TRAFFIC & TRANSPORTATION PROBLEMS IN METROPOLITAN CITIES

METROPOLITAN TRANSPORT 1
COMMITTEE ON PLAN PROJECTS
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SUMMARY OF CONTENTS

INTRODUCTION

The Study Team on Metropolitan Transport was set up by the Planning Commission in September, 1965 under the aegis of the Committee on Plan Projects. The terms of reference of the Study Team are as follows :

(a) to assess the adequacy and limitation/ deficiency of existing transport facilities in relation to present needs in the cities of Calcutta, Bombay, Madras and Delhi, including roads, road transport and rail transport;

(b) to determine the long-term requirements of passenger and goods transport in these cities, having due regard to the overall plans of metropolitan development and location of industrial, commercial and other activities;

(c) to study the feasibility of various proposals for meeting requirements for different media of transport and to recommend phased programmes for the development of the facilities needed, including estimates of costs and returns, methods of financing and scheme of execution;

(d) to propose appropriate administrative and other arrangements for the operation of metropolitan transport services; and

(e) to make such other recommendations as may be necessary.

2. Shri P. H. Sarma, formerly General Manager, Northern Railway, was appointed Leader of the Study Team but soon after, he resigned due to personal reasons. Shri A. V. D'Costa, formerly Chief Engineer of the Central Railway, took over as Leader of the Team. The present composition* of the Study Team is as follows:

Leader

Shri A. V. D'Costa, (Formerly Chief Engineer, Central Railway)

Members:

Gen. Harkirat Singh, Adviser (Construction), Planning Commission.

Shri K. K. Nambiar, Associated Cement Companies, Bombay.

Dr. B. Datta, (Formerly Member, Finance Commission), Secretary, Education Department, Government of West Bengal.

Shri J. M. Trehan, Chief Engineer (Roads), Ministry of Transport.

Shri K. L. Luthra, Chief, Transport Division, Planning Commission.

Shri K. A. Khan, Additional General Manager, Delhi Transport Undertaking.

Dr. V. G. Bhatia, Director, Transport Research, Ministry of Transport.

Shri B. G. Fernandes, Town and Country Planner, Ministry of Works, Housing and Urban Development.

Shri K. Devanathan, Joint Director, Ministry of Railways.

Secretary

Shri S. B. Saharya, Planning Commission.

3. Technological developments in transport are responsible to a large extent, for the present complexities in the field of urban transportation. The most important of these is the result of the growing dominance of motorised transport which has brought about a radical change in the general structure of urban area. It has led to severe repercussions on land use and economic activity. This has been accompanied by a shifting of population from the central core areas of the city to the suburbs. There has also been a marked shift in the employment patterns in the central city areas with a corresponding change in their economic functions. It has created the present problem of intense concentration of

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*The Government of India Resolution dated the 1st October, 1965 appointing the Study Team is given in Appendix I.

Due to the death of Shri K. G. S. Iyer, Joint Director (Traffic Research), Railway Board, in an air crash in January, 1966, Shri K. Devanathan took over as Member of the Team.

Owing to retirement of Shri Goverdhan Lal, Shri J. M. Trehan, Chief Engineer (Roads), Ministry of Transport, assumed Membership of the Team.

traffic in the metropolitan centre along with further demands for suburban mobility and commutation service between suburbs and the main centre of activity.

4. There is thus, pressing need to devise suitable transportation plans for urban areas to facilitate daily movement of people, goods and vehicles quickly, cheaply and efficiently, through and within a metropolitan area in order to keep pace with rapid industrial development of the country. The general urban transportation plan not merely deals with traffic channels which are of particular importance to various sections of the city. It also involves a terminal system where long-distance traffic is collected and distributed. Hence the needs of both types of traffic have to be taken into account. It is obvious that the transportation system for a large city has to be planned as a whole to provide adequate facilities for production and distribution of goods, rendering of services to business and to individuals, and efficient local movement of people in peak hours.

Studies in Foreign Countries

5. Problems of metropolitan transport are receiving intensive study in countries like the U.S.A., U.K. and Japan. In U.S.A., the Committee on Economic Development produced some time back a policy statement on 'Developing Metropolitan Transportation Policies.' Some of the transportation studies conducted in important U.S. metropolitan cities, such as the Pittsburgh Area Transportation Study, the Chicago Area Transportation Study, and the Penn-Jersey Study focussed on Philadelphia, are notable. They are applied over large areas, covering number of small authorities in whose hands the zoning decisions lie. The objectives of these studies were, "first to predict the forms that development will take as a result of the play of the property market and the likely decisions of the Zoning authorities; then to forecast the consequences in terms of movement in the general sense; and finally to interpret the movement needs in terms of transport systems, that is to say, to produce actual proposals for roads, railways etc., to meet the movement needs". These studies are highly organised and costly, involving the collecting and processing of vast quantities of facts and figures with the help of computer techniques. The U.K. Government published in 1963 an important report entitled "Traffic in Towns" which is a pioneer study of the long-term problems of traffic in urban areas. It also indicates the direction in which thought should be turned and further research undertaken.

Long-Term Transportation Planning

6. The long-range transportation planning for a metropolitan region requires a comprehensive study and careful analysis of probable traffic flows and needs related to growth of urban area and land use, population and economic level. The planning process includes collection of basic data arising out of the trip surveys, the land-use survey and of existing travel facilities inventory. The trip-surveys consist of the home interview, truck-taxi and road-side interview surveys which relate to question about origin and destination of each trip, mode of travel, trip purpose etc. The land-use survey gives information about the types and amount of land-use activities and also helps in understanding the comparative trip generating characteristics and linkages between all types of land uses. The study of existing travel facilities will indicate the capacity and quality of existing highways and mass transportation routes. The future need for the travel facilities can only be established if the present situation is known. The data collected as a result of such surveys have to be supplemented with facts relating to trends in employment, population, number of vehicles etc. These facts not only help in appreciating the problem but also provide the means for more accurate estimates of the future. After critical analysis of the data thus collected, it will be possible to project future travel demand and evolve a suitable metropolitan transportation plan. Detailed location and design studies have to be done as soon as the plan is finalised.

Approach to the Task

7. For a long time, the State Governments have tended to look at the problem of traffic in the metropolitan towns with anxiety and helplessness. Architects and planners have, no doubt, brought forward a stream of ideas but so far, no unified view has been taken of the highway and mass transportation facilities in the context of a total metropolitan transportation system. Therefore, the importance of comprehensive and integrated transport planning has to be fully realised.

8. At the instance of the Metropolitan Transport Team, Study Groups consisting of high level experts in different fields were set up by the respective State Governments (the detailed composition of the Study Groups for each metropolitan city is given in Appendix II). The object in associating the State Study Groups was to facilitate the task entrusted to the Team by providing it with the basic data, such as the present traffic needs, land usage and the changes likely to take place in the pattern and composition of the

needs and developments over the next 20 to 25 years. A list of points on which basic information was required in regard to each city, was drawn up and forwarded to the respective State Study Groups.

9. It was realised that the basic data which should help in identifying the main problems and preparing a base to evolve a suitable mass transport structure, was not available in case of Bombay, Madras and Delhi. The Study Team, therefore, felt the need for having comprehensive traffic surveys in each of the above cities. However, in case of Calcutta, detailed traffic studies have already been done. The Team has now suggested certain engineering feasibility surveys—one for providing an electrified railway dispersal line and the other for a rapid transit system.

Interim Report

10. While the terms of reference of the Study Team do not specifically require an Interim Report, it is recognised that the studies and surveys which the Team has proposed for the various cities are complex and time consuming. Meanwhile, the traffic problems will further outgrow the capacities of the various existing facilities, thereby creating more confusion. It has to be realised that the traffic situation in most of these cities has already reached such a critical stage that some immediate remedial measures are necessary. Delay in tackling these problems is likely to create further obstacles in the successful realisation of a long-range comprehensive transportation plan.

11. The Team, therefore, thought of bringing out an Interim Report with the hope that its recommendations will assist in the formulation of the Fourth Plan in its final stages. The Interim Report is generally evaluative. Such problems which are common to all the four cities have been identified. A programme has been proposed for execution during the Fourth Plan which will help in solving their immediate needs. An attempt has been made to designate the adjustments necessary to link the existing facilities and the short-term proposals into an integrated single system. Several useful proposals have been made in the past by various bodies and these have been woven into an integrated system. Care has, however, been taken that the short-term programme does fit in the long-term transportation plan that the Team is expected to draw up as a result of various studies and surveys. The Team considers the surveys and studies suggested in the Chapters that follow, to be a necessary foundation for effective planning of the transport system in metropolitan cities of Calcutta, Bombay, Madras and Delhi.

12. It is expected that the above studies and surveys would take about 18 to 24 months to complete. The Team has, therefore, proposed a phased programme of studies which will ensure continuous flow of data. This would enable the Team to make recommendations on urgent problems from time to time. Finally, based on these studies a comprehensive metropolitan transport plan would be evolved.

Acknowledgements

The Study Team gratefully acknowledges the assistance and co-operation received from the Ministries of Railways and Transport, the State Governments, the State Study Groups, the management of Zonal Railways, Port Commissioners, Central Road Research Institute, the Calcutta Metropolitan Planning Organisation and other officials and non-officials. The Team trusts that all these agencies will continue to extend their co-operation to the Team for the completion of the task assigned to it.


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CHAPTER II

METROPOLITAN GROWTH AND TRANSPORTATION PROBLEMS


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Chapter I

METROPOLITAN GROWTH AND TRANSPORTATION PROBLEMS

Throughout India, population have been moving from sparsely settled rural areas into complex and densely crowded urban centres in search of employment because of low standards of rural living in the country. The 1961 census showed that 79 million or 18 per cent of the total population of India was urban. Of these, nearly 48 per cent lived in the cities with population of 100,000 and above. About 20 million people or one fourth of the entire urban population were concentrated in 12 metropolitan cities with a population of 500,000 or more *viz.*, Calcutta, Bombay, Delhi, Madras, Hyderabad, Ahmedabad, Bangalore, Kanpur, Poona, Lucknow, Nagpur and Agra.

The urban population increased by 16·5 million or 26·41 per cent during the preceding decade; the cities with population over 100,000 however, registered the highest growth (Refer Table 1). This suggests a flow of migrants from the smaller towns to cities as much as from the rural to urban areas. Given an acceleration in the current rate of urban growth which must be expected with more rapid industrialisation, it is likely that the urban population of India will have increased to 174 million[1] by 1981.

table 1

Growth of urban population by classes of towns (1931—1961)

(population in million)

year	urban population	percentage variation	class I (100,000 & above)	percentage variation	class II (50,000-100,000)	percentage variation	class III (20,000-50,000)	percentage variation
1931	33·46	..	9·50	..	4·11	..	6·00	..
1941	44·15	31·97	16·00	68·49	5·12	24·59	7·74	28·99
1951	62·44	41·43	26·43	65·12	6·74	31·58	10·44	34·78
1961	78·94	26·41	38·18	44·47	9·79	39·26	14·63	40·14
increase from 1931 to 1961	..	135·94	..	301·95	..	138·01	..	143·64

Source : Census of India, 1961

1.1. The economic development policies have not directed sufficient attention to a more balanced spatial distribution of industries to forestall the urbanisation that accompanies concentration of industry. The fact that large cities already exist, has created a tendency to further centralise industrial developments in them. This is evident particularly, in Bombay's growth pattern as has been pointed out by the Gadgil Committee[2] that "Government action has been responsible for aggravating the situation on the Island of Bombay created by concentrated licensing of industrial establishments". The Report further adds, "We understand, for example, that even in spite of the Study Group Report[3], 24 of the 41 industrial licences granted in 1963 were granted for units in the Greater Bombay. In the year 1964, out of the 37 industrial licences granted for new units in the State, 8 were for units located in Greater Bombay. In the same year, out of the 146 industrial licences granted in the State for substantial expansion in the existing units or manufacture of new articles in the existing units, 102 were for units located in Greater Bombay".

[1] *Projected Urban Population in "Dimensions of Growth" (P. 16)*

[2] *Report of the Committee appointed for Regional plans for Bombay-Panvel and Poona Regions* (1956)

[3] *Barve Committee Report* (1959).

Between 1952—64, out of about 4,000 industrial units licensed in the country, nearly 42 per cent were located in cities of one million and above. Consequently, the metropolitan cities have grown at a substantially faster rate than the country's medium or smaller sized urban centres.

Growth of Metropolitan Cities

1.2. While the urban population of India as a whole recorded an increase of about 136 per cent in the thirty year period (1931—61) the percentage increase of the four metropolitan cities (Calcutta, Bombay, Delhi and Madras) was 206 during the same period (Refer Table 2). Greater Bombay more than trebled its population since 1931. Particularly, phenomenal rise in population has been that of Delhi. From 0·45 million in 1931, its population increased to 2·36 million in 1961 thus recording an increase of more than 400 per cent. The population of Calcutta and Madras also more than doubled in the thirty year period.

table 2

Growth of the four metropolitan cities (1931-1961).

(population in million)

city	1931	1941	1951	1961	percentage increase 1931—61
Greater Bombay	1·27	1·69	2·97	4·15	227·44
Calcutta	1·22	2·17	2·69	2·93	139·72
Delhi	0.45	0·69	1·44	2·36	427·74
Madras	0·71	0·86	1·42	1·73	142·49
total of four cities	3·65	5·40	8·52	11·17	206·03
total urban population	33·46	44·15	62·44	78·94	135·94
class I cities	9·50	10·00	26·43	38·18	301·95

Source : *Census of India*, 1961.

1.3. The living conditions in these metropolitan cities have become increasingly difficult as a result of growing concentration of population and economic activities in them. The population density in Calcutta city is as high as 28,759 persons per sq. km. Though Greater Bombay and Delhi have on an average densities of 9,597 and 7,314 persons per sq. km. respectively, 60 per cent of Greater Bombay's population is concentrated on the Island city measuring 66·6 sq. kms. while in Delhi 60 per cent of its population is concentrated in an area of less than 18 sq. kms.

1.4. The economic activities of these metropolitan cities are concentrated in even much smaller areas. While the number of workers, particularly in the central district has kept pace with the growth of population, the central areas have not significantly increased in area. Table 3 indicates an upward trend in the number of workers specially in the secondary and tertiary sectors of the economy during the last three decades.

table 3

Comparative statement of the workers in the main industrial categories from 1931 *to* 1961

city	year	workers	primary	secondary	tertiary
Greater Bombay	1931	598,920	11,679	179,151	408,090
	1951	1,353,867	18,698	530,056	805,113
	1961	1,686,668	31,920	733,478	912,270
		(40·6)	(0·8)	(17·6)	(22·2)
Calcutta	1931	586,226	4,502	95,298	486,426
	1951	1,156,376	7,104	278,074	871,198
	1961	1,182,789	3,216	345,054	834,519
		(40·4)	(0·1)	(11·8)	(28·5)
Delhi	1931	181,773	10,923	51,792	119,158
	1951	515,191	3,915	150,840	360,436
	1961	746,815	11,866	200,323	536,626
		(31·7)	(0·5)	(8·5)	(22·7)
Madras	1931	338,449	11,326	51,015	276,108
	1951	436,100	11,739	116,577	307,784
	1961	526,981	7,462	162,592	354,927
		(30·5)	(0·5)	(9·5)	(20·5)

Source : *Census of India*, 1961.
note: *figures within brackets indicate percentage of workers to the total population.*

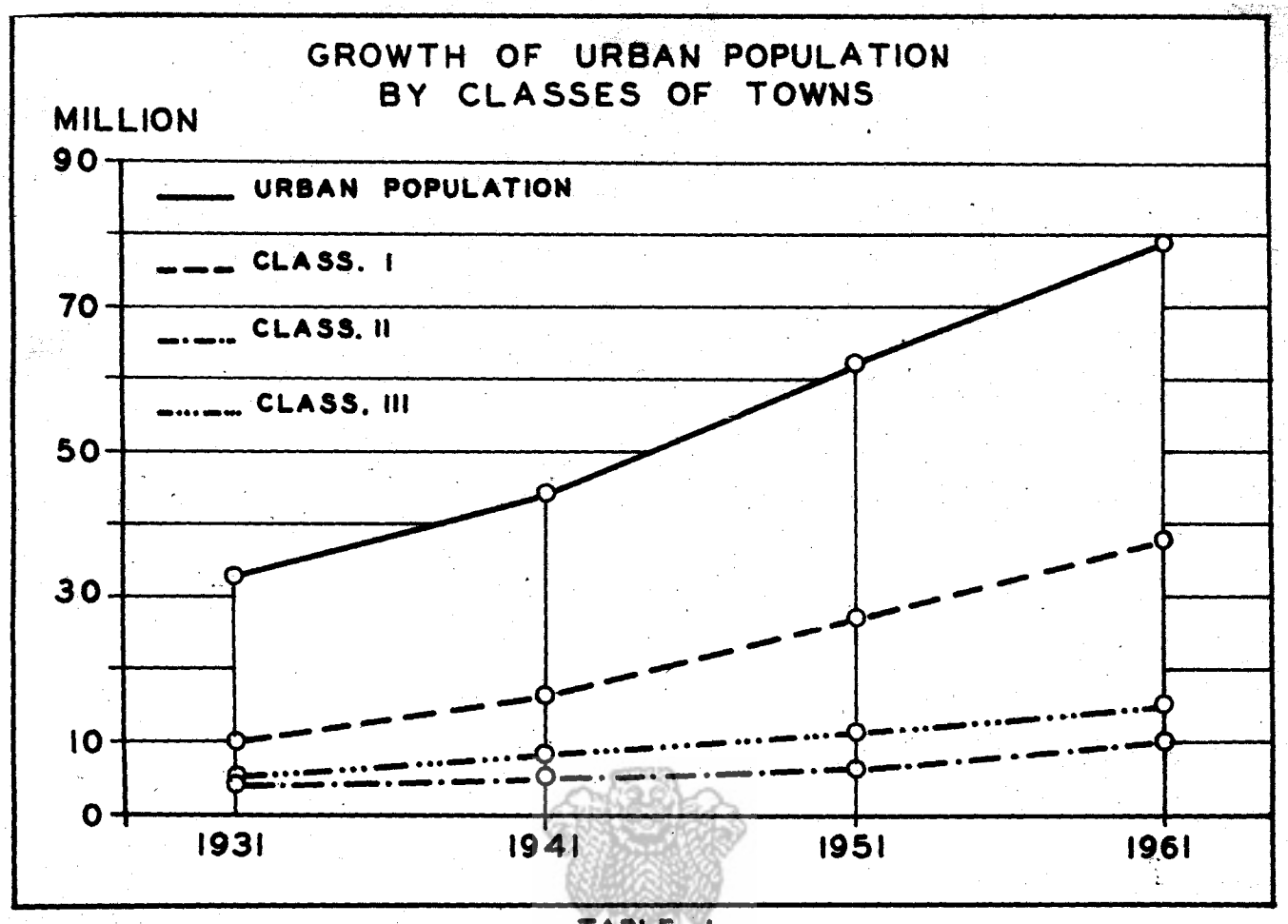

TABLE. I

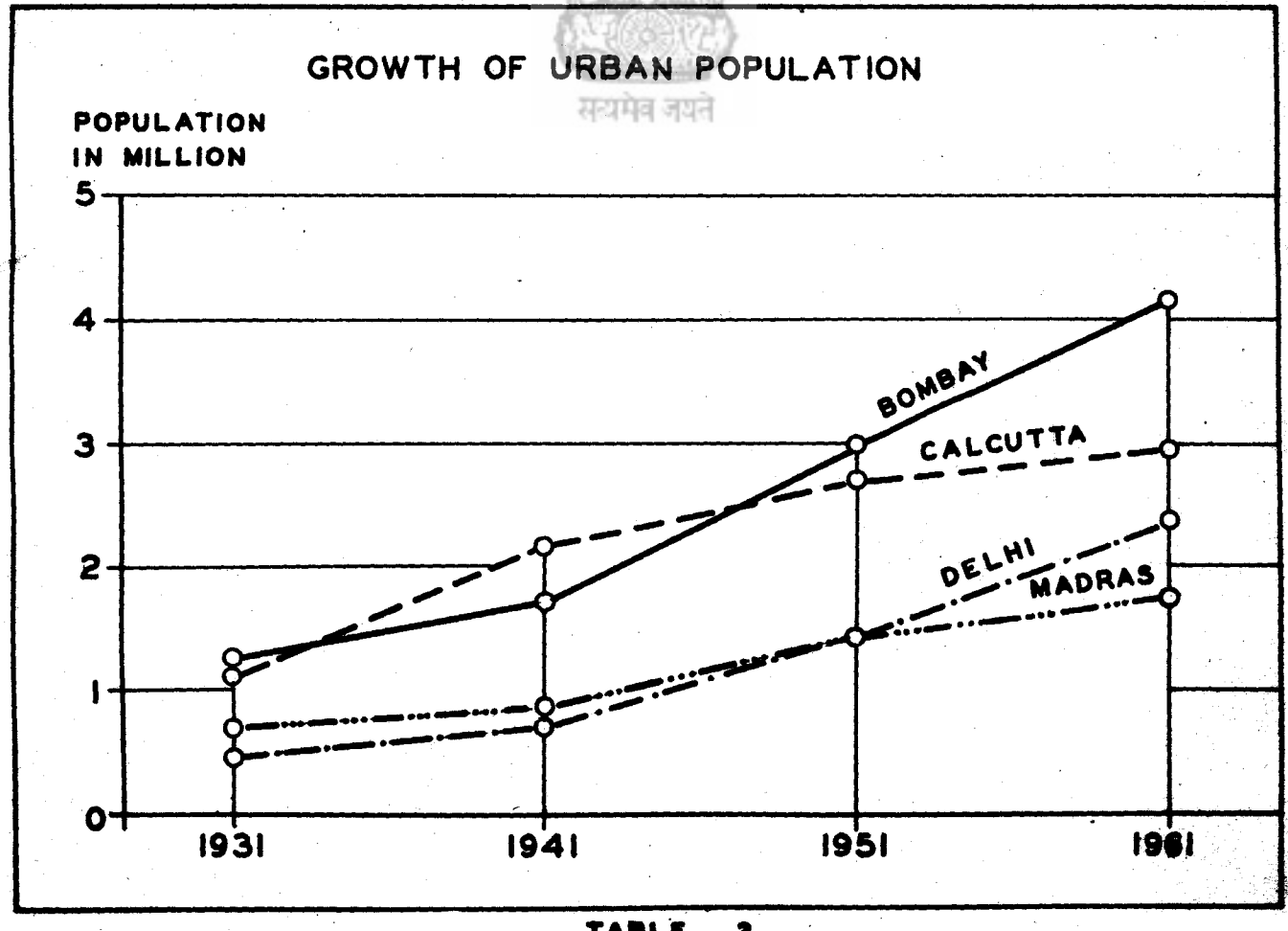

TABLE _ 2.

The net result of this phenomenal increase in population and working force is that they have placed an increasing demand on traffic and mass transportation system.

Traffic and Transportation Problems

2.0. The unplanned urban expansion and the inefficiencies of the older parts of these metropolitan cities which remain uncorrected even today, have further brought about congestion in the central core of the cities and a chaotic sprawl over to the suburbs. The overcrowding of population in the metropolitan centres of Bombay, Calcutta, Delhi and Madras have created complex problems, such as air and water pollution, crowded insanitary housing, grossly inadequate urban amenities and services—all these are major problems common to the metropolitan cities. One of the pressing problems is the poor availability of adequate, safe and rapid transportation system for moving people and goods within the metropolitan area.

2.1. The traffic and transportation problems of metropolitan cities, therefore, need particular attention. The entire urban metropolitan transportation network is a terminal system that collects and distributes intra-city and inter-city traffic and provides it with terminal facilities. The functions of an urban circulation system, thus are much more important because of the volume of traffic it has to cater to. Peak hour rush connected with journey-to-work and traffic jams on the roads are the most critical problems faced in Calcutta, Bombay, Delhi and Madras today. Traffic studies conducted in these metropolitan cities indicate that between 45 to 50 per cent of the total daily passenger trips are performed during the peak hours of the day, about 60 to 70 per cent of which were for journey-to-work while the balance of trips were spread over the rest of the working day.

2.2. Such acute 'peak' traffic conditions are caused by the concentration of large employment centres improperly located in relation to residential areas, coupled with increasing distances between work places and dwellings which has brought about the rush of commuter to and from the core area of the city. The physical separation of persons and various establishments in the metropolis and the need for travel to overcome this separation is best reflected in the land-use pattern of the metropolis. Specialisation of land-uses and their arrangements in space are basic causal factors in creating traffic.

2.3. Greater Bombay has developed on a longitudinal axis with an enormous quantity of traffic generated along the south-north arteries. There is heavy concentration of the Government offices, commercial and business houses, docks and much of the industry etc. in the south of Island city. The suburbs on the other hand developed principally as 'dormitory' areas. This has resulted in over-congestion of the existing road and railway systems, for there is a massive flow of traffic during the peak hours from north to south in the morning and from south to north in the evening.

2.4. The linear development of the Calcutta conurbation along both the banks of the Hooghly river, with only two bridge crossings, has aggravated the traffic and transportation problem because the major employment centres are located in Dalhousie Square and Burra Bazar areas while residential areas are in the north and south of the Central Business District.

2.5. In Delhi, which has a radial pattern of development, the major employment and business centres are located in the hub of the urban complex with residential areas along the rim. Consequently, there is a centripetal traffic movement in the morning and a centrifugal one in the evening, creating acute peak traffic problems. However, the Delhi Master Plan envisages deconcentration of employment centres and a beginning has since been made in this direction.

2.6. Public mass tranport provided by buses and suburban trains, is at present, the predominant form of mechanised transport for the residents of these four metropolitan cities. However, the facilities available for mass transportation, particularly by city buses in Calcutta, Bombay, Madras and Delhi are grossly inadequate for providing fast, comfortable and convenient travel at time and places of major demand. Long queues at bus stops, crowded buses and excessive travel time due to added street congestion are common features in these metropolitan cities.

2.7. The average speed with which the traffic moves on the streets is about 15 kms. per hour. The root cause of traffic congestion is that much of the inherited road network in these cities with narrow widths and frequent intersections, has become obsolete in design and capacity to satisfactorily cater to the demands placed upon them by the present volume and type of vehicles. In Bombay and Calcutta the ratio of the road area to the total area of the city is less than 12 per cent as compared to 23 per cent in London and 25 per cent in Paris. Apart from inadequate capacities, the city roads in these metropolitan centres serve the dual purpose of access to abutting buildings as well as thoroughfares.

2.8. Parking of vehicles and loading and unloading operations along the kerbs, usurp valuable road pavement adding to the reduction of

street capacity. None of the four cities have any substantial provision for off-street parking facilities in the central areas. Then, there is the problem of encroachment on foot-paths along the roads by hawkers and pedlars which results in the pedestrians cluttering up the city roads, especially during peak hours. Bicycles, animal-drawn vehicles and hand-carts further aggravate the congestion and chaos on the roads. Consequently, mass transportation vehicles are restricted from performing their assignments satisfactorily.

2.9. The traffic congestion apart from causing delays in the movement of passengers and freight, increases wear and tear of vehicles and fuel consumption, in addition to man-hours lost. It is largely responsible for increase in accidents in these cities and greater expenditure for police supervision and other administrative services rendered. Improperly sited residential areas in relationship to major employment centres on the other hand, give rise to very little off-peak travel and the peak load vehicles return practically empty, imposing an additional burden on the economy. In Delhi for instance, the operational expenditure of the Delhi Transport Undertaking exceeds the revenue earned per kilometre due to uneven transportation demand on a time basis.

2.10. The mass transport services provided by electrified suburban trains in Bombay, Calcutta and Madras are also inadequate in capacity to cater to the volume of passengers. During the peak hours, the suburban trains are packed to 'crush load'. Platform facilities at important suburban stations along the route are grossly inadequate to satisfactorily service the needs of the passengers. The location of the suburban terminals particularly in Calcutta and Bombay, is such that the majority of the detraining passengers at the terminals have to depend on road transport for completing their journey to destination in the central area of the city, with the result that an additional burden is imposed on road traffic. With rapid development of suburban areas, rail traffic is expected to increase substantially. The demand for suburban rail transport in Calcutta and Howrah will have increased by 65 per cent in 1976, according to projections made by the C.M.P.O.

2.11. The existing concentration of economic activities in the central areas of the four metropolitan cities has created a demand for passenger movements which have already overtaxed the capacity of suburban railways, the street system and the available transport facilities. Further concentration by more intense building construction in the central area is promoted without regard to its effects on the new transportation demands and parking requirements that will be generated. To cite a few examples, location of new industries in the Trans-Thana area in Bombay without adequate provision of housing facilities for the workers, will generate demand for commuter transporation. The intense commercial development of Backbay Reclamation area in the southern tip of the Island city which will create about 100,000 new jobs, will give rise to substantial additional traffic in the Central Business District which is already chocking with congestion. Similarly, intense commercial building activities in the central areas of Calcutta and Madras with no improvement in the existing capacities of the down town road system will further aggravate the existing traffic congestion.

2.12. Such decisions on location of land use which attract intense traffic create serious repercussions on the existing traffic capacity of the transport network in the core area of Bombay. Substantial capital resources are needed to improve the traffic mobility of the existing traffic related to the present land use in the central business area. There is already a proposal for constructing a system of freeways and cross-connectors in the Island city at a cost of about Rs. 1000 million for servicing the demand of existing traffic. To cater to the demand imposed by the additional volume that will be generated as a result of further intensification of commercial land use in the Reclamation area would necessitate additional expenditure in transportation overheads. Thus a never-ending race between transport demand and supply continues.

