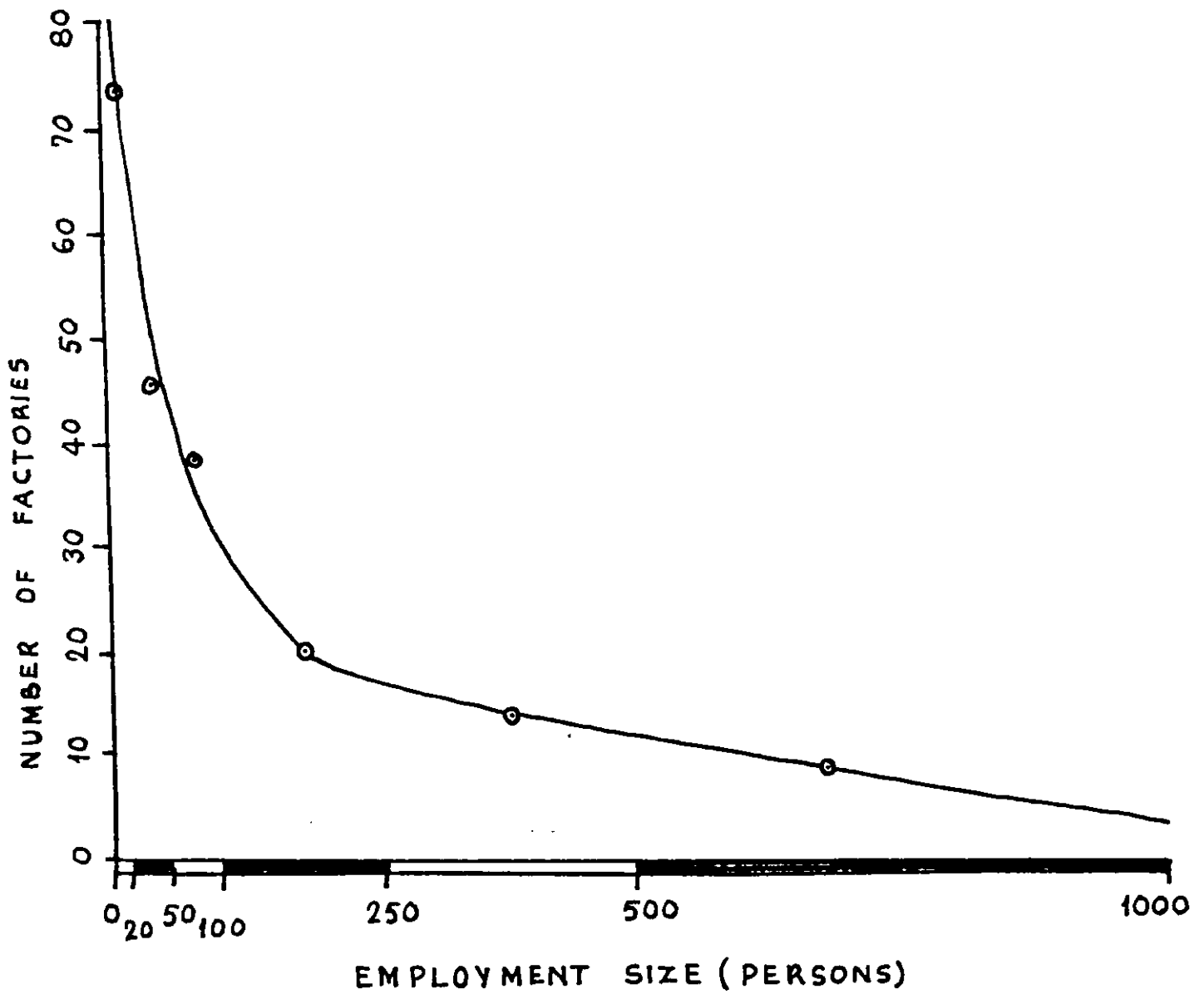


CHAPTER-IV.

SPATIAL DISTRIBUTION OF INDUSTRIES IN COCHIN
AND THE ENVIRONS.

Structure of Industries in Cochin and Environs :

4.1. There were 253 factories in Ernakulam district in 1966 registered under Section 2 m(1) and (11) of the Indian Factories Act 1948. It is found that 201 factories out of this total are located in the city of Cochin and the environs extending upto the municipal town of Alwaye. The distribution of these factories according to the size of employment is given below.



DISTRIBUTION OF FACTORIES
IN COCHIN AND ENVIRONS
BY EMPLOYMENT SIZE (1966)

FIG. 6

Distribution of Factories in Cochin & environs
According to the Employment Size as on 1966.*

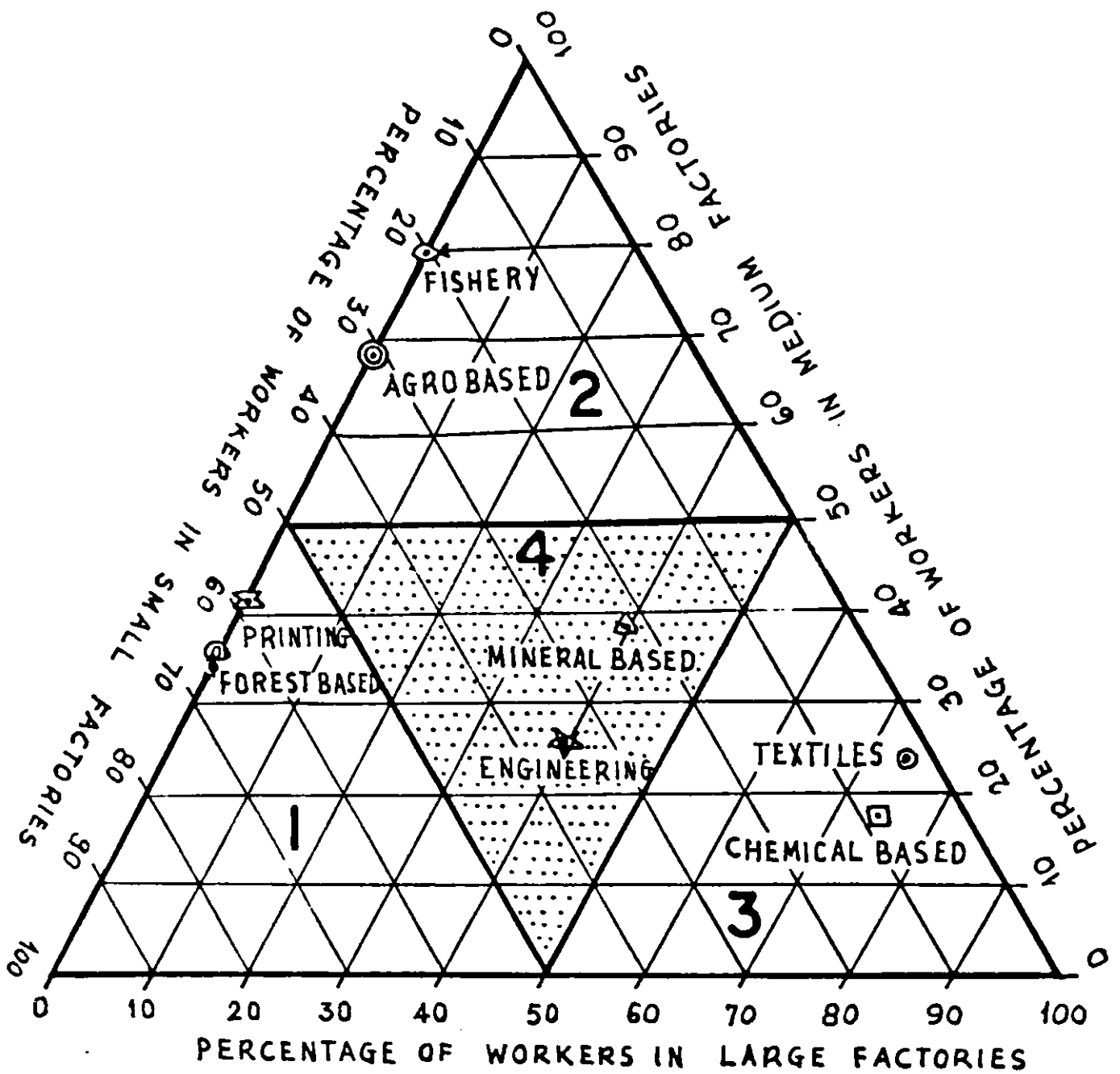
Employment size	No. of Factories.
Upto 20 workers.	73
20 to 49 "	46
50 to 99 "	38
100 to 249 "	20
250 to 499 "	14
500 workers & above	10
Total	201

* Source : Inspector of Factories,
Trivandrum.

It is seen that only 4.5 percent of the total factories employed more than 500 workers. These are classified as large sized industries. 17 percent of the total factories are medium sized with an employment size of 100 to 499 workers. The rest (78.5%) of the factories are small sized. Fig.6 gives a graphical representations of this distribution. It is evident that as the employment size increases, the number of factories get rapidly reduced. The curve approximates to a hyperbola. However, it is seen that the proportion of large sized industries is more than that in the state (3.2%) -

(refer para 2.3, chapter II). There are only 44 factories which employed more than 100 workers. If the environs are to encompass the municipal town of Perumbavoor, this number rises upto 50 and includes all the factories of Ernakulam district employing more than 100 workers. Thus practically all medium and large sized factories of the district are seen to be focussed about the city of Cochin.

4.2. An analysis of the proportion of workers in the large, medium and small sized units of each type of industries in Cochin and environs may help to understand the spatial distribution of industries therein. Table 8 gives the proportion of workers in different sized units according to types of industries as existed in 1966. In the agro-based, fishery, forest based and printing industries there are no workers employed in large sized units. As far as forest based and printing industries are concerned, the larger proportion of workers is in small sized factories, whereas the proportion of workers in fishery and agro-based industries is more in medium sized factories. The workers in general engineering and mineral based (including extraction and refining) industries are more or less equally distributed amongst small, medium and large sized units. In textiles and chemical based industries the proportion of workers is maximum in large sized units.



DISTRIBUTION OF WORKERS IN SMALL,
MEDIUM & LARGE FACTORIES IN COCHIN
AND ENVIRONS BY MAIN INDUSTRIES.(1966)

FIG. 7

4.3. Fig.7 summaries this analysis. A graph is drawn with the three sides of the triangle representing the percentage of workers in small, medium and small sized factories. Corresponding to each type of industry there will be one point in the triangle. All the types grouped above are thus marked in the graph.

The different types of industries are grouped in four distinct zones in the graph. Zone 1 represent a distribution in which the percentage of workers in smaller factories is more than 50 percent and that in medium and large factories combined less than 50 percent. Forest based and printing industries fall in this zone. These are generally small sized units. Zone 2 represents a distribution in which the proportion of workers in medium sized units is more than 50 percent and that in small and large sized units combined less than 50 percent. Here while the numerical number of factories may be more in small sized units than in medium sized units, the industry can be generally classified as medium sized due to higher proportion of workers in that group. Fishery and agro-based industries fall in this zone. Zone 3 represents a distribution where the workers in large sized units have a proportion of more than 50 percent to the total employment. Essentially there are industries which are large sized and capable of employing large number of workers. Textiles and chemical based industries fall in this category. The central area, zone 4 represents

a distribution in which the workers are more or less equally distributed in the different sized units. These industries (general engineering and mineral based) are such that they can be economically operated with a smaller or larger number of workers depending on the size and function.

Spatial Distribution of Industries :

4.4. It is of importance to study not only the mere structure but their spatial distribution in the city and environs. Map 11 gives this distribution. Only those industries which employ more than 100 workers are taken for representation in this map. One thing which is evident from the map is that there is a concentration of industries in an area along the National Highway 47 between the city of Cochin and Alwaye town, This covers the areas of Eloor and Kalamassery. There is a concentration within the city limits as well. There are a few industries to the west of the city in an area called Ambalamukal. The distribution pattern of industries is so vivid as to separate them into two distinct zones. If circles are drawn with the Cochin port as centre and a radius of 6 miles, all the industries within the city will be enclosed in a zone tentatively called the City Zone. The zone covers almost the entire area of the city as well. If another circle is drawn with a radius of 12 miles the intervening space between this circle

and the City Zone will encompass all the other industries concentrated in the periphery of Cochin city. This may be called the Peripheral Zone. For all practical purposes the Peripheral Zone can be considered as the industrial environs of the Cochin city. The distance of 12 miles represents that from Cochin to Alwaye and can be considered as the distance upto which the urban influence of Cochin will be predominantly felt, as any point beyond that will be more influenced by the town of Alwaye. The fact that most of the major industries lie within this distance is a factor from which this may be deduced. Appendix 1 gives the names and employment size of the factories lying in the City Zone and Peripheral Zone. It is seen that those industries which lie in the peripheral zone are mostly large sized units. It will be worthwhile to investigate if there existed any specific reason for the concentration of industries in such demarcated zones in the process of the growth of industries.

Growth of Industries in Cochin and Environs :

4.5. Map 12 and 13 give the distribution of industries in Cochin and environs as existed in 1961 and 1956 respectively. It is seen that the zones mentioned in para 4.4 existed distinctly a decade back. Since not many industries were established between the pre-independence days and 1956, the reason for concentration of industries in specified zones is to be found in the

political history of the study area. Before independence Cochin and environs presented an area of mixed political jurisdiction. The Fort Cochin and Wellington island were in the jurisdiction of the British Government and it is seen that the industries located in these places are either those belonging to foreign companies or those which were connected with the repair and maintenance of the harbour works. Eranakulam and Mattanchery were under the jurisdiction of the Maharaja of Cochin. While Mattanchery was mainly a centre of trade, and there existed only few small sizes factories manufacturing coir goods, Eranakulam was the capital of Cochin State and the only major industry was the Tata Oil Mills and Soap Factory. The industries which existed in these areas were mostly labour intensive and only those which processed agrobased products for the export market.

4.6. But the municipal town of Alwaye and the area of Eloor and Kalamassery belonged to Travancore State. Travancore state was pioneer in modernization and the industrial base was paved by Sir C.P.Ramaswamy Iyer, the last Divan of the Travancore State. The choice of Eloor-Kalamassery area for setting up industries with sophisticated technical know-how seems to have been based on four fundamental reasons. The first is the proximity to the port through which raw materials could be brought to the industries. The second reason could be that the area was unique with facilities for -

transportation, particularly by waterways, the most suitable mode of transportation for bulky and imperishable goods. Thirdly the hydro-electric power developed in the Travancore State formed the precondition for industries largely power intensive, which justified the relative economy of bringing raw materials from outside and processing it here. The industrial complex thus created formed the nucleus for further industries to come up in the area, independently as well as sharing the bye-products. Lastly both the Cochin and Travancore States were ahead in literacy and technical education and there existed educated trained manpower to work in these industries.

4.7. With this back ground it is easy to analyse the growth of industries in Cochin and environs and also note the shifting trends in location. In 1956, there were only 25 factories which employed more than 100 workers. The emphasis on location is characterised by the proximity to waterways. In 1961, the number of industries were 34 showing an increase of 36 percent in 5 years. However during this period a few industries already existing had only expanded their establishment and absorbed more workers. The shift is already noted to be taking place away from the waterways to the interior. The distribution of industries in 1966, shows 50 industries marking an increase of 48 percent over a

period of 5 years. Here a few industries have already got aloof from the waterways altogether (for example, Cochin Refinery). The progress thus during the last decade has been spectacular. Whether this trend will continue or not depends on various factors deciding the location. The first step towards understanding these factors is an analysis of type of industries which will reveal the specific character of industries developed in this area.

Type of Industries in the Peripheral Zone :

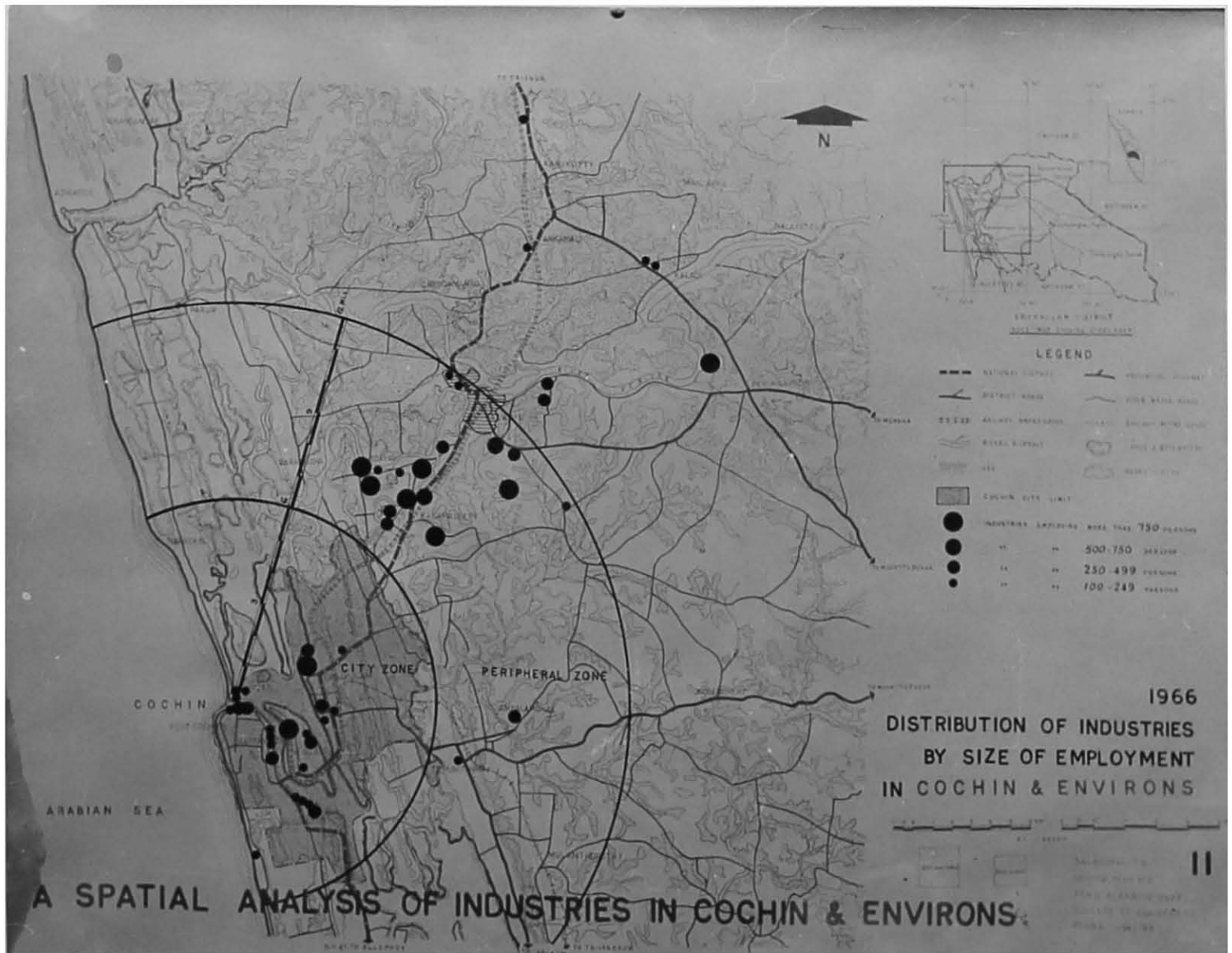
4.8. Map 14 indicates the types of industries in the Peripheral Zone as existed in 1966. The concentration of industries in Eloor-Kalamassery is comprised of mostly chemical based, mineral based and extraction and refining. The core of this area is Fertilizers and chemicals Travancore Ltd. which get the raw materials completely from foreign countries and manufacture artificial manures and chemicals. The Travancore Cochin Chemicals, Hindustan Insecticides and Travancore Chemical Manufacturing Company form other Chemical based industries. There is much sharing of bye-products within these industries and hence justify their clustering together. The Indian Aluminium Company and the Cominco Binani Zinc smelter plant are largely power intensive and are classified as extraction and refining industries. Here again the raw materials are brought from foreign countries as well as north India.

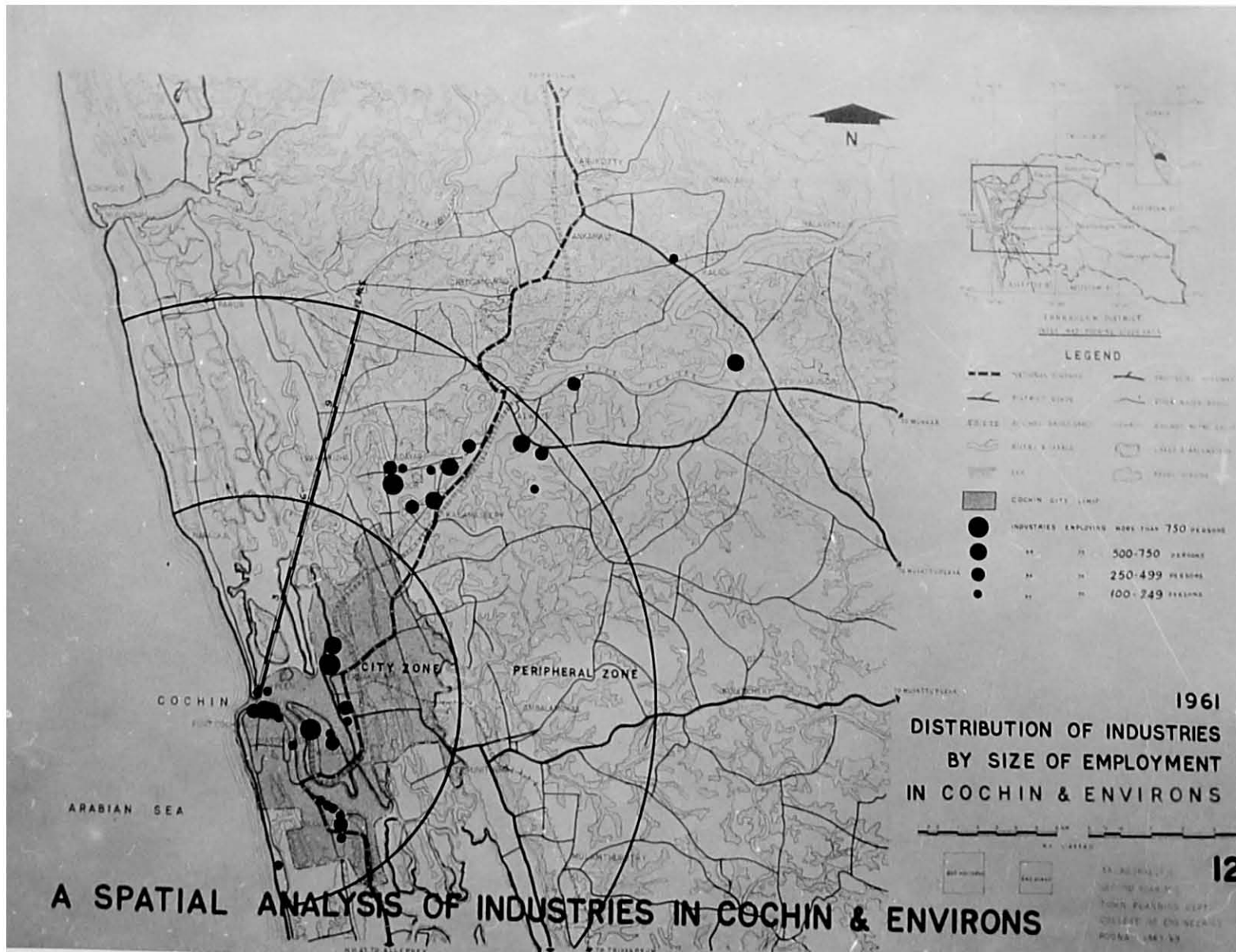
Indian Rare Earths Ltd. make use of ilmenite and monozite sand, mined from the beach near Chavara in southern part of Kerala. Other mineral based industries are Standard Potteries and Travancore Ogale Glass Manufacturing Co.Ltd. The agro-based industries consists of textiles, rubber and cashew. The general engineering includes Hindustan Machine Tools Ltd. Seshasayee Wire ropes and repair and maintenance workshops of Kerala State Transport and defence services. In the agrobased industries and general engineering no concentration is found and gives a picture of wide dispersion. There exists no need to cluster with little sharing of by-products. Towards the west of Cochin city the establishment of extraction and refining is that of Cochin Refineries commissioned in 1965 to refine crude oil brought from Iran. The bye-products of this industry will be utilized by a petro-chemical complex near that and is bound to make up another industrial centre. It may be noted that all these industries are not only power intensive but also those requiring large extent of land.

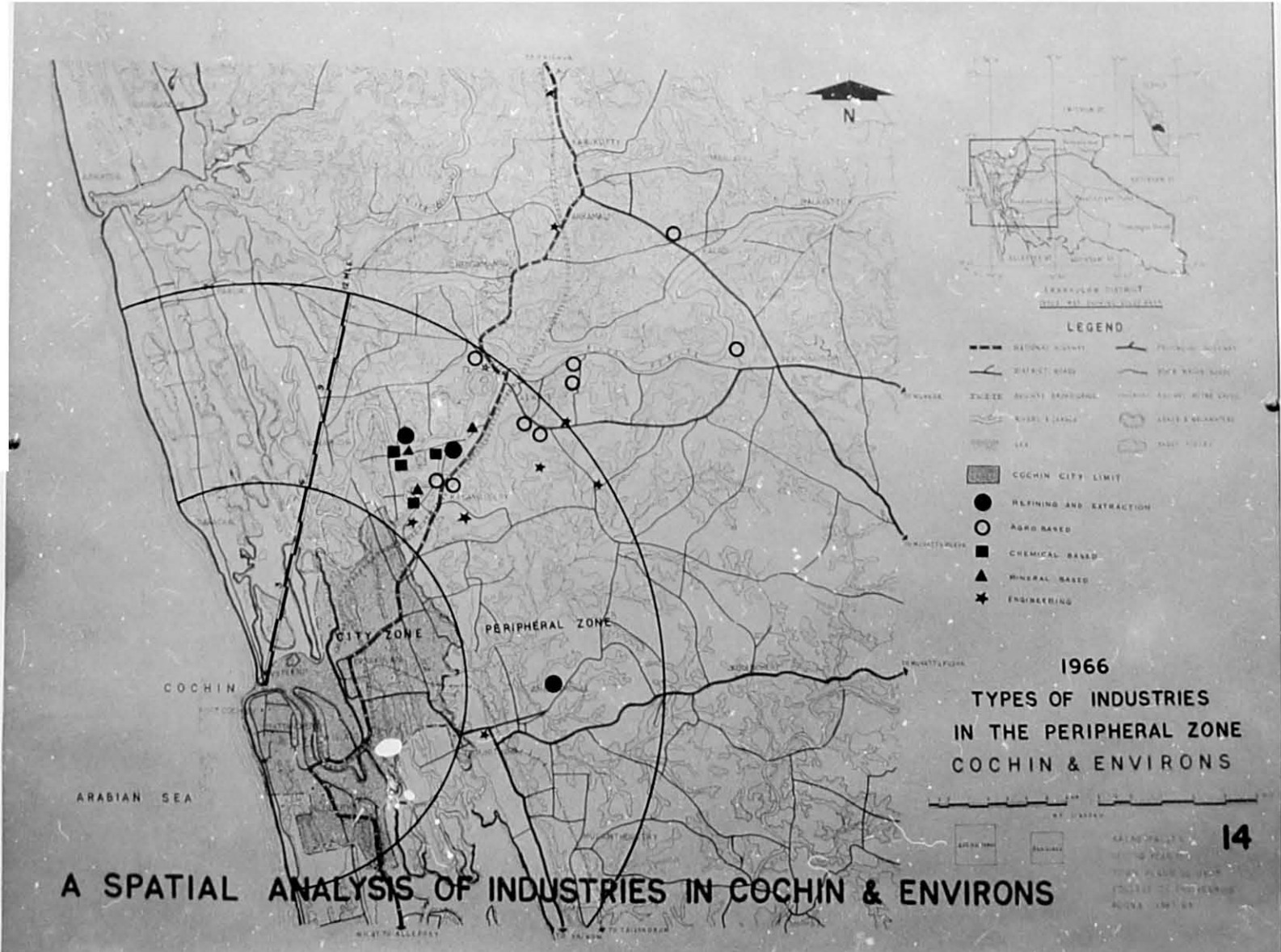
4.9. Thus, in the peripheral zone it is seen that the type of industries existing are those of chemical based, textiles, mineral based and general engineering. It is also seen from Map 11 that these units are mostly large sized employing more than 500 workers. These industries thus absorb a large share of total workers

- 38 -

employed in each of the types. The size and nature of industries necessitates an analysis regarding commodity flow to complete the picture of export distribution. This is attempted in the following chapter.







CHAPTER-V.

INDUSTRIAL COMMODITY FLOW.

5.1. The relation between the location of major industries and the transportation lines is an important aspect to be considered in the spatial analysis. The industries give rise to enormous traffic, both in raw material and finished product. Since the efficiency of transportation will affect the production, distribution and consumption, this analysis is vital for planners in order to eliminate any aspect hampering the smooth commodity flow. Also knowing the relative emphasis and economy of different modes of traffic, realistic priority can be given.

5.2.

5.2. So far in Kerala only one published report regarding the commodity flow is available. This relates to the traffic through inland water and the survey relates to 1958-59 before the Aroor bridge, which is the vital road connection to the south of Cochin, was opened. In 1961-62 an industrial survey was conducted by the town planning department in and around Cochin. The survey encompassed some 93 industries, medium and large, in and around Cochin. The analysis attempted here has made use of both of these survey tabulations.

Traffic Generated by Different Types of Industries :

5.3. Table 13 gives the details regarding the type of industries surveyed by the Town Planning Department and the total traffic generated by them. It is seen that the traffic generated by refinery and extraction industries take a share of 61.9 percent of the total traffic. A considerable portion of this is the traffic to Cochin refinery at Ambalamukal. The storage and distribution of petroleum products takes the second position with 12.6 percent of the traffic. Chemical based industries have a share of 11.2 percent followed by service industries with 7.35 percent. The share of other types of industries is comparatively small.

Traffic by Different Modes of Transport :

5.4. The total traffic handled by different modes of transportation is given below :

Total traffic (in Tonnes) handled by
different modes of transportation in Cochin
and environs 1965-66.*

Modes of transportation.	Total traffic (tonnes).
Ship and inland water ..	4,97,608
Ship and rail ..	15,92,148
Ship and road ..	1,21,799
Rail and road ..	1,62,057
Rail and inland water ..	2,546
Rail ..	13,73,020
Road ..	7,98,913
Inland water ..	2,29,426
Total ..	47,77,517

*Source :Town Planning Department,
Regional Office, Cochin.

It is seen that 22,11,555 tonnes of the (46.5%) total industrial traffic is originating from or destined to Cochin port. When the export items of Cochin port are analysed the share of manufactured products of industries is found to be comparatively very small.

This will mean that almost a big share of the total industrial traffic is originating from the port. The dependency of the industries in the region to the port can be clearly seen from this single factor.

5.5. In the total industrial traffic of 47,77,517 tons, inland waterways come into picture for transporting 7,29,580 tonnes marking a share of 15.3 percent. Roads help in transporting 10,82,769 tonnes and the share to the total traffic is 22.6 percent. In 1965, the share of railways was 31,29,771 tonnes (65.5 percent). Out of this 15,90,000 tonnes comprised of crude petroleum for the Cochin refineries shipped from Iran to Cochin port. By 1966-67 the pipe line connection from Cochin port oil berth to Ambalamukal was completed and this traffic was diverted by pipe lines. Taking this into consideration the share of railways drops down to 32.2 percent and the share of 33.3 percent is taken by pipe lines. Thus the new positions of the different modes of transportation are taken by pipe lines, railways, roads and waterways respectively in the order of importance. The traffic survey report on inland navigation in Kerala (1959) has analysed the traffic movement for the industrial complex of Eloor-Kalamassery. It as found that a quantity of more than 4,23,000 tonnes was moved per year through waterways between Cochin and Alwaye marking a share of 42 percent of the total traffic requirements of industries.