2.13. The tendency towards urban concentration must be effectively restricted. Formerly, when cities were smaller in areas, it was essential to centralise shopping, commercial offices and services, entertainment etc. to enable pedestrians to cover each of the establishments without much difficulty. In an expanding metropolis of today, the need for such arrangements is no longer as great. Dispersal or deconcentration of these centralised activities would obviate the necessity of bringing in large number of people and supplies to a relatively small area in the Central Business District. Traffic can in this way be minimised by eliminating unnecessary travel. By creating various facilities in the suburbs, the strain on mass transportation system will greatly lessen. Transportation problems can never be solved if Calcutta, Bombay, Madras and Delhi continue to crowd too many people and too much economic activity in too little a space. Traffic congestion during rush hours will be inevitable as long as work-areas are cen-

Heavy loading and unloading scene at one of the Calcutta streets

Inefficient traffic control at an intersection
in Calcutta

Long queue of waiting passengers

Traffic congestion and delay at road-rail grade crossing

Heavy volume of cycle traffic and typical behaviour causing traffic problems

tralised and the land use in the central area is further intensified.

Need for Metropolitan Regional Planning

3.0. The haphazard and unsystematic growth of the four metropolitan cities that has thus far taken place has added to the traffic and transportation problems of these major cities of India, more rapidly than these cities have been able to overcome the problems of their central area congestion. The urban pattern that has emerged in each of these cities as a result of unguided urban growth which is painfully visible, is the concentration of economic activities in the central areas and sprawling residential developments in the suburbs. The journey-to-work is greatly affected by such urban pattern.

3.1. The population of Bombay, similar to other large cities, has more than doubled during the last 30 years. The limits of Bombay Municipal Corporation have twice been extended between 1950 and 1957. The extension of the limits, however, in no way served to arrest the urban sprawl or to control it, as no effective measures were taken for land use control and zoning. Even today the process of uninterrupted urbanisation continues. A similar situation exists in Calcutta and Madras. However, it may be pointed out that the urban sprawl in Delhi has been stemmed by the provision of inviolable green belt around the urbanisable limits.

3.2. The problems of metropolitan growth cannot be satisfactorily resolved if physical planning confines itself within urban municipal limits, as metropolitan problems transcend the local political boundaries. None of the Acts relating to town planning in these four metropolitan cities are as comprehensive and forward-looking as necessary. The Delhi Development Act (1957) confines planning to the Union Territory of Delhi, while the Delhi Metropolitan area extends beyond the boundaries of the territory into States of Haryana and Uttar Pradesh. The Madras Town Planning Act (1920) confines planning within the limits of Madras Corporation. The Bombay Town Planning Act (1954), until recently, confined planning within the city limits.* In West Bengal, the Calcutta Metropolitan Area (Use & Development of Land) Controls Act was passed only in 1965, but this Act is soon to be replaced by a comprehensive planning law for the State.

3.3. It is essential to expedite the enactment of comprehensive planning which will extend the present scope of planning beyond the city limits into the surrounding regions. However, the bigger problem with which most of these metropolitan cities are faced, is the dearth of qualified personnel and resources and the absence of adequate powers and coordinating authority to enforce land use and zoning regulations.

3.4. Two important aspects of physical planning and urbanisation need to be stressed. The first is the importance of limiting the size of the geographical area and the population of the metropolis. Our cities which have spread over a wider area, have created economic problems not confined to public transportation alone, but to all other public utilities and services, necessitating extensive capital outlay and excessive maintenance cost. However, the mounting cycle of concentration of economic activities in these few large urban centres and the resulting urban sprawl can only be broken by a rational distribution of future urban development into the existing small and medium size towns within the metropolitan region, not only for improved efficiency and welfare within the metropolitan cities, but also for a more effective bridge between city and the surrounding rural areas. What is necessary, therefore, is the provision of urban infra-structure facilities in the towns around the metropolis which would serve as counter-magnets and thereby arrest the existing trend of migration to the metropolitan centres. Such a strategy of dispersal is important especially in view of the fact that the big push in urbanisation is yet to come. Even the modest projections of our urban population by 1981 are estimated at 174 million which is more than double the 1961 urban population. The second is the imperative need for the comprehensive and systematic urban renewal of the core areas of the metropolitan cities which have become derelict and functionally obsolete to provide for the efficient movement of traffic. Through urban renewal, a balance between developed land and space required for movement of traffic could be restored.

3.5. The key to the solution of transportation problems, therefore, is proper physical planning of the metropolis and surrounding region. The fact that demand for transportation in cities continues to outrun supply, regardless of our efforts to increase transportation capacity at excessively high capital cost, indicates the

*Maharashtra has since enacted a new Town Planning Act — "Maharashtra Regional and Town Planning Act —1966"

need for directing more attention to this neglected side of the problem. Wilfred Owen[4] has emphasised that "solutions to transportation problems do not merely depend on measures designed to provide additional transportation capacity, but on the ability to develop urban communities in which satisfactory transport is possible". He further states that "the opposite course of attempting to supply transportation services to meet whatever demand arising from unplanned and uncontrolled growth, seems doomed to continuing failure. He recommends that we must harness demand for transportation through sensible control over land use.

3.6. While comprehensive development plans for the four metropolitan areas are being formulated, there is an urgent need to determine the relationship between traffic generation and intensity and various types of land use in our metropolitan cities through survey and research. Such studies were made for the cities of Chicago, Detroit, Washington and Philadelphia in the United States of America, before preparing the transportation plan in relationship to future land use pattern. A modest beginning has been made in this direction in the metropolitan cities of India. Some of the studies required have been enumerated in the Chapters that follow for each city.

Need for Integrated Approach.

4.0. Segmented and piece-meal approach to metropolitan transportation planning and administration followed in the metropolitan cities is woefully inadequate. What is needed is comprehensive region-wise planning, development, management and operation of all metropolitan transport facilities. Since different transportation modes available in these cities are closely inter-related, it is essential that the principal means of mass passenger transportation operations be co-ordinated to provide efficient and convenient services to the travelling public.

4.1. This will require public action at Central, State and Local levels for setting up a single metropolitan transportation authority, representing various concerned interests, to achieve the required coordination. Legislation will have to be enacted to empower the authority to act promptly and effectively. Such an authority when established, could take any one of the number of administrative forms, but the most important factor, however, is that it should have sufficient jurisdiction over the metropolitan area to carry out integrated programme for traffic and transportation improvements that will result in the maximum benefit at least cost. This would include planning for future development of transport, including rapid transit, expressways, off-street parking facilities, terminal facilities for passengers and goods vehicles and other related facilities, such as intersection improvements, modern traffic control and regulatory devices. A decision on the choice of the administrative form, however, may be made only after careful examination of the issues involved. Calcutta is already contemplating to set up such an authority for dealing with its complex traffic and transportation problems.

4.2. Basic traffic and transportation problems common to all the metropolitan cities have been generally enumerated above. It is proposed to deal with such problems concerning each metropolitan city in detail in the Chapters that follow. A development programme for improving traffic mobility has also been recommended for the four metropolitan cities for execution during the Fourth Plan period.

1. *Wilfred Owen — The Metropolitan Transportation Problem* (1966) — *a Brookings Institution Study.*

CHAPTER II

CALCUTTA

CALCUTTA METROPOLITAN DISTRICT


सत्यमेव जयते

Chapter II

CALCUTTA

Calcutta is the biggest metropolis of India which has a population of more than 7·5 million according to the 1966 estimates, and an area of 1255 sq. kms. The Calcutta Metropolitan District stretches from Kalyani on the north-east to Kalyanpur on the south-east, from Bansberia in the north-west to Ulberia on the south-west. The metropolitan area comprising 2 municipal corporations, 33 municipalities and 37 non-municipal urban areas, is today a linear north-south urbanised sprawl on both the banks of the river Hooghly.

1.1. The development of the city started in the 16th century as a small British trading centre on the banks of the river Hooghly which gradually became a centre of trading for a number of countries. As trade and commerce developed, the settlement absorbed the villages of Kalikatta, Govindpore and Sutanati. Urban growth got concentrated along the river because it provided the best means of transportation, to and from the deep water port and the hinterland. The city has extended mostly in the north-south direction. The river Hooghly stands as a definite barrier to land transportation between the east and west areas of this linear conurbation.

Population Trend and Density

1.2. Calcutta's economic and cultural impact over the entire region of eastern India with a quarter of India's total population, is overwhelming. Its magnetic attraction for migrants in search of employment is unrivalled by any other urban centre. Since 1921, the Metropolitan District and the city of Calcutta have nearly trebled in population. After the great peak of 1931-41, when the population of the CMD grew by almost 2 million in 10 years, the rate of growth has slowed down significantly. During the period 1931-61, the population of Calcutta city grew by 140 per cent, and that of the CMD by 165 per cent. While the city of Calcutta has a growth rate which is the slowest amongst all the major cities of India, that of the CMD as a whole is considerably faster, the reason being that large parts of the twin cities of the conurbation-Calcutta and Howrah—have almost reached a saturation point and therefore, most of the recent metropolitan growth is taking place outside the densely settled parts of the central city complex. In fact, the population figures over the 1951-1961 period show that the outer ring of the central areas is now advancing two and a half times faster than the twin central cities. The recent growth of the metropolitan Calcutta is given in the following table:

Table 1

year	CMD population (million)	percentage variation	Calcutta city population (million)	percentage variation	index of population growth		
					CMD	Calcutta	CMD (outside Calcutta)
1921	2·25	..	1·05	..	100	100	100
1931	2·54	+12·9	1·22	+16·2	113	116	110
1941	4·31	+69·9	2·17	+77·9	191	207	179
1951	5·37	+19·7	2·70	+24·4	238	257	222
1961	6·72	+25·1	2·93	+8·5	298	279	316

Source : Census of West Bengal, 1951 and District Handbooks of West Bengal, 1951.

1.3. The rapid growth in population is due to the continual inflow of migrants from the hinterland and other distant parts of India. It was particularly heavy following the Partition in 1947. The present annual volume of population growth through natural increase in the CMD as a whole, is approximately 165,000 and the annual net influx of migrants is about 58,000—giving a total population increase of over 200,000. It is estimated that the population of the CMD would increase to 9·42 million by 1976, 11·82 million by 1986 and over 14 million by 2001 A.D.

1.4. The following table gives the overall population density in the Calcutta Metropolitan District over the last few decades:

table 2

density persons per sq. km.

year	Calcutta	Howrah	C.M.D. (excluding Calcutta & Howrah)	total C.M.D.
1921 .	67,837	44,920	5,865	11,779
1931 .	78,648	51,722	6,395	13,292
1941 .	139,589	87,240	10,304	22,546
1951 .	173,788	99,783	13,041	28,063
1961 .	183,523	117,901	19,143	35,141

Source: *Census of West Bengal*, 1961.

The densities in the Calcutta Metropolitan District are among the highest in the world and the congestion in some parts of the city is so extreme that it could be judged intolerable by any standards. Calcutta's average densities are 159 persons per developed acre, and 294 persons per residential acre. The density in some parts of the CMD is as low as 5 to 10 persons per acre. Even within the Calcutta city, densities are fairly low in some areas.

1.5. *Employment*: According to the Census of India, the total CMD employment in 1961 was 2·4 million which is 82 per cent of the total urban population of West Bengal and 9 per cent of the total for urban India. The following table shows the employment by sectors in 1961 in the CMD:

table 3

	CMD employment (000)	Per-cent of total	CMD as per cent of urban West Bengal	CMD as per cent of urban India
total employment .	2,418	100·0	81·7	9·16
primary sector .	70	2·9	83·3	0·02
secondary sector .	1,014	41·9	88·9	11·80
tertiary sector .	1,334	55·2	76·9	9·20

Source: *Census of India*, 1961.

The tertiary sector has always been the CMD's dominant employer in the past. With 55·2 per cent of total employment, it maintains Calcutta's position as the great commercial, financial and transport centre of a far-flung regional net-work. The composition of the tertiary sector also reflects the heavy influx of unskilled migrants. The agricultural sector in the CMD is negligible and over the next 20 years or so, additional jobs will have to be provided by the secondary and tertiary sectors which will further increase the demand for transport services.

Central Business District

2.0. The metropolitan area presents a picture of mixed land use as housing, industry, commerce etc. are all located in close proximity to each other. Most of the industrial areas are situated on the west of river Hooghly. Commercial houses are mostly concentrated in the Dalhousie Square and Chowringhee areas. Business and Government offices are centred in Dalhousie Square, while retail and service centres are located near the Chowringhee and Burra Bazar areas. The Sealdah railway station is approximately 2·5 kms. east of the centre of business activity. The docks, warehouses and railway tracks of the Port Commissioners are along the east bank of the Hooghly, extending from Howrah bridge to the Kidderpore area on the south. Major industrial development is located along the G. T. Road in Howrah and in the Kidderpore area in Calcutta as well as along the eastern fringe of the city.

Transportation pattern and Traffic Situation

3.0. Calcutta's extraordinary difficulties in regard to traffic and transportation on the intra-city traffic lines, can be clearly assessed from the fact that there are severe quantitative deficits in such transportation facilities. Only 5·1 per cent of the land areas in Calcutta Metropolitan District is assigned to transportation uses, against an accepted minimum of 20

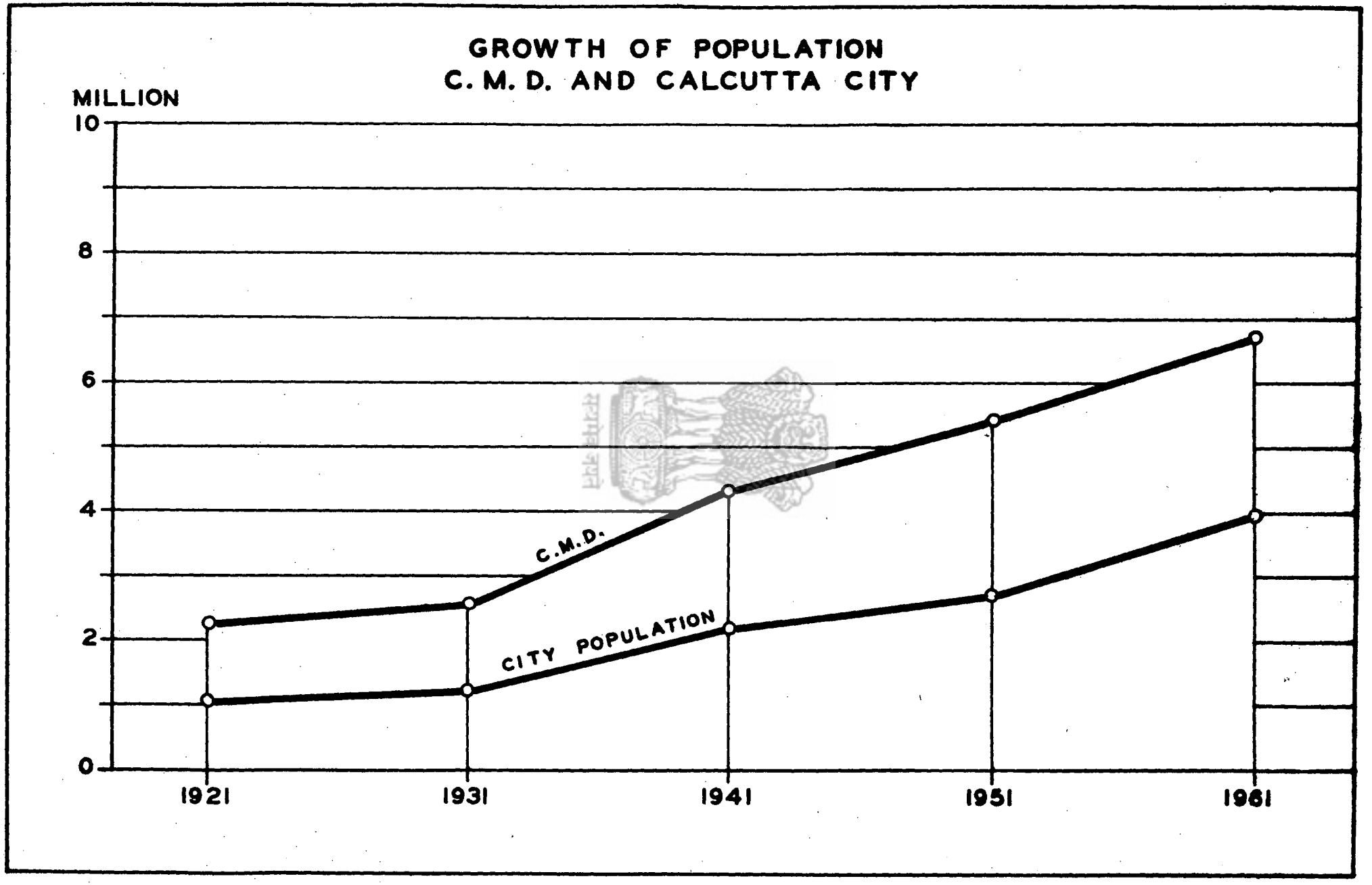
GROWTH OF POPULATION
C. M. D. AND CALCUTTA CITY
MILLION
10
8
6
4
2
0
C.M.D.
CITY POPULATION
1921
1931
1941
1951
1961

TABLE. I

to 30 per cent which is necessary by modern standards for a city. In addition, Calcutta has to face entirely inadequate means of trans-river movements across the Hooghly because the metropolitan area straddles across and spreads on both sides of the river. The position is further accentuated by the two parts of the city, one on either bank, having developed rapidly for the greater part over the years as unplanned north-south conurbations.

3.1. *Howrah bridge*: The Howrah bridge is the main and only convenient direct transportation route linking Calcutta and Howrah. On an average day, more than 500,000 persons move over the Howrah bridge—207,200 people by buses and 113,800 by trams. The number of pedestrians alone is 125,000. During the peak hours the movement is about 10.3 per cent of the daily total. The Vivekanand bridge at Bally, is located too far north of the core areas of Calcutta and Howrah. On an average day, it serves a total of 9,825 vehicles and about 2,580 pedestrians. An origin-destination survey undertaken by the C.M.P.O., indicates that a considerable portion of the fast vehicle movements crossing the river are short and terminate in zones very near the Howrah bridge approaches. The average annual traffic increase on Howrah bridge has been 10.1 per cent over 1946 volume.

3.2. *Haldia*: New port factilities are under construction at Haldia, about 100 kms. downstream of Calcutta which is likely to be completed in 1970-71. The facilities will supplement the Calcutta Port and is expected to handle the bulk of the heavy cargo. To begin with, it is supposed to handle 10-11 million tonnes. It is also proposed to set up a petro-chemical plant and a fertilizer plant. Haldia with direct transportation links to regions yielding coal and ore, would certainly generate appreciable traffic on the highways serving it. There is no doubt that sooner or later as port activities in Haldia mount up, a direct connection will be provided to the commercial distributing centres in Calcutta and its whole-saling and warehousing centres.

The activities at Shalimar rail terminal are gradually going up and such activities are bound to be reflected in increased travel movements in the C.B.D.

3.3. *Existing roads and arteries*: The two main roads of great importance to Calcutta and Howrah are the Barrackpore Trunk Road running northwards from Calcutta on the east, and the Grand Trunk Road also running northwards from Howrah on the west. These are the main feeders to Calcutta's north-south main street system. It is only the two trunk roads and the railway lines that provide means of travel from the outskirts of the city and from the limits of the metropolitan area to Calcutta and Howrah. The north-south main streets are served by the east-west feeder roads of the grid, but neither the main trunk roads nor the main streets or cross-feeder roads, are of adequate widths or standards. Severe street congestion prevents improved service and limits the number of surface transit vehicles that can be effectively put into operation. While the position in regard to road and street improvements in the Calcutta Metropolitan District have remained static, undoubtedly due to difficulties in carrying them out, the daily traffic into Calcutta has grown up by leaps and bounds. Out of the total 802 million trips made by the combined bus and tram system per year, the largest proportion of trip-purposes is on account of commuter traffic.

3.4. *Traffic situation*: The C.M.P.O. have made a study of the principal passenger traffic corridors in Calcutta. Analyses of the traffic study reveal that the passenger flow is tidal. During the morning peak period, the flow is directed towards the central core area and during the evening peak hours the flow is reversed. There are two principal transit corridors-one along the north-south axis and the other along the east-west axis. It has been observed that the morning peak is more pronounced than the evening peak. The volume of traffic entering the central core area is about 85,000 and the volume of out-bound passengers in the evening peak period nearly 77,000. The peak flow of passengers per hour from the south on Chowringhee Road alone is more than 13,000, from the north about 22,000, from the east (mainly Sealdah Station) about 22,000, and from the west (across Howrah bridge) about 20,000. Thus the principal transport corridors carry about 77,000 persons per hour, the remaining 8,000 persons being carried by other routes.

3.5. *Travel speeds*: Travel speeds are an index of the congestion on the roads and streets and provide useful means for evaluating system deficiencies. The C.M.P.O. conducted a travel speed survey on all sections of the major roadway system. In about half of the major streets in Calcutta, north of Dharmtalla Street and in Howrah, travel speeds are less than 20 kms. per hour. In the south, Chitpur Road and Lower Circular Road near the Sealdah Station, the travel speed is less than even

11 kms. per hour. On the approaches to the Howrah Bridge and along the entire Lower Chitpur Road, the travel speed is less than 15 kms. per hour. In south Calcutta, because of the lower population densities, wider roads and fewer slow-moving vehicles, the speed is more than 20 kms. per hour. Only the roads in the area of the Calcutta Maidan including Kidderpore Road and Red Road, have travel speeds about 38 kms. per hour.

During the past five years the number of accidents in Calcutta has risen by 20 per cent—17,504 in 1965 as against 14,554 in 1960. There has also been a sharp rise in fatal accidents.

3.6. The extraordinary congestion occurs on account of existence of the two railway termini—Sealdah and Howrah—which are well away west and east of the C.B.D. In the morning Sealdah is the trip-end for the rail commuter so far as the railway journey is concerned. Later, in order to reach his workplace the commuter has to go either by bus or tram which are over-crowded, or else he must trudge the distance of more than a mile along the narrow east-west streets which are heavily congested both by public and private transport vehicles and by hordes of pedestrians. Similarly at Howrah Station, thousands of commuters are disgorged with trip destinations in the C.B.D. crossing the Howrah Bridge, after negotiating difficult road approaches to the bridge on the Howrah side. It is the concentration at Howrah and Sealdah of commuter traffic, the absence of proper dispersal of such intense traffic and the inability of the existing street system to accommodate it, that create a crisis in traffic conditions. It is difficult to devise a suitable method of dispersal along the existing road system. It is, therefore, necessary to resort to some means of rapid transit for their dispersal.

3.7. *Existing transport facilities*: Buses, trams and suburban trains are the main means of mass transportation in the Calcutta-Howrah urban complex. The Calcutta State Transport Corporation operates fleet of buses in the Calcutta—Howrah area. The tram services are operated by the Calcutta Tramway Company, which is a private undertaking. Connections between Calcutta and its suburbs and between Howrah and its surrounding areas are provided by the Railways.

3.8. *Trams*: In Calcutta and Howrah, there are 26 tram routes operating over 68 kms. of double track. Of the 459 trams available, about 415 are pressed into daily service which are hardly sufficient to meet the peak-hour tram travel demand without serious overloading. It has been observed that sometime 200 persons are accommodated as against its capacity for 75 persons. The importance of a tram service in Calcutta can be gauged from the fact that more than one million tram trips are made on an average week day. The maximum load concentration is at the Howrah bridge where 100,000 tram passengers are carried during the day. The system has very few modern tramcars. Observations on the routes indicate considerable deviation from scheduled headways and speeds. On most of the routes, the road congestion interferes so much with the tram speed that scheduled operations get completely disrupted and trams either move very slowly or are repeatedly blocked to a standstill for several minutes. However, on some sections of routes where it runs on reserved rights-of-way, the trams are able to move with a speed of 30 to 40 kms. per hour.

3.9. *Motor buses*: The bulk of the motor bus service in Calcutta is provided by the State Transport Corporation. Private companies continue to operate on certain routes in the area. The State Transport Corporation's fleet totals 886 buses, including 306 double deckers. The average number of buses pressed in daily service is about 700. The fleet in daily operation is not adequate to meet the traffic requirements. The extent of congestion in buses is clear from the following figures.

vehicle	capacity	passengers during peak hours
single decker bus . . .	46	100
double decker bus . . .	62	150

These buses carry more than 1·5 million passengers daily. The majority of bus routes provide trunk line type service, rather than feeder

services and are subjected to considerable friction along the routes due to congestion, street interference and over-loading.

3.10. *Suburban Railways*: The suburban railway section which serves the Calcutta metropolitan area extends as far as Burdwan, Krishna Nagar City and Bongaon on the north, Kharagpur and Diamond Harbour and Port Canning on the south. The frequency of suburban trains into Sealdah in the morning peak period is at headway of 3, 4 and 5 minutes. The suburban train passenger traffic at Sealdah Station has increased from 77·3 million passengers in 1955-56 to 135·8 million in 1964-65; the corresponding figures for Howrah are 40·9 million and 90·5 million which show that the extension of the suburban electrification further back from Howrah has resulted in a considerable increase in commuter traffic. The number of suburban passengers carried since 1955-56 is given in the table below:—

table 4

year	Sealdah (in million)	percentage increase over 1955-56	Howrah (in million)	percentage increase over 1955-56
1955-56 .	77·3	100	40·9	100
1956-57 .	81·2	105	39·4	96
1957-58 .	84·6	109	40·5	99
1958-59 .	89·7	116	43·6	107
1959·60 .	107·5	139	52·2	128
1960-61 .	113·8	147	68·8	168
1961-62 .	120·2	155	78·3	191
1962-63 .	124·8	161	82·1	201
1963-64 .	127·4	165	85·7	210
1964-65 .	135·8	176	90·5	221

Source: *Eastern Railway.*

The following table shows the daily number of suburban trains on Howrah and Sealdah Divisions since 1955-56:—

table 5

year	Sealdah Division			Howrah Division		
	under steam	under electric	Total	under steam	under electric	total
1955-56	223	..	223	126	..	126
1956-57	229	..	229	130	..	130
1957-58	231	..	231	92	40	132
1958-59	243	..	273	58	100	158
1959-60	267	..	267	48	121	169
1960-61	275	..	275	46	120	116
1961-62	275	..	275	46	120	166
1962-63	279	..	279	46	120	166
1963-64	193	84	277	44	118	162
1964-65	160	118	278	44	120	164
1965-66	140	146	286	12	152	164

Source : *Eastern Railway.*

3.11. *Parking*: Calcutta like other major cities of the world, is faced with serious parking problems. This is mainly due to large increase in population coupled with an increased dependence on motorised road transport, particularly, the private automobile. The traffic and parking problems get further complicated on account of large number of refugee pavement dwellers, and excessive sidewalk encroachments and mixed traffic. Parking congestion is acute in the Dalhousie Square and Burra Bazar areas.

3.12. *Truck terminals*: At present Calcutta is the receiving and distributing centre for the whole of Eastern India. The cargo handled by Calcutta Port increased from 7·8 million tonnes in 1954 to 11·1 million tonnes in 1961, showing an increase of 30 per cent. All this movement

of traffic to and from the CMD affect to a great deal intra-city movements. The parking of heavy trucks on narrow streets around the Central Business District is a serious source of congestion and traffic interference.

3.13. *Level crossings*: There are in all 105 level crossings in the metropolitan area. Of these, 27 are classified as 'A', 61 as 'B' and 17 as 'C' grade crossings. As these are all at grade, frequent interruptions in the continuity of the metropolitan road lines are caused. With the electrification going further back from Calcutta, extending the suburban railway facilities to the rural parts beyond the CMD, there are bound to be severe difficulties if the existing road-rail crossings at grade continue. It will be difficult to maintain 2 or 3 minutes headway which will be necessary in the case of suburban railway traffic of the future. The replacement of level-crossing by over/under-bridges in the CMD therefore, deserves serious consideration.

The CMPO have recently undertaken a study of 'A' class level-crossings where on account of severe interruptions to road and rail traffic, grade-separated crossings are required. Of the 27 'A' class level crossings, 10 are on the west side of the Hooghly and 17 on the east. On the west side, the level-crossings are located on major arterial roads which carry both local and regional traffic, particularly commercial goods traffic. On the east side they are situated where the railways cross arterial roads and which give access to already developed or rapidly developing suburban areas in the CMD.

Prior Studies

4.0. *The Ginwalla Report* (1947): Realising the difficulties that the commuters were facing at the two suburban terminals at Sealdah and Howrah, the Terminal Facility Committee was appointed in 1947 under the Chairmanship of Sir Padamji Ginwalla. The Committee was asked to examine the problems of bringing and dispersing the daily passengers from the neighbouring colonies and satellite towns of Calcutta to the central core area. It recommended the scheme of a Circular Railway from Dum Dum Junction *via* Chitpur Yard, Hastings, Kidderpore Docks, Majerhat, Kakurgachi chord and back to Dum Dum. It also recommended elevated operation from Fairlie Place to Outram Ghat and over the Kidderpore Docks.

4.1. *The Roy Report* (1953): The Government of India appointed a Committee under the Chairmanship of Shri S. N. Roy to investigate the feasibility of the Circular Railway for Calcutta. This Committee endorsed the views of the Ginwalla Committee with certain modifications. According to the Committee's Report, the proposed Circular Railway would require to be taken over certain areas on elevated structures and generally follow the existing Port Commissioners' tracks. Chitpur Yard was considered as the main marshalling yard in this scheme.

4.2. *The Sarangapani Committee* (1956): The Sarangapani Committee was appointed by the Ministry of Railways for working out the details of electricification of the Eastern Railway. This Committee also made recommendations for providing Circular Railway in Phase II of the Railway Electrification Scheme.

4.3. *The French Company Report* (1949): At the request of the Government of West Bengal, the *Compagnie du Chemin de fer Metropolitan de Paris* made a report on the possibilities of establishing an underground electric transportation net-work in Calcutta. It recommended the construction of two subways —one to extend from the Howrah Maidan to Sealdah station (6·26 kms.) and another between Paikpara and Kalighat (11.86 kms.), both crossing each other at Dalhousie Square. The Report also suggested the locations for the tube stations, their designs, rolling stock and other essential items.