5.6. The trends of shifting emphasis on different modes of transportation can also be analysed with reference to the traffic flow of commodities originating from Cochin port and destined to the different parts of Kerala. It has been estimated that, in 1930-1931, the traffic moved 34 percent by road and rail and 66 percent by water. By 1960-61 the position is such that 58 percent of the traffic moved by road and rail and 42 percent by water. In 1966-67, after the commissioning of the pipe line, 61 percent of the traffic moved by road and rail, 31 percent by pipe lines and only 8 percent by waterways.*

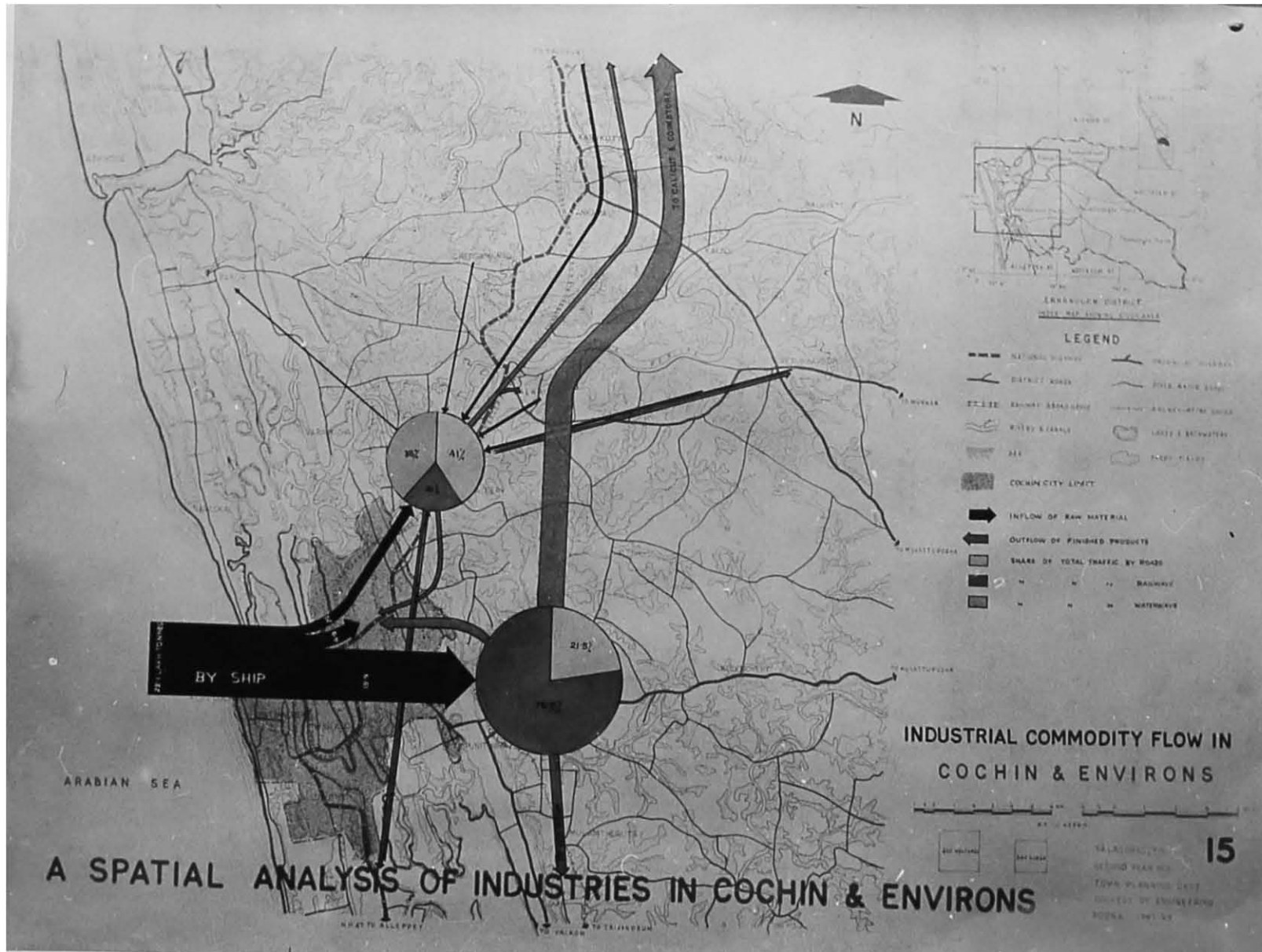
5.7. It is worth analysing these shifting trends. In the early years of Cochin's development as a modern port, in 1931, the port traffic was mostly carried by waterways. When the port was commissioned with rail and road connection there was a radical shift from waterways to roads and railways. The greater speed, reliability and manoeuvrability of road transport has come to stay as well as the preference of the trade to railways for long lead traffic has continued. The traffic by waterways has languished and has been superceded by roads and railways in 1966-67. Also in this year all the existing modes of transport have been invaded by the revolutionary concept of pipe lines which has diverted large portion of the traffic from other modes of transportation.

* K. Joseph Chacko, Problems of Perspective Planning in the development of Cochin port, Seminar in Greater Cochin Development (1967).

5.8. Various reasons can be attributed to these shifting trends. The preference of industry (taking only that sector for the present study) to different modes of transportation essentially depends on 4 factors.

1. Rate of cost.
2. Time.
3. Bulk.
4. Reliability.

For movement of Cargo of a bulky nature water transport is ideally suited. The rates offered also compare favourably. But the movement through water is slow. To cite an example, to cover a distance of 18 miles between Cochin and Alwaye by waterways a country craft takes about 12 hours compared to an hour or so by road. Using mechanised boats and extending the facilities for tugging of country boats, this time may be considerably reduced. But the stagnant nature of waterways mostly due to natural geographical rigidities and partly due to the failure in organising the available water transport facilities on a more efficient footing (refer also para 3.9 chapter III) has pushed this mode into the back ground at the present time. Another factor is the water logging and the densely populated nature of the coastal belt, which has been avoided by the industries. The industries requiring extensive land have shown a preference to the interior due to lower land cost.



This has necessarily caused the shift in the modes of transportation of industrial commodity. Roadways have stolen a march over railways in these locations in many cases. The importance of pipe lines for transporting oil is universally acknowledged due to its greater speed, safety and reliability. The impact of roads, railways and pipe lines for handling industrial traffic is obvious in modern times. Viewing from this angle the future of water transport is bleak. But a co-ordination of all these modes seems to be the correct approach in Cochin and environs to achieve optimum economy in the transportation cost.

Traffic Requirements of Different Industries in the Major Industrial Areas :

5.9. Table 10, gives the total traffic requirements and their mode of transportation in the industrial areas of Eloor-Kalamassery and Ambalamukal. Map 15 gives a pictorial representation of these details. It is seen that the traffic requirements of the Cochin Refineries at Ambalamukal is much more than that of Eloor-Kalamassery areas, even though the latter area has a concentration of industrial units and have the largest share of total industrial workers. The reason is due to the nature of processing which takes place in the two areas and the nature of the final product. Out of the total industrial traffic originating from Cochin port, (22.1. lakh tonnes)

a lions share (15.9 lakh tonnes) is directed to Ambalamukal. This is crude petroleum. It is processed there and the refined oil finds exist mainly to Calicut and Coimbatore side, to Kottayam side and to Cochin city. This traffic is shared by roads (23.5%) and railways (76.5%). Out of the total traffic which the Eloor Kalamassery area gives rise to, the raw materials are mainly coming from Cochin port (2.2 lakh tonnes) and the rest from different parts of Kerala. The finished products are distributed throughout Kerala and also find exist to outside via Coimbatore. Of the total traffic 41 percent is shared by roads, 21 percent by railways and 38 percent by waterways. The commodity flow of industries situated in the City Zone is not considered for the present analysis, because of the fact that the industries there are mostly medium and small sized belonging to agrobased fishery or service type and make use of products which are available in the State.

Raw Materials and Finished Products :

5.10. The raw material requirement of the agro-based industries is mainly met by the State itself. The oil mills, coir factories and other establishments make use of coconut as the raw material. The materials are of bulky nature and the transportation is mainly by waterways. Textile industry gets cotton from outside the state, both from north India and foreign countries, and the

route is via sea. The chemical industry solely depends on raw materials from foreign countries. Mineral based industries use indigenous materials mostly, however industries like Indian Aluminium Co. get the raw materials from Bihar, Assam, West Bengal, U.S.A. and Europe. Generally we can say that non-agro-based industries depend mostly on raw materials from outside the state.

5.11. Regarding market, no exact data is available as to the quantum of manufactured goods locally consumed and the surplus available for the market. A general indication however is obtained from the commodity flow. Much of the finished products of industries of this area finds exit to the all India market by rail and road. The main consumption areas of chemicals and basic metal products are the industrial towns like Bombay and Calcutta. It has not figured much in the foreign markets except for traditional products like coir and new products like frozen and canned fish. Complementary use of bye-products by industries is a common feature particularly in the complex developed in Eloor-Kalamassery.

5.12. One aspect is evident from this analysis. The industrial base of this region is essentially a process oriented one with the raw materials brought from outside, processed here and sent to all India market. But there is no denial of the fact that indigenous material play their role. In such an economy, the reason for the growth

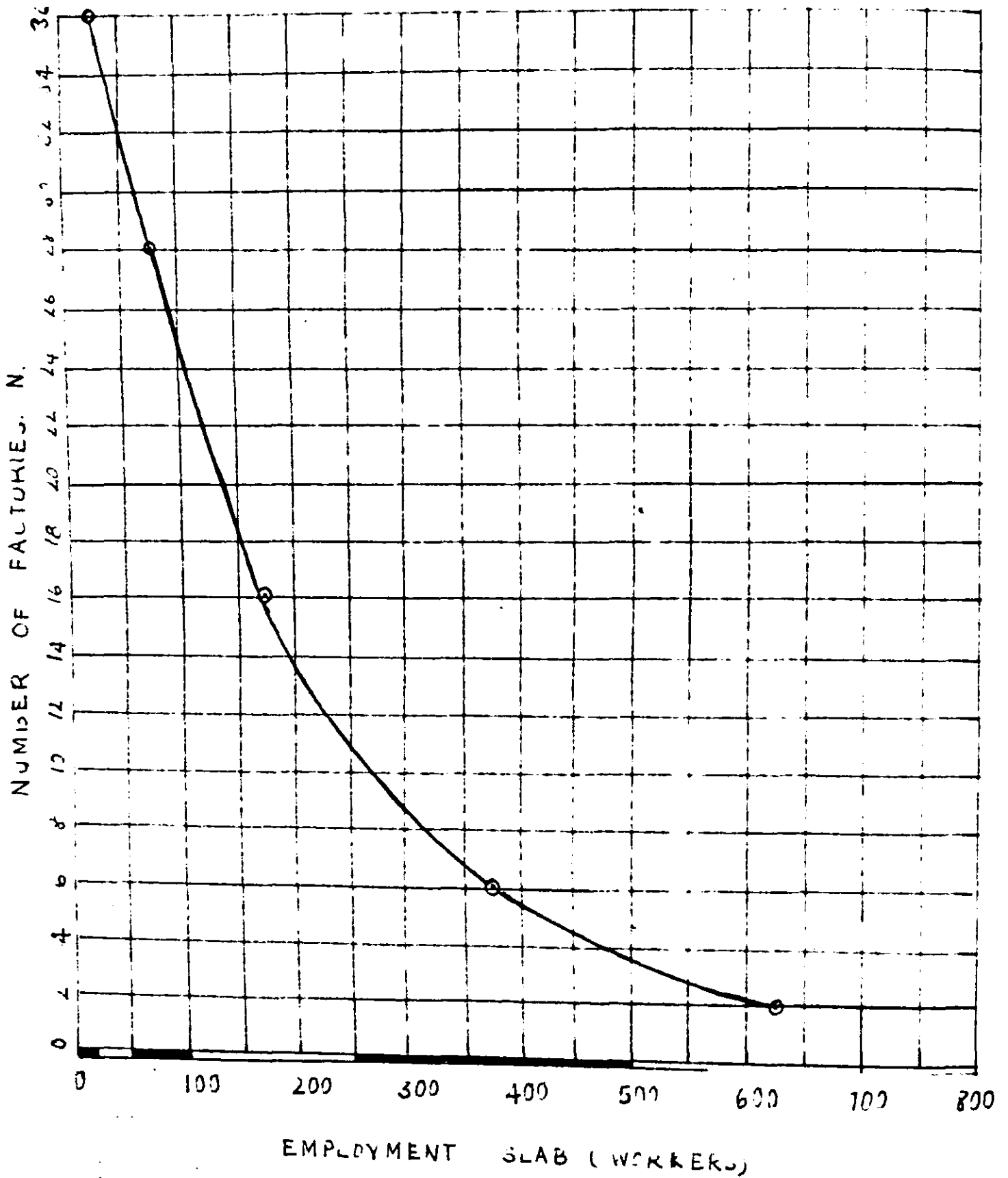
of industries is not solely based on the raw material available or the local market. The facilities of easy and economical transportation particularly at a place where break of bulk takes place, make the location of industries much more suitable than in the interior. Convergence of the various transportation modes again fixes the median of location of these industries.

Another important aspect which affects the location is the social overheads. The wages of labour their housing, commutation other social amenities all these influence the relative economy of the location of industry. These social aspects of industrialization are discussed in Chapter VIII.

CHAPTER-VI.

SPATIAL DISTRIBUTION OF INDUSTRIES IN COCHIN CITY

6.1. It was seen in para 4.1, Chapter IV that there are only 10 large sized industrial units in the City of Cochin and environs. Out of this only two are located in the City Zone. One is the Tata Oil Mills and Soap Factory and the other is the Harbour Maintenance Workshop. In the subsequent analysis it was shown that the medium and small sized units were essentially in the types of agrobased, fishery, forest based and printing. Thus the scale and type of industries situated in the City Zone necessitates a separate treatment which is attempted here.



DISTRIBUTION OF FACTORIES BY EMPLOYMENT SIZE

IN CITY ZONE

FIG. 8

Structure of Industries in the City Zone :

6.2. The distribution of factories in City Zone is given below :

Distribution of Factories in the City Zone according to employment size as on 1966.

<u>Employment Size.</u>	<u>No.of factories in City Zone.</u>	<u>No.of factories in Cochin and environs.</u>
Upto 20 workers	60	73
20 to 49	35	46
50 to 99	28	38
100 to 249	16	20
250 to 499	6	14
500 and above	2	10
Total	147	201

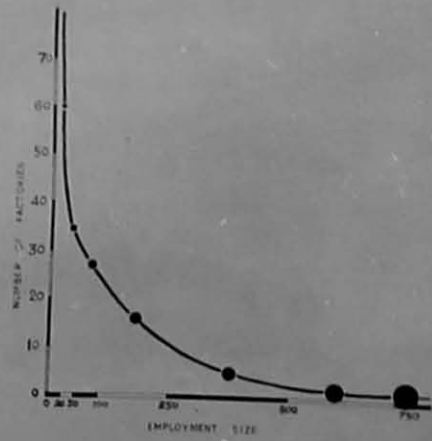
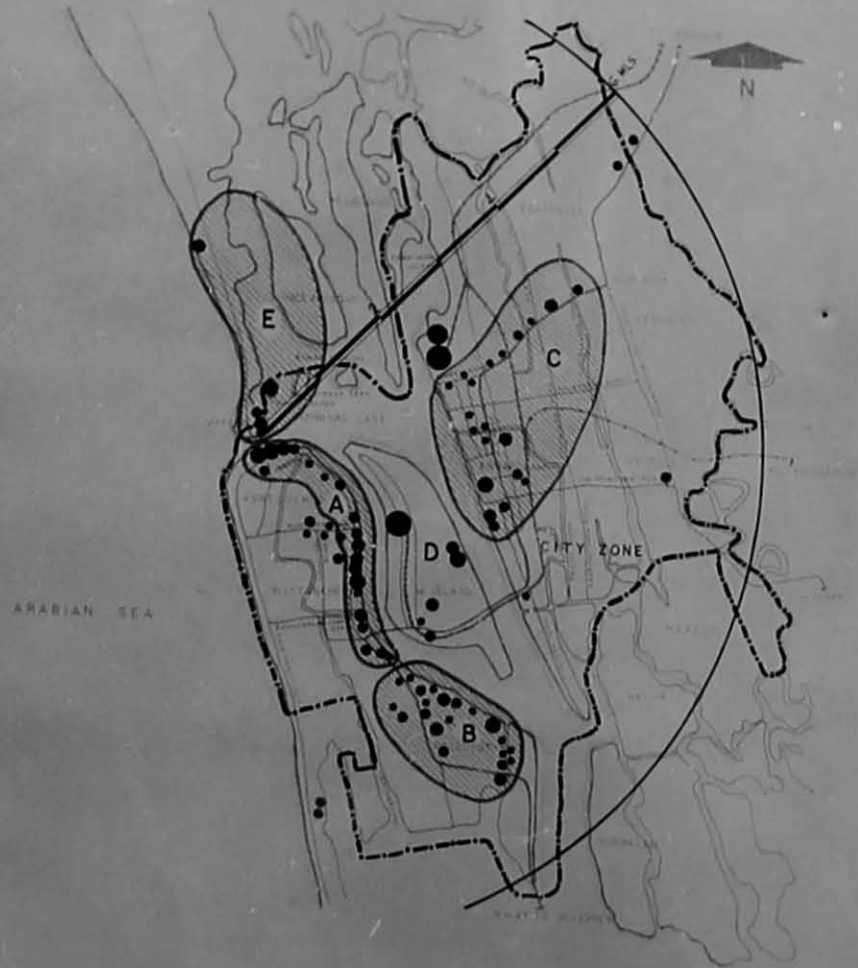
Source : Inspector of Factories, Trivandrum.

Comparing the distribution of factories in the City and environs with that in the City alone one can see the predominance of medium and small sized units within the City. Among the small sized units 123 out of 157 are in the City Zone and in the medium sized units 22 out of 34 are in the City Zone. Here again a graphical representation (fig.8) gives the same characteristics as noted in the distribution of industries

in the state as well as in the city and environs together. However, the graph is approaching nearer to the hyperbola in the case of City Zone. As the employment size increases the number of factories get reduced rapidly.

Spatial Distribution of Industries in the City Zone :

6.3. Map 17 gives the distribution of factories in the City Zone. All factories having an employment upto 20 workers are plotted in the map. The distribution shows five distinct areas. Area A is a narrow belt on the foreshore of Mattanchery and Fort Cochin. Area B indicates a concentration of units in Palluruthy. In area C, there is no evident concentration. The units are dispersed in character. Area D refers to the Welligdon island and the factories are those connected with the defence services or harbour works. Area E shows factories only few in number and connected with the city limits only by water way. Areas A, B and C show typical spatial distribution of industries in any city. These areas are characterised by concentration along a belt, concentration in a cluster and deconcentration or dispersion. Another feature is marked by the fact that all these areas are focussed to the Cochin port and is an indication of centralization of industrial units about the port facilities.



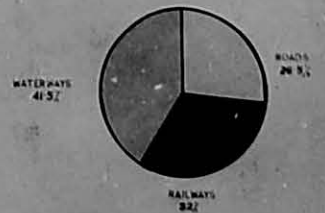
DISTRIBUTION CURVE

●	INDUSTRIES EMPLOYING MORE THAN 750 PERSONS
●	" " 500 - 749 "
●	" " 250 - 499 "
●	" " 100 - 249 "
●	" " 50 - 99 "
●	" " 20 - 49 "

1966
DISTRIBUTION OF INDUSTRIES IN
COCHIN CITY



A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS



MODE OF TRANSPORTATION OF INDUSTRIAL COMMODITY

- CHEMICAL BASED
- ▣ STORAGE & DISTRIBUTION
- ▲ MINERAL BASED
- ★ GENERAL ENGINEERING
- ▼ PRINTING
- AGROBASED
- ◀ FISHERIES

1966
TYPES OF INDUSTRIES IN COCHIN CITY



A SPATIAL ANALYSIS OF INDUSTRIES IN COCHIN & ENVIRONS

Types of Industries in the City Zone :

6.4. The nature of these areas may be made clear by studying the types of industries in the City Zone. Map 18 gives the distribution of industries by type in the City Zone. It is seen that the belt A is predominated by fishery industry. Since the raw material (fresh fish) is to be processed by freezing or canning as soon as possible and the handling is to be reduced to a minimum due to the perishability of the raw material and finished products the location on the shores are most ideal for this industry. Area B shows concentration of different types of industries including engineering, agrobased, boat building yards and a few fisheries. At Palluruthy there is an industrial estate. This location near the already existing urban centres of Fort Cochin and Mattanchery was favoured by private enterprises. Till 1967 this area was only a suburb of these municipalities and was free from the municipal tax. The extension of boundaries of Cochin city has brought this suburb into the fold of the Corporation. Area C is predominated by service industries like printing. The mere existence of printing industry in an area is a factor worthy of note. It is an indication of the general literacy level, the commercial and industrial activity (means of propaganda, publicity, advertisement etc.) and impetus to a series of ancillary activities. This area shows dispersion of factories due to its very nature.

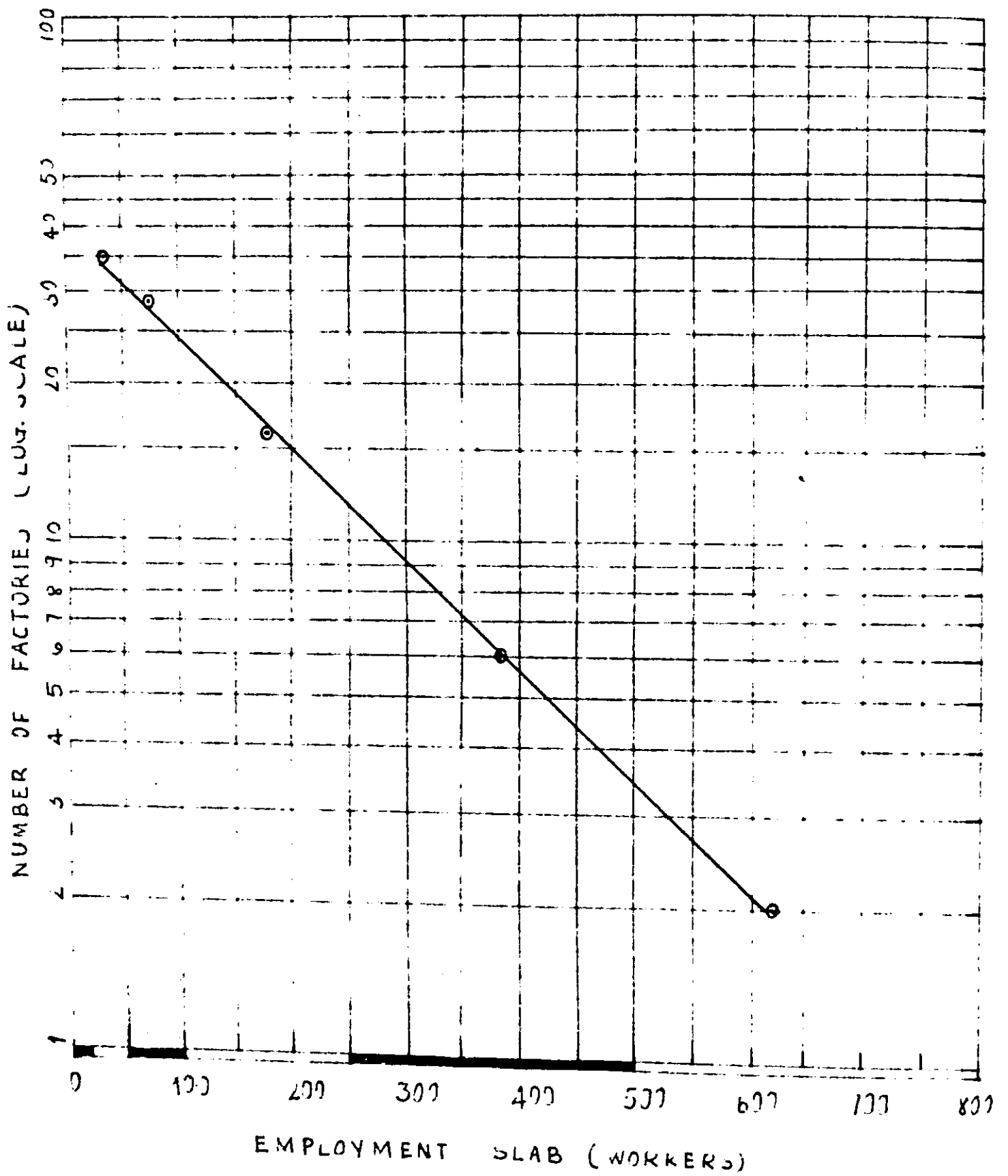
Commodity Requirements of Industries in the City Zone :

6.5. The industries in the City Zone give rise to a total traffic of 11,62,154 tonnes. Out of this the traffic tonnage moved by ship to Cochin is only 3,86,347¹ tonnes. This explains the use of indigenous materials by the industries. Out of this total traffic, 26.5 percent was moved by roads, 32 percent by railways and 41.5 percent by water ways. The dependency of industries in water-ways in Cochin evident from these statistics.

Measurement of Association in Spatial Distribution :

6.6. Upto this point, attention has been focussed on methods suited for describing the way in which the industrial units were distributed in space. The association between the spatial distribution of different localities was also explained, with reference to the type of industries. For a variety of reasons different localities are preferred by industries. A common need, such as easy access to transportation facilities and sharing the bye-products may create a clustering of establishments. Locational associations of this sort is a matter of common knowledge. An awareness of the phenomena is not, however, a substitute for a standardised measure of the degree to which these institutions

1. Department of Town Planning, Regional Office, Cochin.



DISTRIBUTION OF FACTORIES BY EMPLOYMENT SIZE

IN CITY ZONE

FIG. 9

6.8. It was seen that on plain co-ordinate paper this relation is given by a curve approximating to a hyperbola. This, however, cannot be a pure hyperbola as the two ends have to end some where and cannot be asymptotic to the X and Y axes . To understand the nature of this curve, the values are plotted on a semi-logarithmic graph (Fig.9). It is seen that the curve is a straight line. The logarithm of the number of factories is dependant on the intercept on the Y axis and the slope of the line. That is to say, the logarithm of the number of factories and the employment size are unjversely proportional.

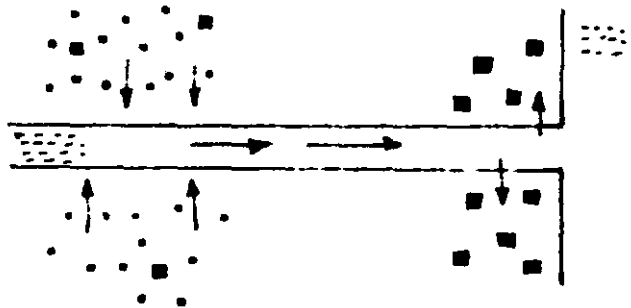
6.9. Though this may be an individual phenomenon observable in Cochin City, it is quite possible that such relations may exist in identical cities with identical functional integration amongst the industrial units. This is a problem of research by itself. No such correlation is attempted here due to the limitations of this work. However, valuable inference can be derived from the graph. If the relationship is given by the straight line and the slope indicates the degree of interdependence of the different units, an increase in the number of larger units will make a proportionate increase in the smaller units. The line will move itself parallel to the original line, and the number of units employing smaller number of workers will increase in much larger numbers, as the relation is plotted on the

COIR INDUSTRY

NON-FACTORY SECTOR
(Retting, Fibre making, Spinning)

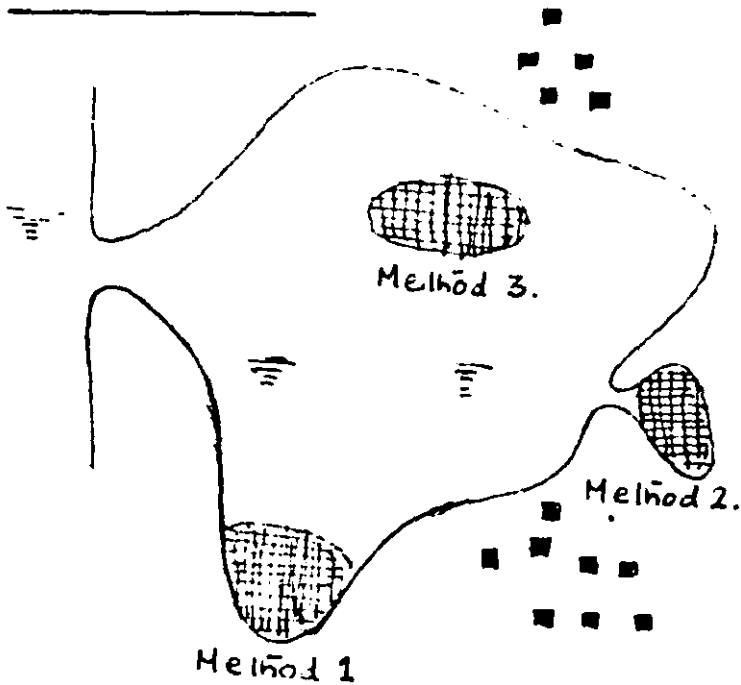
FACTORY SECTOR
(Ropes, Mats, Carpets, etc.)

I HUSK COLLECTION.



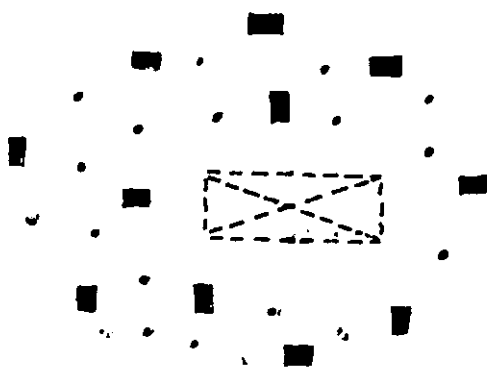
- 1 Husk collected from individual households
2. Transported to coastline by country boats
- 3 Distributed to retters near backwaters

II RETTING



- 1 Retting possible only in backwaters
2. Retting Period 8-10 months.
3. No houses very near to retting area
- 4 Retted husk distributed locally for fibre making.
- 5 Retting affects quality of Coir

III SPINNING



1. spinning done in open air
2. Spinning on collective basis
3. House holds near spinning yards.
- 4 No spinning during monsoons.
- 5 Yarns send to factories.

FIG.10

logarithmic graph. This will give employment for more workers, create more industrial products and raise the general economy of the city. The importance of setting up larger units in any city is evident from this analysis.

Traditional Industries :

6.10. This analysis will be incomplete without mentioning the traditional industries in Cochin, the most important of them being coir and fishery. Fig.10 gives a graphic representation of the activities in the coir industry. Coir industry can be divided into non-factory sector, and factory sector. In the non-factory sector, husk is collected from the interior, transported mainly by country boats and distributed to retters near back water. Retting is possible only in back waters and is affected by the salinity of the water. Retting takes 8 to 10 months to complete. The retted husk is distributed locally. One of the most unpleasant of all the local occupations is that of separating the coir fibres in the coconut husks, which have lain rotting for months in pools of muddy, brackish water. It is done by women, who squat before their piles of husks and beat them out with wooden clubs until the fibres are detached from the sodden and rotten pith; afterwards other workers card and spin this fibre. For this filthy and exhausting work, the women are being paid 30 to 75 paise a day.³

3. Coir economics and statistics, Coir Board Ernakulam, Half Yearly Bulletin, Vol.IV No.2, July 1962,p.14.

The wages are deplorably low and lead to conditions of starvation and semi-starvation. When we remember that Kerala accounts for 95 percent of the total production of coir fibre and yarn and 55 percent of this is exported, and also 4 to 5 lakhs of population are connected with it, the picture is really appalling.⁴

6.11. In the factory sector production of various coir goods such as mats, matting, rugs, carpets etc. are manufactured out of yarn. The factory sector is more organised. In this sector the proportion of female labour was only 16.5 percent and that of skilled workers was about 75 percent.⁵ Most of the occupations in the industry are piece-rated. The piece rates of certain occupations like matting, weaving, rehanking, sorting, sizing and opening have been standardised by the Coir Industrial Relation Council constituted by the Kerala Government. The rates, however, depend on the design and the quality of the products. The Coir Board, Ernakulam is trying to introduce modernization in all the activities of coir industry. In spite of all these efforts the Coir Industry is declining. Some major industries even in Cochin have been closed down and smaller units have been compelled to scatter in rural areas due to lower wages there.

4. Ibid, the Socio Economic Survey of the Coir Board analyses the tragic picture of this industry.

5. Ibid, page 115. The Statistics relate to 1960.

The fisheries constitute the next most important industry. Unlike the declining coir industry, this sector has shown much progress in recent years due to a variety of reasons and has come to the extent of leaving an impact in the industrial economy of Cochin and environs. A study given in the following chapter analyses the growth of the fisheries and attempts to evolve the spatial distribution of freezing and canning factories in Cochin.