4.4. *The Frieling Report* (1964): A study of mass transportation plan was undertaken by Mr. Gerald H. Frieling, Mass Transportation Consultant of Wilbur Smith & Associates. The report recommended an aero-rail system which could use light-weight cars over elevated structures. It suggested initial construction on two alignments—*Line No.* 1 in the north-south corridor *via* Chittaranjan Avenue and Chowringhee Road from Galif Street on the north to the Kalighat Tram Depot on the south, and *Line No.* 2 through the east-west corridor between the Sealdah and Howrah Railway stations *via* Bepin Behari Ganguli Street, Chittaranjan Avenue, Sagar Dutta Lane, Ezra Street, Charnock Place, Dalhousie Square West, Kalighat Street, Strand Road and the Howrah Bridge. Transit terminals have also been suggested for the upper levels of the two railway stations.

4.5. *The Garbutt Report* (1966): Mr. Paul E. Garbutt of the London Transport Board undertook the study at the instance of the CMPO to define the nature and extent of transport needs, both existing and projected in the Calcutta area. The Report is known as the 'Rational First-Phase Transit Plan for Calcutta'. The Plan envisaged the construction of a high

capacity urban elevated rapid transit railway on the main north-south exis of the city, having at its north-end (Dum-Dum Junction) an easy passenger interchange facility with the Eastern Railway suburban system.

It may be stated that the above studies were limited in scope and reflected by and large professional opinions rather than conclusions based on detailed engineering and economic studies.

Main Proposals for Solving the Transportation Problems

5.0. The proposals are designed to improve the utilisation of the existing transport system as an immediate measure, and to lay the foundation for the long-term development of efficient metropolitan transport. So far as the road system is concerned, two basic alignments should provide the necessary immediate relief. There is also an urgent need to supplement this with some means of dispersal of commuter traffic which comes by rail into Sealdah. Such a dispersal should be along the perimeter of the Central Business District and within convenient walking ditance from most points of the Central area. The provision of a suburban railway dispersal line running from north to south, parallel to the north-south road arteries supplemented by a grade-separated rapid transit line, will bring a large number of trip-end points into convenient walking proximity. The grade-separated transportation facility might take the form of an underground railway or an elevated railway system.

Fourth Plan Proposals

5.1. *Development of roads and bridges*: The Development and Planning Department of the West Bengal Government had drawn up schemes relating to traffic and transportation for the Fourth Plan costing Rs. 47 crores. Details of the schemes are given in Annexure I. These were considered by the Study Team in detail. However, due to limited resources available, priorities were worked out and a revised road development programme costing Rs. 23 crores was drawn up as given in Annexure II. In the Fourth Plan, it is now proposed to have a new bridge over the Hooghly near Princep Ghat, and a north-south Howrah Expressway linking the new Hooghly river crossing to Varanasi Road. The new bridge is expected to serve an average daily movement of 32,000 vehicles by 1973, and about 69,000 vehicles by 1983. Another bridge over the Hooghly has been proposed at Kalyani with proper approach roads to connect the proposed Eastern Metropolitan By-pass with National Highway No. 2.

5.2. One of the important schemes which has been proposed is the construction of the Eastern Metropolitan By-pass—Narkel Danga Main Road to Lower Circular Road and link connector to Lower Circular Road. The other arterial road proposed for construction during the Fourth Plan, is an extension of Amherst Street upto Park Street which will greatly improve north-south traffic circulation on the east bank. Besides, there are other proposals for widening major arterial roads and schemes for ensuring easy circulation between fast developing areas in the metropolitan city.

5.3. In relation to the existing Howrah bridge and the two major railway termini on the east and west banks of the Metropolitan District, the major traffic bottlenecks are:—(i) Howrah Station area; (ii) Sealdah Station area; and (iii) Approaches on the Calcutta side to the existing Howrah bridge. It is suggested that necessary improvements should be carried out as early as possible.

5.4. *Replacement of level crossings*: Delay surveys were conducted by the C.M.P.O. to ascertain the repercussions of the hold-up of vehicular traffic at some level crossings, both from the point of view of total vehicular traffic as well as the different categories of vehicles. On the basis of these studies, certain priorities have been worked out in regard to the construction of over/underbridges during the Fourth Five Year Plan. It is recommended that the undermentioned level crossing should be immediately replaced by grade-separated arrangements:—

(1) Serampore Level Crossing over the G.T. Road;

(2) Baidyabati South crossing over the G.T. Road;

(3) Baidyabati North crossing over the G.T. Road;

(4) Lilluah Level Crossing;

(5) Maurigram Level Crossing—Howrah—Andul Road; and

(6) Punjab Line Level Crossing gate over the G.T. Road.

Since no provision has been made for the replacement of level crossings in the State's Fourth Five Year Plan, the Team feels that it

is necessary to make additional financial provision for the purpose. In case it is not possible to find additional funds, the Team suggests post ponement of the lesser urgent schemes in favour of level crossings.

5.5. *Parking and truck terminals*: The C.M.P.O. have undertaken several field surveys in order to obtain reliable data on existing parking characteristics, particularly in the area bounded by major Government offices, principal banking and commercial houses, as well as most of Calcutta's major wholesale and retail marketing area including Burra Bazar and New Market. It is noticed that hardly any effort has been made to rationalise the use of kerb facilities on the basis of parking demand. Also, a limited number of off-street parking facilities are available. During the next 20 to 25 years, there is bound to be considerable growth in parking requirements. It can be assumed that parking demand will increase at the same rate as passenger car trips terminating in that sector. It is suggested that proposals regarding off-street parking contained in the report prepared by the C.M.P.O. should be implemented early which should greatly increase over-all parking capacity and rationalise kerb space usage. It will be necessary to completely eliminate kerb-side parking on numerous streets in the core area and regulate distribution of usage between kerb and off-street facilities. It is understood that a pilot fee-parking project has been developed for the New Market area and is now under consideration of the State Government. This scheme would encourage short-term parking and bring in revenue and should be extended to the shopping areas along Chowringhee and Park Street.

There are no regular truck terminals in Calcutta. In the congested Burra Bazar area, very little off-street parking or docking facilities are available for lorries. According to the O. & D. Survey, over 5,600 trips or 18 per cent of the CMD's total have either an origin or destination in the traffic zones in Burra Bazar area. There is an urgent need for developing modern and efficient truck terminal facilities. It is suggested that till permanent truck terminal facilities along Kona Expressway (as recommended in the Basic Development Plan for C.M.D.) are developed, the land recently reclaimed by filling in the New Cut Canal in the Salt Lake Area might be utilised temporarily for parking of trucks. The site is not far off from the central area.

5.6. *Modernisation of traffic operations*: In order to improve traffic operations which are obviously in need of betterment to come upto modern efficiency standards, intensive and immediate application of traffic engineering treatment are recommended. The implementation of such plans would increase the efficiency and capacity of existing street system. It would minimise traffic accidents and substantially reduce all economic losses attributed to inefficient traffic operations.

In Calcutta city, responsibilities for various aspects of traffic engineering works are shared by several different agencies. A traffic engineering agency does not yet exist in Calcutta. It is necessary that this work be carried out in the framework of an overall traffic operations plan for the city. The traffic operations plan should include comprehensive signalisation, channelisation and redesigning, signing and pavement markings and street lighting. In the Fourth Plan a provision of Rs. 1 crore has been made for implementation of traffic operations plan.

FURTHER ACTION PROGRAMME

(i) *Traffic Demand Survey*

In order to have an idea of the destination of commuter season ticket holders alighting at Howrah and Sealdah stations, and the further mode of transport used by them for reaching their places of work in the city area, a traffic demand survey has been suggested by the Study Team. The survey has already been initiated by the Eastern Railway authorities in collaboration with the C.M.P.O. The results of the survey are awaited.

(ii) *Engineering Feasibility Survey—Suburban Dispersal Railway Line*

The West Bengal Government had suggested a scheme for a Circular Railway with the object of bringing daily commuters from the neighbouring townships and colonies to the central core area. The scheme for a Circular Railway was examined by the Study Team with particular reference to the feasibility of its alignment, and to the extent it would ease the traffic situation in Calcutta. As a result of the discussions with the Port Commissioners, the Railways and the West Bengal Study Group, it was felt that the alignment for the Circular Railway as proposed by the State Government may not serve the purpose fully. An alternate alignment was drawn up and discussed with the West Bengal Study Group and the Eastern Railway authorities in June, 1966. It was agreed that a preliminary engineering feasibility study of the suggested alignment was necessary. It may be mentioned that none of the Committees set up

in the past to examine this question, had undertaken any engineering feasibility study. Briefly, the object of preliminary engineering study is to secure all the data necessary to determine the feasibility of alignment both in regard to line and levels of a suggested suburban dispersal electrified railway line. The study will relate to two sections—one from Dum-Dum to Princep Ghat, and the second to serve the Salt Lake area where the State Government have plans to settle about a million people. The details of the proposed feasibility study are given in Annexure III.

As regards the organisation required for undertaking the engineering feasibility survey of the suburban electrified dispersal line, it has now been agreed that a small survey party composed of Railway Officers would carry out the survey shortly under the guidance of the Study Team.

(iii) *Engineering Feasibility Study—Rapid Transit System.*

As already mentioned, it is impossible to devise a method of dispersal of commuters along the road system. The suburban railway dispersal line proposed earlier, will have to be supplemented by a grade-separated rapid transit line for better, quicker and convenient intra-city travel. A grade-separated mass transportation facility might take the form of an underground system or an elevated system, such as monorail, conventional or modern rapid transit system.

The Team is of the view that a feasibility study is necessary before a decision in regard to the form of a rapid transit system is reached. Of major importance in the decision are the physical characteristics of the area, the cost of construction and operation, and the ability to absorb such costs in the economy of the country. The details of various studies required in this connection are given in Annexure IV.

Since the feasibility study for a grade-separated system is being undertaken for different forms of rail transport, the Study Team feels that it would be advisable to have a senior engineer from the Railways as over-all incharge of the survey organisation. The necessary technical personnel for detailed studies would be drawn from different departments, viz., Railways, P.W.D., Ministry of Transport, C.M.P.O, etc. Such an organisation would obviously function under the aegis of the West Bengal Government. The latter have already agreed to the proposal and necessary provision has been made in the Fourth Plan.

Annexure I

Schemes for Road and Bridges for the Fourth Five Year Plan as proposed by the West Bengal Government

Sl. No.	Name of the Scheme	Description	Total estimated cost (Rupees in lakhs)
1.	A new Bridge over the Hooghly River . .	High Level Tied Arch Type of bridge with a main span of 3810 metres.	1600·00
2.	*North-South Howrah Expressway* :		
	(*i*) Proposed Hooghly River Crossing to Varanasi Road (2).	4 lane divided, total length 11.5 kms.	324·00
	(*ii*) Buckland Bridge Reconstruction & Extension.	4 lane divided	200·00
3.	*Eastern Metropolitan By-pass—Northern Section*:		
	(*i*) Proposed Vivekananda bridge approach to Barrackpore—Barasat Road	4 lane divided, total length 14.1 kms.	264·00
	(*ii*) Barrackpore-Barasat Road to Kalyani (1)	4 lane divided, total length 24.·8 kms.	232·50
4.	*Eastern Metropolitan By-pass—Southern Section*:		
	(*i*) Southern Section (Narkal Danga Main Road to Lady Willingdon Road.).	4 lane divided, total length 11.5 kms.	252·00
	(*ii*) Link Road to Biren Roy Road. .	4 lane divided, total length 3.5 kms.	84·00
	(*iii*) Link Road to Taratola Road . .	4 lane divided, total length 6.4 kms.	200·00
	(*iv*) Link Road to Rash Behari Avenue .	4 lane divided, total length 2.2 kms.	17·50
	(*v*) Link Road to Hazra Road . . .	4 lane divided, total length 2.2 kms.	49·00
	(*vi*) Link Road to Lower Circular Road .	4 lane divided, total length 2.2 kms.	49·00
	(*vii*) Link Road to C.I.T. Road. . .	4 lane divided, total length 1.6 kms.	40·00
5.	Construction of a bridge with approaches at Kalyani to connect Eastern Metropolitan By-pass with NH No. 2.		500·00
6.	*Widening & Extension of important roads in Calcutta.*		
	(*i*) Construction of Kasba over-bridge. .		101·56
	(*ii*) Construction of Chetla over-bridge .		24·80
	(*iii*) Widening of Prince Anwarshah Road.		342·86
	(*iv*) Widening of Raja Subodh Mullick Road		32·95
	(*v*) Widening of Jadavpur Central Road .		5·69
	(*vi*) Widening of Russa Road South .		161·35
	(*vii*) Extension of Amherst Street upto Park Street.		188·49
7.	Remodelling of the approaches to the existing Howrah Bridge at the Calcutta end.		200·00

Annexure II

Fourth Plan Proposals

(Rs. in lakhs)

Sl. No.	Scheme	Fourth Plan Outlay
1	2	3
	Transport and Communication—Continuing Schemes	
1.	Howrah Station Area Improvement	164·00
2.	Sealdah Station Area Improvement	90·00
3.	G.T. Road By-pass	50·00
4.	Lighting on Dum Dum Highway	13·56
	(*a*) Remaining Works of Dum Dum Super Highway	10·00
		327·56
	New Schemes	
1.	Hooghly Bridge at Princep Ghat	800·00
2.	Hooghly Bridge at Kalyani	324·00
3.	Traffic Operations Plan	100·00
4.	Buckland Bridge Reconstruction	150·00
5.	Despran Sashmal Road	70·00
6.	Raja Subodh Mullick Road	34·68
7.	Prince Anwar Shah Road	70·00
8.	Chetla Bridge	23·66
9.	Ballygunge-Kasba Overbridge	75·00
10.	Link Road from N. H. 6 to Princep Ghat Bridge (L. A. only)	50·00
	Barrackpore-Kalyani Expressway	50·00
12.	Eastern Metropolitan By-pass	50·00
13.	Link Road from Jessore Road to Dum Dum Highway (near Patipukur)	10·00
14.	Final Design Study of Mass Transit including Circular Railway	65·00
	TOTAL	1872·34

Annexure III

Engineering Feasibility Survey for Providing Suburban Dispersal Railway Line

1. *North of Dum-Dum Princep Ghat section*

The object of this preliminary survey is to secure all the data necessary to determine the feasibility of an alignment, both in regard to line and levels, of a suggested suburban dispersal electrified railway line.

1.2. The lines proposed are to start from a take-off from near Belgharia on the east side of the line, after which the direction of the run will be from north to south between the Bagjola Khal and the existing railway alignment, where it will join up with a right take-off from an extension of the suburban lines from Bally to Dum-Dum, after this line has crossed the double line suburban tracks by a fly-over. This junction is considered necessary so that the dispersal lines, will be possible to get to, both from the Sealdah-Naihati Suburban and Main Sections, as well as Bally-Branch from Howrah via the Dankuni loop.

1.3. The proposed alignment will then run further southwards in a direction which will keep it more or less parallel to the Bagjola Nalla for its length from a crossing of Bagjola Khal across the old Dum Dum Road, then crossing both the legs of the Jessore Road, and upto a point short of the Krishnapur Canal and the new Dum Dum Expressway. The crossing over the Dum-Dum and the Jessore Roads will be by fly-overs as also the crossings over the Dum-Dum-Bongaon. From this point, the alignment will turn round a right angle to run parallel for the full length of the Dum-Dum Expressway, from a point opposite the Bagjola Pumping Station, upto the New Cut Canal bank, which it will have to bridge over before it will turn another right-angle to follow the south bank of the New Cut Canal for its full length upto its junction with the Circular Canal. After a fly-over near the entrance of the New Cut Canal from the Circular Canal, the alignment will then proceed along the northern banks of the Circular Canal, parallel to the Pran Krishna Road and to the canal, until the alignment reaches a point near the Lift Bridge at the entrance to the Circular Canal, from the Hooghly. From this point, the alignment will be along that of the existing C.P.C. Railway tracks. The alternative of taking this alignment on the North Bank of the New Cut Canal, after going through an under-bridge already existing for an industrial siding should be also considered. The alignment north of the New Cut Canal can then be continued, if necessary, by setting back some track and the south boundary wall of Chitpur Goods Yard. The length of track from the junction of the New Cut Canal and the Circular Canal and upto a point near the Chitpur Canal Lift-Bridge, may have to be a high level track, so that co-ordination can be done at that high level for an elevated rapid transit system in case it is found necessary as a result of feasibility study of the rapid transit system.

1.4. From the meeting point of the suggested alignment for the two suburban lines and the C.P.C. Railway tracks, it may be necessary to carry the suggested double lines, either above or below the existing C.P.C. Railway lines, *i.e.*, in such a way that the existing opportunities of crossing and recrossing from banks and back, will be available, as fully as at present, not only for wheeled traffic, but also for the very large number of pedestrians or pilgrims, bathers, and river-side workmen and people who constantly cross the Hooghly in ferries.

1.5. The Survey can be divided into two main parts:—

(i) For the length from the take-off from Belgharia upto a meeting point with the alignment that connects upto the C.P.C. Railway. The Survey will have to be an accurate transit survey with levelling to give line and levels, of all existing structures, roads, railway tracks, canals, etc., which come against the alignment or have to be crossed or bypassed. After running the preliminary trial transit lines, the final alignment fixed must be done by a final location survey, and permanent survey pegs put down. If found expedient, the preliminary survey lines may be run with a prismatic compass for speed, but the final location of the alignment must be fixed with a transit

instrument, and longitudinal and cross-sectional levels must be taken for this final alignment.

(ii) The second major part of the Survey is from the junction-point of the first alignment, with the C.P.C. Railway right up to the Lift-Bridge over the entrance to Tollys Nalla. This portion of the survey need not be a theodolite survey; an open traverse with a prismatic compass will be sufficient, the instrument being set up at every station and the bearings of both the lines meeting there being taken. Local magnetic attraction is very likely, on account of built-up structures nearby and the existence of the steel-work alongside the alignment.

2. *Salt Lake Reclamation Extension*

In view of the scheme for reclamation of the vast North Salt Lake City Extension area and the areas between the existing suburban lines and the Dum-Dum Expressway as also the area to the west of the Cantonment Khal where a population of over one million will be settled within the next 10 to 15 years, it may be necessary for a further extension of this proposed suburban dispersal line, taking off from near the Bagjola Pumping Station circumventing it, and the confluence of the Krishnapur canal and Bagjola Khal and turning southwards to cut through the proposed North Salt Lake City Extension which will be offering an area of 9·6 sq. kms. for housing. The object of the survey will be for demarcating the strip of land to be reserved for the suburban railway tracks.

2.2. There is already a suggestion under consideration for the provision of a siding to function as a mineral siding for the vast amount of building materials that will have to be brought to this rapidly developing area for constructional purposes. This alignment will have to be taken through the heart of north Salt Lake City Extension area *i.e.*, Sectors 1, 2, 3 and continued southwards to fly over the New Cut Canal, the Beliaghata Canal Main Road and the Beliaghata Canal, and over other roads and inland waterways that come across this alignment, until it joins the existing railway lines south of Ballyganj Station. Thus there will be possible a link from the north to south of Calcutta which will bypass Sealdah and thereby reduce the suburban traffic load that would otherwise be thrown in it, by generation of the new traffic in the Salt Lake Area. This line will transport commuters from the north to a point to the south of the Calcutta Metropolitan area without entering Sealdah. Such an additional line to the South of Calcutta with a dispersing line on the east bank of the Hooghly, and a terminal at Sealdah, will provide three points in the Calcutta Metropolitan District for commuter traffic coming from the north of Calcutta and the huge population that will be settled in those regions. This connection will enable the commuters from the north to reach the South of Calcutta without a break of trip.

Annexure IV

Feasibility Study for Rapid Transit System

The primary purpose of this study would be detailed analyses of a recommended rapid transit system for north-south and east-west corridors as a part of the overall transportation plan for Calcutta. In order to fully evaluate all possibilities, it will be necessary for any future rapid transit feasibility study to give full consideration to both elevated and under-ground type systems, despite the many obvious physical and economic limitations to the development of an underground system of rapid transit.

2. The proposed feasibility study will include the following items:—

1. Supplementary origin-destination data. These will be obtained by conducting 'on the vehicle' or 'post-card' type surveys of transit riders on all routes operating in the study area, particularly the routes in or adjacent to the corridors of proposed rapid transit routes. Related information will be obtained on travel purpose, boarding and departure points, and the time of day that trip is made.

2. Operating characteristics of existing mass transportation service. These characteristics will be studied in depth to determine current usage of each system on normal week-days, including service schedules, vehicle loading, vehicle headways and lay-over time by vehicles at terminals. Speed and delay studies would be conducted on lines within the influence area of the proposed rapid transit system. Overall travel times between terminals will be obtained for all lines. All prior operational studies will be reviewed in detail.

3. Examination of present distribution patterns of transit passengers in the central part of Calcutta and at major shopping centres and points of heavy traffic generation.

4. Assignments of vehicles and passenger volumes will be made to recommended routes for current and future years. The projections of travel volumes will be co-ordinated with the current overall transportation study now under way Population trends, land use potentials, traffic data, operating programmes and other transportation factors will be considered in detail as they relate to the proposed rapid transit alignment in particular, and to the entire mass transportation system in general. The evaluation will also be related to recommended improvements in surface transportation in outlying area.

5. Travel demands on individual sections of both types of rapid transit facilities will be evaluated and the implication of estimated usage of both systems for the overall mass transportation network will be analysed and compared. A programme of staged construction, changing future demands and future extensions in rapid transit service will be suggested.

6. Complete civil engineering studies for both systems of rapid transit in order to determine the civil engineering feasibility and problems related to the development of each system. These studies would include investigation of soil conditions, drainage requirements, interference with underground utilities, building foundations and other subsurface construction, and a determination of the availability of materials and contractors to develop each type of system. Time required for the development of each system will be estimated and the adaptability of each system to a programme of staged construction will be evaluated.

7. Examination and comparison of legal problems that might arise from construction and operation of both elevated and underground systems. These studies would include legal action that might result from right-of-way acquisition, excessive and damaging ground settlement or other damage to buildings attributable to underground cons-

exports is particularly disastrous, when the prices of jute goods are high on account of high costs. By adding a heavy burden of speculators' profit the competitive strength of the commodity is considerably weakened. Then again, the fact that the price can be made to fluctuate from day to day and even from hour to hour has, of late, tended to encourage "hand to mouth" buying by foreign countries.

8. The I.J.M.A. has, on more than one occasion, asked that the industry be protected from such activities. No action however has been taken. We have heard at length all the arguments that could be put forward in favour of speculation in jute goods. We remain impressed with the need for the removal of this very grave danger to the stability of the industry and the expansion of the export trade, and we recommend that immediate steps be taken to prohibit all futures trading in jute manufactures.

9. It is necessary here to make a distinction between the Futures market and the Forward market. The difference between forward trading and futures dealing lies in that in the former what is being sold is either goods or capacity to produce goods. The producer takes the ultimate responsibility for fulfilling the forward contract. At the buyer's end too, the buyer is a person, who wants the goods to be delivered to him on the date specified in the contract either for shipping them to an overseas buyer or selling them to another ultimate consumer, if he himself does not happen to be one. In the futures market, however, what is sold is a basis quality which gives a hypothetical claim to any one of a range of goods, which the seller hopes to fulfil by having resort to a purchase at a later date when the market is more favourable to him or by making a purely financial settlement of the difference between the sale price and the prevailing ready price when the due contract matures.

10. To reduce speculation as much as possible, it would seem desirable that even in forward trading, the speculative element should not be allowed to intrude itself and sales should be made permissible only to the consumer overseas or the shipper and to no other intermediaries. Such an arrangement, it has been said may weaken the position of the mil's regarding finance. We do not see why this should be so, since even with forward sales, payments are only made when delivery becomes due. As in the last analysis, the total demand for and the total sale of jute goods must rest on the willingness of the consumers to purchase, the industry cannot really hope in the long run to sell more than the consumers will buy, simply because there are some intervening speculators. The action proposed has become all the more necessary because, regrettable as it is, the number of cases in which mills sell their goods on a forward basis to their own managing or selling agetns is, we understand, on the increase. These agents run a separate business which derives advantage from the sale of these contracts to other persons, the profits from such transactions not appearing in the mills accounts.

11. The measure proposed would be the ideal arrangement. There appears however to be much opposition to it by the trade as it is felt that its immediate effect would be an entire dislocation of the marketing conditions and a retardment of the progress of exports which is the opposite of what we wish to achieve. The disturbance in the market may not be as long-lived as the trade apprehend and the long-term prospects of the export trade will benefit greatly from the change proposed. In certain very special circumstances, as for example when a foreign consumer fails in business and cannot take up the goods contracted for by him, it may be necessary to permit a shipper to sell to anothe:


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CHAPTER III

BOMBAY


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Chapter III

BOMBAY

The metropolis of Bombay spread over two Islands, is one of the largest ports in Asia and serves and influences a vast hinterland. With the development of complex of industries, social and economic facilities, the city has acquired a pre-eminence of its own. The development of city started in the 17th century. The Bombay Island originally comprised 7 islets which by means of connecting causeways and break-waters to shut out the sea, coalesced in to grow into a promontory of solid land, measuring about 5 kms. in width at the northern end and narrowing to a rock point at Colaba, its southern extremity. This is connected at its northern limits with Salsette Island by means of causeways and railway embankments. The Bombay metropolitan region includes the whole of Greater Bombay, Thana, Kalyan, Bhivandi and Bassein Talukas of Thana district and Uran Taluka and portions of Panvel, Karjat and Khalapur Talukas of Kolaba district. It covers an area of 3,840 sq. kms. and consists of 940 villages inhabited by 639,000 persons and 19 urban centres with a population of 4·64 million.

Population Trend and Density

1.1. In 1864, the population of Bombay which then had an area of 47·67 sq. kms. was 784,000. It increased to 928,000 in 1901. The population in the next four decades doubled itself and was about 1·8 million in 1941. There was a phenomenal growth of population during the next two decades. It reached about 3·0 million in 1951 and 4·2 million in 1961. The rate of growth during the decade 1941-51 was 66 per cent and nearly 40 per cent during 1951-61. The growth of population was accompanied by a continuous expansion in area and an urban sprawl. The area of the island in 1961 was 67·58 sq. kms. In an attempt to solve the problems created by the tremendous growth of population and the physically expanding urban agglomeration, the limits of the Corporation had to be twice expanded in the span of seven years. The growth of population in Greater Bombay from 1901-1961 is shown in the graph.

1.2. The rapid growth in population is due to the continuous inflow of migrants from the hinterland and from other parts of India in search of employment opportunities which have grown sharply due to phenomenal developments in industrial activities in the post-independence era. The Partition of the country in 1947 also added to the great influx of population into the area. It is estimated that the population of the Greater Bombay would increase to nearly 7·1 million by 1981.

1.3. The following table gives the over-all population density in the Bombay district over the last few decades.—

table 1

ward*	density per acre			
	1931	1941	1951	1961
A . . .	25	40	57	76
B . . .	188	221	295	288
C . . .	466	480	719	769
D . . .	95	28	167	216
E . . .	138	163	234	272
F . . .	30	42	79	105
G . . .	37	62	123	150
average density .	69	89	139	165

* 'A' — Upper Colaba, Middle & Lower Colaba, Fort Southern, Fort-Northern (Esplanade).
'B' — Mandvi, Chakla, Umarkhadi, Dongri.
'C' — Kharatalao, Kumbharwada, Bhuleshwar Market, Dhobitalao, Fanaswadi.
'D' — Khetwadi, Girgaun, Chowpati, Walkeshwar, Mahalaxmi.
'E' — Tardeo, Mazgaon, Tadwadi, 1st Nagpada, 2nd Nagpada, Kamathipura, Byculla.
'F' — Parel, Sewri, Naigaum, Matunga, Sion.
'G' — Dadar, Mahim, Prabhadevi, Worli, Chinchpokali, Lovegrove.

Within Greater Bombay, the population density is very uneven, varying from as low as 6 persons per acre to as high as 769 persons per acre during 1961. In the 'C' ward the density was the highest in the Market area (1762) and in Bhuleshwar (1520). Higher residential density is noticed in some of the oldest developments in the south of the city and the surrounding areas, on account of the tendency to reside near the place of work.