CHAPTER-VII.

CASE STUDY OF FISHERY DEVELOPMENT IN COCHIN.

7.1. While the non-agrobased industries step up the pace of industrialization in an undeveloped economy of any region, the maximum utilization of the existing resources is the key factor in the economic development. The spectacular development of Indian seafood industry will be perhaps the most fascinating chapter in the industrial advancement of Kerala in the last decade. With more than 70 to 80 percent of India's export of frozen and canned seafood effected through the port of Cochin, it is worth while to study the development of fisheries in Cochin and analyse its future pattern.

7.2. Among the fishing nations of the world, India's position is seventh and in Asia it is third, the first and second position being taken by Japan and China (main land) respectively.¹ India has a coast line of 4667 k.m. excluding the islands and the marine fishing at present is mostly limited to 10-15 k.m. width. In most regions the area covered by the fishing operations is only part of the continental shelf.

7.3. Table 11 gives the total marine fish landing in India. A comparison of the marine fish catch from the east and west coast of India reveals that the total marine fish catch from the west coast is about 60 percent or more of the total marine fish catch in India. Among the states in India, Kerala having 576 k.m. (12 percent of India) coastline records the maximum catch of marine fish. This is nearly 30 percent of the total marine fish catch in India and 60 percent of the catch of the west coast.

7.4. Marine fishing in Kerala is the occupation of about 75,000 fishermen who operate about 20,000 country crafts. Kerala has also 7453 stake nets which are used for coastal fishing. Fishing is a traditional occupation and the fishermen have much skill in

1. Seafood Trade Journal, Vol. III, No. 6, p. 42 Cochin, June 1968.

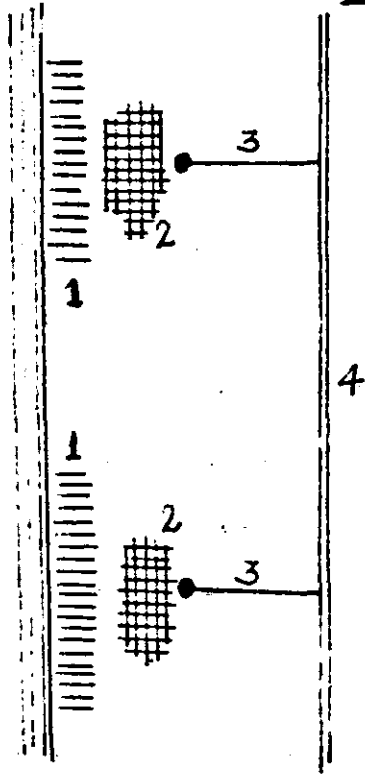
navigation and fishing. They have fairly good knowledge of the availability of fish, their migration and the changing weather conditions.

Seasonal Variation in Marine Catch ² ;

7.5. Though regular fishing is restricted to the inshore regions of the coast, a set of variable parameters prevent uniform catch to be obtained in all seasons. The commercial catches are dominated by Sardines, Anchovies, Sprats, Sharks, rays, Silver bellies, Pomfrets, Tunnies, Seer fish, Machrels etc., the migratory character of these fishes, turbulence of the sea, prevailing winds and storms, monsoons all affect the catch in seasons. The maximum catch is during the last quarter of the year, after the ^{en}weaking of S.W.monsoon and before the commencement of N.E.monsoon. It shows a gradual decrease from January to June. This fluctuation has relation to the industries which depend on marine fish as the raw material. For nearly 6 months in a year the availability of marine fish is greatly reduced and is not even sufficient to meet the needs of the local market. At the same time during abundance much fish is wasted due to lack of processing facilities.

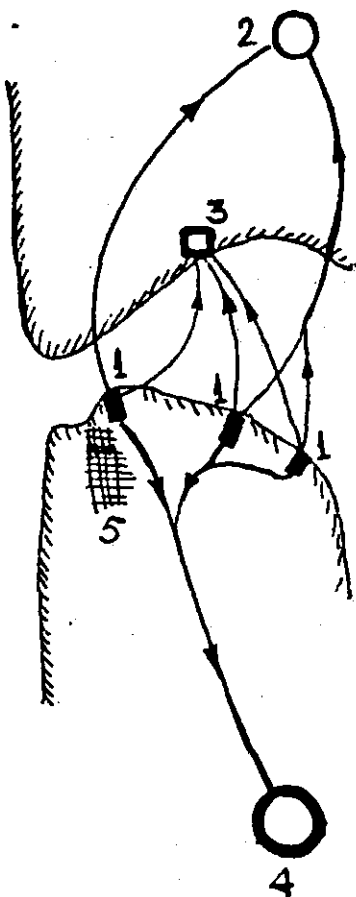
2. C.T.Sammuel, Seasonal variation in the abundance of marine fish in Kerala, Seafood trade Journal, Vol.III No.7, pp 11-13, Cochin, July 1968.

FISHERY INDUSTRY



TRADITIONAL

- 1 Country boat landing along shore
2. Fishermen's settlement also the collection point, and curing yards.
- 3 Feeder road
- 4 Main road to market.



MODERN

1. Landing jetties shifted to interior
2. Major market for fresh fish
3. Freezing plant.
- 4 Major town for processing
- 5 Fishermens settlement.

FIG.11

Organization of Traditional Fishing Activity :

7.6. Fig.11 summarises the fishing activity of Kerala coast. Fishing is restricted to shallow continental shelf with country craft landing spread throughout the shore. The catch seldom exceeds 25T/boat/year. The fishermen's settlement shows nucleation near the coast due to the need of collective action during the fishing activity. This forms the collection point. The traditional method of preservation of fish is by sun-drying with salt at the curing yards usually located near the collection point. Fishermen dispose their catch either no middlemen or co-operative societies. The middlemen sell the fish either to processing plants or to traders for distribution. A few co-operative societies process the fish themselves or sell it to traders or processors. All the three modes viz. road, rail and water are used to transport the fresh catch either to processing factories or to the local market.

Mechanization and its Effect :

7.7. Mechanised fishing is of recent origin in Kerala the initiative being taken by the Indo-Norwegian Project. However this is being quickly adopted by trained fishermen. The mechanised boats are mostly 30 feet to 40 feet craft with 30 to 60 H.P.engines. One immediate impact of mechanisation is that the fishing ground is extended to 15 miles into the deep sea and the

catch is considerably increased. Another impact is the shift of landing places from the shore to the interior backwaters for landing jettify facilities. Mechanization has also changed the mode of processing. The abundant catch necessitates the freezing units to be located near the landing to reduce travel distance before freezing. The curing by sun-drying is considerably reduced. Canning however is more sophisticated and takes place only in major towns. All these activities can be clearly seen in the environs of Cochin, from Munambam to Vypeen.

Structure of Processing Factories :

7.8. The whole of the processing industry is export oriented. The large bulk of canned and frozen products is directed to U.S.A. Continent, Japan and Australia and dried and salted fish to Ceylon, Burma Hongkon etc. Beginning with a few thousand kilogram the export from Cochin port has reached 10,000 M.tonnes per annum, in the last decade.

7.9. Among the 23 sea food industries in Kerala registered in 1966, 12 employed 1 to 49 workers, 7 employed 50 to 99 workers and the rest employed 100 to 449 workers. In all they employed 1540 workers. Out of these 14 (60%) were located in Ernakulam district and employed 1332 (86.5%) workers. All these factories are located in Cochin city.

Spatial Distribution of Processing Factories in Cochin :

7.10. The curing yards in the environs of Cochin are located at Nayarambalam, Narackkal, Malipuram, Chellanam, Kannamaly and Munambam, all along the sea coast. The freezing and canning factories are located on the foreshore of Mattanchery and Palluruthy. They are spread out in a narrow belt along the foreshore to avail the water frontage for transporting the fish.

Development of Allied Industries :

7.11. One important aspect of the development of fishery is the impetus given by this industry to boat building. As a first step towards the mechanisation of fishing activity, attempts were made by the Indo-Norwegian project to fit the indigenous craft with 4 H.P. engines and was found to be inefficient. Thereafter designs were made for boats, lengths varying from 22 feet to 40 feet. The craft and gear section of the Central Institute of the Fishery Technology has been engaged in the designing of different types of boats, mechanical accessories and fishing gear.

7.12. The boat building activity at Cochin is completely in private sector and it has a capacity of 435 boats per annum.³ This capacity is shared by ten boat building yards. A spatial distribution of these

3. Marine products export promotion Council, Development of Fisheries in Cochin area, Cochin, 1965, pp.28-29.

as well indicate concentration in a belt along the east coast of Matanchery. M/s Brunton & Co. is a reputed firm of boat builders in Cochin and employ upto 250 persons. Other establishments are comparatively modest and not much mechanised. The skill of traditional carpenters is used in most of these establishments and a few even work in temporary sheds.

Discussion :

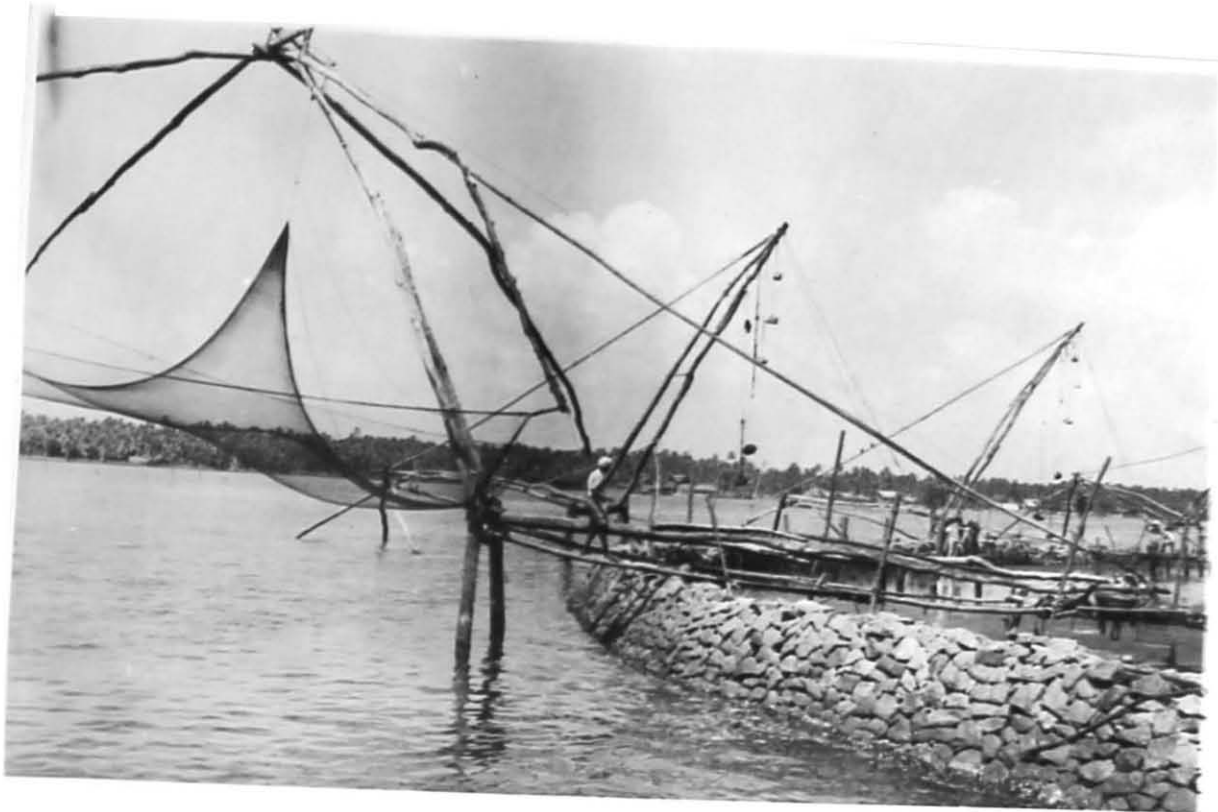
7.13. The total earning from export of seafood from Cochin in 1966 was Rs.11.5 crores. The present target is to expand the export to the extent of earning a foreign exchange of Rs.30 crores by the end of fourth plan.⁴ In view of the past development this is only a safe optimism. However the target can be achieved only by increasing the catch to a corresponding degree. This will have to be done by bringing more fishing boats and trawlers into operation. Thus there will be an increase in boat building activity as well.

7.14. At present the processing factories are located on the east bank of Mathachery (area A, Map 18) The water supply is scarce and the power failure almost common in this area. Against these odds, the prime location factors have been a vast market in foreign countries, the proximity to the port and good communication with the harbour. But scarcity of space for expansion has pushed some factories to be located

4. Kurwath Damodarn, Fisheries Development in Greater Cochin, Seminar on Greater Cochin Development (1967).

on the foreshore of Palluruthy (area B, Map 18). When bigger crafts operate, this location will cause difficulty due to the intervening Palluruthy bridge. Also the intervention in the shipping channel with numerous crafts will hamper the efficient and smooth transportation.

7.15. The future expansion will thus necessarily cause spatial problems. The obvious alternative seems to be the extension of fishery industries on the northern side i.e. the foreshore of Vypeen (area E, Map 18). With the water supply assured by some means, this area with the backwater depth coming to 18 to 20 feet will be ideal for expansion. The boat building yards, dry docks and repair facilities all combined can make this area a unique fishing harbour. The fact that one of the major boat building yards and a few processing plants are located there indicates this shift in location of the factories. This will also be ideal in the sense that no interruption of shipping channel will take place. Munambam has prospects as a minor fishing harbour and thus the whole island will teem with this specialized industry.



Stake nets are used for
coastal fishing....



Country crafts are used
for marine fishing..



**Fishermens settlement
shows nucleation.....**



**Need for collective action
during fishing activity...**



Mechanized fishing is of
recent origin in Kerala...



Processing factories show spatial preference to the shores of backwaters...



Many boat building yards work in temporary sheds....

P A R T - III

CHAPTER-VIII

SOCIAL ASPECTS OF INDUSTRIALIZATION.

8.1. Experience in the industrialised countries has shown that unplanned and uncontrolled growth of industries led to hazards to the health of the workers directly engaged in industries and to the community as a whole. In view of the close relationship between social and economic development, attention need be given to the contributions which social policies can make towards the achievements of industrial objectives.¹

1. United Nations, Report of the Interregional Seminar on Social aspects of Industrialization (New York), 1965.

The social factors are to be taken into account in the same way as economical and technical factors, in determining the path of industrial development. There are no universal criteria for determining the social allocations as it very much depends on the Socio-economic environments of the region, on the historical back ground on which industrialization has taken place, on political decisions, as well as on geographical and climatic conditions. These social aspects include education and training of workers, the living conditions and the wage level, trade union movement, housing and community facilities and problems of commutation to work place and back.

Education and Training of Workers :

8.2. A successful industrialization programme depends on the effective utilization of human resources. This, in turn, presupposes educational and training programmes that are adequate to provide the number of trained persons required and flexible enough to adjust to the changing requirements for skills. This training must be of primary concern in the national policy of developing countries.²

8.3. The industrial requirement of technical manpower will consist of graduates or diploma holders

2. Ibid.

in engineering and skilled craftsmen. The former category is in the nature of capital asset and requires longer period of training. The latter category of skilled craftsmen requires shorter period of training, but the number in which they are required, is much larger. The ratio between skilled workers and engineers is roughly nine to one.³ This necessitates institutions to train people in the required categories. Table 12 gives the growth of these institutions from 1956-57 to 1965-66. In 1956-57 there existed one Engineering College, ten other engineering institutions and five technology schools. In 1966-67, the Engineering Colleges were 6, other engineering institutions 31 and Technology schools 71. The trend of growth is also marked in the out turn of trained manpower from these institutions. In 1966-67, acute and widespread unemployment was observed both among diploma holders and Industrial Training Institute trainees.⁴ However, shortage of trained personnel is likely to be felt in certain fields like ship building and naval architecture, metallurgy, fishery technology etc. The training facilities of skilled workers are provided at present at the production-cum-training centres as well as inplant training by a few private concerns. The facilities are inadequate on the

3. N.C.A.E.R. - Techno-economic survey of Kerala, New Delhi (1962) p.224.

4. Kerala (1967), an economic review p.60.

assumption of the ratio between engineers and skilled workers.