1.4. *Employment*: According to 1961 census, the total working population in the metropolitan region was 2·16 million out of a total population of 5·28 million. The following table shows sectorwise employment in the Bombay-Panvel-Khopoli Region :—

table 2

area	percentage of workers to total population			percentage of non-workers to total population
	primary sector	secondary sector	tertiary sector	
Greater Bombay	0·77	17·67	22·19	59·37
Bassein Taluka	28·88	6·04	10·59	54·49
Thana Taluka	13·27	13·14	14·28	59·31
Kalyan Taluka	12·03	9·92	14·23	63·82
Bhivandi Taluka	30·36	13·23	5·91	50·50
Panvel Taluka	37·12	2·27	6·07	54·54
Uran Mahal	32·20	5·73	7·43	54·64
Karjat Taluka	32·25	3·00	11·25	53·50
Khalapur Taluka	36·24	5·67	8·08	50·01
total :	5·41	15·80	19·81	58·98

Source: *Census of India 1961.*

1.5. *Growth of traffic* : The rise in population and rapid industrialisation have created an increasing trend in vehicle ownership. Private cars have increased by over 225 per cent and all registered motor vehicles by more than 260 per cent during 1955-66. The following table shows the growth of registered vehicles in Greater Bombay during this period :—

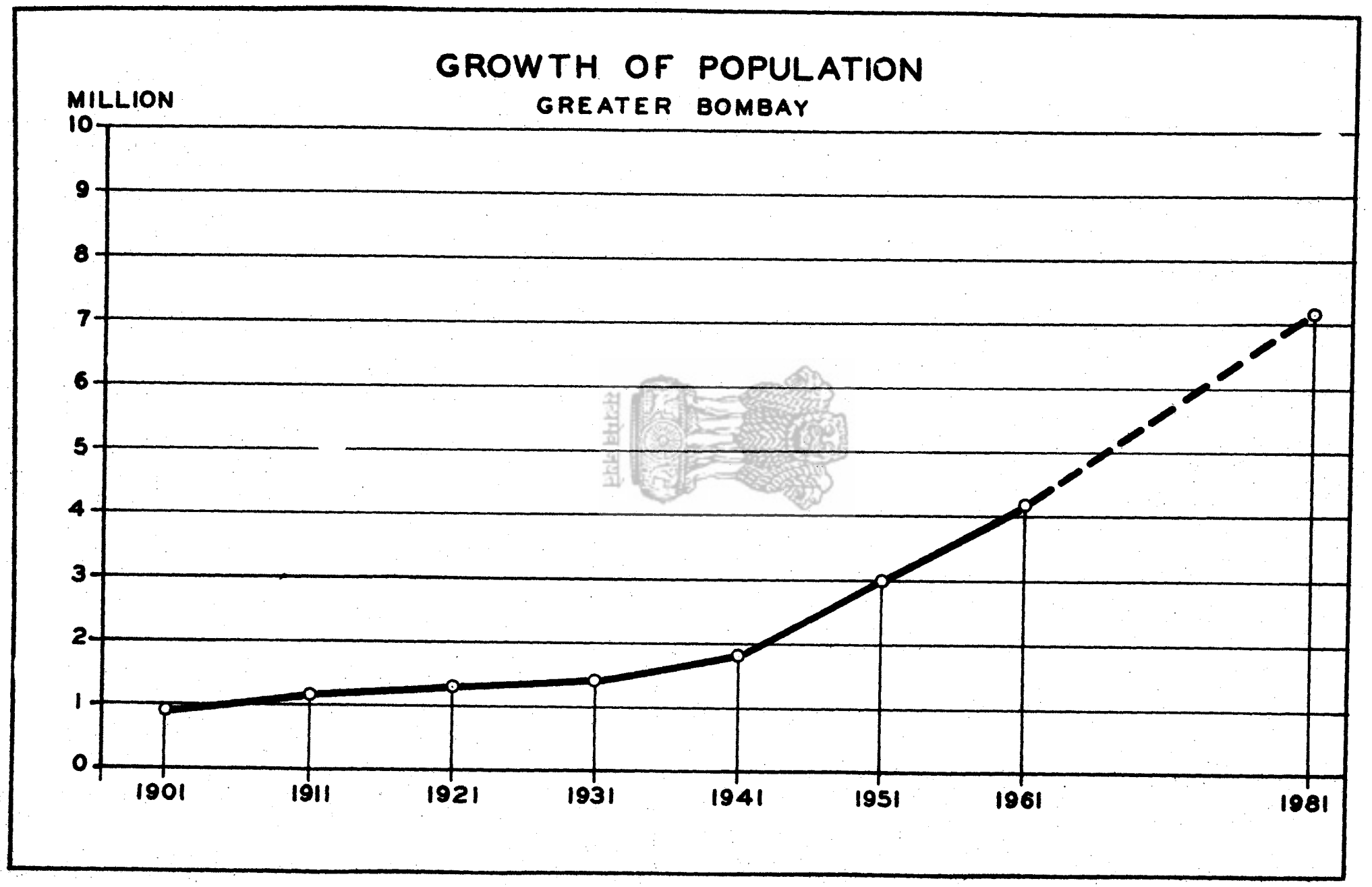
table 3

class of vehicles	1955	1960	1965	1966
motor cars	22,863	45,222	68,455	75,075
motor cycles	1,556	7,983	16,736	18,095
motor taxis (including auto-rickshaws)	3,263	4,612	10,110	11,413
stage carriages and buses	662	1,866	2,198	2,252
lorries	7,209	13,725	21,459	22,546
ambulances	54	90	152	162
school buses	49	295	357	367
slow moving vehicles	2,253	6,280	6,105	5,944
miscellaneous vehicles	482	1,068	1,861	1,966
total	38,391	81,141	127,433	138,720

Source : Police Commissioner, Greater Bombay.

GROWTH OF POPULATION

GREATER BOMBAY



LAND UTILISATION BOMBAY CITY

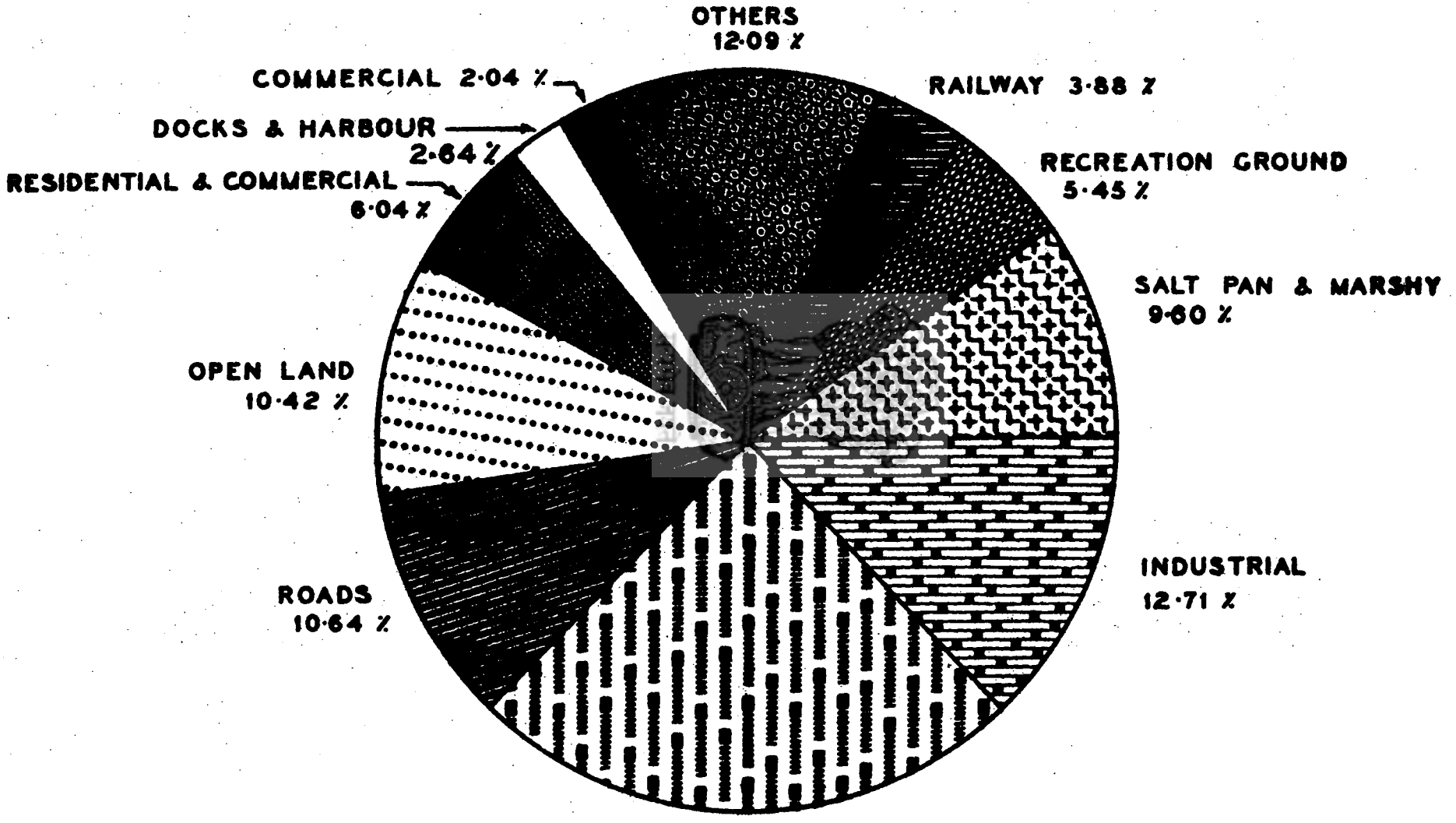


TABLE 4

Existing Land use

2.0. There is mixed land-use pattern in the metropolis where housing, commerce, industry etc. are all grouped together. There is, however, heavy concentration of commercial activity in the southern part of the city which is spread over an area from Museum to Princess Street, except in some localities of older developments and part of the Backbay Reclamation Scheme which are predominantly residential in character. Commercial activity is also widespread in the precincts of Kalbadevi, Bhuleshwar and Opera House. The central part of Bombay is largely a zone of mixed uses, interspersed with several industrial uses, such as small workshops and godowns. The following table gives the existing land-use pattern of Bombay city :—

table 4

uses	percent
1 residential	24·49
2 commercial	2·04
3 industrial	12·71
4 residential & commercial	6·04
5 commercial & industrial	0·37
6 residential & industrial	0·36
7 residential, commercial and industrial	0·38
8 godown and stores	5·66
9 recreation ground	5·45
10 open land	10·42
11 railway	3·88
12 docks and harbour	2·64
13 salt pan and marshy	9·60
14 defence services	3·52
15 roads	10·64
16 miscellaneous	1·80

Source : *Report on the Development Plan for Greater Bombay, 1964.*

Central Business District

3.0. The centre of business activity in Bombay is in and around the Fort and Mandvi areas. The Fort district comprises important areas such as Colaba, Backbay, Flora Fountain, Bori Bunder, Ballard Estate, Marine Lines, Mahatma Gandhi Road and the Mahatma Jyotiba Phule Market. These areas accommodate the head offices of the Maharashtra Government, Municipal Corporation, Port Trust, Western and Central Railways, big banking and insurance companies, commercial houses and retail shopings centres.

The Mandvi area is bounded by Sardar Vallabhbhai Patel Road in the north; P. D' Mellow Road in the east; Carnac Road in the south; and Ebrahim Rahimtoola Road in the west. The area is primarily occupied by whole-sale warehouses and godowns. It is a commercial centre of movement of goods by road, rail and sea.

Transportation Pattern and Traffic Situation

4.0. Bombay's mounting difficulties with regard to traffic and transportation can be assessed from the fact that only 10·64 per cent of the total area is assigned to transportation uses against 20 to 30 per cent which is considered a minimum by modern standards for a city. Besides, urbanisation is continuing along the lines of communications with the result that the city's transport problem is getting worse. According to the Gadgil Report[1], "the method of ribbon development takes the line of least resistance. All activities are most easily located along the existing communication lines. In Bombay such development is proceeding interminably and will soon reach the Ghats". Another notable factor is the convergence of roads at the centre of commercial and governmental activities in the Fort area, and relatively little road development in the vicinity of the Mahalaxmi area. A substantial part of the industrial zone is not provided sufficiently with good roads. The two Railways are barriers across the east-west roads and require a number of grade-separated crossings.

4.1. *Existing roads and arteries* : Two main north-south routes form the basis of the arterial system on Bombay Island. The eastern route connects Colaba and Sion, passing through Flora Fountain, Bori Bunder, Bhendi Bazar, Byculla, Lal Baugh and King's Circle. The western route begins from Netaji Subhash Road and passes through Chowpatty, Kemp's Corner, Haji Ali, Worli Naka and Shivaji Park, connecting the Mahim Causeway. The arterial system in the suburbs is much simpler than on Bombay Island as much of the area is not yet fully developed. Development is generally concentrated to the south in Bandra, Andheri, Khar,

1 *Report of the Committee appointed for Regional plans for Bombay-Panvel and Poona Regions* (1966).

Chembur, Ghatkopar, Kurla and along the Ghodbunder and Agra roads. A single road generally serves both the arterial and local distributor functions.

4.2. There are four major north-south routes which form the basis of the arterial system in the Island of Bombay *i.e.*, Netaji Subhash Road, Peddar Road, Hornby Vellard, Dr. Annie Besant Road, Veer Savarkar Marg and Mahim; (2) Maharshi Karve Road, Dr. Anandrao Nair Road, Sana Guruji Road, Namjoshi Road, Gokhala Road, Lady Jamshedji Road and Mahim; (3) Dadabhai Naoroji Road, Palton Road, Mohamedali Road, Ebrahim Rahimtoola Road, Sion Road and Sion; (4) P. D'Mellow Road, Reay Road, Zakeria Bunder Road, Rafi Ahmed Kidwai Road and Sion. East-west links are Vir Nariman Road, First Marine Street, Carnac Road, Sardar Vallabhbhai Patel Road, Maulana Shaukat Ali Road, Bellasis Road, Clarke Road, Connaught Road, Sayani Road, King Edward Road and Tilak Road.

4.3. *Traffic situation*: A survey was undertaken in the year 1964 by the Bombay Municipal Corporation for the preparation of the Development Plan for Greater Bombay. The survey indicated that the heaviest traffic movements occur mostly during the months of December to February. Daily variations noted a marked similarity between the Fort area with the normal flow being appreciably consistent, except on Sundays. The hourly variations of traffic showed morning and evening peaks in both directions in the Fort area with northward movement in the evening and southward movement in the morning. The Mahim Causeway had a stronger directional characteristics southwards in the morning and northwards in the evening, the flow being twice as much as the reverse flow at the peak hours. There is a north-south movement of 53,000 fast vehicles per day approaching the Island, increasing to 1,64,000 crossing Maulana Shaukat Ali Road and 1,62,000 crossing Carnac Road. The volume entering the Fort from the south is about 54,000 vehicles per day.

4.4. *Travel speeds and delays*: The efficiency of road system in a city is judged by the speed with which traffic from the central area can reach the outskirts during peak hours. The studies earlier made, indicate that in the city proper, low speeds are obtainable on the Mohamed Ali Road, Dr. Ambedkar Road up to Khodadad Circle. High speeds are possible along Netaji Subhash Bose Road, Peddar Road, Annie Besant Road and Veer Savarkar Marg. The western route permits speed varying from 48 to 56 kms. per hour with an occasional speed drop at Peddar Road to 24 to 32 kms. per hour. The D'Mellow Road, Reay Road, Zakeria Bunder Road and Rafi Ahmed Kidwai Road route permits speed ranging from 24 to 32 kms. per hour. Maulana Shoukatali Road, Elphinstone Road and Tilak Road permit speeds of less than 24 kms. per hour. Of the east-west route, only Bellasis Road affords a speed of over 24 kms. per hour.

4.5. *Accidents*: The congestion on roads due to the large number of motor vehicles have also caused an increase in the number of accidents. The following table indicates the number of registered motor vehicles and the number of accidents :—

table 5

year	registered motor vehicles	accidents	
		fatal	total
1955 . . .	36,138	250	18,861
1960 . . .	74,861	282	25,270
1961 . . .	85,044	324	28,654
1962 . . .	90,647	336	30,201
1963 . . .	98,813	350	25,418
1964 . . .	109,103	390	23,770
1965 . . .	121,328	487	23,003
1966 . . .	132,776	517	24,492

Source: Police Commissioner, Greater Bombay.

4.6. *Existing transport facilities*: The mass transportation needs of the city are catered to by the two suburban surface railways and the buses which carry a vary heavy load of passengers in the peak hours. The buses are operated by the Bombay Electric Supply and Transport Undertaking. Connections between Bombay and its suburbs are provided by the suburban electric services of the Central and Western Railways.

4.7. *Buses*: In the suburban development of the city, buses assumed importance because of their greater route flexibility. The old city trams were gradually replaced by buses a few years ago. While in 1948-49, trams carried nearly 60 per cent of the total passengers, the proportion decreased to about 6 per cent in 1962-63 and 3 per cent in 1963-64 at the end of which the tram cars were abolished. The bus operation in Bombay has more than doubled during the last decade. In 1955-56 there were 631 buses with the BEST Undertaking while in 1965-66 the number increased to 1342 buses. In 1955-56 the daily average number of passengers carried was 8,84,000 while in 1965-66 it was 1·84 million showing an increase of 108 per cent. During the same period, the daily average kilometres operated also increased from

99,508 to 2,04,158 registering an increase of 105 per cent. The suburban buses operated by the State Road Transport Undertaking carry on an average 24,000 passengers per day.

The fleet operation in the city is not adequate to meet the requirements of the passengers. The extent of congestion in buses would be clear from the following table :—

table 6

type of buses	No. of buses	passenger carrying capacity			average load per bus
		seated	standing	total	
single decker (conventional)	349	13,441	3,617	17,058	49
single decker (underslung)	258	10,917	6,340	17,257	67
double decker	735	51,051	5,880	56,931	77
total	1,342	75,409	15,837	91,246	68

4.8. *Suburban Railways* : The Railways constitute the most expedient and effective means of mass transportation in Bombay. Greater Bombay is served by the Central Railway on the eastern flank and the Western Railway on the western flank. Both these services penetrate into the core of Greater Bombay with terminals at Victoria Terminus and Churchgate. The suburban section of the Western Railway extends from Churchgate to Virar, a distance of 60 kms. and that of the Central Railway extends from Bombay V. T. to Kalyan, a distance of 54 kms. The headway of western suburban trains is little less than 3 minutes and that of the Central Raiway is 2.6 minutes.

The annual passenger traffic on the two Railways has shown a tremendous growth. During 1955-56, the passenger traffic was 162 million on the Central and 178 million on the Western Railways. It rose to 343 million and 337 million in 1964-65, thereby showing an increase of 112 and 89 per cent respectively. Both the Railways carry about 1·8 million suburban passengers daily. A number of steps have been taken in the recent past to meet the requirement of peak-hour suburban traffic which include the introduction of additional trains, augmentation of the rake composition form 8 to 9, introduction of 8 car rakes on the Harbour Branch line, provision of route relay interlocking at key points, extension of automatic signalling, construction of additional passenger platforms, and provision of arterial sidings with a view to relieving capacity on the suburban and main lines etc. It may be pointed out that in spite of the increase in train services and other steps taken for the clearance of suburban rush during the peak hours, overcrowding still continues.

4.9. *Port traffic* : The traffic handled by the port has steadily increased from 6·99 million tonnes in 1950-51 to 18·12 million tonnes in 1965-66. The capacity of the Docks is estimated at 6.70 million tonnes which after the completion of the recent extension is estimated at about 8.20 million tonnes. The Docks are expected to handle about 8.6 million tonnes of traffic by 1970-71.

4.10. *Parking* : In Greater Bombay, adequate facilities are not available for off-street parking. Parking of cars in the carriageways of main streets and roads leads to a waste of the road space and hampers the continuous flow of traffic. A parking survey made by Wilbur Smith and Associates indicates that demand for parking within convenient walking distance is most intense in areas, such as Flora Fountain, Bori Bunder, Dadabhai Naoroji Road, Pherozshah Mehta Road, Medows Street, Vir Nariman Road, Carnac Road and Marine lines.

4.12. *Truck terminals*: Truck registration during the period 1952-62 has witnessed an increase from 6,843 to 14,326. A survey conducted by Wilbur Smith & Associates indicates that the heaviest movement of truck traffic is in the Dock area along 3.2 kms. length of P.D.'Mellow Road. According to surveys carried out, 4,839 trips were made from Alexandra Dock per day; 4,133 from Wadi Bunder Goods yard; 3,048 from Carnac Bunder Goods yard and 2,418 trips from Princess and Victoria Docks whereas other termini had fewer than 1,000 trips per day. Most of the trips so generated lead towards the Central Business District. Bombay has no specially designed truck terminal as yet. Trucks are seen parked along the kerb line in certain areas in the vicinity of the Port and other warehousing and whole-sale marketing centres.

4.13. *Level crossings*: There are number of level crossings in the metropolitan area of Bombay. With an increase in the number of trains, the level crossings have to be closed very often and that too for long periods. Such frequent and prolonged closures cause considerable inconvenience to road traffic which has grown tremendously. Rail traffic is also adversely affected because accumulated road traffic while being passed, trains have often to be halted at level crossing signals, causing disruption to the tight schedule of train running.

Prior Studies

5.0. *Barve Committee Report* (1959): The Government of Maharashtra appointed a Committee under the chairmanship of the late Shri S. G. Barve to solve the difficulties that commuters were facing and also to suggest measures to check the growth of industrial development in the Bombay area. The Committee realised the need of investigations for providing an underground railway system in Bombay. It recommended (i) construction of a rail-*cum*-road bridge over Thana Creek for the purpose of opening out other areas across the Thana Creek along the mainland; (ii) steps for opening townships for suburban dispersion; (iii) decentralisation of industry by regulating the location of new industrial units; (iv) provision of ferry service across the harbour; (v) development of new centres of business activity in the Bandra-Kurla area; (vi) reclamation of land at Backbay and Creek areas between Wadala and Chembur; (vii) construction of a main highway connecting Frere Road *via* Reay Road and Sewri to Wadala and Tulsi Pipeline Road; and (viii) construction of short tunnel through Malabar Hill to join up to a road along the sea-face etc. Some of these recommendations have already been implemented.

5.1. *I.L.O. Mission Report* (1962): The International Labour Office Management Development and Productivity Mission to India undertook a comprehensive survey of the operations of the BEST Undertaking's transport activities with particular reference to (i) tramway services; (ii) improving the efficiency of the bus services; and (iii) alternative modes of transport. The Report recommended the replacement of trams by buses. The relative advantages and disadvantages of trolley buses were examined and it was observed that trolley buses could be recommended for the main replacement programme or for any major expansion of transport fleet. It recommended that diesel-engined double decker buses would be the right substitute. The Report recommended overhead/underground railways which could cope with the tremendous mass transportation problems.

5.2. *Bombay Traffic and Transportation Study* (1963): A study was conducted by Wilbur Smith & Associates to obtain the required information on future transportation needs of the Greater Bombay area. From an evaluation of the future roadway needs, as determined from extensive origin and destination studies, they have recommended a phased plan for the development of a system of freeways, expressways and improved arterial streets, estimated to cost Rs. 96 crores. Intensive operational improvements have also been suggested for correcting certain deficiencies. Emphasis has also been given to the need for restrictions on parking and slow moving traffic and construction of pedestrian safety fences. Several intersections have been suggested to be re-designed and signalised to permit maximum utilisation of the capacity of existing roadways. The Plan has been proposed to be implemented in four stages (1963-1981) so that the entire system is available to the traffic by 1981.

M/s. Wilbur Smith have also recommended in their report that "to properly plan for the future mass transportation needs for the Bombay Study area, detailed studies will be required relative to possible new system of mass transportation, as well as studies involving expansion of the present modes of bus and rail".

5.3. *Report on the Development for Greater Bombay* (1964): The Bombay Municipal Corporation prepared a Development Plan with the objective to secure dispersal of population to the suburban areas, decentralisation of industry and commerce from the city and to provide new roads and arteries, public facilities, such as hospitals, schools, markets etc. The Development Plan has outlined a series of proposals which stretch the existing pattern of north-south developments even further. The Development Plan has accepted the present situation of high population concentration in the south and also in the areas of Andheri-Bandra on the west, and Chembur, Ghatkopar, Kurla on the east, with the ribbon type of development along the two arterial routes.

The Plan recommends proposals for improving the existing net-work of the road system by providing north-south links and widening of existing roads. The provision of two new arterial roads of freeway standards has been proposed along the east and west fringes of the city to absorb traffic away from the congested parts of the city. The western promenade freeway

will connect Netaji Subhash Bose Road with Mahim Causeway along the western coast. The project involves tunnelling through Malabar Hill. The East Island freeway will run from cross Island connector at Museum to Mahim Creek connector.

5.4. *Gadgil Committee for Regional Plan for Bombay-Panvel Region* (1966): The Gadgil Committee was asked to formulate broad principles of regional planning for the metropolitan region of Bombay-Panvel and to make recommendations for the establishment of a Metropolitan Authority for the preparation and execution of such plans. The Committee recommended that metropolitan regional plan should indicate how best the distribution of population of the region (present and future) should be brought about in its various aspects of living and working. It also recommended that the Regional Plan should lessen the concentration of economic activities in the Bombay Island. The Committee referred to the various studies undertaken in the past in connection with the road system in Greater Bombay and observed that "no attention has yet been paid to the problem of mass transportation. This requires to be studied carefully at an early date". In this connection the Committee referred to the proposal for an underground railway which might cost Rs. 75 crores. The Committee felt that "unless steps on suggested lines are taken, the transport conditions will worsen and the cost will become even higher than that now estimated".

Referring to the appointment of a Regional Planning Board under the Regional Planning Act for the preparation of regional plans, the Committee has suggested that the proposed Board should be high-powered, representative and independent of the local, public and semi-public authorities, operating in the region.

Future Land Use

6.0. The Gadgil Committee has formulated certain broad principles of regional planning for the metropolitan area of Bombay. It recommended that the future land use plan should set forth restrictions on the density of land use in terms of population or building bulk and should define the areas to be reserved for various activities. The Committee have suggested dispersal of industries, lessening of economic activity in the Bombay Island and development of suburban areas as neighbourhood units in order to relieve pressure on the central city area.

Main Proposals for Solving the Transportation Problems

7.0. *Development of roads in the Fourth Plan*: For the future roadway needs, as determined by extensive surveys, a system of freeways and expressways and improved arterial streets was recommended by Wilbur Smith & Associates. They suggested four stages for implementation of the entire programme. It was envisaged that by the end of the Fourth Plan, the programme included in stages 1 and 2 costing Rs. 54 crores would be completed. The Study Team examined the schemes in detail. Keeping in view that the whole programme should not be out of step with the general scheme likely to be drawn up, the Team asked the State Government to formulate a realistic road development programme for the Fourth Plan with due regard to its physical and financial capacity. A small technical group of engineers was set up to rephase the road development programme. Taking into account that the effective working years of the Fourth Plan period would be only 3 years (allowing for time involved in preparing the projects and acquisition, etc.), the Sub-Committee drew up a road programme costing Rs. 42.7 crores of which Rs. 27·2 crores were proposed to be spent in the Fourth Plan. The details of the programme are given in Annexure I. However, in view of the limited resources available a provision of Rs. 18 crores was made by the Planning Commission for development of metropolitan roads in Bombay during the Fourth Five Year Plan.

On account of the reduced outlay, the Study Team worked out fresh priorities in consultation with the State Study Group. The revised programme is given in Annexure II. The main schemes included for implementation during the Fourth Plan are parts of East Island Freeway and the West Island Freeway (Malabar Hill Tunnel), construction of link roads joining two expressways, construction of Chembur Mankhurd Road link to join the approach to Thana Creek bridge. The East Island Freeway is expected to give immediate relief to the section between Carnac Bunder Road and the point where D'Mellow Road ends and Reay Road commences. The traffic congestion in this area is due to lot of inlet and exit of heavy trucks, going into and coming from dock and godowns. It is proposed to construct an elevated freeway on this length. The Study Team has also suggested to the State Government that a separate full-time technical cell should be set up immediately to undertake detailed engineering studies of the works included in the Programme.

7.1. *Backbay reclamation programme*: There is a proposal of the State Government to develop about 600 acres of the Backbay Reclamation area south of Sachivalaya. It is proposed to develop 40 per cent of the area for intense commercial use with a floor space index of 3.5. Such development would generate substantial volume of new traffic as there is bound to be substantial addition to the total employment in the Fort area. The development of the Backbay Reclamation area alone may create about 100,000 new jobs. Most of these employees would be using the already overcrowded mass transportation services. Taking this into consideration, the Study Team suggests that before the State Government go ahead with their plans for intense commercial development in the Reclamation area, proper study should be conducted to analyse the local traffic and transportation problems that are likely to be created as a result of such development. Past experience shows that commercial areas generate the highest amount of traffic than any other urban land use. This will be particularly so, when the proposed new commercial area on the reclamation programme will be contiguous to the Central Business District of Bombay.

7.2. *Replacement of level crossings*: As a result of a meeting held between the Railway Minister and the Chief Minister of Maharashtra in early 1965, a policy decision was taken that all important level crossings on the Bombay suburban section should be replaced by road over/under bridges in the next two or three years to facilitate free movement of through traffic. It is suggested that the following level crossings on the Western Railway should be replaced by road over/under bridges, as early as possible :—

(i) Matunga and Bandra;
(ii) Vile-Parle;
(iii) Andheri and Jogeshwari;
(iv) Jogeshwari and Goregaon;
(v) Goregaon and Malad;
(vi) Kandivli and Borivli (subway);
(vii) Kandivli and Borivli; and
(viii) Borivli and Dahisar (two level crossings)

It is also suggested that the following level crossings on the Central Railway be replaced by grade-separated crossings in a phased programme :—

(i) Bhandup-Mulund;
(ii) Kalyan;
(iii) Vikhroli-Bhandup;
(iv) Ghatkopar;
(v) Sewri;
(vi) Govandi;
(vii) Wadala;
(viii) Chembur Road;
(ix) Trombay; and
(x) Thana.

7.3. *Parking and truck terminals*: Wilbur Smith & Associates undertook parking surveys in two important areas of the Central Business District to determine the current availability of parking space against the parking demand, the turn-over rate and the total utilisation of parking facilities etc. The Survey was undertaken for the Fort and the Mandvi areas and projections were made for the 1981 parking demand. It suggested that enough space should be provided for parking facilities otherwise kerb-side parking would lead to unnecessary congestion on the roads and would reduce the carriageway capacity of the existing roads and streets.

Under the Development Control Rules, definite parking space is insisted upon for all new industrial and commercial establishments within their respective holdings to admit as much off-street parking as possible in areas of new development. Parking space for residential zones is also insisted upon in the higher income group residential areas. The Development Plan has made reservations for parking lots. These reservations are not based on any scientific study but are the results of *ad hoc* decisions to provide relief to highly congested areas of the Central Business District. Such parking facilities are also required to be provided at Railway stations and other recreational and cultural centres. Multi-storeyed parking facilities would sooner or later have to be provided in larger numbers in the Fort area and in other parts of the Central Business District to relieve the road congestion. At present Bhatia Baugh & Horniman Circle are proposed to be developed for the purpose. The Study Team suggests that these multi-storeyed parking facilities should be provided at an early date and the provision of the Development Control Rules followed strictly.