Living Conditions and Wage Level :

8.4. No data is available about the living conditions of workers in Kerala State or in any specific area for a realistic analysis, though some socio-economic surveys have been conducted amongst fishermen and coir-workers. Whereas the per capita income of Kerala as a whole is about Rs.300/-, that of the fishermen is only about Rs.110/- (the average family income was found to be Rs.540/- by the official survey). Even the fishermen do not represent the nadir of poverty. The workers employed by coir industry for extracting fibre from the husk (mostly women) get a daily wage of less than 75 paise and children employed in spinning get as little as 30 paise.

8.5. Table 13 gives the earnings of factory employees of the different States in India. It is evident that per capita daily earning of the workers in Kerala (Rs.3.54) is one of the lowest and almost half of the all India average (Rs.6.13). Even in terms of increase recorded between 1964 and 1965 the increase in the State (+ 12.4%) is below the All India average and about half the increase in the neighbouring State of Madras (+24.3%). This wide disparity is mainly due to

the traditional agrobased industries in general and their predominance in the total industrial sector. Table 14 gives the average daily earnings of workers in different types of industries. It is seen that the chemical based industries pay the highest wages followed by mineral based and general engineering. The predominance of non-agrobased industries is Cochin and environs put this area in a comparatively better position in the State. This wage structure, however, is to be related to the working class consumer price index. At Ernakulam the index stood at 698 in 1966 with the base 100 as on August 1939.⁵ This is one of the highest indices among the different centres in Kerala.

Trade Union Movement :

8.6. Though the higher rate of literacy, lower wage levels and poor living conditions form the basic factors for the trade union movements, how they effect the industrial climate and the general welfare of working class are the aspects to be considered in relation to the economic development, while the trade union movement has many good aspects to its credit, just as organising workers co-operatives, and management participation, it vitally affects the industrial performance by strikes and resulting loss of man days. In the manufacturing

5. Bureau of Economics and Statistics - Basic Statistics relating to Kerala Economy, Trivandrum (1968).

sector the percentage of man-days lost to the total mandays available in Kerala was of the order of 1.91 percent in 1958, the highest figure in India.⁶

8.7. Trade Unionism prevalent in the State which is not always unmixd with political motives, has been responsible for retarding the progress of investment in Kerala by potential investors from outside the State. However, there does not seem to be enough statistical evidence to justify the view that labour in Kerala is more aggressive than in most other parts of India the labour troubles in Kerala are not more acute than in the other States like Madras, Andhra, Bombay and West Bengal.⁷ Cochin and environs have shown generally a propitious industrial climate.

Housing for Industrial Workers :

8.8. A survey conducted by the Cochin Regional Office of the Town Planning Department (1965) encompassing 25 major industries in the area revealed interesting facts about the housing conditions of industrial workers in the area. While the private enterprises have not yet started thinking of providing accommodation to their employees, in undertakings where Government had some sort of interest, about 13.24 percent of employees were

6. Indian Labour Year Book 1958.

7. N.C.A.E.R. Techno-economic Survey of Kerala, New Delhi (1962) page 152.

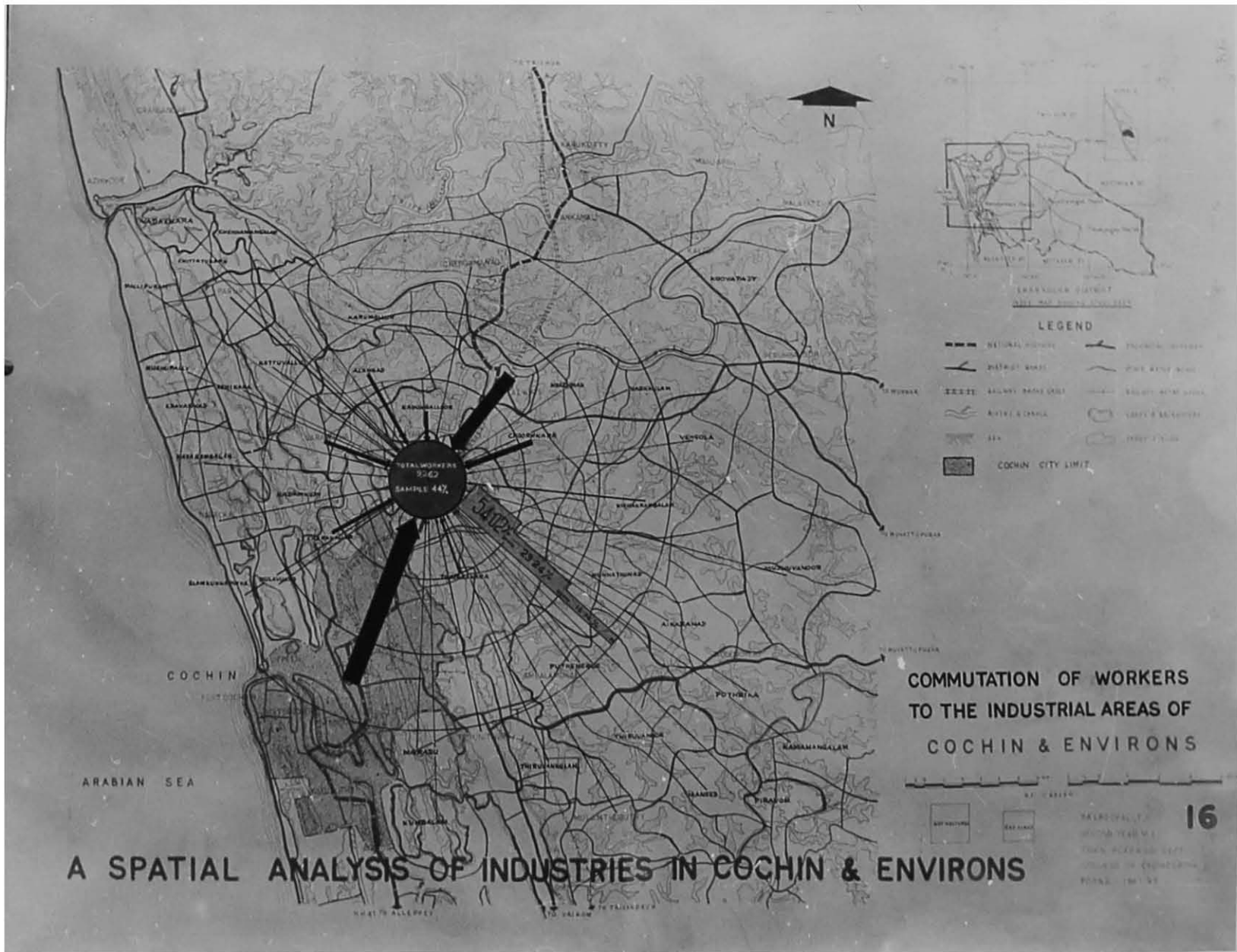
provided with quarters . 48.7 percent workers lived in quarters owned by themselves, or their near relatives and 38.06 percent lived in houses rented from private owners. Out of the 87 percent workers residing either in own houses or with relatives and in rented houses 58.23 percent showed a willingness to shift to factory quarters if provided, and 29 percent were not willing to shift. The willingness of workers of different slabs of salary income is given in table 15. The table indicates that the shortage of housing exists for all slabs of workers. But those getting less Rs.250/- p.m. predominates in the total number of workers as well as those requiring proper housing. However no data is available as to the nature of accommodation they presently occupy.

8.9. Distribution of workers according to the distance from the residence to the place of work.*

Distance of commutation	Percentage of total workers.
0 - 1 mile ..	34.52
2 - 3 mile ..	18.28
4 - 5 miles --	10.82
6 -10 miles ..	26.23
11 -15 miles ..	8.00
16 -20 miles ..	1.69
21 -30 miles ..	0.44
More than 30 miles.	0.02

	100.00

* Source : Department of Town Planning, Regional Office, Cochin.



It is seen from the above table that about 64 percent workers commute a distance of 5 miles or less and 26 percent a distance of 10 miles or less. Only 10 percent workers come from beyond 10 miles radius to the place of work. It was also revealed by the survey that about 36 percent of workers make use of no vehicles, 40.64 percent workers come by bus, 10.6 percent by vehicles provided by the Company, 7.87 percent of workers use boat and the rest go by car, scooter or train. The same pattern is evident in the monthly travelling expenses of workers. About 35.91 percent employees do not incur any expenses for the journey, 26.84 percent spend less than Rs.10/- p.m. and 25.51 percent between Rs.10 to 25 p.m. as travelling expenses for their journey to work spot and back. Time taken for the journey, however, cannot be related to the distance in this region due to the existence of vast areas under water sheets. The journey time depends on the conveyance used. Nearly 23.86 percent of workers stay within a distance which need only 15 minutes or less to cover. About 39.16 percent of workers stay within an area of 15 to 30 minutes journey. The places of residence of 29.24 percent workers are at a distance that can be covered within half to one hour and the rest stay farther away from the work spot.

8.10. Thus the analysis of the commutation of workers reveals that it has not yet figured as a serious problem to a majority of workers. The time or expenses are moderate. Combined with the fact that almost 48.7 percent people live in owned houses or with close relatives, the social overheads, which the factory has to spend on labour welfare, are considerably reduced. Whether this will continue to be so far long is debatable. The increasing distance from factories, housing shortage in town, bad quality of housing, lack of community facilities, tedious transportation, all these are bound to come up soon if this pace of industrialization continues. However, this has to be viewed in a larger perspective. Individual solutions to these problems by factories are bound to create more difficulties. We have, therefore, to study the overall growth of industrial areas and growth of towns which will help us to define the broader solutions to this problem.

CHAPTER-IX.

INDUSTRIALIZATION AND URBAN GROWTH.

9.1. The impact of industrialization will be manifested in all the activities of the community. By bringing a vast number of workers and families together and necessitating other services and amenities to be provided to them, industrialization will create a community of urban character. These growth centres in turn will attract more and more industries and population, ultimately resulting in a specific spatial pattern of settlement. While it is essential to know the growth pattern of individual areas, what is more important in such cases is to see the inter-action of the various

urban areas in the environs in a single framework. Since cities are dynamic metabolisms the dimension of growth brings about varying spatial relationships between one centre and the other. This variation influences the future of the region and should attract particular attention from planners.

The Urban Growth Pattern of Study Area :

9.2. The Port City of Cochin has shown this dynamic growth in the last decades. The three municipalities which constitute the major part of the new city have not only recorded staggering increase in population but also extended the boundaries to bring more and more suburbs into its fold. Table 16 gives the growth of population of these three Municipalities from 1901 to 1961. Till 1921 the growth of population has been only nominal. During the decade 1921-1931 the increase in population was of the order of 45 percent. This was the time when the port work began. 1931 to 1941 shows an increase of about 30 percent. The port work was completed in this decade and it was declared a major port in 1940. The decades following 1941 is the period in which the industrialization started.

9.3. The increase in population has essentially two dimensions - The natural increase as well as increase due to migration. A study of the inter district migration

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within Kerala State reveals that it takes place both towards rural and urban areas. The reason for migration essentially, is the availability of employment opportunities in non-agricultural pursuits. But the absence of organised industries in cities, may be the reason for the movement of population to the rural areas. If we consider the total immigrants to the urban areas of the state as 100, 23 persons were those who migrated to the urban areas of Ernakulam district and is the highest of all districts. This includes those who migrated from rural areas as well as from urban areas. Again in Ernakulam district movement from urban to urban areas within the district is also keenly felt. It may be that there is movement from small towns to bigger towns. Thus we may assume that the city of Cochin had the largest share of immigrants in the towns of the State and this can be mainly due to the industrial activity in the city and environs.

Land Use Pattern of Cochin City :

9.4. The manifold activities of the population finds spatial expression in the land use pattern and fixes up the predominant role of individual city. In the three municipal areas of Ernakulam, Mattanchery and Fort Cochin, the developed land was found to be only

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1. V. Subramania Swamy - Some aspects of migration in Kerala, Seminar on population growth in Kerala and its implications, Trivandrum, March 1965.

57 percent of the total area, the rest being taken by paddy fields, water logged areas and water sheets. The division of this land into various uses* are given below :

Land use.		Percentage of developed land
i) Residential	..	78.00
ii) Commercial	..	5.06
iii) Industrial	..	1.91
iv) Public	..	4.51
v) Parks and open spaces.		1.53
vi) Transportation	..	8.31
vii) Defence	..	0.69
	Total	100.00

*Source : Town Planning Department,
Regional Office, Cochin.

(i) Residential use consume 78 percent of the total developed land. This high figure is due to the particular type of settlement. Most of the houses are single storeyed and occupy independant compounds. The density varies from 16 p.p.a. to 200 p.p.a. When high densities approach with single storey structures the condition approximates to slum condition with conjection, lack of ventilation, light and air and poor sanitation. This is more so in Mattanchery and Fort Cochin.

ii) Commercial use take 5.06 percent of the total land. This is due to the commercial nature of the city. This includes both wholesale and retail stores, and godowns. The commercial centre not only serves the local population, but also the vast hinterland.

iii) The industrial use is confined to 1.91 percent of the total land. Most of the industries are small scale and are inter-mixed with commercial and residential uses. The locations are mostly on the foreshore of back waters. The area is rather small compared to the size of settlement, but here the land is intensively used. In fact most of the industries are choked up with lack of space for expansion. The major industries as noted earlier are in the outskirts of the city.

iv) Ernakulam is the district head-quarter and there are a number of public offices. Also Cochin is dotted with many major educational institutions, hospitals and other public buildings. This more or less justifies the use of 4.51 percent of the total developed area of the city.

v) Parks and open spaces are using only 1.53 percent of the area. This figure is very low, but the vast water sheet and paddy fields interspersed in the town compensates this shortage.

vi) Roads and railways take only 8.31 percent of the total land. This again speaks of the congestion in the transportation system. Roads are narrow and in poor condition. The National Highway 47 passes through the heart of the city. It is characterised by ribbon development even outside the municipal limits. The roads are inadequate for vehicular traffic. The traffic circulation is poor.

9.5. This description reveals that the city as such does not have much industrial activity when compared to commerce. The fact that only 1.91 percent of the total land is taken by industries while commercial use takes as much as 5.06 percent of the total land clearly shows that Cochin city is essentially a commercial centre. In fact all port cities are commercial cities. It is only the industries set up in the environs that gradually change the character.

Factors Affecting the Dynamic Growth of Cities :

9.6. Map 19 gives the distribution of urban centres in the environs of Cochin City. It is seen that all the smaller urban units scattered in the map have a population near about 20,000, whereas that of the Cochin city is about 3.5 lakhs. But the growth rates of these smaller centres also have been phenomenal. Always was only a small village of population 3800 in 1901 and has grown

to about 5 times in six decades. The industrial area of Eloor-Kalamassery is situated midway between Cochin and Alwaye. The industrial area of Ambalamukal is near the urban centre of Trippunithura. Other centres are also distributed more or less at distance of about 10 to 12 miles. Out of this only Cochin and Alwaye are connected by National Highway 47 and broad-gauge line. Trippurithura is connected to Cochin by provincial highway and metre-gauge line. Other centres have no direct connection with Cochin city.

9.7. The slow and natural growth of a city will take place along all directions gradually moulding it into a circle, in the case of port cities into a semicircle. But if the surroundings are not uniform, if there are lines of easier organised transportation, the dynamic growth of the city will take place first along the axes of easier transportation creating a star like configuration.² It is also necessary to know how the city grows in conjunction with other settlements in its environs. If we take the former argument it may be deduced that smaller centres will grow along the lines of transportation connecting to the larger city gradually filling the gap between them. With this process continuing for many decades the composite city takes several shapes in

2. C.A. Doxiadis, The future of Copenhagen, Ekistics, Vol.15, No.89, Athens, April 1963.

different phases of evolution but in the long run tends to form a vast urban area forming a 'Megalopolis' as termed by geographer Gottmann.

9.8. It will be exaggerating to say that Cochin will develop itself into that state in the near future. But the earlier phase is definitely discernible. The dynamic character is given to the city by the industrial activity taking place in the environs. This activity brings in more and more workers, their families, and other tertiary population and is fastly closing up the gap between the urban centres. This dynamic growth is seen along Cochin-Alwaye and Cochin Trippunithura lines. Already these areas are characterised by ribbon development and it is only a matter of a decade or so when depth will be added to this growth.

9.9. It will be of interest at this juncture to analyse the concept of urban influence as referred in the Census Atlas of Kerala (Map 39) as the degree of urbanization. Herein a town having more than 1 lakh population is assumed to have urban influence extended upto a radius of 24 k.m., towns with population 50,000 to 99,999, a radius of 16 k.m. and other towns of population 10,000 - 49,999 a radius of 8 k.m. In Map 19 these circles also have been shown. According to this it appears that all the urban centres in the environs will form a contiguous urban area as the influence lines

are all encompassed within the urban influence of Cochin city. This, however, seems to be very arbitrary. The assumption of the influence circles excludes the transportation routes and their relative emphasis in particular direction. Also this excludes the impact of industries giving the cities its character of dynamic growth. In fact it is these factors which will decide the growth pattern as well as the influence of larger urban centres.

Spatial Problems Created by Dynamic Growth of Cochin :

9.10. Having assumed that Cochin city will grow as indicated in Map 19, it is of importance to see what spatial pattern will be created in the future. When the growth is restricted to the urban centres the industrial area comes on the periphery of the towns. But when this gap in the transportation routes is filled in by urban growth, the location of industries shifts itself from the periphery to the limits of the city. Here the very purpose for which these industries should be located away from the city will disappear and this will create hazards to the normal function of both the city and the industry. The industrial traffic will have to move through the urban areas and is bound to choke up the various activities therein. It is obvious that this will not be a very desirable thing. How this can be alleviated? , what are the controls to be exercised?

What are the policies to be adopted? and what could be the desirable pattern of growth in this area? all these problems will have to be faced by a team of planners, while preparing the development plan for this region. This requires spatial analyses of various other entities in the city structure, and the co-ordination of the combined results. What has been attempted so far is only to develop a technique for such an analysis.

SUMMARY OF CONCLUSIONS

1. Preconditions for Industrialization in Kerala :

It was seen in Chapter I that there exist all the preconditions necessary for rapid industrialization in Kerala State, except the availability of metallic minerals. But even in this respect, the examples of countries like Japan show that the lack of indigenous metallic minerals need not hamper this process. Technological innovations are necessary in Agrobased sector to form a base for the shift to Non-agrobased sector. The settlement pattern of the State also is ideal for diversification of industrial activity as the natural resources and population are uniformly distributed in the land.

2. Industrial Structure of the State :

The characteristic features of industrial structure in Kerala was seen in Chapter II. The industrial sector is predominated by small scale units. When compared to Non-agrobased sector, the workers are much more in Agro-based sector which, however, is characterised by low productivity. In agrobased sector the regional concentration of specific industry is also seen. Only in Ernakulam district, the non-agrobased industries hold the predominant role employing almost twice the number of workers in Agrobased sector. These industries are

technologically advanced. The prime reason for the location of these industries seems to be the proximity to the major port of Cochin.

3. Cochin and Environs :

The historical development of Cochin from a small coastal settlement to a miniature metropolis was described in Chapter III. Two factors seem to have influenced this development. The first is the geographical advantage of a natural sheltered harbour and the second the hinterland rich with spices and other cash crops. The trade through Cochin port has shown steady progress during the past and it earns a good share of foreign exchange for the Nation. The economic development of the State also hinges on this Port. The role of Cochin in the economy of the State as well as the Nation is very important and requires special considerations. In the environs of Cochin there exist all preconditions necessary for setting up industries, specially those which requires raw materials to be imported. Lack of foresight to make use of these preconditions can be detrimental to the economic development of the State.

4. Spatial Distribution of Industries in Cochin and Environs :

In Chapter IV an attempt was made to analyse the spatial distribution of industries in Cochin and environs. While analysing the growth pattern it was found that the

historical background fixed the pattern of spatial distribution. The spatial distribution was characterised by two distinct zones - one encompassing the industries mainly within the city and other on the periphery of the city. These zones are being called City Zone and Peripheral Zone respectively. Subsequent analysis also showed that Peripheral Zone was predominated by large and medium industries of chemical based, mineral based, textiles and general engineering types. These are found to be characterised by the following features :

- (i) They require large tracts of land.
- (ii) They need specialised structures.
- (iii) They utilise large amount of bulky raw materials, power and water and produce bulky finished products.
- (iv) They require effective contact with established heavy transportation system.
- (v) Their products are not perishable so that the time-distance factor to the market is not so important.
- (vi) They have no need for direct contact with retail consumers.
- (vii) Their relatively stable labour force does not fluctuate violently from season to season.
- (viii) Some of these industries also have nuisance features like noise, odour, danger of fire and problems like waste disposal.
- (ix) There is much sharing of bye-products and consequent need for clustering together.

5. Industrial Commodity flow :

The scale and nature of industries in the Peripheral Zone necessitated an analysis of the commodity flow which

was attempted in Chapter V. Herein it was found that the industries depended on raw materials brought completely from outside the area. Largest portion of the raw materials is being brought by ship and is bound to depend on the efficiency of port facilities. As per the estimate of the Port Trust, the total traffic is expected to go upto 8 to 8.5 million tonnes by 1971 and the capacity of the port to handle traffic will be only 6 to 7.5 million tonnes by that time. This is a factor which is likely to cause congestion and delay affecting the industrial growth. The provisional outlay of the Fourth Plan for Cochin is only 13.28 crores out of 234.33 crores for all the major ports. Viewing from the economic importance of the port in general and the needs of industries in particular, this allotment seems to be very negligible.

The analysis of the modes of transportation in the area revealed a shift of emphasis from waterways to roads and railways as well as pipe line. The reasons for this shift were found to be due to the geographical rigidity of waterways and the spatial shift of industries from the shores of backwaters to the interior. It was also found that the industries located in the Peripheral Zone catered for outside market more than the local market. This factor fixes up the importance of developing efficient transportation routes in the area and co-ordination of different modes of transportation for smooth commodity flow.

6. Spatial Distribution of Industries in City Zone :

Analysis of spatial distribution of industries in the City Zone attempted in Chapter VI revealed that there are three distinct areas of characteristic distribution pattern. The concentration of industries in a belt along the foreshore of backwaters (area A, Map 18) comprised of fishery and agrobased industries. It is found that these industries have the following characteristic features :

- (i) The raw materials and the finished products are bulky in nature and require cheap transportation.
- (ii) They expand and contract violently with seasonal changes.
- (iii) They are labour intensive.
- (iv) The raw materials and finished products are perishable and require minimum handling and transshipment (as in fishery).
- (v) They are export oriented and requires easy access to the harbour.

The concentration of industries in a cluster is also noted (area B, Map 18) in the City Zone. These industries comprising of general engineering, chemical and timber based are found to have the following characteristics :

- (i) They use urban land intensively.
- (ii) They can operate efficiency on a small scale and do not require large investment.
- (iii) They require close contact with the market.
- (iv) There is sharing of bye-products.

In certain areas (area C, Map 18) there is wide dispersion of industries. They consist of mainly printing and general engineering, and are found to have the following characteristics :

- (i) There is no sharing of bye-products.
- (ii) They are mostly service industries and require close contact with actual customers.
- (iii) They have no nuisance value and so can be located within residential areas.

A synthetic analysis of these industries in the City Zone also indicated a possible functional integration. The mutual association of these industries is found to be represented by a straight line when the number of units and the size of employment were plotted in a semi-logarithmic graph. It is deduced that for an increase in the number of bigger units there will be a proportionate increase in the smaller units given by the relation.

$$\text{Log } N = a - b x$$

- where
- N is the number of units
 - a is the intercept on the Y axis.
 - b is the slope of the line
 - x is the average size of employment.

7. Traditional Industries in the Area :

Poor wages and low productivity seems to hasten the decline of coir industry. On the other hand a potential

foreign market and abundance of raw material seem to re-establish the traditional fishery industry by modern innovation. In Chapter VII it was seen that the modern organised fishery industry in Kerala has shown spatial preference in Cochin due to proximity of port and sheltered backwaters. The factories are seen to be concentrated in a belt on the foreshore of Mattanchery. Lack of space for expansion seems to shift their location beyond Palluruthy bridge to the south. It is found that this location may not be suitable considering the intervention to the movement of bigger crafts by the bridge as well as congestion in the shipping channel. The expansion of this industry in a big way necessitates ancillary facilities like boat building yard and docking and repair facilities. A spatial shift towards north in the shores of Vypeen seems to be the answer to the problem faced by this industry.

8. Social Aspects of Industrialization :

Low wages, facilities for education and training provided by the State, relative absence of problems of housing and commutation, etc. seem to be the factors which helped Cochin and environs to develop as an industrial area. However the organised trade union movement has helped to focus the attention of authorities to the social aspects of industrialization. In Chapter VIII an attempt was made to indicate the importance of social policies to be evolved by the State

in the path of effective industrialization for balanced economic and social development.

9. Impact of Industries on Urban Growth :

In Chapter IX, attempt was made to synthesise the industrialization and urban growth pattern. It was found that industrialization imparts dynamism to the urban growth. This dynamic growth will take place along easier organised transportation. The tendency of growth of two urban centres, connected by an efficient transportation route will be to grow towards each other and fill in the intervening space. In the present study it was found that such a growth will take place from Cochin towards Alwaye and Trippunithura. The intervening industrial areas will then be marked by a spatial shift from its peripheral location to within the city limits causing problems for the community. This catastrophic phenomenon will be a prelude to the formation of conurbation and could be fully understood only by spatial analyses of other physical entities in city structure. As the present study is restricted to only the spatial analysis of industries, no attempt is made to give any concrete proposals.

T A B L E S

Table -1

Growth of Population of India and Kerala for 1901-1961 *

Year	I n d i a			Popula- tion in lakhs.	K e r a l a		
	Population in lakhs.	Decennial percentage variation	Geometric rate of growth(%)		Decennial percentage variation	Geometric rate of growth(%)	Kerala Popula- tion as %of India's popula- tion.
1	2	3	4	5	6	7	8
1901	2362.81	-	-	63.96	-	-	2.71
1911	2521.22	5.73	0.65	71.48	11.75	1.19	2.84
1921	2513.52	0.31	0.33	78.02	9.16	0.90	3.10
1931	2790.15	11.01	1.05	95.07	21.85	1.98	3.41
1941	3187.01	14.22	1.34	110.32	16.04	1.50	3.46
1951	3611.30	13.31	1.26	135.49	22.82	2.08	3.75
1961	4392.35	21.50	1.98	169.04	24.76	2.24	3.85

*Source : Registrar General of India, Final Population Totals, Census of India, Paper No.1, Manager of Publications, Delhi, 1962.

Table-2.

Districtwise Distribution of Agrobased Industries in Kerala(1966)

Districts	Textiles		Forest based		Other Agrobased		Total Agrobased	
	A	B	A	B	A	B	A	B
1	2	3	4	5	6	7	8	9
Cannanore	202	7,726	55	2,253	29	1,950	286	11,929
Kozhikode	24	2,377	93	4,183	84	4,949	201	11,509
Palghat	2	296	51	1,652	78	1,262	131	3,210
Trichur	8	3,845	87	1,561	131	3,800	216	9,206
Ernakulam	7	2,343	61	1,258	81	4,655	149	8,256
Kottayam	-	-	40	1,052	141	5,609	181	6,661
Alleppey	-	-	12	287	224	12,070	236	12,357
Quiloor	1	964	60	2,049	230	75,236	291	78,249
Trivandrum	10	1,239	10	365	44	4,118	64	5,722
Kerala	254	18,790	469	14,660	1,042	113,649	1,765	147,099

*Source : Bureau of Economics & Statistics, Trivandrum.

A = Number of factories.

B = Number of workers.

Table -3

Districtwise Distribution of Non-agrobased Industries in Kerala(1966)*

Districts	Chemical based		Mineral based		General Engi- neering.		Miscellaneous		Total	
	A	B	A	B	A	B	A	B	A	B
1	2	3	4	5	6	7	8	9	10	11
Cannanore	1	9	9	613	22	394	46	1,088	78	2,104
Kozrikoda	7	316	27	4,498	53	1,387	52	1,498	139	7,699
Palghat	11	325	14	710	50	1,724	46	1,710	121	4,469
Trichur	27	700	121	5,073	71	1,596	45	753	264	8,122
Ernakulam	18	5,017	36	3,422	83	5,497	79	2,688	216	16,624
Kottayam	6	199	5	479	39	994	34	864	84	2,533
Alleppey	5	57	7	139	7	207	27	338	46	741
Quilor	9	220	51	3,094	37	1,707	21	472	118	5,493
Trivandrum	3	375	5	84	31	1,609	41	1,513	80	3,581
Kerala	87	7,218	275	18,109	393	15,115	391	10,924	1,146	51,366

* Source : Bureau of Economics & Statistics, Trivandrum.

Table - 4.

Traffic Handled at the Port of Cochin During 1956-57 to 1965-66 *
(in '000 tonnes).

Year	I m p o r t s			E x p o r t s			Total Traffic.		
	Coastal	Foreign	Total	Coastal	Foreign	Total	Coastal	Foreign	Total
1956-57	791	538	1,329	127	299	426	918	837	1,755
1957-58	816	610	1,426	140	262	402	956	872	1,828
1958-59	806	549	1,355	137	316	453	943	865	1,808
1959-60	851	696	1,549	146	282	428	999	978	1,977
1960-61	913	709	1,622	150	238	388	1,063	947	2,010
1961-62	1,018	859	1,877	168	240	408	1,186	1,099	2,285
1962-63	1,031	928	1,959	146	257	403	1,177	1,185	2,362
1963-64	1,157	877	2,034	156	265	421	1,313	1,142	2,455
1964-65	1,074	1,186	2,260	191	260	451	1,265	1,446	2,711
1965-66	1,050	1,362	2,412	195	264	459	1,245	1,626	2,871

*Source : India Ports and Shipping Statistics, Transport Research Division, Calcutta, Ministry of Transport & Shipping No.2, April 1967.

Table- 5

Principal Imports of Cochin Port for the past six years. *

S.No.	Commodities.	1960-61 M.T.	1961-62 M.T.	1962-63 M.T.	1963-64 M.T.	1964-65 M.T.	1965-66 M.T.
1	2	3	4	5	6	7	8
1.	Rice and Paddy	75,593	1,84,088	99,214	54,667	1,64,097	2,86,059
2.	Other grains including pulses & flour	36,602	34,216	32,009	27,488	1,73,903	2,93,662
3.	Coal ..	3,49,820	3,32,956	3,67,843	3,67,385	2,96,154	1,92,431
4.	Sugar	234	12,277	23,188	3,706	93	199
5.	Machinery, Hardware & etc.	57,304	56,780	59,721	82,703	97,395	68,508
6.	Cashew nuts.	64,566	75,231	1,07,281	1,33,612	1,34,028	1,12,567
7.	Motor Vehicles.	58	208	646	217	565	564
8.	Chemicals & its preparations.	60,657	60,688	6,674	7,358	6,975	10,310
9.	Drugs & Medicines.	1,611	1,494	1,277	1,186	858	814
10.	Oil Seeds including Copra ground-nut.	24,809	23,578	25,573	10,385	8,984	15,771
11.	Paint & Dyes.	1,373	1,799	1,654	1,552	1,278	1,028
12.	Paper, old News Paper and Stationery.	9,226	12,010	10,304	10,865	11,012	8,544
13.	Cotton goods & Yarn.	2,460	2,639	2,357	2,083	1,703	1,126
14.	Cotton Raw	32,848	36,648	33,030	32,872	25,810	15,592
15.	Plywood & Timber	113	59	374	27	127	-
16.	Provisions & Spices.	1,553	7,138	4,838	6,740	8,337	5,122
17.	Manure	1,19,329	1,24,612	1,87,697	1,63,137	1,46,666	1,67,521
18.	Tobacco including cigar & cigarettes.	3,764	2,901	3,136	2,750	2,811	1,679
19.	Oil Cakes.	5,395	2,091	1,478	851	441	195
20.	Salt	21,615	28,893	22,547	30,865	32,005	25,896
21.	Miscellaneous.	7,52,331	8,78,285	9,68,578	1093,862	11,47,285	12,05,175
	Total	16,21,261	18,77,591	19,59,389	20,34,311	22,60,827	24,12,763.

*Source: Cochin Port Trust.

Table-6.