7.4 Bombay has no specially designed truck terminals. Trucks today are seen parked in numbers along the kerb-line in certain areas in the vicinity of the Port and warehouses. These locations are based to ensure the minimum transport costs to the operators. With the decentralisation of industries and commercial establish-

ments and the need to free the roadway of parked trucks, it is necessary that proper truck parking terminals be established. The Development Plan has suggested two sites—one in the vicinity of the Dock area at Reay Road and the other at Cotton-Green. In the Wadala Salt Pan area, a vast land has been reserved for general warehousing. In the vicinity of this zone, land has been earmarked for a truck terminal. Another suggestion has been made that an elevated truck terminal over Wadi Bander Goods Yard should be constructed. In the suburban area also it is proposed to locate truck terminals, specially at the northern limits of Greater Bombay. The Team recommends that a well designed and adequately sized terminal away from the C.B.D. should be constructed to accommodate trucks. It is also suggested that the movement of trucks in the C.B.D. should be restricted to non-peak hours of the day and loading and unloading should be encouraged during the night.

7.5. *Modernisation of traffic operations*: Wilbur Smith and Associates have suggested many improvements to assist the flow of traffic which include prohibition of 'U' turns, providing of turning movements at intersections, parking regulations and restrictions in loading and unloading, lane markings on the street, bus-bays at bus stops, one way traffic system, pedestrian crossings and a ban on slow moving traffic on arterial roads. M/s. Wilbur Smith have also suggested a signalisation programme for 54 important intersections to be taken in hand on a priority basis. Major intersection treatment for 33 important crossings have also been recommended. The Study Team is of the view that the above programme should be undertaken and efforts should be made to complete the improvements at these intersections as early as possible.

FURTHER ACTION PROGRAMME

(i) *Mass Transportation Studies and Surveys*: The survey conducted by Wilbur Smith and Associates was confined only to road traffic. The report clearly states that much of the future travel in Bombay must be by public transportation, even if policies on automobile manufacture are liberalised and suggested road improvements are effected. Rapid transit networks may have to supplement the conventional forms now in use.

The bus services of B.E.S.T. and the suburban services of the two Railways which presently cater to the requirements of mass communication in Bombay, carry a heavy load of passengers in peak hours. The number of passengers carried daily by the Central and Western Railways together is about 2 million. The exact number of passenger trips by the railways and buses coming to the Fort area during peak hours is not available. A fair idea could be had from the fact that the total employment within 3·2 kms. of Flora Fountain is about 525,000 and that about 80 to 90 per cent of the commuters use public transportation system. As against a carrying capacity of 1,800 (including standees) for a 9 car—rake, the Western Railway have estimated a crush load capacity of about 3,000. The travel conditions of mass commuters even at the present level of usage are critical. Taking this situation in view, Wilbur Smith and Associates and the Gadgil Committee have recommended that problem of mass transportation has to be studied carefully at an early date. For this, detailed studies will be required relative to possible new system of mass transportation as well as studies involving expansion of the present modes of bus and rail. The Study Team recommends that systematic surveys and studies should be conducted to study various aspects of mass transportation. The purpose of the mass transportation study will be to develop a comprehensive and long-term plan for mass transport for the Bombay metropolitan area.

The Team is of the view that the study area for the mass transportation study should include the entire Bombay metropolitan region as recommended by the Gadgil Committee in Bombay Regional Plan. The study area adopted by Wilbur Smith and Associates for their Bombay traffic and transportation study was confined only upto Bassein and Thana Creeks in the north, western foot-hills of Belapur in the east and sea in the west and south. However, care would have to be taken to avoid any duplication of the work already done by M/s Wilbur Smith and other agencies.

(ii) *Work Place Survey in the C.B.D.* According to Wilbur Smith and Associates, gate counts conducted between the hours of 7.00 A.M. to 11.00 P.M. at Victoria Terminus recorded 3,30,000 passengers. At Churchgate station between 6.00 A.M. to 11.00 P.M., 165,000 persons were recorded. The peak period rail usage figures of inbound passengers at V. T. and Churchgate were 30,000 and 20,000 respectively. The heavy outflow of commuters at V. T. and Churchgate causes high pedestrian density at exits to these stations, thus leading to serious conflict between pedestrians and vehicular traffic. Pedestrians not only impede the flow of traffic, causing reduced speeds and capacities but also create safety hazards for all

road users. Since the traffic problem is acute in the Central Business area, the Team has asked the State Study Group to give top priority to the Work Place Survey in the C.B.D. This would enable the Team to suggest immediate relief measures or dispersal of traffic in the C.B.D. area.

The Study Team in consultation with the State Study Group has prepared detailed programme of studies and surveys for drawing up a comprehensive mass transportation plan for the Bombay Metropolitan region. The survey is likely to be taken up soon by the Town Planning Department who will obviously need help of the Railways and other concerned agencies.

Annexure I

Road Development Programme for the Fourth Plan

(Rs. in lakhs)

Sl. No.	Items	Approx. cost	Proposed outlay in					Total Outlay in IV Plan	Spill-over to V Plan
			1966-67	1967-68	1968-69	1969-70	1970-71		
1	2	3	4	5	6	7	8	9	10
1.	Malabar Hill Tunnel and W.I. Freeway between Malabar Hill and Haji Ali.	840	1	50	100	200	250	601	239
2.	East Island Freeway between Carnac Road And Matunga`	2670	7	125	300	460	560	1452	1218
3.	Central Island Express way between Matunga and Sion.	50	1	9	30	10	..	50	..
4.	Construction of link roads	300	1	20	50	90	100	261	39
5	Construction of Chembur Mankhurd Road .	150	1	5	40	40	40	126	24
6.	Acquisition of land & structures :								
	(*a*) E.I. Freeway between Museum & Carnac Road .								
	(*b*) Sardar V. P. Road between Bhendi Bazar and I. E. Freeway	260	..	..	100	90	40	230	30
	(*c*) Carnac Road junction Phule Market to E. I. Freeway.								
TOTAL		4270	11	209	620	890	990	2720	1550

Annexure II

Revised Road Development Programme for the Fourth Plan

(Rs. in lakhs)

Sl. No.	Items	Approx. estimated cost	Proposed outlay in the IV Plan	Spill over to V Plan
1	2	3	4	5
1.	Malabar Hill Tunnel (including chowpatty connection) and West Island Freeway Between Malabar Hill Tunnel and Haji Ali.	840	600	240
2.	East Island Freeway between carnac Road and junction of 'D' Mellow Road and Reay Road	900	330	570
3.	Construction of Link roads joining two Express Highways			
	(*a*) Bandra Dharavi 40			
	(*b*) Andheri Ghatkopar 120			
	(*c*) Goregaon Mulund 140			
	300	300	300	Nil
4.	Construction of Chembur Mankhurd Road (Link to join the approach to Thana Creek Bridge).	150	150	Nil
5.	Acquisition of land and structures :			
	(*a*) Sardar Vallabhbhai Patel Road between Bhendi Bazar & E.I. Freeway 60			
	(*b*) Carnac Road Junction at Jyotiba Phule Market to E.I. Freeway. 60			
	120	120	80	40
6.	Acquisition of land and structures along the entire length of E.I. Freeway excluding the portion covered by item (2) above.	340	290	50
7.	Provision for study of Mass Transport and Engg. Survey, Design etc.	50	50	Nil
		2700	1800	900

CHAPTER IV

MADRAS


सत्यमेव जयते

MADRAS METROPOLITAN AREA

Chapter IV

MADRAS

The Madras City started originally from a village called Madras Pattanam, is of comparatively more recent origin than many of the historically old cities of India. The city was established over the site of a small hamlet which existed before the British started an establishment there in 1640. Since then, over a period of three hundred years the city has grown and expanded both in population and area. Being on the east coast, it has grown towards north, west and south. Its urban development has taken place in areas which had for centuries been good farm-lands. The growth of Greater Madras has been the result of the development of a number of residential nodes which were all outside the original city limits. Greater Madras now comprises Thiruvattriyur on the north; Villivakkam on the west; St. Thomas Mount and Pallavaram on the south; and Kodambakkam, Saidapet, Guindy, Adyar, Sembiam and Aminjikarai on the south-west. Even these limits are being crossed as a large number of workers in Madras city live further away in villages served by the railway lines and trunk roads.

1.1. *Area and Population*: With the onset of the Five Year Plans, Madras city has particularly experienced a high rate of economic growth. Its population has risen from 856,000 in 1941 to 1·73 million in 1961. The city's present population is estimated at about 2·0 million. The physical size of the city which was about 76·8 sq. kms. in 1940, has increased to 128 sq. kms. through gradual accession of the fringe areas.

1.2. *Metropolitan area*: The metropolitan area, delineated as a result of certain studies conducted in connection with the preparation of the Master Plan for the Madras city, extends over an area of about 1152 sq. kms. with a population of 2·3 million. It consists of about 301 villages and many urban centres, apart from the city of Madras. The metropolitan area includes the Corporation of Madras, the three Municipalities of Tambaram, Alandur and Tiruvottiyur, the township of Ambattur, the Cantonment Board of St. Thomas Mount and Pallavaram and many other Panchayats.

1.3. *Density Pattern*: There is heavy concentration of population and large number of settlements in the south-western sector of the metropolitan area along the Western and south-western lines of communications. Next in importance, is the conceneration in the northern sector. The north-western and southern areas are at present rather sparsely populated. On an average, the northern and south-western segments show a density range of 390 to 1950 persons per sq. km. while in the southern and north-western areas it is less than 40 persons per sq. km. However, in the city area the density varies from 1750 to 114,500 persons per sq. km. according to 1961 census.

1.4. *Growth of traffic*: The rapid urban growth in the recent years has led to serious congestion on certain roads and their intersections. Table 1 gives the number of registered auto-vehicles of various types in Madras city since 1961.

table 1

sl. no.	vehicles	actual figures					
		1961	1962	1963	1964	1965	1966
1.	motor cars	11,797	13,538	13,314	14,600	14,809	15,410
2.	motor cycles and scooters	4,119	5,354	5,081	5,597	6,391	7,740
3.	private and public carriers	2,831	3,188	3,151	3,116	3,440	3,607
4.	scooter rickshaws	198	194	205	198	186	140
5.	taxis	1,252	1,467	1,686	1,710	1,825	2,083
6.	buses	715	855	945	1,077	1,143	1,420
7.	others	134	104	269	204	154	36
	total	21,046	24,700	24,651	26,502	27,948	30,436

The growth in vehicular traffic has also caused considerable increase in the number of road accidents in the city. The demand for parking space has mounted with the rapid growth of vehicular traffic and entire kerb-side parking is creating acute problems in business centres such as, Mount Road and George Town areas.

2.0. *Land Utilisation*: The main agricultural areas in between the Madras-Calcutta Trunk Road and the railway lines, and between the Madras-Bangalore and Madras-Tiruchi railway lines, fall within the ayacuts of the Redhills and Chambarambakkam tanks. The agricultural lands of Redhills ayacuts are being acquired for the location of a major refinery and fertiliser plant. Among the urban centres, major industries are being located mostly in Ennore where the oil refinery and fertiliser units are also proposed to be located. Ambattur in the west has developed considerably with the establishment of Government Industrial Estate and other industrial units set up by private enterprise. In the north a petro-chemical complex is being developed and in the west, automobile and engineering industries are being established. Along the south-east, many industries of varied character have been located. It is also noticed that the trend in location of new industries has shifted towards the south along the Madras-Mahabalipuram Road, thus showing a break away from dependence on the Railways.

The following tables give the land utilisation by percentage in the metropolitan area (including Madras city) and the Madras city respectively.

table 2

uses	per cent
1 non-urban	75·7
2 residential	6·2
3 commercial	0·4
4 industrial	2·5
5 transport & communications	4·7
6 recreational	1·3
7 public & semi-public	3·0
8 utility services	0·2
9 vacant	6·0

table 3

uses	per cent
1 residential	33·4
2 commercial	3·2
3 industrial	3·8
4 public & semi-public	10·6
5 recreational	3·4
6 non-urban	12·4
7 transport & communications	17·3
8 other utilities	0·9
9 vacant	15·0

It may be seen from the above tables that while the Transport & Communications sector constitutes 17·3 per cent of the total area of Madras city, the corresponding figure for the Madras metropolitan area is 4·7 per cent only.

3.0. *Central Business District and Work Centres*: The George Town area forms the main Central Business District of the city, where major commercial and public offices are located. To the south of the central market of George Town, are the secretarial offices and Defence establishments. The Mount Road is well known for commercial activities, as there are many public offices located all along it. In the south-western part is the Guindy Industrial Estate where the Hindustan Teleprinters, Oldham, Halda etc. are located. The Triplicane area is another busy centre with the University, public offices and many service industries. In the south, Adyar is the centre of a number of higher technical institutions. Perambur, Ayanavaram and Sembiam are the old industrial districts of the city wherein are located Binnys, the Railway Loco Works, the Integral Coach Factory, the Simpsons and various oil companies depots. These along with the railway goods and marshalling yards form part of the northern area of the city.

3.1. The major work centres in the metropolitan area are as below :—

(i) in the north at Ennore, are located many major industries like the Parrys, Fertiliser Plant, Ashoka-Leyland, Ennore Foundaries, Enfield India etc.,

(ii) in the west at Ambattur and Avadi, besides the Industrial Estate, are the T.V.S. Group of Industries, Dunlop, T.I. Cycles, Asiatic Oxygen, Shaw

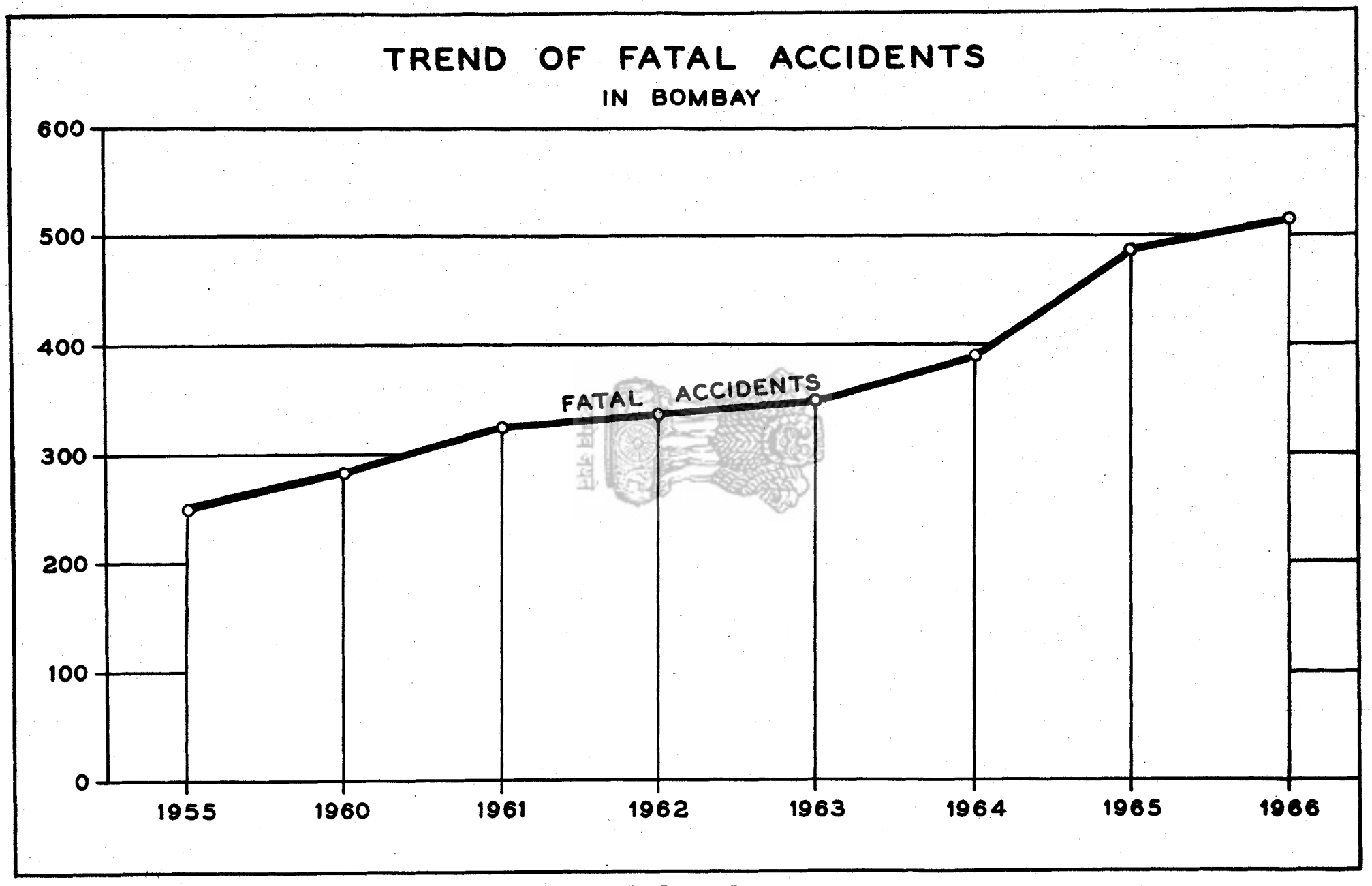

TREND OF FATAL ACCIDENTS
IN BOMBAY
600
500
400
300
200
100
0
FATAL ACCIDENTS
1955
1960
1961
1962
1963
1964
1965
1966

TABLE 5

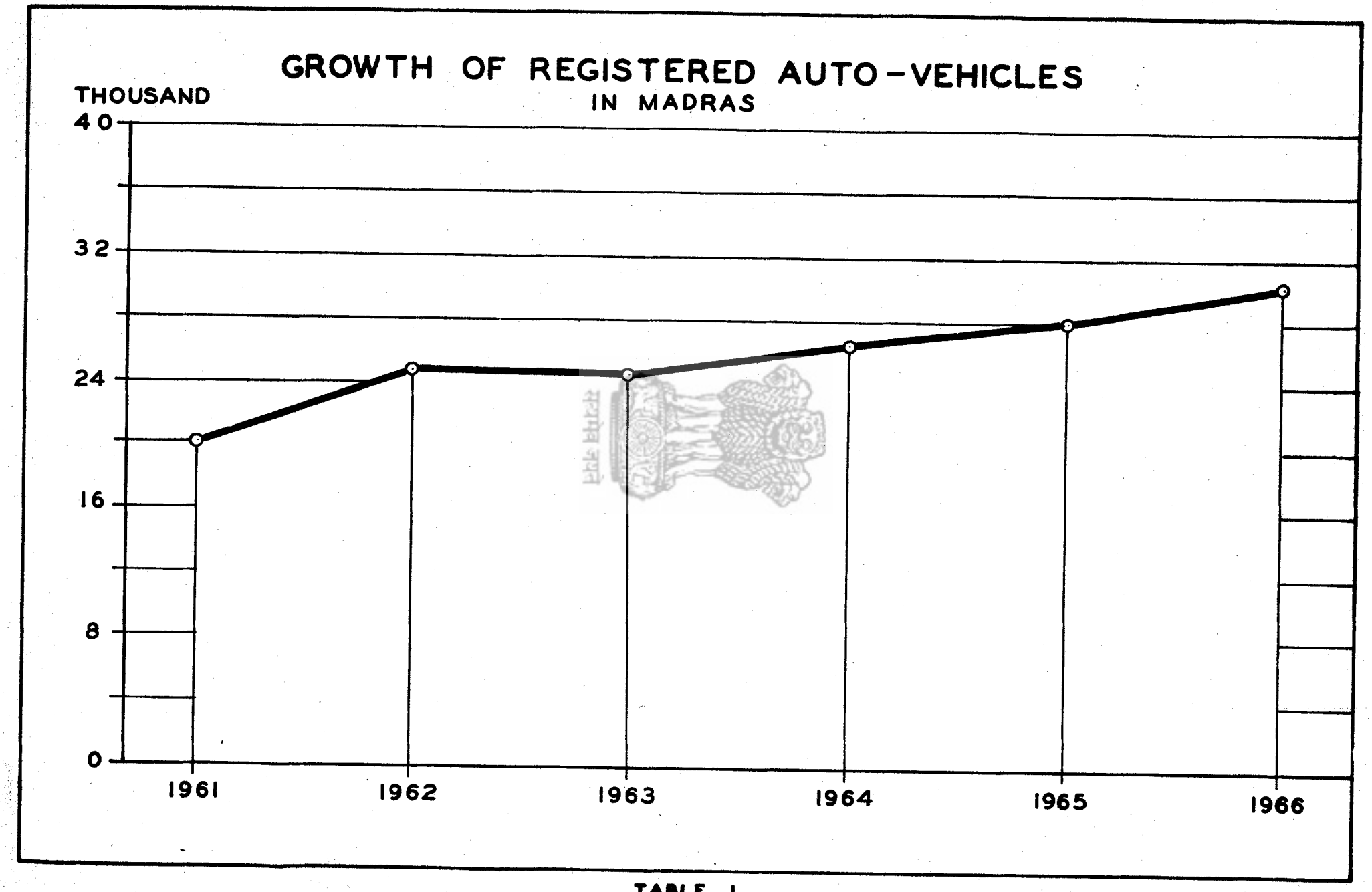

GROWTH OF REGISTERED AUTO-VEHICLES
IN MADRAS
THOUSAND
40
32
24
16
8
0
1961
1962
1963
1964
1965
1966

TABLE. 1

Wallace Fertiliser Plant, Tube Products, Tank Factory and many other major engineering industries; and

(iii) in the south-west along the Trunk Road and railway route are located the Surgical Instruments, English Electric, Binny Engineering, Standard Motors etc.

Transportation Pattern and Traffic Situation

4.0. The pattern of the road system in and around the metropolitan area is the old grid-iron inside the city with a number of radials taking off towards the north-south and west. The three National Highways (NH-4, 5 & 45) serve the western, northern and southern parts respectively. The volume of through traffic on the radial roads is very large and it gets mixed with slow moving local traffic near the city, thereby creating severe congestion on the roads. There is also a high incidence of accidents on these roads, particularly at junctions and intersections. Major district roads run in between them, connecting Madras to various urban centres. There is a good network of village roads available to serve the movement of traffic within the outer parts of the metropolitan area. While the road pattern by itself is suitable for easy movement of traffic, there are many bottlenecks, like narrow bridges over the rivers, railway level-crossings and certain missing links in the existing system.

4.1. The northern and western rail routes connect Madras with Vijayawada and Bangalore. These lines while serving the movement of long distance passengers and goods also cater to the travel needs of daily commuters within the metropolitan area.

4.2. The Buckingham Canal which in its 420 kilometres run, connects Peddagundam in the north to Mercanam Lake in the south, passes through the metropolitan area, and the city of Madras. It flows almost parallel to the coast line within about 5 kilometers of it and is used only for transport of building materials and fire-wood. The total volume of traffic moved over the city length of the canal has gradually fallen on account of poor draught which is due to progressive siltation over the years.

4.3. *Traffic situation*: As mentioned earlier, there are vast industrial developments on the periphery of the metropolitan area and new ones are being added. The new residential colonies have added traffic to the already heavy congestion on the city roads. The Central Business District of Madras and the intense commercial activities along Mount Road generate an enormous volume of vehicular traffic on the road. While the population density in the old city centre is quite high and this itself generates a great amount of local circulation, it is the daily work trips during the peak period which almost pararyse the existing road and rail systems.

4.4. The city authorities through improvements of the roads and by better traffic control have so far managed to cope with the growing traffic. No efforts have, however, been made for carrying out major road facilities like expressways and freeways. The road system of Madras while it served fully the needs of the past, was not well conceived and planned for meeting the future intense motorized traffic demand, with the result that arterials like Mount Road, the Poonamallee High Road, the roads running northwards like the Walltax Road, the Mint Road, the Thambuchetty Street and the Angappa Naicken Street are all chocked with intensive volume of all types of traffic.

4.5. Another serious handicap to the traffic in Madras is that little effort has been made in the past to increase the capacity of its road system by way of providing adequate off-street parking facilities, off-street loading and unloading bays for trucks and off-the-road boarding and alighting stages for its bus services.

4.6. *Level crossings*: The city is divided by the Adyar and Cooum rivers, the Buckingham Canal and by the railway lines coming into it. The river and rail intersections across the main roads have become major bottlenecks in the existing road network and prevent the free movement of both rail and road traffic. The frequent closure of railway crossings on the main roads during the peak hours, cause delays to road traffic often for about 40 to 50 minutes at a time.

In the greater Madras area, there are 103 road-rail crossings out of which 19 have been provided with road over/under bridges. Within the Madras city limits, there are 43 road-rail crossings out of which 19 have been provided with road over-bridges. Out of 37 level crossings between Madras Beach and Tambaram which is the main mass transit movement corridor of electric suburban trains 2 have already been abandoned, 7 have been provided with over-bridges and one with a road under-bridge. With the introduction of the A.C. traction between Madras Beach and Tambaram section, the frequency and speed of electric train services are bound to increase. Since this track passes through the industrial complex of the metropolis, a large number of roads cross the railway track. The gates of some of the level crossings remain practically closed during the peak period between 7.30 a.m. to 11.30 a.m. and 4.30 p.m. to 8.30 p.m. Hence there is an urgent need to eliminate these major bottlenecks at level crossings.

4.7. *Mass transport facilities*: There are two main agencies which provide mass transportation facilities in the Madras metropolitan area:

(i) the Suburban train services of the Southern Railway; and

(ii) the public bus transport of the Madras State Transport Service.

The dominating pattern of movement till recently, was substantially uni-directional, (south-north in the morning and north-south in the evening), this being as high as 85 per cent of the total traffic. This trend has changed over recent years and the south-north and the north-south traffic now constitute only about 55 per cent of the total. The change in the pattern of movement has arisen due to the spread- out of the town, primarily in the west and also in the north where major industrial nodes have been set up.

Railways: The existing railway system serving the City consists of two B. G. lines coming into Central Station from Trivellore and Gummudipundi and the third a B. G. link between the Madras Central and the Beach. The first two railway lines were originally laid for intra-city passenger and freight traffic and were not intended for heavy suburban commuter traffic. In addition, there is M. G. suburban electrified section between Madras Beach and Chingleput. From Madras Beach to Tambaram, there are double lines on which E. M. U. stock operates. From Tambaram to Chingleput, there is single line operation. There is another single line M. G. track from Madras-Egmore to Tambaram. The entire service from Madras Beach to Villupuram is now operated on A. C. traction with the completion of the changeover from D. C. to A. C. between Madras Beach and Tambaram since January this year.

The suburban sections of the Southern Railway in the Madras area carry about 225,000 passengers per day. The existing suburban train facilities are not adequate to meet the requirements of the commuters, with the result that a lot of peak period overcrowding occurs on these sections. The extent of overcrowding on the different suburban sections is briefly given below:

A. *Broad Gauge*:

(i) *Madras Central-Gummudipundi (distance 47 kms)*

5 out of 7 trains run each way on this section are overcrowded; this is more perceptible on the Madras Central-Ennore sub-section (distance 15 kms) and the highest occupancy during the day is 217 per cent and 201 per cent in case of Down and Up direction trains respectively.

(ii) *Madras Central-Tiruvellore (distance 42 kms)*

Overcrowding on this section occurs mostly between Madras Central and Avadi (distance 22kms) on 26 trains out of 61 (bothways). This is largely due to office and workshop staff and occurs during morning and evening peak hours. The highest occupancy in Down and Up directions are 286 per cent and 261 per cent respectively.

B. *Metre Gauge*:

Madras Beach-Tambaram-Chingleput (distance 60 kms.)

On the Madras Beach-Tambaram electrified section, 208 Electric Multiple Unit trains (103 are in the Down direction and 105 in the Up direction) are being run daily. The morning and evening peak hour services are run with double units and the off-peak hour services are run with single units. The maximum overcrowding occurs generally at stations between Madras Park and Saidapet, the highest occupancy being 404 per cent in the Down direction and 440 per cent in the Up direction.

4.8. *State Transport Service*:—The State Transport Service provides a major public mass transportation facility. Its fleet has grown from 595 buses in 1961-62 to 1026 buses in 1966-67. The number of passengers carried per day has also increased from 518,827 in 1961-62 to about 846,000 in 1966-67. Table 4 gives the growth of the State Transport bus system during the last six years.

table 4

	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
1. fleet strength	595	663	694	820	953	1,026
2. no. of routes operated	110	110	129	145	160	185
3. no. of buses operated	529	587	637	749	757	864
4. average bus coverage/day (in kms.)	188	217	233	236	219	211
5. no. of passengers carried per day —city	443,089	494,969	581,310	669,700	629,000	699,000
—suburban	75,738	90,191	103,841	106,583	133,000	146,000

Source : State Transport Department.

Fourth Plan Proposals:

5.0. Certain short-term proposals have been drawn up for implementation during the Fourth Plan in order to meet the immediate needs of the Madras metropolitan area and also to remove major bottlenecks in the existing road network. These include schemes relating to the construction and improvement of roads and bridges, provision of over/under bridges at important level crossings, subways across main streets, measures for providing traffic signals and other road safety devices. The metropolitan road development programme for the Fourth Plan as recommended by the Study Team is given in Annexure I.

Roads: One of the important road schemes included in the Fourth Plan is the construction of a new road which will connect Ennore with the proposed Oil Refinery at Manali and the Fertiliser and Petro-chemical complex which will be adjacent to the refineries. The alignment of this road will lead up to Ponneri and Pulicate to cater to the anticipated enormous road traffic that will be generated in this great industrial node. An outer ring road has also been suggested which will serve as city by-pass for through traffic using the three National Highways (NH 4, 5 & 45). It will serve various industrial units developing on the outskirts of the city and within the catchment of the by-pass.

Bridges: It is proposed to widen three bridges on N.H.5. These bridges are located within the city limits on the main traffic route between Madras and Calcutta. The widening of the bridges will enable free movement of traffic.

Level crossings: A sum of Rs. 1·50 crores has been allocated for construction of six over bridges/subways on certain level crossings within the Madras city limits which require urgent and immediate attention. In all 12 level crossings are proposed to be provided with over/under bridges within city limits in between the electrified Madras Beach-Tambaram M. G. Section. Two under-bridges have already been sanctioned. One is at the Kannammapet level crossing and the other at the Doraiswamy Iyer Road level crossing. It is recommended that construction of atleast six over/under bridges be completed as early as possible which will remove serious congestion and delays at the city's main level crossings.

Traffic operation plan: The traffic operation plan includes provision of pedestrians guard rails, traffic control devices, bus-bays, parking lots, traffic safety and traffic education and improvements of important inter-sections.

5.1. *State Transport Service development programme*: The State Transport Service has drawn up a programme for expanding its fleet strength to cope with the future demand of the passengers within the Madras metropolitan area. The fleet strength is expected to increase from 1026 to 1161 by 1971.

Demand for a Mass Transit System:

6.0. The Madras Government have stressed the need for providing a Circular Railway in Madras. They have pointed out that there is a heavy movement of daily commuters from the suburban areas into the central area which requires immediate attention. At present, the facilities provided by the Madras State Transport Service and the Southern Railways suburban electric and steam trains are not adequate to cope with the increasing demand of commuters. Severe overcrowding occurs in buses as well as trains, particularly during the peak embankment.

The conversion from D.C. to A.C. traction will undoubtedly improve the efficiency of the suburban services, but is not the ultimate solution of the problem. In the past, commuter movements in Madras were generally uni-directional *i.e.* from south to north. Recently this pattern has gradually shifted from south to west, west to north and north to north-east. As the city is developing in all directions except the east where the sea sets the limits, it has been stressed that there is pressing need for an extensive network of a suitable mass transportation system.

6.1. The following alignment has been suggested by the State Government for the proposed circular railway:

(a) *Madras Beach to Tambaram via Thiruvanmiyur with double track* (32.4 *kms*)

The Railways feel that the proposed broad gauge alignment would be feasible only if a break-through could be possible in the built-up area of Adyar and also if the State Government was agreeable to the proposal for laying a railway line on a position of Buckingham Canal embankment.

(b) *Ennore and Korattur with double track* (20.0 *kms.*)

This alignment would have to cross the Korataliyar river and also the National Highway.

(c) *Korattur to Tambaram with double line* (27.2 *kms.*)

The B. G. alignment from Korattur to Tambaram will pass through Ambattur, Poonamalle,

Pammal and Tiruneermalai. This alignment will run through heavily built-up areas and cross a number of city roads and highways. Provision for overbridges or under-bridges will have to be made where necessary. According to a rougn estimate made by the Southern Railways, these three Sections would cost about Rs. 28.50 crores which also includes about Rs. 9 crores as the cost of land acquisition.

This issue was discussed with the officials of the Madras Government and Southern Railway. The Study Team appreciates the problem but is of the view that before any decision is taken, it is necessary to establish the need for such facilities on the alignments suggested on the basis of travel-demand survey. The State Town Planning Organisation has been asked to conduct necessary studies.

6.2. The Study Team has also under consideration a proposal to utilise the Buckingham Canal alignment within the city limits for providing an underground railway system. The stretch of Buckingham Canal in the Madras city passes through the heavily built-up areas of Tondarpet, George Town, Triplicane, Mylapore, Central Station, Basin Bridge, Vysarpadi, New Washermanpet, Marina, Krishnampet, Perimet etc. The length of the canal within the city limits is 19.2 kms. Its bed width varies from 6—18 metres with an average of 9 metres through the city stretch. Its draught varies from 0·6 to 1·8 metres, the average being 0·9 metre. The present utility of the canal in the city area is almost negligible. If the Buckingham Canal is closed within the city limits, its alignment could be used for providing an underground railway. Moreover, the surface could be available for providing a motor road to expressway or even freeway standards. Much of the vehicular congestion on the South Beach Road and on the Mount Road could be absorbed by this motor road and provide considerable relief to these roads. The new motor way would minimise the number of railway crossings that would otherwise be required in the city area. However, a Committee has been appointed by the State Government to examine the future of the canal and its recommendations are awaited which may help the Study Team in the preparation of an overall road development plan and mass transport facilities in the Madras city.

FURTHER ACTION PROGRAMME

Comprehensive Traffic and Transportation Study:—To solve transportation problems in a metropolis, measures such as improvement of a few busy routes or removal of the bottlenecks in the existing road network or provision of some parking space at a particular business centre will not alone suffice. The problems are required to be studied in detail and planning should be done on the basis of comprehensive studies and surveys. The traffic surveys carried out in the past in the Madras city were very limited in scope, covering a provision of a specific facility with the immediate object of improving or redesigning the same. The Study Team has, therefore, felt the need for having a comprehensive traffic and transportation study for the Madras metropolitan area which would help in identifying the problems and prepare a base to evolve a practical and flexible long-term plan for meeting the future traffic needs of the metropolitan city.

The Study Team has finalised the detailed programme of studies and surveys to be conducted. The scope of the proposed studies is to find out the traffic and transportation demand, the extent of the facilities available and also the significant factors affecting travel modes, frequency, purpose and other aspects of various trips made by passengers. It would cover the movement of both passengers and goods. The following studies have been proposed:

1. Home Interview Survey.
2. Taxi Survey.
3. Truck Survey.
4. Warehouse Survey.
5. Cycle Survey.
6. Mass Transport Study.
7. Parking and Terminal Study.
8. Intersection Improvement Study.

The data collected from the above studies will be analysed systematically to determine the traffic and transportation demand and travel characteristics. The present demand will be projected to the future design year.

It has been agreed that the above studies would be conducted by the Town Planning Department in collaboration with the State Highway Research Department.

ANNEXURE I

ROAD DEVELOPMENT PROGRAMME FOR THE FOURTH FIVE YEAR PLAN

Name of the Scheme	*Rupees in lakhs*
1 Construction of Overbridges/Subways, at 6 Level Crossings within the city limits	150·00
2 Formation of a new road from 3/1 of Ennore Expressway to the proposed Oil Refinery near Manali to connect M. 2/3 of Tiruvottiyur Ponneri-Panjetti Road	32·50
3 Widening of 3 bridges on N.H. 5 (Madras-Calcutta Road) within Madras City limits near Basin Bridge area and improvements to the approaches.	20·00
4 Outer Ring Road connecting Madras-Calcutta Road (N.H. 5) Madras-Bangalore Road (N.H. 4) and Madras-Trichy-Dindigul Road (N.H. 45) Land Acquisition and formation of a portion	40·00
5 a. Improvement to the road from Madras Harbour to Avadi and on to 17/0 of Madras Tiruvellore Road *via* Aminjikarai on Madras-Bangalore Road (N.H. 4)	40·00
b. Widening of bridges on Madras-Bangalore Road (N.H. 4) at Aminjikarai and	10·00
c. at General Hospital	15·00
6 Improvements to the road from Madras Harbour to 5/1 of Madras-Calcutta Road (N.H. 5)	65·00
7 a. Road from Madras Harbour to connect Madras-Mahabalipuram road to Tiruvanmiyur	49·00
b. Reconstruction of Elphinstone bridge across Adyar	50·00
8 Improvements to Madras-Trichy-Dindigul Road (N.H.45) from Saidpet to St. Thomas Mount.	75·00
9 Improvements to road from Marmalong Bridge to Irumbuliyur	18·00
10 *Widening of the following bridges across Buckingham Canal* :	
i) Edward Elliots Road	7·00
ii) Cutchery Road	7·00
iii) Lloyds Road	7·00
iv) Pycrofts Road	7·00
11 *Widening of the following Bridges* :	
a. Andrews	12·00
b. Harris	12·00
c. Commander-in-Chief Road	12·00
d. Anderson	12·00
e. Bridge across Otteri Nallah near Ganta Road	4·00
f. Bridge across Otteri Nallah on Perambur High Road	4·00
12 *Subway or Pedestrian overbridge at the following points* :	
i) On National Highway 4 near Park Station overbridge on Poonamallee High Road	1·50
ii) On Mount Road near Thousand Lights overbridge	1·50
iii) Opposite Egmore Station on Gandhi Irwin Road (Overbridge)	1·50
iv) On South Beach Road opposite Pycrofts Road (Subway)	5·00
13 a. Improvements within the present right of way from South Beach Road from Raja Annamalaipuram to R.K. Mutt Road upto Andhra Mahila Sabha.	12·60
b. Imprrovements within the present right of way to Elphinstone Bridge Road from R.K. Mutt Road to Elliots Beach Road (cost of bridge not included)	3·40
c. Improvements within the present right of way of Elliots Beach Road to Regional Labour Instiutute including widening of bridges.	4·00
14 Improvements to stretch of road within present right of way from N.H. 45 *via* Band Practice Road, South Beach Road upto All India Radio :	
i) Band Practice Road from N.H. 45 to War Memorial	2·00
ii) South Beach Road from War Memorial to All India Radio	13·50
15 Stretch of Road from N.H. 45 *via* South Usman Road A.I., A.I., A.3. A.3, C.4, C.4 (T.P. Roads) Tank Bund Road, Sterling Road, Nelson Manicka Mudaliar Road upto N.H. 4:	
i) Sir Mohammed Usman Road from Mount Road to Kodambakkam Railway overbridge.	10·20

Name of the Scheme	*Rupees in lakhs*
ii) Stretch of Road from Kodambakkam over bridge A.I., A.I., A.3, C.4, C.4 Tank Bund Road, Sterling Road, Nelson Manicka Mudaliar Road (Railway level crossing at Sterling road end and causeway excluded). .	4·00
16 Stretch of road from Nungambakkam High Road *via* Kodambakkam High Road and Arcot Road upto city limits :	
i) Kodambakkam High Road from Nungambakkam High Road to over-bridge.	11·50
ii) Arcot Road from Railway overbridge to City limits.	
17 Stretch of road from R.K. Mutt Road	
a. Greenways Road	4·00
b. Chamiers Road	6·90
18 Stretch of road from Melpatti Ponnappa Mudali Street, Gantz Road, Stephensons Road, Cooks Road, Konnur High Road upto City limits :	
a. Gantz Road	2·43
b. Stephensons Road . . .	2·90
c. Cooks Road	2·50
d. Konnur High Road . . .	10·20
19 Madavaram High Road from Melpatti Ponnappa Mudali Street to National Highway 5. (Madras-Calcutta Road)	6·20
20 Extending New Avadi Road in front of Water Works towards east to meet Madavakkam Tank Road, West of Madavakkam Bridge including widening the bridge 20.	11·50
21 *Road safety and parking facilities*	
a. Pedestrian Guard Rails . . .	7·50
b. Traffic Control Devices . . .	20·00
c. Bus Bays	3·00
d. Parking lot near Pals Restaurant .	5·00
e. Traffic Safety and Education .	1·00
f. Traffic Accident Investigation Bureau	3·50
g. Improvements to Intersections .	10·00

CHAPTER V

DELHI


सत्यमेव जयते

Chapter V

DELHI

The city of Delhi as it exists today, is built chiefly around the walled city of Shahjahanabad which was established in the 17th century. In 1820, the British Government constituted the district of Delhi. Soon after, the Government set up its headquarters outside the city walls towards the north in a new settlement, known as Civil Lines. In 1912, the British Government shifted its seat from Calcutta to New Delhi. At that time it was envisaged that New Delhi would not grow beyond the Safdarjang airport. The total plan area covered was about 3,200 acres for a projected population of about 65,000. The new Capital was functionally independent, having a minimum number of physical links with the old city. No thought was given to the preparation of an overall plan for the entire metropolitan area nor was any scheme prepared for redistribution of population from the old areas to the new settlements. Since then, the two adjacent cities—Delhi and New Delhi—have developed separately instead of growing into one unit. Today, the main connecting road between Delhi and New Delhi is through the Delhi Gate, known as Faiz Bazar—Elgin Road and Lothian Road.

1.1. During the Second World War, Government activities increased rapidly. New areas were developed to accommodate the additional population. The sporadic industrial growth and increase in commercial activities attracted more and more people from the neighbouring areas. During this period large migration took place from the adjoining villages and towns to meet the city's increased labour requirements. Even now it is estimated that about 70,000 people come to settle in Delhi from surrounding areas every year.

1.2. In 1947, as a result of Partition more than half a million refugees moved into Delhi creating numerous problems. A number of rehabilitation colonies sprang up all around the city, except in the north where land was subject to floods almost every year. Since these were emergency projects and no time was available for formulating or following the minimum planning standards, the areas developed at below standard levels. With the formation of the National Government, new responsibilities were added and expansion in Government activities necessitated provision of additional office and residential accommodation for new employees. Private colonisers entered the market and started buying land and developing it for sale to the general public. New commercial areas were also developed and new industries started taking shape in the west and south of Delhi. The colonies which thus sprung up all around the city have most inadequate road connections, little transportation facilities and marginal standard of public utilities.

1.3. *Greater Delhi today*: Till the formation of the Municipal Corporation of Delhi, the conurbation of Greater Delhi consisted of eleven towns (*i.e.*, Old Delhi, Red Fort, New Delhi, Civil Lines, South Delhi, West Delhi, Shahdara, Cantonment, Mehrauli, Najafgarh and Narela). Each of these towns was under the separate and independent jurisdiction of a municipal or notified town area committee. Three of these, Mehrauli, Najafgarh and Narela are very small in size and not contiguous to the main bulk of the habitation. Seven of the other towns are contiguous to one another. The remaining town of Shahdara, though separated by the Yamuna River, has a close link through a very busy rail-cum-road bridge and is for all practical purposes, contiguous to Old Delhi. These eight towns taken together can be said to form one whole unit of habitation within which the Delhi Municipality occupied the central position.

1.4. The Delhi Municipal Corporation Act came into force in 1958. The Corporation has now within its fold all the local bodies in Delhi, except the then New Delhi Municipal Committee and the Cantonment Board. A good part of the area of the New Delhi, Municipal Committee was also transferred to the Municipal Corporation. The urban area of Delhi thus consists of 3 towns viz., (i) D.M.C. (Urban), (ii) N.D.M.C. and (iii) Delhi Cantonment Board. The urban area of the Delhi Municipal Corporation has been divided into seven zones which are co-terminus with the seven administrative zones of the Corporation. According to the Surveyor General of India, the total area of the Union Territory of

Delhi at the time of 1961 census was 1484.1 sq. kms. Table I shows the distribution of this area into various tracts and zones including their population and densities:

table 1

tract/zone	area		population		density per sq. km.
	sq. kms.	percentage of	size	percentage of total population	
Delhi	1,484·1	100·0	2,658,612	100·0	1,791
Rural Delhi	1,157·5	78·0	299,204	11·3	258
Urban Delhi	326·6	22·0	2,359,408	88·7	7,225
D.M.C. Urban	240·84	16·2	2,061,758	77·6	8,561
Zone-I—Sahadara	39·50	2·6	150,674	5.7	3,815
Zone-II—City-Sadar-Paharganj	12·95	0·9	715,564	26·9	55,256
Zone-III—Karol Bagh-Patel Nagar	15·54	1·1	323,311	12·2	20,805
Zone-IV—Civil Lines -Subzimandi	27·84	1·9	362,176	13·6	13,009
Zone-V—Transferred Area	41·44	2·8	222,860	8·4	5,378
Zone-VI—South Delhi	64·13	4·3	115,577	4·3	1,802
Zone-VII—West Delhi	39·44	2·6	171,596	6·5	4,351
New Delhi	42·74	2·9	261,545	9·8	6,119
Delhi Cantt.	42·97	2·9	36,105	1·3	840

Source : *Census of India*, 1961, *District Census Handbook, Delhi*

1.5. *Metropolitan area*: In the Master Plan, the Delhi metropolitan area has been defined, keeping in view the following two considerations: First, the area should be sufficient to include not only present urban development closely related to Delhi on a daily basis but also such areas as may become the object of development within the actionable future. Secondly, it should include present non-contiguous areas which are already urbanised and which maintain a strong daily inter-action with Delhi, irrespective of the fact that they may ultimately become part of a continuous urban development.

The metropolitan area extends from Nerela in the north to Ballabhgarh and Gurgaon in the south and from Ghaziabad in the east to Bahadurgarh in the west. It measures 64 kms. north-south and 60 kms. east-west with an area of about 2,000 sq. kms. It includes Loni, Ghaziabad, Faridabad, Bahadurgarh, Ballabhgarh, Gurgaon, Narela and Sonepat. All these towns are within a 40 kms. radius of Central Delhi except Sonepat which lies slightly outside this radius.

1.6. The Delhi urban area is expected to extend from Coronation Pillar in the north to Mehrauli in the south, and from the Hindon river in the east to Nangloi in the west, measuring 24 kms. north-south and 42 kms. east-west, with a total area of about 435 sq. kms.

Growth of Population

1.7. Upto 1912, Delhi was a city of moderate size. As mentioned earlier, several factors had influenced the growth of its urban population. Delhi is now the third largest city of India after Greater Bombay and Calcutta and is growing at a faster rate than any other large metropolis in the country. The growth of population both urban and rural since 1901 is given in Table 2.

table 2

year	total population of Delhi territory	percentage increase	urban population	percentage increase	rural population	percentage increase
1901	405,819 (100·0)	..	208,575 (51·4)	..	197,244 (48·6)	..
1911	413,851 (100·0)	2·0	232,837 (56·3)	11·7	181,014 (43·7)	—8·2
1921	488,452 (100·0)	18·0	304,420 (62·3)	30·7	184,032 (37·7)	+1·7
1931	636,246 (100·0)	30·3	447,442 (70·3)	47·0	188,804 (29·7)	+2·6
1941	917,939 (100·0)	44·3	695,686 (75·8)	55·5	222,253 (17·6)	+17·7
1951	1,744,072 (100·0)	90·0	1,437,134 (82·4)	106·6	306,938 (17·6)	+39·9
1961	2,658,612 (100·0)	52·4	2,359,408 (88·7)	64·2	299,204 (11·3)	—2·5

Source : Census of India, 1961 : *District Census Handbook, Delhi*.

NOTE : Figures in brackets show percentage to total population.

1.8. It will be seen from the graph that the maximum increase occurred during the decade 1941-51. The rate of growth during the last two decades has almost been constant as is revealed from the curve tending to be a straight line. The growth of urban population has followed broadly, the same pattern as that of the Union Territory as a whole, but the curve in this case is comparatively more regular upto 1941, after which its slope like that of the whole territory rises steeply.

It is estimated that the total population of the Union Territory of Delhi was 3.4 million in 1966. According to the estimates made by the office of the Registrar General of India, the population is expected to be 4.38 and 6.72 million in 1971 and 1981 respectively.

1.9. *Growth of Traffic*: There has been a tremendous increase in the number of registered automobile vehicles during the last two decades which has risen to 81,488 in 1966 from 9,803 in 1947—the rate of average increase per annum being 38.4 per cent. The following table shows growth of vehicles during the period 1960-66 :

table 3

year	no. of vehicles	no. of cycles*	no. of slow moving vehicles
1960	35,232	375,000	12,607
1961	41,052	400,000	13,106
1962	47,898	425,000	12,815
1963	,791	450,000	14,183
1964	66,742	475,000	14,700
1965	78,900	500,000	14,900
1966	81,488	525,000	16,700

Estimated figures

There has also been a phenomenal increase in animal driven vehicles in the past few years. These are concentrated in old Delhi.

Central Business District and Work Centres

2.0. The Central Business District of Delhi enjoys a unique character. The work centres are concentrated at a few well defined areas—the Central Secretariat, the Connaught Place and Indraprastha Estate complex in New Delhi, and Chandni Chowk (Fatehpuri, Khari Baoli, Naya Bazar, Sadar Bazar) in Delhi.

Connaught Place is a planned general commercial centre. Business and professional offices, banks and insurance companies mostly occupy the first floors of the buildings of Connaught Place. The Super Bazar is located in the outer circus. The commercial and Government offices have extended southwards on Parliament Street and Janpath. Asaf Ali Road and Link Road have recently been developed as big commercial and business centres. Ajmal Khan Road in Karol Bagh has also come up as an important shopping centre.

The Chandni Chowk area has taken a linear form spreading over a distance of more than 3 kms. extending from Red Fort to Bara Tooti in Sadar Bazar with spurs towards north and south at various intervals.

2.1. Delhi is one of the important trade distribution centres of the north-west India. Retail trade is carried on in almost every street of the city of old Delhi. Only New Delhi is saved from this situation due to strict enforcement of land use control measures.

2.2. The nucleus of the Union Government offices is formed by the North and South Blocks of the Central Secretariat. To this have recently been added many multi-storeyed office buildings. Temporary hutments and barracks around the Secretariat are being demolished and multi-storeyed buildings constructed. The other large concentration of the Union Government offices are on Parliament Street and Indraprastha Estate. The Civil Lines area provides office accommodation, primarily for the Delhi Administration. Table 4 shows the important office concentration areas along with their strength:

table 4

sl. no.	Office concentration area	strength
1	Around Central Secretariat :	
	(*i*) Krishi Bhavan	5,065
	(*ii*) Udyog Bhavan	5,510
	(*iii*) South Block	5,555
	(*iv*) Kashmir House	1,458
	(*v*) North Block	15,282
	(*vi*) Rail Bhavan	4,618
2	Parliament Street	10,746
3	Connaught Circus	11,122
4	Jamnagar House	8,194
5	Baroda House	10,030
6	Exhibition Ground	8,717
7	I.P. Estate	12,162
8	Asaf Ali Road	3,386
9	Delhi Municipal Corporation	2,250
10	Tis Hazari	3,892
11	Old Secretariat	5,155
	total	113,542

Transportation Pattern and Traffic Situation

3.0. The Grand Trunk Road which connects north-west India and the Ganges Valley, crosses the Yamuna River near Delhi on the lower deck of the railway bridge between the Red Fort and Shahdara. Between the north-west outskirts of Delhi and the Red Fort, the G.T. Road no longer provides capacity for through traffic, and its utility has been greatly diminished by various encroachments and intersections. The Delhi urban area has become a focal point of the five National Highways, *viz.*, N.H.1—Delhi-Amritsar; N.H.2—Delhi-Agra; N.H.8—Delhi-Jaipur-Ahmedabad-Bombay; N.H.10—Delhi-Rohtak-Fazilka-Pakistan Border; and N.H.24—Delhi-Lucknow.

LAND UTILISATION

MADRAS METROPOLITAN AREA

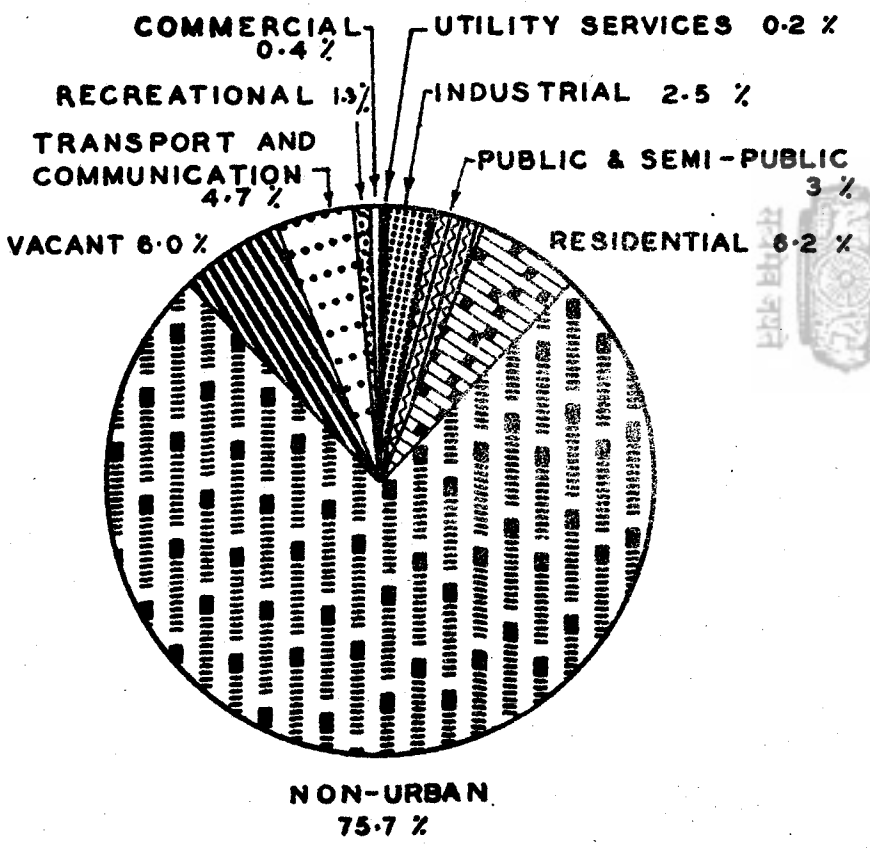


TABLE-2

MADRAS CITY

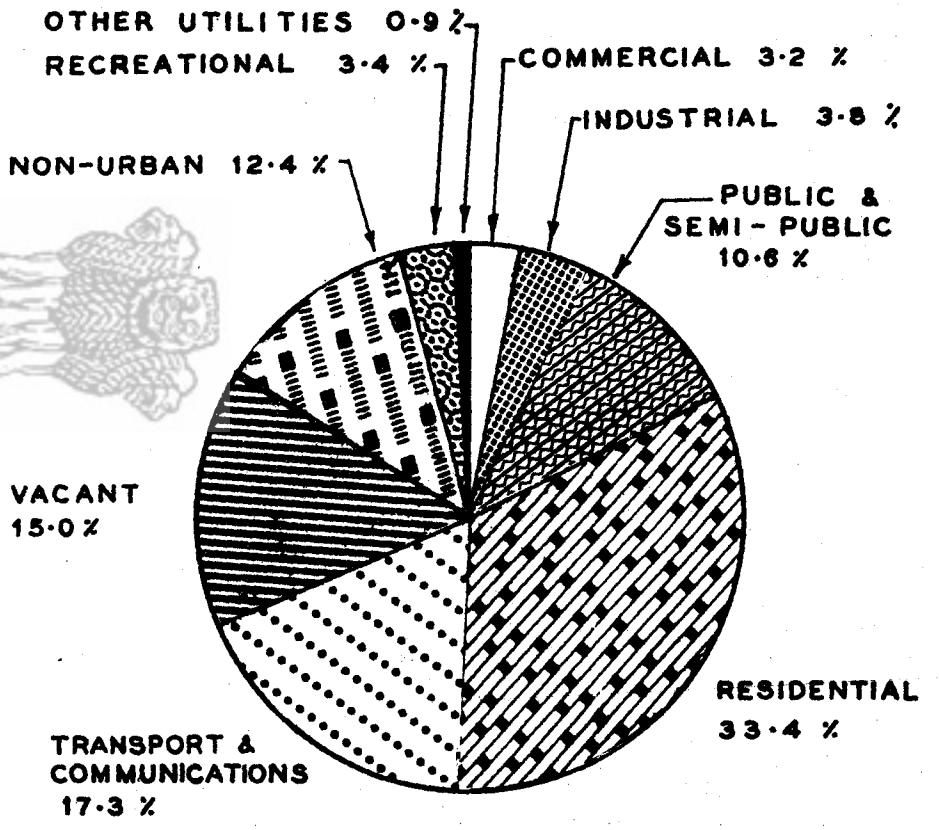


TABLE-3

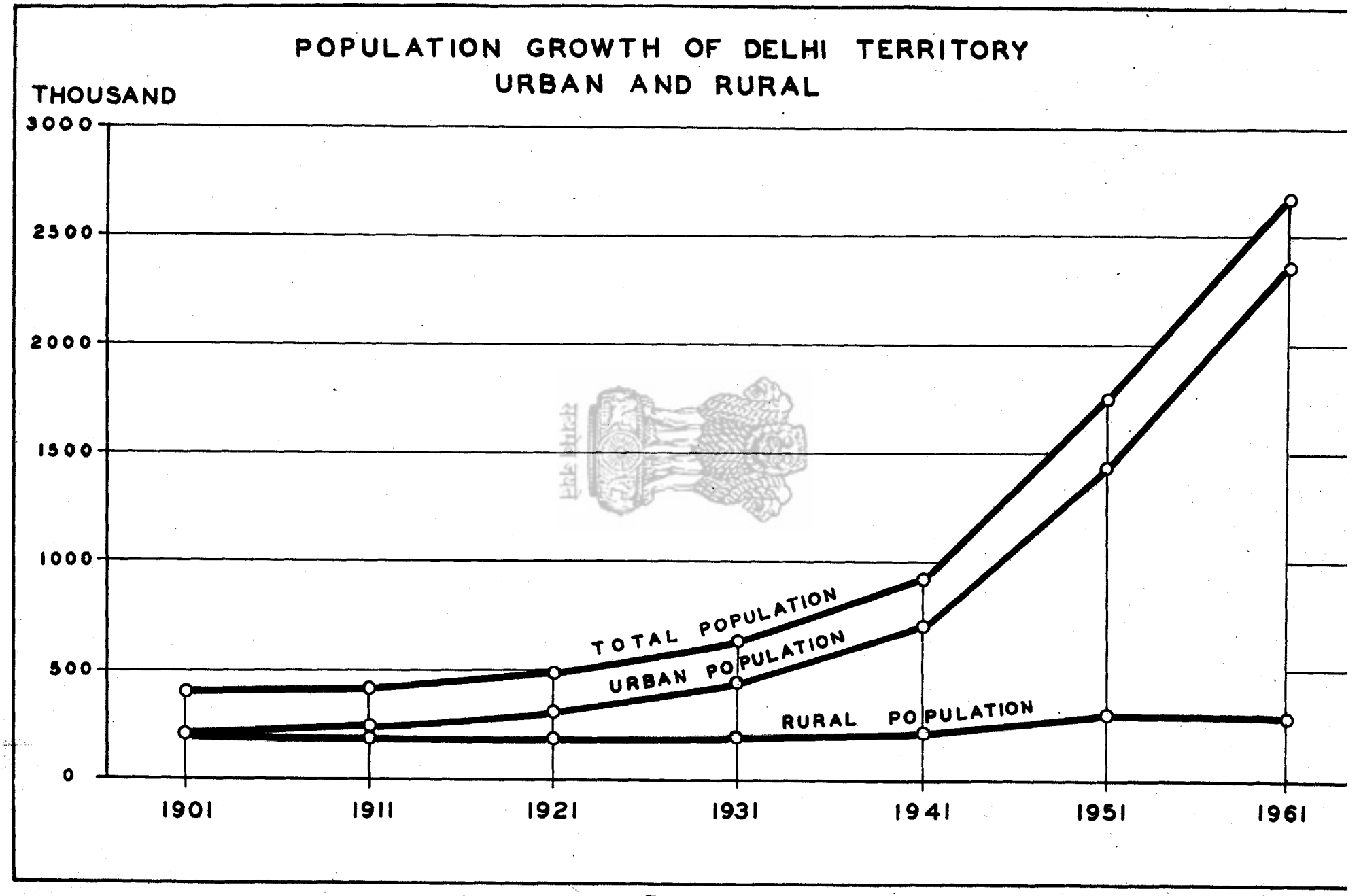

POPULATION GROWTH OF DELHI TERRITORY
URBAN AND RURAL
THOUSAND
3000
2500
2000
1500
1000
500
0
TOTAL POPULATION
URBAN POPULATION
RURAL POPULATION
1901
1911
1921
1931
1941
1951
1961

TABLE. 2

3.1. In order to avoid major congestion centres in the heavily built-up areas of the city, the Delhi Master Plan provides an outer Ring Road encircling the urbanised area of the city. The function of the outer Ring Road would be primarily to by-pass through road traffic while the inner Ring Road is designed to serve the fast moving traffic en-route between local origin and destination to circle the central congested areas. One section of the outer Ring Road, known as the National By-pass, parallel to the Yamuna River has already been completed. Many links have now been provided connecting the inner Ring Road with various congested areas with the result that the Ring Road has now more or less degenerated into a local distributor.