Principal Exports from the Port of Cochin for the past
Six Years. *

S.No.	Commodities.	1960-61 M.T.	1961-62 M.T.	1962-63 M.T.	1963-64 M.T.	1964-65 M.T.	1965-66 M.T.
1	2	3	4	5	6	7	8
1.	Coir produce	62,566	65,276	67,189	69,025	70,907	68,448
2.	Teak	39,363	38,261	47,684	46,224	41,076	48,822
3.	Coconut Oil.	14,874	16,250	12,296	11,296	12,445	10,064
4.	Rubber	23,598	23,529	26,362	28,966	33,043	41,363
5.	Coconuts.	20,375	25,867	20,625	15,115	22,400	18,546
6.	Cashew Kernels.	42,541	46,489	54,564	54,416	65,101	61,936
7.	Oil Cakes.	3,896	2,505	4,116	3,428	3,476	2,885
8.	Prawns-skinned.	4,208	6,399	8,322	9,814	12,303	12,834
9.	Cotton-raw	1,610	694	1,704	2,412	1,662	1,246
10.	Cotton waste.	5,142	8,198	5,042	3,863	3,542	3,440
11.	Rice, Paddy & other grains.	3	15	436	861	1,736	1,355
12.	Pepper	17,648	17,983	13,936	19,208	19,353	27,379
13.	Ginger	7,177	8,282	6,906	6,463	5,808	6,604
14.	Turmeric	653	651	949	890	622	1,189
15.	Nux-vomica	220	254	88	145	197	145
16.	Lemon-grass oil	1,065	960	1,298	843	1,173	866
17.	Cashew shell liquid	5,455	6,080	7,290	9,438	14,600	13,222
18.	Coffee	5,036	6,276	7,782	9,863	10,890	11,352
19.	Copra	9,210	16,301	7,430	11,577	20,775	29,059
20.	Timber & Wooden shooks.	6,627	6,493	8,528	7,577	8,997	11,212
21.	Tile & Bricks.	1,721	735	37	806	944	475
22.	Cement	1,089	1,551	2,476	2,996	17,146	15,188
23.	Mineral sand inclu- ding Magnesite.	53,437	40,779	35,142	23,061	5,920	10,455
24.	Miscellaneous	59,894	67,859	58,026	83,428	76,972	61,030
	Total	3,87,408	4,07,687	4,03,268	4,21,715	4,51,088	4,59,115
	Bunkers.	78,768	89,592	86,713	90,689	1,27,120	81,933

* Source: Cochin Port Trust.

Table - 7.

Traffic Handled at the major Ports during 1960-61 to 1965-66*
(in '000 tonnes).

Year	Calcutta	Vishakha- patnam.	Madras	Cochin	Marmugoa	Bombay	Khandla	Total
1	2	3	4	5	6	7	8	9
1960-61	9,541	2,764	3,039	2,008	6,404	14,632	1,597	39,985
1961-62	9,198	2,780	3,467	2,286	6,500	14,196	1,409	39,836
1962-63	10,091	2,148	3,785	2,362	5,459	16,184	1,771	42,800
1963-64	10,799	3,365	4,166	2,456	5,854	17,715	1,808	46,163
1964-65	10,928	3,741	4,398	2,712	6,620	18,879	2,312	49,590
1965-66	9,728	4,460	4,872	2,872	7,867	17,910	2,505	50,214
Rate of growth in 6 years(%).	1.9	60.8	60.5	43.0	23.0	22.5	63.0	25.5
Surplus or Deficit in earnings in 65-66(₹ in lakhs).+	(-)174.30	(+)33.16	(+)29.29	(+)49.44	(++)22.89	(+)359.41	(+)24.74	(+)344.63

Source : * India Ports & Shipping Statistics, Transport Research Division, Calcutta, April 1967, Vol.2.
+ INDIA, 1967, Publication Division, Ministry of Information & Broad Casting, Delhi, 1967.

Table -8.

Distribution of workers among small, medium and large factories in Cochin and
Environs by type of Industries (1966)*

Type of Industry	Percentage of Workers in			Total
	Small Factories less than 100 workers.	Medium factories (100-499 workers).	Large factories (more than 100 workers).	
1	2	3	4	5
Fisheries	29.8	79.2	N11	100.00
Agrobased	32.0	68.0	N11	100.00
Forest based	66.0	34.0	N11	100.00
Printing	58.5	41.5	N11	100.00
Mineral based & Extraction.	22.0	38.0	40.0	100.00
General Engineering	35.5	25.0	39.5	100.00
Chemical based	9.3	17.4	73.3	100.00
Textiles.	3.0	23.0	74.0	100.00

*Source : Computed from list of Factories and average workers per factory in different employment slab in the State.

Table-9.

Total traffic (in tonnes) generated by different types of industries
in Cochin and environs 1965-66. *

Type of industries.	Unit	Total traffic tonnes.	%age of total traffic.
Agrobased ...	22	1,38,957	2.91
Textiles ...	5	7,170	0.15
Forest based ...	7	18,559	0.39
Chemicals ...	10	5,33,588	11.2
Minerals ...	10	84,131	1.76
Engineering ...	17	62,159	1.3
Refinery & extraction..	3	29,56,850	61.9
Storage and distribution	3	6,03,248	12.6
Sea food ...	5	20,943	0.44
Service ...	11	3,51,912	7.35
<u>Total</u> ...	93	<u>47,77,517</u>	<u>100.00</u>

*Source : Town Planning Department, Regional Office, Cochin.

Table -10.

Total Commodity Traffic For Various Industries
Located in Eloor-Kalamassery Area & Ambalamukal Area,
(1965-66)*

Mode of Transportation		Traffic (Tonnes)
1		2
<u>Eloor-Kalamassery :</u>		
Road	...	1,81,179
Ship and Road	...	68,508
Rail & Road	...	1,28,587
Inland water	...	79,207
Ship and inland water..		1,48,135
Total	...	6,05,616
<hr/>		
<u>Ambalamukal :</u>		
Road	...	2,79,400
Railway	...	10,26,500
Pipe lines	...	15,90,000 +
Total	...	28,95,900

+ Corresponds to 1966-67.

* Source : Deptt.of Town Planning, Regional Office,
 Cochin.

Table- 11.

Total Marine Fish landing in India,
in 1965.

State	Fish landing in tonnes.
1	2
<u>East Coast :</u>	
West Bengal ...	12,244
Andhra Pradesh ...	76,477
Madras ...	179,215
Total East Coast ...	167,935
<u>West Coast :</u>	
Madras ...	19,804
Kerala ...	339,173
Mysore ...	68,476
Maharashtra ...	131,907
Gujerat ...	80,590
Trawlers ...	Not available.
Total west Coast ...	639,950
Grand Total ...	807,885

* Source : Seafood Journal, Vol. 11, No. 1,
Jan. 1967, Cochin.

Table - 12.

Growth of Educational Institutions in Engineering
and Technology *

S.No.	Item.	1956-57	1960-61	1965-66
1	2	3	4	5
1.	Engineering College.	1	4	6
2.	Pupils in Engineering Colleges.	338	1,888	5,105
3.	Other Engineering Institutions (Polytechnics & ITI)	10	22	35
4.	Pupils in Polytechnics and I.T.I.	1,568	7,037	9,882
5.	Technology Schools	5	88	71
6.	Pupils in Technology Schools	373	3,310	2,453

* Source : Basic Statistics Relating to Kerala Economy 1956-57 to 1965-66, Bureau of Economics & Statistics, Trivandrum, 1968.

Table-13.

Earnings of Factory Employees* Earning less than
Rs.400 per month.**

State/Union Territory.	Per capita daily earning in rupees		Percentage variation in earning
	1965	1964	1964 to 1965
1	2	3	4
Andhra Pradesh	3.19	3.23	- 1.2
Assam	4.80	3.62	+ 32.6
Bihar	5.94	5.28	+ 12.5
Gujerat	6.69	5.92	+ 13.0
Jammu & Kashmir	3.14	3.02	+ 4.0
Kerala	3.54	3.15	+ 12.4
Madhya Pradesh	5.70	6.45	- 11.6
Madras	6.30	5.07	+ 24.3
Maharashtra	7.29	6.52	+ 11.8
Mysore	5.81	5.31	+ 9.4
Orissa	5.33	3.81	+ 39.9
Punjab	5.41	4.59	+ 19.2
Rajasthan	4.95	4.41	+ 12.2
Utter Pradesh	5.55	4.99	+ 11.2
West Bengal	5.99	4.55	+ 9.9
Andaman-Nicobar Islands	5.57	4.54	+ 22.7
Delhi	7.18	5.83	+ 23.2
Himachal Pradesh	3.29	4.46	- 26.2
Tripura	2.15	2.21	- 2.7
All India	6.13	5.24	+ 13.1

* Including employees in Defence Factories, but excluding those in Railway Work-shops.

** Source : Annual Returns under the payment of Wages Act, 1936, (An Economic Review, Kerala 1967, Bureau of Economics & Statistics, Trivandrum).

Table - 14.

Employment and earnings of workers covered by the payment of Wages Act 1946 for the year 1966 (persons drawing less than Rs.400/- a month).

Sr. No.	Industry	Average daily earnings Rs
1.	Canning and preservation of fruits & veg.	1.90
2.	Canning and preservation of fish and other seafoods.	5.54
3.	Rice and flour mills	2.75
4.	Sugar	7.23
5.	Oil Mills	3.43
6.	Tea Factories	3.14
7.	Cashew	2.14
8.	Starch & other food articles.	3.50
9.	Bidi Cigar	4.08
10.	Cotton Textiles.	5.28
11.	Coir	4.56
12.	Knitting	2.52
13.	Other textiles	10.27
14.	Umbrellas	3.27
15.	Saw mills.	4.51
16.	Plywood	4.50
17.	Other timber industries.	2.53
18.	Paper mills	6.14
19.	Paper products	4.36
20.	Printing & binding	4.93
21.	Rubber products	5.54
22.	Artificial manures	7.11
23.	Pharmaceuticals	4.42
24.	Soap	10.22
25.	Other chemicals	9.29
26.	Petroleum & refineries.	12.37
27.	Bricks & tiles.	3.88
28.	Glass	5.71
29.	Pttery & earthernware	3.80
30.	Cement	Not available.
31.	Basic metal industries.	8.88
32.	Metal products.	4.54
33.	Agricultural impliments.	3.69
34.	General Engineering.	4.95
35.	Other machineries.	8.12
36.	Electrical machineries.	5.40
37.	Marine engines	8.33
38.	Repairs of motor vehicles.	4.90
39.	Manufacture of bye-cycles.	4.12
40.	Other industries.	9.40
	<u>Total</u>	----- 4.69

Source : Bureau of Economics & Statistics, Trivandrum.

Table-15.

Willingness of Workers in Different Slabs of
Salary to Shift to Factory Quarters, if Provided. *

Monthly Salary	Total Workers.	Percentage of workers to total workers willing to shift to factory quarters.
1	2	3
Less than Rs.100/-	4.04	3.26
100 - 149	25.51	18.17
150-199	29.39	19.18
200 - 249	19.01	8.50
250 - 299	11.06	3.98
300 - 399	5.84	2.93
400 - 499	2.93	1.36
500 - 749	1.57	0.66
750 - 999	0.44	0.15
1000 and above	0.21	0.04
<u>Total</u>	<u>100.00</u>	<u>58.23</u>

*Source : T.P.Department, Regional Office, Cochin.

Table -16.

Growth of Population of Ernakulam, Mattanchery
and Fort Cochin Municipalities (1901-1961)*

Year	Ernakulam	Mattanchery	Fort Cochin	Total
1	2	3	4	5
1901	21,901	20,061	19,274	61,236
1911	21,195	23,508	20,023	64,726
1921	23,192	24,664	20,637	68,493
1931	36,638	39,645	22,818	99,101
1941	46,790	53,346	26,320	1,26,456
1951	62,281	73,904	29,881	1,66,066
1961	1,17,253	83,896	35,076	2,36,225

*Source : Decennial Census Report,
Census of India (1961).

APPENDIX-I.

Industries employing more than 500 workers
in Cochin and environs (1966).*

<u>S.No.</u>	<u>Name</u>	<u>Manufacturing Process</u>	<u>Location</u>
1	Ashoka Textiles, Always.	Cotton Textiles	Peripheral Zone.
2	Chalkolas Spinning & Weaving Mills, Kalamassery.	-do-	-do-
3	Premier Tyres Ltd., Kalamassery.	Tyres.	-do-
4	Fertilizers & Chemicals Trawancore Ltd. Eloor.	Fertilizers.	-do-
5	Travancore Cochin Chemicals, Always.	Caustic Soda, & other chemicals.	-do-
6	Indian Aluminium Co. Ltd. Alupuram, Always.	Aluminium metal & extruded sections.	-do-
7	H.M.T. Ltd. Kalamassery.	Machine tools.	-do-
8.	Naval Armament Depot Edathala, Always	Repair & Maintenance.	-do-
9	The Tata Oil Mills Co. Tatapuram, Ernakulam.	Soap, Oil refining & hydrogenation.	City Zone.
10	Cochin Harbour Workshop Wellington Island.	Repair & Maintenance.	City Zone.

* Source : Inspector of Factories, Trivandrum.

APPENDIX-II.

Industries Employing 100 to 499 Workers
in Cochin & Environs(1966).*

<u>S.No.</u>	<u>Name</u>	<u>Manufacturing process.</u>	<u>Location</u>
1	Mackar Pillai & Sons, Alwaye.	Cashew	Peripheral Zone.
2	Ramnath & Co.,Alwaye.	-do-	-do-
3	Kathayee Cotton Mills Alwaye.	Textiles.	-do-
4	Travancore Chemicals Mfg.Co,Alwaye.	Chemicals.	-do-
5	Cochin Refineries Ltd. Ambalamukal.	Refining Crude petroleum.	-do-
6	Standard Pottery Works (P) Ltd.,Alwaye.	Ceramics.	-do-
7	G.T.N.Textiles,Alwaye.	Textiles.	R -do-
8	Indian Rare Earths,Eloor.	Processing mono- zite sand.	-do-
9	Hindustan Insecticide Ltd. Udyogmandal.	D.D.T.	-do-
10	Sheshasayee Wire Ropes Alwaye.	Steel Wire Ropes.	-do-
11	Thermo Electric Equipments Trippunithura.	Electrical equipments.	-do-
12	K.S.R.T.Workshop,Alwaye	Repair & Mainten- ance.	-do-
13	New India Fisheries Cochin-5.	Processing Seafood.	City Zone.
14	Indo-marine Agencies, Cochin-2.	-do-	-do-
15	Cochin Co.Ltd.,Cochin-2.	-do-	-do-
16	Kerala food packets (P)Ltd. Cochin-5.	-do-	-do-

contd.

<u>S.No.</u>	<u>Name</u>	<u>Manufacturing Process.</u>	<u>Location</u>
17	Indo Marine Agencies (P) Ltd.Cochin-5.	Processing Seafood.	City Zone.
18	Island Seafoods(P)Ltd. Cochin-1.	-do-	-do-
19	Volkart (India)P.Ltd. Cochin.	Coir mats.	-do-
20	Aspin wall & Co.Ltd. Fort Cochin.	-do-	-do-
21	Gundu Island Coir Products Co-op.Society,Cochin.	-do-	-do-
22	Pierce Laslie & Co.Ltd. Cochin-1.	-do-	-do-
23	Geo fabrics,Edacochin, Cochin-5.	-do-	-do-
24	Naval Store Depot, Wellington Island.	Furniture	-do-
25	Govt.Press,Ernakulam	Printing.	-do-
26	Mathrubhoomi Press,Kaloor.	-do-	-do-
27	Burma Shell Oil Installa- tion, Ernakulam.	Storage & Distribution.	-do-
28	Tata Fison Industries, Cochin-5.	Copper-dust.	-do-
29.	Geovanola Bnney Ltd. Cochin-5.	Pen Stock pipes.	-do-
30	Base Repair Organization Wellington Island.	Repair & Mainte- nance.	-do-
31	Caltex (India) Ltd., Ernakulam.	Storage & distribution.	-do-
32	Brunton & Co.Ltd., Cochin-1.	Boat Building.	-do-
33	Naval Aircraft Repair Organization.	Repair & Mainte- nance.	-do-
34.	Code tail cashew Co. Ernakulam.	Repair of Machines	-do-

* Source: Inspector of Factories,Trivandrum.

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