3.2. The basic factor in the Delhi road traffic situation is the limited access between Delhi and New Delhi. New Delhi was originally planned as a capital centre with the system of roads radiating from Connaught Circus with little regard to highway connections with old Delhi. The Delhi-Agra broad-gauge railway line dividing the two areas, has only two road under-passes at Minto Bridge and at Tilak Bridge. Since the two cities have now gone far towards coalescence, traffic jams occur on these two accesses. The Civil Lines which was developed as a residential area has poor street connections with the rest of the urban area. As most of the traffic avoids the already congested Grand Trunk Road through Subzimandi and Sadar Bazar, the main route for through movement is *via* Alipur Road, Kashmere Gate, Elgin Road and Faiz Bazar Road.

3.3. *Traffic situation*: The rapid urban growth in the recent years has created serious traffic problems in the city. With the expansion of the city, more people are shifting to the outer areas while the principal focal points of employment and shopping are still concentrated at a few places. In the Central Secretariat area alone, there are about 37,500 employees. The general traffic pattern during the peak period is uni-directional. The rise in population and increase in the number of vehicles and their growing use has resulted in heavy concentration of traffic on many roads beyond their capacity. The traffic is mixed in character and slow moving vehicles and pedestrians use the same carriageway of the roads. Besides, there is frequent obstruction of footpaths and kerbs by hawkers and vendors. The problem is further aggravated on account of the plying of large number of bicycles. A substantial percentage of people going to and from the work centres use bicycles. According to O & D Survey conducted in 1957, about 7 out of 10 vehicles plying on Delhi roads were bicycles. It is estimated that the number of bicycles would increase to about 700,000 by 1970-71.

3.4. *Road conditions*: A major portion of road mileage in Delhi consists of bituminous surfacing. Light type of bituminous surfacing and premix chipping type of construction are adopted even for important roads catering to heavy traffic. The condition of most of the roads has thus become deplorable. Due to lack of coordination amongst concerned authorities, roads are frequently cut up for repairs of water mains, electric and telephone cables and sewers, the patch work after such cutting up is done unsatisfactorily which results in a broken surface once again. The maintenance of roads is also very poor. These factors are not only responsible for reduced speeds but also cause accidents. Repair works even on important roads take considerable time to complete. Such works are done during the day time and this obstructs traffic. This could definitely be avoided if the repairs are undertaken only during the night hours, as is being done in other major cities of India. The lighting of roads, traffic signs and signals, intersection geometrics, road markings and traffic islands are inadequate and defective which are some of the main causes of road accidents in the city.

3.5. *Road accidents*: The enormous increase in vehicular traffic has caused a number of road accidents in Delhi. During the last eight years (1958—66), road accidents increased by 193 per cent against about 243 per cent increase in motor vehicles. In 1966, loss of human lives was 332. This could reach an alarming toll of 500 or so by 1971 if effective steps are not taken to improve road safety by application of modern traffic engineering techniques. The following table gives the severity of accidents in Delhi during 1958—66:

table 5

year	fatal	injury	property damage	total
1958	118	915	1805	2838
1959	160	1362	2178	3700
1960	156	1544	3105	4805
1961	162	1875	3983	6020
1962	234	2425	4575	7234
1963	245	2696	4258	7199
1964	267	2838	4901	8006
1965	313	2922	5221	8456
1966	332	2825	5190	8347

3.6. *Parking and terminal facilities*: The parking demand has greatly increased with the rapid growth of vehicular traffic in Delhi and is particularly acute at centres, such as Connaught Place, Chandni Chowk and Karolbagh. Trucks and goods vehicles from outside come right into the city, thereby creating congestion as parking and loading and unloading facilities for trucks are not available. Several traffic problems arise due to inadequate off-street parking facilities, parking lots and parking garages in the business centres. Even the newly constructed Inter-State Bus Terminal at Kashmere Gate lacks several basic facilities which cause great inconvenience to passengers. Even the approaches to the Bus Terminal have not been properly provided.

3.7. *Level crossings*: There are several level crossings where traffic hold-ups are quite frequent and much delay is caused to vehicular traffic. The level crossings at Patel Road, Rohtak Road, Link Road (Defence Colony) and Sarai Rohilla are serious traffic bottlenecks. The main road arteries to some of these crossings are closed for a considerable time during peak periods. According to a study, the level crossing at Rohtak Road on an average remains closed for 9 hours in a day and the time for one single closure extends as much as 45 minutes. The Safdarjang level crossing is also a similar bottleneck for vehicular movements to and from South Delhi. The other level crossings are at Sewanagar, Shaktinagar, Shakur Basti, Mehrauli-Mahipalpur Road and Jail Road on the Rewari Railway line.

3.8. *Trans-Yamuna traffic*: This faces a great problem of undue delays at the existing bridge which is also a great traffic bottleneck. The existing Yamuna bridge is the principal link between Delhi and Shahdara. Plying of slow moving traffic on the bridge limits the capacity of this link for fast moving traffic.

3.9. Efforts in the past to solve the traffic problems have not shown impressive results. This is mainly due to the fact that:—

(i) responsibilities for tackling Delhi's traffic problems have been divided between a number of organisations;

(ii) action to provide roads, parking and transport services has been taken independently and piece-meal without any definite over-all concept; and

(iii) there has been lack of adequate funds to meet the extraordinary requirements of the essential improvements.

3.10. *Mass transportation facilities*: Delhi, like other metropolitan cities, is also faced with the problem of mass transportation. So far, mass transport in Delhi has been mainly handled by the buses of the Delhi Transport Undertaking and to a limited extent by rail. The D.T.U. is not able to cope with the increasing demand of the public. As earlier mentioned, the concentration of work centres at a few places has created serious problems for the D.T.U. With about 800 vehicles on the road on an average, the Undertaking's buses carry about 750,000 passengers daily in the Union Territory of Delhi. Table 6 gives the relevant data on the growth of passenger traffic during the period 1961—67 :

table 6

sl. no.	year	average no. of buses on road per day	average no. of passengers travelled per day (000)	total no. of trips per day
1	1961-62	552	505	3,966
2	1962-63	618	594	7,720
3	1963-64	639	550	9,036
4	1964-65	649	534	10,140
5	1965-66	733*	600	10,264
6	1966-67	820**	750	12,000

*includes 57 Private buses.

**includes 50 Private buses.

3.11. There is, however, much overcrowding in the buses during the peak hours as most of the people travel to work and back home during that period. The peak period trips constitute about 70 per cent of the total D.T.U. trips. Considering the trend during the past few years, it is estimated that the Undertaking will be required to carry about 900,000 passengers daily by the end of 1970-71. Buses alone will not be able to cope with this heavy volume of passenger traffic which is ever increasing. It will, therefore, be necessary to provide a rapid transit system to service the future demand satisfactorily.

3.12. The movement of intra-urban passengers by rail has also increased considerably.

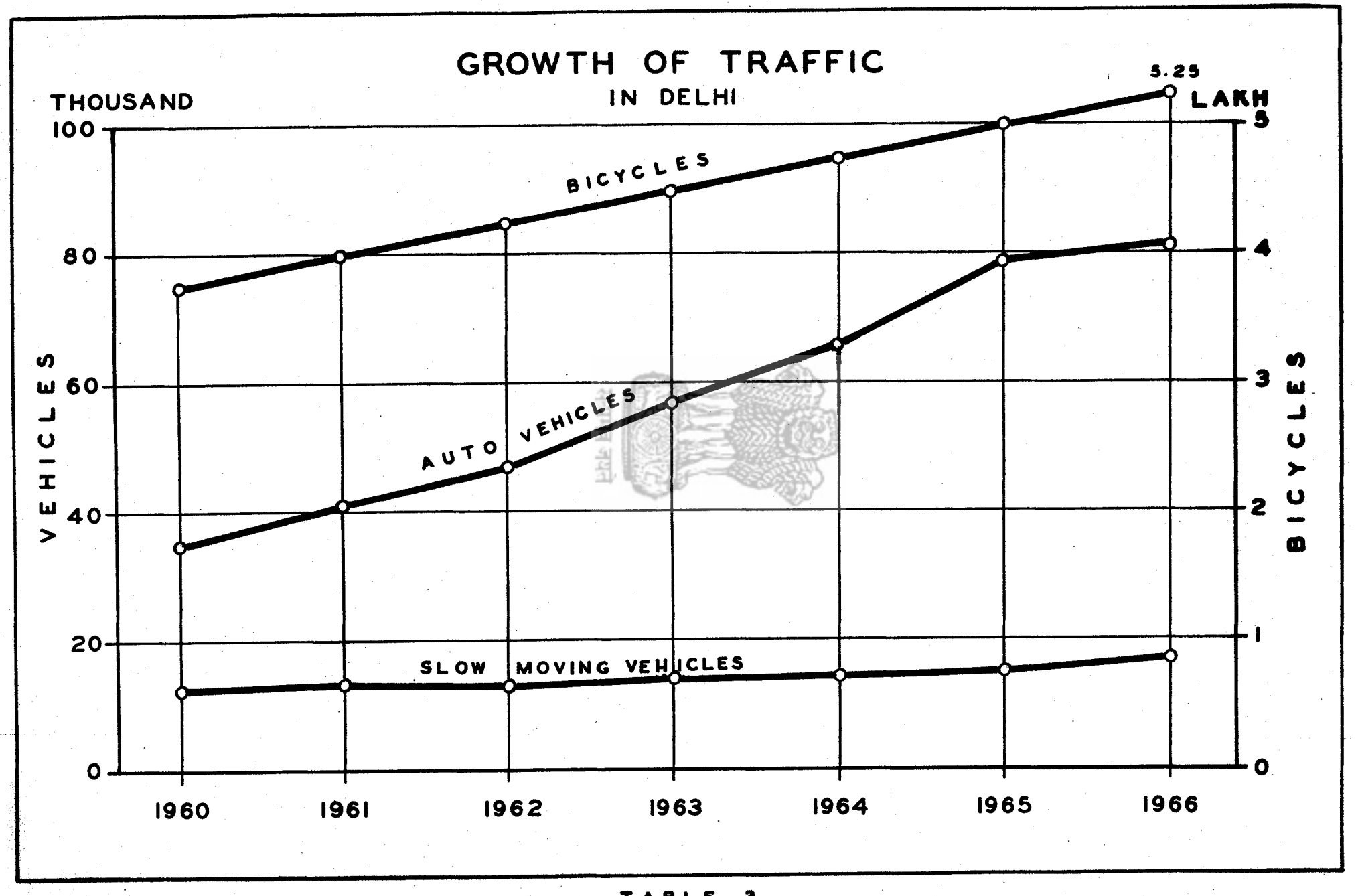

GROWTH OF TRAFFIC
IN DELHI
THOUSAND
LAKH
5.25
100
80
60
40
20
0
5
4
3
2
1
0
VEHICLES
BICYCLES
BICYCLES
AUTO VEHICLES
SLOW MOVING VEHICLES
1960
1961
1962
1963
1964
1965
1966

TABLE. 3

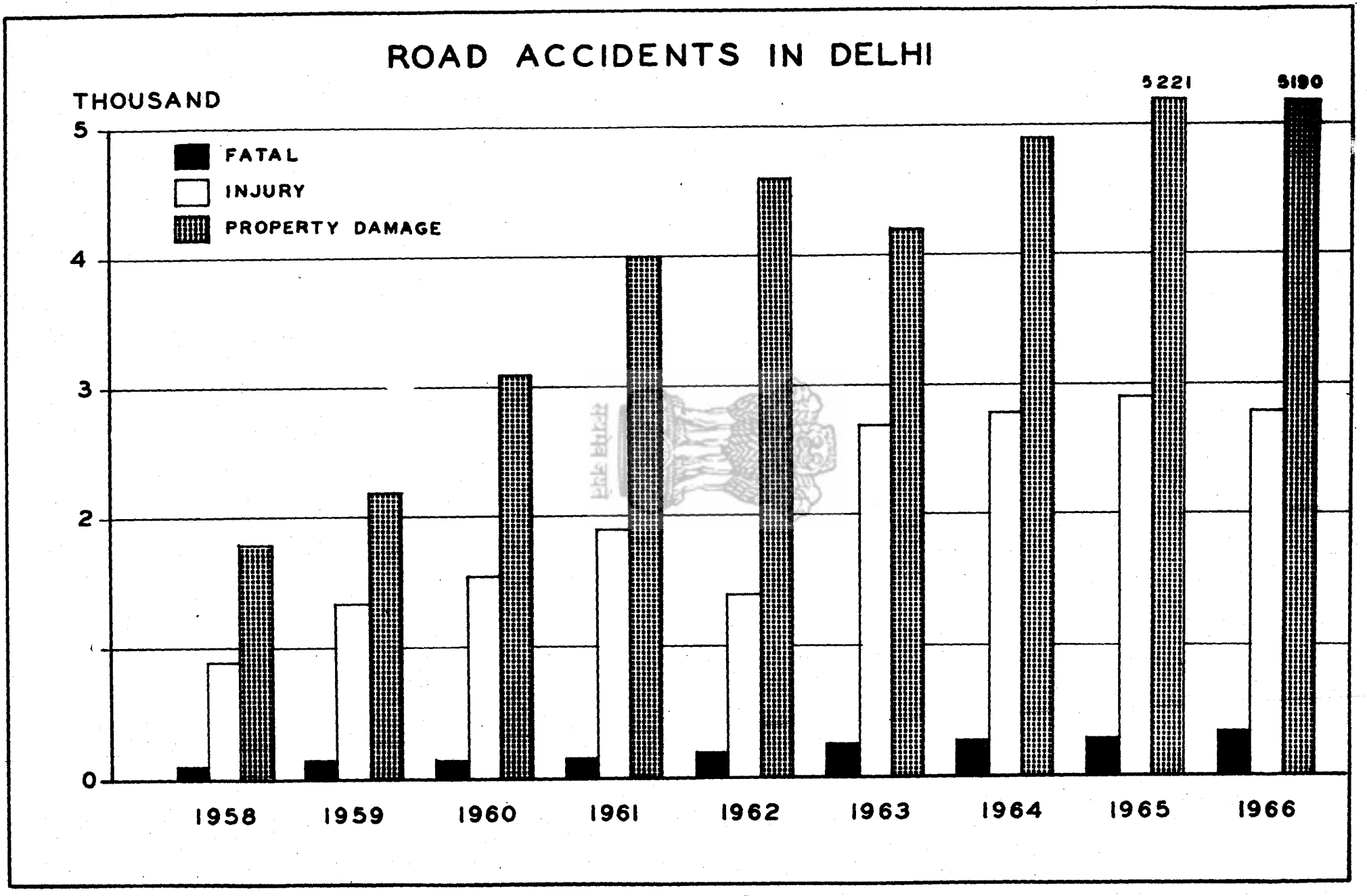

ROAD ACCIDENTS IN DELHI
THOUSAND
5
4
3
2
0
FATAL
INJURY
PROPERTY DAMAGE
5221
5190
1958
1959
1960
1961
1962
1963
1964
1965
1966

TABLE. 5

In 1964-65, the number of daily inward and outward passengers at various stations in the Delhi urban area was 33,000 each way. It is expected to increase to about 48,000 and 78,000 by 1971-72 and 1981-82 respectively. Large concentrated flows of traffic in the morning and evening are required to be handled at Delhi and New Delhi stations. The main factors responsible for the existing situation are: (i) limited facilities at Delhi and New Delhi stations; (ii) steam traction; (iii) absence of route relay interlocking installations; and (iv) difficult lay out of the track between Delhi and New Delhi Railway stations.

The possibility of running and accepting a larger number of suburban trains with reduced headways during the peak period has to be examined. However, the use of electric traction or diesel rail cars have become inevitable.

Prior Studies

4.0. *Origin and Destination Study* (1957): An Origin and Destination study of traffic by the road side interview method was carried out by the Central Road Research Institute in collaboration with the Town and Country Planning Organisation in the year 1957. This study was of great use in preparing the Master Plan of Delhi which was approved by the Cabinet in 1962. As per the Delhi Development Act, the Delhi Master Plan has to be reviewed after every five years in order to keep it up-to-date, but studies have not been taken up so far. Even the Origin and Destination study conducted earlier has become out of date. Besides, it did not include a study of the mass transportation demand, traffic projections and traffic assignment for the future design year.

4.1. *Bhagwan Sahay Committee* (1963): The problem of traffic in Delhi was also investigated by a Committee set up by the Government of India under the Chairmanship of Shri Bhagwan Sahay, the then Chief Commissioner of Delhi. The Committee has suggested certain short-term measures to regulate the easy flow of traffic in the city. Along with this, it has suggested redesigning of old Delhi and New Delhi Railway Station Yards and the provision of openings and passengers' access terminals on both sides. The Committee has also recommended that a comprehensive survey of the traffic and transportation situation and its related problems should be carried out by a team of experts.

Preliminary Study

5.0. The Study Team realised the urgency of removing existing bottlenecks and for providing adequate facilities for free movement of traffic in the Delhi metropolitan area. The Team, therefore, asked the Central Road Research Institute to study the limitations of the existing road net-work, requirements of additional roads, intersections and crossings needing immediate attention and to draw up a comprehensive programme accordingly for implementation during the Fourth Five Year Plan.

5.1. On the basis of a study of the present and future land use pattern, existing Corporation zones and census zones, the study area was divided into 50 zones (Annexure I). Details, such as present and future population, present and future working force, employment opportunities etc. of each study zone were determined from the available data on the basis of certain assumptions. Travel time factors were determined for the proposed network of roads. A mathematical model to estimate the total passenger trips for the purpose of work between different zones for the year 1961 was set up and with the suitable assumption for model split, the passenger trips by vehicles other than mass transport and by mass transport were calculated. Figures 1 and 2 show the desire line maps for vehicles other than mass transport and by mass transport respectively.

5.2. The desire line trend shows that zones 28, 30 and 31 (Tilak Nagar, Daya Basti and Shakti Nagar) will generate heavy volume of traffic to other zones, whereas zones 3, 4, 14 and 32 (Industrial Area Shahdara, Central Secretariat, R. K. Puram and Timarpur) will attract heavy volume of traffic from other zones. Zones 1, 25, 26, 27, 39, 40, 47 and 48 (Navin Shahdara, Kirti Nagar, Rajauri Garden, Hari Nagar, Ajmeri Gate, Darya Ganj, Lodi Road and Jangpura) will have moderately heavy traffic to other zones. Zones 9, 22, 24, and 34 (Karolbagh, Okhla, Indraprastha Estate and Civil Lines) will attract moderately heavy traffic from other zones.

5.3. For the purpose of assigning the projected traffic with the known origin and destination, the network of roads proposed in the Delhi Master Plan for the year 1981, was considered. Passenger trips considered in the traffic assignment, refer to work-trips during morning peak period of two hours. Passenger

trips by vehicles other than mass transport between different zones were assigned to the above road net-work. Figure 3 shows the passenger trips assignment by mode other than mass transport for Delhi urban area for the year 1981. For the purpose of finding out the limitations in the capacity of roads and road inter-sections of the proposed road net-work, traffic figures in terms of vehicular volume were converted into passenger car units (p.c.u.).

5.4. The assignment of traffic on Delhi's road net-work shows that certain stretches of important roads would be carrying very heavy volume of traffic and these roads have to be designed to cater to the same. In such cases where ideal conditions cannot be achieved, alternate routes have to be worked out.

Comprehensive Development Programme

5.5. A comprehensive development programme as given in Annexure II has been worked out on the basis of the above preliminary study which would ensure an efficient traffic circulation system in the Delhi Urban area. The programme includes proposals for development of the road system (figure 4) which would suitably fit in the future road net-work. The important bridges and inter-sections, which are major bottlenecks are also included in the scheme. As standing vehicles (parking) create acute problems in areas like Connaught Place and Chandni Chowk, parking garages have been included in this scheme, considering the urgent need for such a facility. As parking, loading and unloading facilities for buses and trucks are at present most inadequate, the scheme envisages the provision of two truck terminals and two bus terminals (D.T.U. buses) and also improvement of the new Inter-State Bus Terminal at Kashmere Gate. The Plan covers traffic education scheme by providing traffic training parks, installation of traffic control devices, improvement of road-rail grade crossings, express cycle tracks etc.

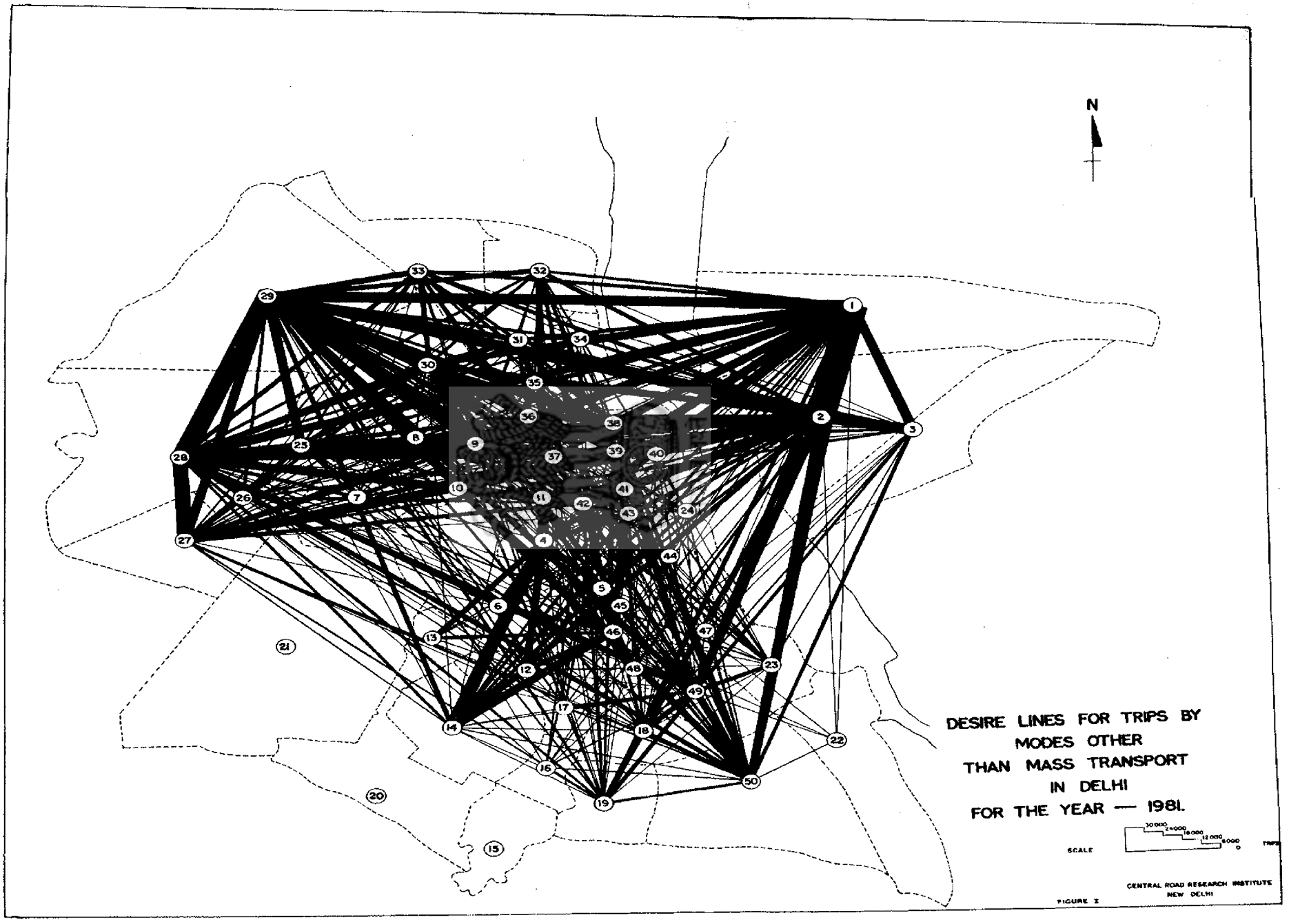
Fourth Plan Proposals

6.0. *Development of roads and bridges*: The total cost of the comprehensive development programme is estimated to be about Rs. 34·74 crores which includes provision for National Highways and schemes financed from the Central Road Fund costing Rs. 9·81 crores. However, due to limited resources the Planning Commission have made an allocation of Rs. 9 crores in the Fourth Plan for the development programme for Delhi. In addition Rs. 3·5 crores have been allocated under National Highway Programme and Rs. 1 crore may be available from the Central Road Fund.

In view of the reduced outlay, the Study Team re-examined the programme for working out fresh priorities. The revised proposals are given in Annexure III. It may be pointed out that the schemes relating to the construction of overunder bridges at (i) School Lane (ii) Link Road (Defence Colony) (iii) Patel Road (iv) Sarai Rohilla and (v) Mehrauli Road could not be fully provided in the revised programme due to paucity of funds. These schemes are of major importance which will go a long way in removing the serious traffic bottlenecks. Since the additional funds required amount to only Rs. 2·52 crores, the Team strongly recommends that additional provision should be made for these schemes in the Fourth Plan. If, however, it is not possible to find additional money for the purpose, the Team is of the view that lesser urgent schemes may be postponed.

6.1. In order to facilitate dispersal of a large number of passengers being disgorged at both the Delhi Main and New Delhi Railway Stations, the Study Team has requested the Town and Country Planning Organisation to draw up a detailed scheme for the improvements and remodelling of these stations in consultation with the Railway authorities. A token provision of Rs. 10 lakhs has been made in the Fourth Plan for executing some of the required improvements. As regards the provision of terminal facilities for buses and trucks and the improvement of the existing Inter-State Bus Terminal at Kashmere Gate, the Team is of the view that the schemes already prepared by the Delhi Development Authority should be implemented as early as possible.

6.2. *D.T.U. Development Programme*: As mentioned earlier, the main reliance for mass transit in Delhi is on the bus system operated by the D.T.U. There has been a growing demand for additional bus services as the existing facilities have proved inadequate. The D.T.U. have drawn up their proposals for the Fourth Plan amounting to Rs. 10·82 crores, with a view to (i), provide an efficient fleet of vehicles to ensure regular, punctual and adequate transport facilities to the travelling public


N
DESIRE LINES FOR TRIPS BY
MODES OTHER
THAN MASS TRANSPORT
IN DELHI
FOR THE YEAR — 1981.
SCALE
30000
24000
18000
12000
6000
0
TRIPS
CENTRAL ROAD RESEARCH INSTITUTE
NEW DELHI
FIGURE 2

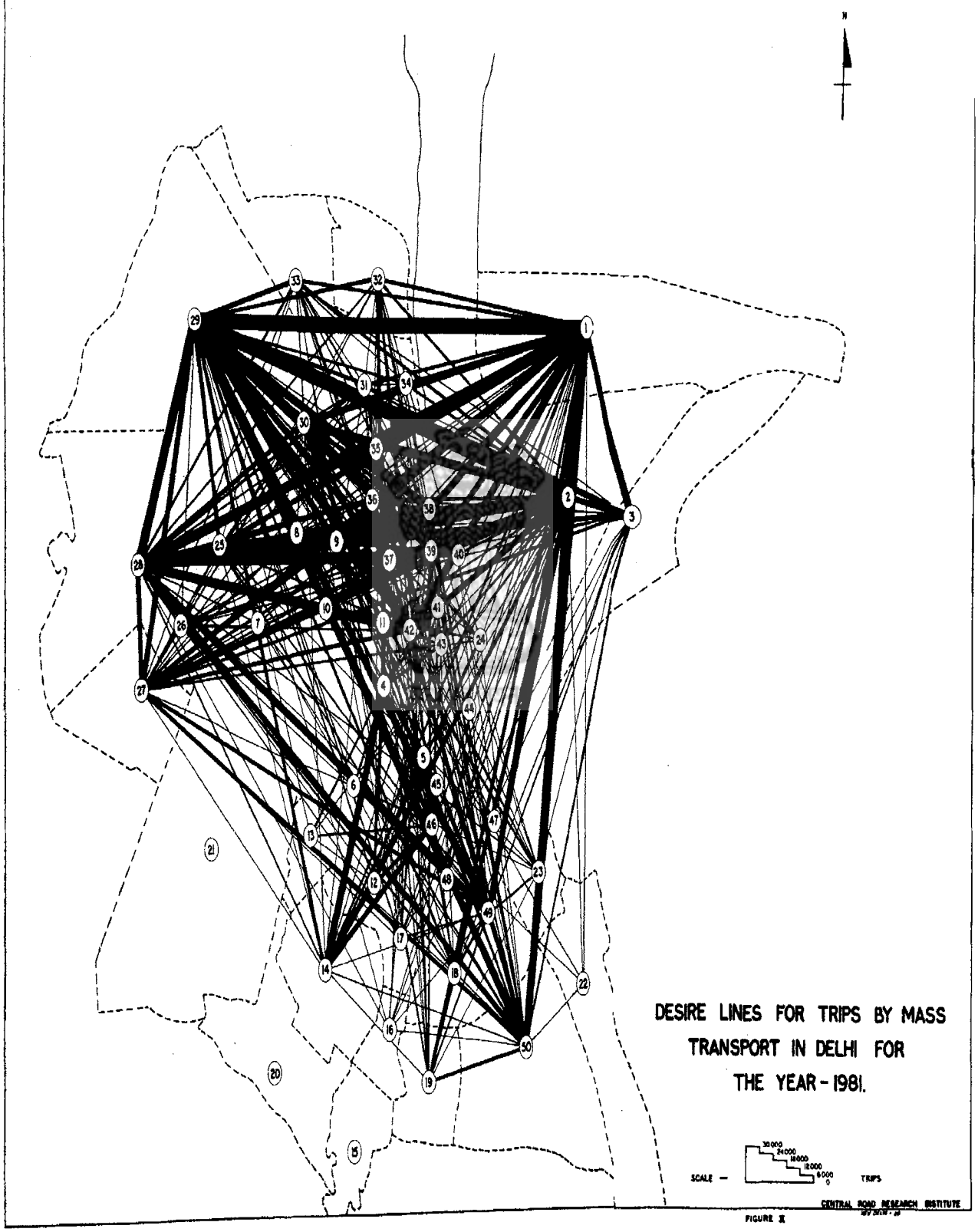

N
DESIRE LINES FOR TRIPS BY MASS TRANSPORT IN DELHI FOR THE YEAR - 1981.
SCALE —
30000
24000
18000
12000
6000
0
TRIPS
CENTRAL ROAD RESEARCH INSTITUTE

FIGURE X

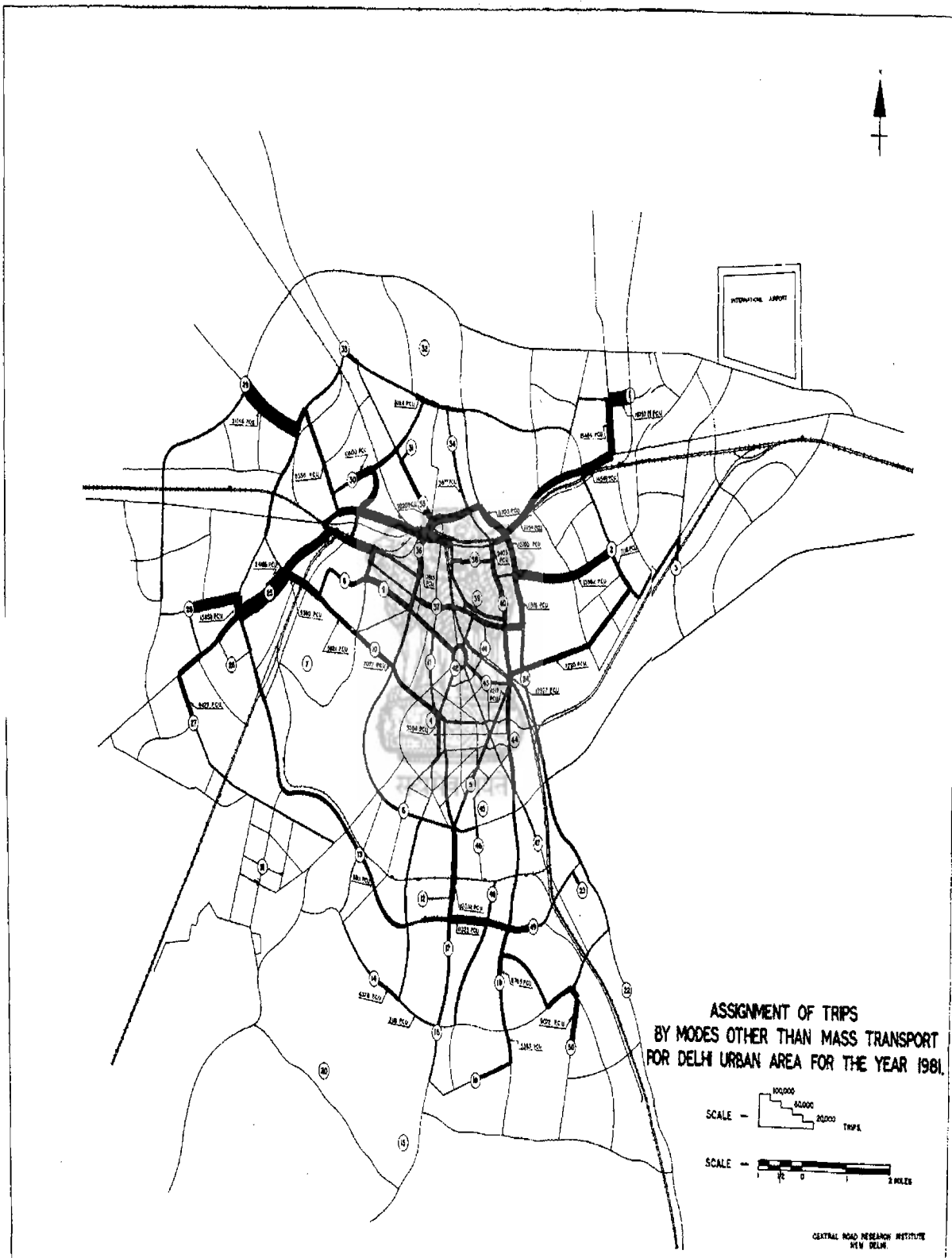
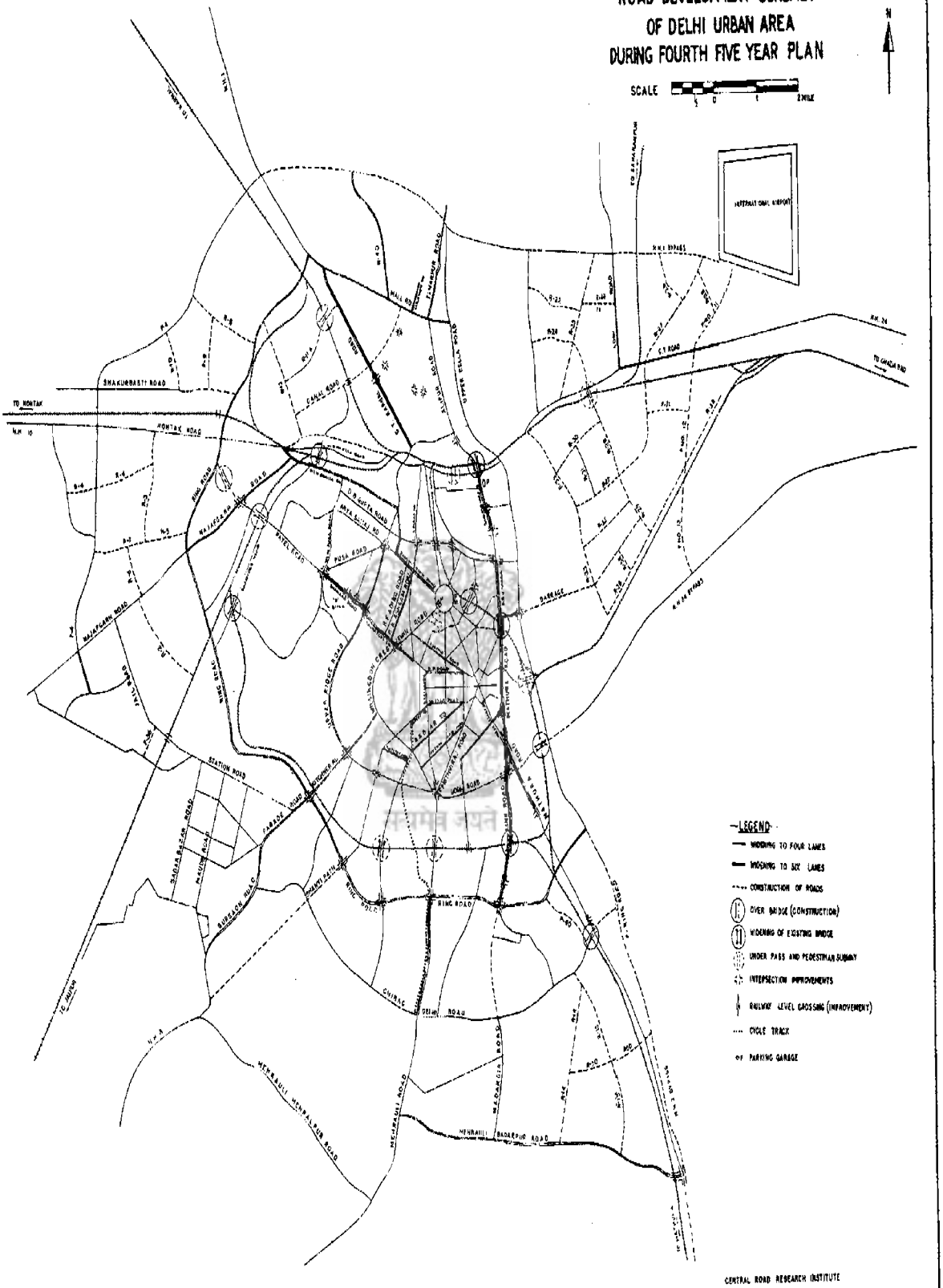

INTERNATIONAL AIRPORT
ASSIGNMENT OF TRIPS
BY MODES OTHER THAN MASS TRANSPORT
FOR DELHI URBAN AREA FOR THE YEAR 1981.
SCALE — 100,000 60,000 20,000 TRIPS
SCALE — 0 1 2 MILES
CENTRAL ROAD RESEARCH INSTITUTE
NEW DELHI.

FIGURE 31

ROAD DEVELOPMENT SCHEMES OF DELHI URBAN AREA DURING FOURTH FIVE YEAR PLAN



CENTRAL ROAD RESEARCH INSTITUTE
NEW DELHI

FIGURE II

in the capital; and (ii) meet the additional requirements of the growing population and provide adequate transport facilities to the newly developed areas.

The build-up of the fleet has been worked out as below:—

(i) For operation on existing routes for increased population. ..	1,400.
(ii) For new colonies, industrial areas etc. ..	125.
(iii) For rural areas	75.
(iv) For Inter-State operation ..	65.
Total ..	1,665.

The Undertaking had a total fleet of 973 vehicles at the end of the Third Plan and provision has been made for an additional fleet of 692 buses during the Fourth Plan. However, due to limited resources, an amount of Rs. 9 crores has been provided by the Planning Commission in the Fourth Plan for the development programme of the D.T.U.

FURTHER ACTION PROGRAMME

Comprehensive Traffic and Transportation Study: A stage has now reached in Delhi that spot improvements such as introduction of a few shuttle services, shifting of a few bus stops, improvement of busy roads etc., will not alone suffice. The problems should be examined in detail on the basis of comprehensive studies. The main object of the studies is to develop practical and flexible long-term plan for meeting the future traffic transportation needs of the entire metropolitan area of Delhi.

The scope of the proposed studies is to find out the traffic and transportation demand, the extent of the facilities available and also the significant factors affecting travel modes, frequency, purpose and other aspects of trips. This would cover the movement of both passengers and goods. The data collected from these studies would be analysed to find out the factors affecting modal distribution, effects of different land uses on traffic generation and also other characteristics of travel as this would help in forecasting future travel demands on scientific basis. Further, analytical studies would be conducted to achieve a desirable modal balance, and assignment would be done to determine the future demand on the road network. The Study Team has discussed in detail the proposed comprehensive traffic and transportation studies and decided that the following studies should be conducted:

1. Home Interview Survey.
2. Commuter Survey.
3. Commercial Goods Transport Survey.
4. Commercial Passenger Vehicles Survey.
5. Outer Cordon Survey.
6. Speed and Delay Study.
7. Screen Points Survey.
8. Collection of data on present Mass Transportation facilities.
9. Parking and Terminal Study.
10. Intersection Improvement Study.
11. Pedestrian and Cycle Survey.
12. Study on Traffic Regulations.

Design of Facilities: The data collected from these studies will be analysed systematically to determine the traffic and transportation demand and travel characteristics. The trips generated from each of the study zones will be related directly to the activities and land use in each zone, data on which will be collected for the study year as well as for the design year. The present demand will be projected to the future design year and thus the future inter-zonal traffic movement will be determined. This will be assigned on the future transportation system to achieve a desirable modal balance. Functional plans and cost estimates for selected system would be worked out. The data thus collected would provide the basis for more detailed engineering feasibility studies. Facilities would be designed for standing vehicles with respective characteristics of present usage and future needs.

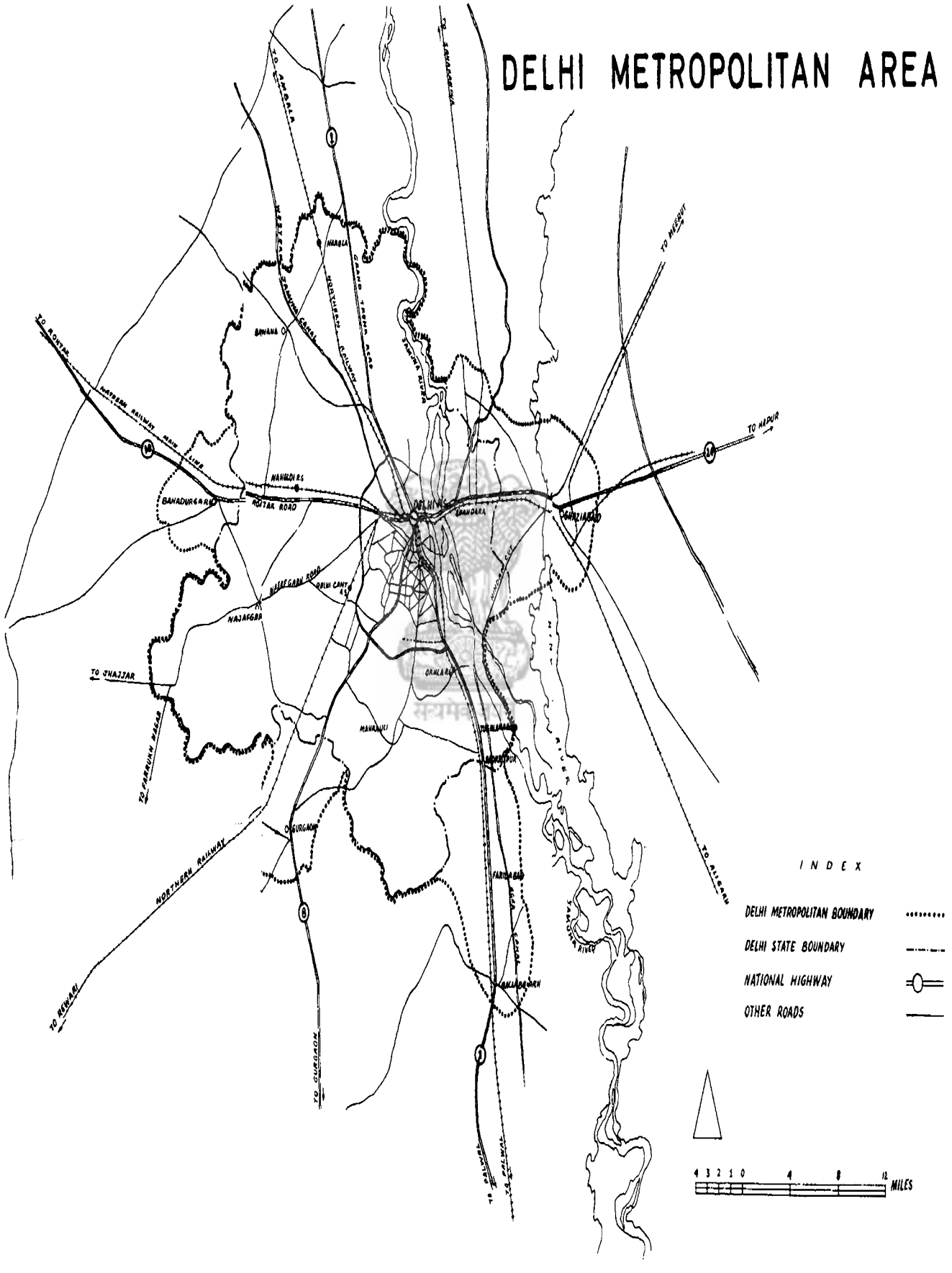
It is expected that the traffic studies would take about two years to complete and would cost Rs. 10 lakhs, the provision for which has already been made in the Fourth Plan. The Central Road Research Institute who have been requested to undertake these studies are likely to start the work from July 1967. Accordingly, it is recommended that provision of Rs. 4 lakhs in 1967-68 and Rs. 6 lakhs in 1968-69 be made for meeting the cost of the Study.

Annexure I

List of Zones

Zone No.	Name of the Zone
1.	Navin Shahdara.
2.	Gandhi Nagar.
3.	Industrial Area Shahdara.
4.	Central Secretariat.
5.	Shahjahan Road.
6.	Chanakyapuri.
7.	Pusa Institute.
8.	Patel Nagar.
9.	Karol Bagh.
10.	Rajendra Nagar.
11.	Gole Market.
12.	Vinay Nagar.
13.	Moti Bagh.
14.	R. K. Puram.
15.	Mehrauli.
16.	Hauz Khas.
17.	Y. Sarai & Medical Enclave.
18.	Kailash Colony.
19.	Malviya Nagar.
20.	Mahipal Pur.
21.	Palam Airport (Delhi Cantt.).
22.	Okhla.
23.	Ashram.
24.	Indraprastha Estate.
25.	Kirti Nagar
26.	Rajauri Garden.
27.	Hari Nagar.
28.	Tilak Nagar.
29.	Shakurbasti.
30.	Daya Basti.
31.	Shakti Nagar.
32.	Timarpur.
33.	Azadpur.
34.	Civil Lines.
35.	Subzimandi.
36.	Sadar Bazar.
37.	Pahar Ganj.
38.	Chandni Chowk.
39.	Ajmeri Gate.
40.	Darya Ganj.
41.	Rouse Avenue—Minto Road Area.
42.	Connaught Place.
43.	Hardinge Avenue.
44.	Sunder Nagar.
45.	Lodi Estate.
46.	Lodi Colony.
47.	Jangpura.
48.	Kotla Sewanagar.
49.	Lajpat Nagar.
50.	Kalkaji.

DELHI METROPOLITAN AREA



Annexure II

Comprehensive Development Programme for Delhi.

1. The road development programme has been worked out mainly tangent wise, taking Connaught Place as the Centre. Details of important schemes are given in the following paragraphs:

(i) *Southern Tangents*

Southern Tangent 1.—It runs to the immediate south of the Connaught Place starting from the eastern end of Ring Road near Purana Quila and ends at the Ring road near Ring Road-Rohtak Road crossing *via* R. P. Road, Talkatora Road, Shankar Road, Patel Road and extending from Najafgarh Road to Ring Road. On this tangent there is already heavy volume of traffic and the route is expected to carry nearly 12,000 p.c.u. on Shankar Road in the year 1981. For the smooth flow of this volume of traffic, it has become necessary to widen this road to six lanes out of which one lane on either side of the road should be provided for the use of cyclists while the remaining carriageways will be used by the other traffic. Simultaneously an over-bridge on Patel Road over the Rewari Railway line crossing and the bridge over the Najafgarh Nallah, should be constructed. To complete this link from one end to another, the Purana Quila underpass should be taken up. The improvements of the important intersections such as Talkatora-Irwin Road, Shankar Road-Bazar Marg, Shankar Road-New Pusa Road, and Patel Road-Najafgarh Road should also be taken up to improve the traffic flow conditions.

Southern Tangent 2.—It starts from the junction of Ring Road with National Highway by-pass No. 24 and ends at Kitchner Road—Lodhi Road junction. Considering the growth of the Shahdara Industrial area and the construction of new bridge over the river Yamuna, it is necessary to complete the link of the four lane Road between Nizamuddin roundabout and Ring Road with an overbridge for providing grade separation on the Mathura Railway line. Intersections at Link Road, Mehrauli, Teen Murti Road and Kitchner Road should also be improved in the proposed phases.

Southern Tangent 3.—This is the Southern Part of the Ring Road and serves as an important link between residential and work centres. The present traffic conditions on this road warrant its immediate improvement, details of which are given in paragraph 4.

Southern Tangent 4.—It runs from Okhla Industrial Estate-Mathura Road junction to N.H. 8 *via* Chirag Delhi Road. Widening of the entire stretch to two lanes should be completed, as it serves as an important link for heavy traffic between the two National Highways No. 2 and No. 8 and is expected to carry about 5000 p.c.u. in the year 1981. For the completion of this link, provision of an overbridge at Okhla railroad crossing is required.

Southern Tangent 5.—It forms an important link between Mathura Road and Mehrauli Road *via* Mehrauli Badarpur Road. Widening of this road is required.

Southern Tangent 6.—It is a link between two important roads *i.e.* Mehrauli Road and Gurgaon Road along the Mehrauli-Mahipalpur Road. Widening of this road to two lanes is also to be done.

(ii) *Eastern Tangent*

It forms an important link between the extreme north and extreme south of the urban area of Delhi, *via* Timarpur Road, Alipur Road, Subhas Marg, Mathura Road and Link Road meeting the Southern Tangent No. 5.

The Eastern tangent connects the residential colonies, such as Timarpur, Kashmere Gate, Kailash, Kalkaji, Lajpat Nagar, Defence Colony, Sunder Nagar etc., to the city's important shopping, commercial and Government office areas of Chandni Chowk, Connaught Place and Indraprastha Estate. This stretch of road carries a heavy volume of traffic at present, and due to the future development of the adjoining areas, it is expected to carry more than 9,000 p.c.u. during morning peak hours in the design year 1981. Considering its importance, it is proposed to widen the Link Road to four lanes, Mathura Road to six lanes, Elgin Road

to six lanes, Subhas Marg to six lanes, Tilak Bridge and Lothian Bridge and also to provide an overbridge across the railway line near Defence Colony. This plan proposes the improvement of important intersections such as Indraprastha Avenue-Mathura Road intersection, Tilak Bridge intersection etc.

(iii) *Western Tangents*

Western Tangent 1.—It runs along Rama Krishan Ashram Road, Chitra Gupta Road, Sadar Thana Road serving as an important link between north residential and shopping area to the south employment centre. As it is located close to the Connaught Circus area as a tangent, it is bound to be an important road and is expected to carry about 6,000 p.c.u. in the design year 1981. Hence widening of this road to four lanes has been suggested. It is also proposed to widen Shanti Path north of Railway line.

Western Tangent 2.—This tangent connects the Airport to Subzimandi crossing along Gurgaon Road, Parade Road, Upper Ridge Road and Rani Jhansi Road. This important link is expected to carry in the year 1981 about 12,000 p.c.u. near Subzimandi area, about 8,000 p.c.u. near Karol Bagh area, and about 5,000 p.c.u. on the southern part of the road. Considering the importance of this link, it is proposed to widen it to four lanes and also to improve the intersections.

Western Tangent 3 (*Shadipur Road*).—This will be a useful link on the eastern side of the Railway line to Jaipur and it is proposed to widen it to two lanes uniformly and also to provide it with a bridge across the Ring Railway.

Western Tangent 4 (*Najafgarh Road*).—Due to industrial and residential developments in this area, this road carries heavy volumes of traffic to and from Delhi and New Delhi areas, and is expected to carry about 20,000 p.c.u. in the year 1981. It is proposed to widen this road to four lanes from Ring Road to Rohtak Road.

(iv) *Northern Tangents*

Northern Tangent 1.—This road is an important link between Rohtak Road and Upper Bela Road and will serve as a by-pass for the traffic coming from Rohtak Road and G.T. Ghaziabad Road. This road is expected to carry about 13,000 p.c.u. in the design year. It is proposed to widen this road to four lanes.

Northern Tangent 2(*Mall Road*).—This is an important link connecting N.H.1-to Upper Bela Road running through the residential colonies of Model Town, Kingsway Camp etc. This road will also serve as an approach to the proposed bridge across the Yamuna on the northern side of the present bridge. It is proposed to widen this road to four lanes in the entire stretch.

Northern Tangent 3 (*Outer Circumferential Road*).—As this road will serve as a by-pass to National Highways in the northern side and connect to Wazirabad barrage, it is proposed to provide a two lane road for the present.

2. *Improvement of Delhi Station Area.*—Being an important railway station with railway lines converging from all directions, the area carries heavy volume of vehicular and pedestrian traffic. There is an urgent need to improve this area. Considering the heavy volume of pedestrian traffic across Queens Road, a pedestrian subway has been proposed next to the Delhi Public Library which will ensure safety to the huge number of pedestrians going across this road to and from Chandni Chowk area. It is suggested that the grade separation for pedestrians at Koria Bridge intersection may be taken up in the near future. It is also proposed to provide suitable parking lots and a channelization scheme for proper regulation of traffic. Considering the traffic congestion at Fatehpuri and Novelty intersections, it is proposed to improve them.

Due to the heavy demand for parking in and around Chandni Chowk area which creates congestion and accident problems, it is proposed to have a parking garage in Red Fort area next to Subhas Marg.

3. *Improvement of Connaught Circus Area.*—This is another very important shopping and recreation centre which attracts thousands of persons every day, creating many traffic and transportation problems. Due to its central location, it is bound to continue as an important C.B.D. The traffic and parking problems in this area have not been tackled in a proper way. It is proposed to improve this area with suitable channelization schemes, traffic control devices, on and off street parking, widening etc. to ensure free and safe flow of traffic. To meet the huge demand for parking near Regal and Super Bazar, parking garages at these places must be provided.

Considering the heavy congestion at Parliament Street due to huge volume of cycle and pedestrian traffic, it is proposed to provide a subway for this traffic to increase efficiency and safety at this intersection.

Panchkuin Road which serves as an important link between Connaught Circus and Arya Samaj Road area, carries a very heavy volume of traffic and is expected to carry about 8,000 p.c.u. in the design year. It is proposed to widen this road to six lanes, out of which the extreme lanes will be for cycle traffic.

As there is a need for having suitable links between New Delhi and Delhi, it is proposed to provide a bridge across the railway lines at School Lane. With the coming up of the Barrage near Indraprastha Avenue, this bridge will be a useful link.

4. *Improvement of Ring Road.*—The Ring Road around Delhi serves as an important arterial link between different residential and work centres and already carries a heavy volume of traffic. Considering its importance, this road should be widened to four lanes immediately and the stretch connecting Mool Chand Hospital and Safdarjang Hospital which is expected to carry about 14,500 p.c.u. in the year 1981, should be widened to six lanes.

5. *Improvement of Roads in Shahdara Area.*—This area has been planned as a self-contained township with about 700,000 of population in the year 1981 and with employment opportunity for about 300,000 persons. With the rapid development in this area, it is necessary to provide atleast the important road links.

Considering the heavy volume of traffic on G.T. Road and Loni Road, it is proposed to widen these roads. Further as there is no link between the northern and southern parts of this area due to location of the Ghaziabad-Delhi Railway Line, it is proposed to provide an underpass near Shyam Lal College.

6. *Roads and Bridges in N.D.M.C. and M.C.D. Areas.*—Keeping in view the present as well as future traffic demand, some roads in N.D.M.C. and M.C.D, areas need to be improved or widened, and also some roads need to be provided in the newly developed areas.

Considering the heavy volume of Cycle traffic between Vinay Nagar area and the Central Secretariat which create many traffic problems, an arterial cycle track has been provided in the plan.

There are many traffic bottlenecks like Mehrauli Road road-rail grade crossing near Airport, 'M' Avenue underpass and Sarai Rohilla Level crossing which create heavy traffic congestion resulting in heavy economic losses and accidents. At these locations it is proposed to provide overhead bridges/underpasses of sufficient width during this plan. It is also proposed to improve at grade road-rail crossing to ease the traffic conditions.

7. *Bus Terminals, Truck Terminals and Bus Bays.*—There are many important places in Delhi and New Delhi, where people change buses and as proper terminals for D.T.U. buses are not provided, it leads to a lot of inconvenience to passengers and also adds to unnecessary heavy pedestrian movements in these busy areas. Hence it is proposed to provide atleast two bus terminals at suitable places. The site for these terminals should be selected after a careful study. Provision has been made for the improvement of the existing Inter-State Bus Terminal at Kashmere Gate and two truck terminals at Rohtak Road and Chandrawal area. An allocation has also been made for construction of bus bays at busy roads.

8. *Traffic Control Devices.*—Traffic Control devices help in regulation and control of traffic. In Delhi, these devices are sparingly used but considering present and future traffic movement, there is an urgent need for such installations. Hence a provision has been made for them in the programme.

To inculcate traffic sense, provision has also been made for additional traffic training parks for children.

Summary of Comprehensive Road Development Schemes of Delhi and New Delhi during the Fourth Five Year Plan

Sl. No.	Name of the Scheme	Estimatd Cost (Rs. in lakhs)
I.	Southern Tangents	265·8
II.	Eastern Tangents	202·1
III.	Western Tangents	82·1
IV.	Northern Tangents	94·7
V.	Improvement of Railway Station Areas	55·0
VI.	Connaught Circus Area	83·5
VII.	Improvement of Ring Road	112·0
VIII	Roads in Shahdara Area	430·5
IX.	Karol Bagh Area	31·2
X.	Tilak Nagar Area	52·0
XI.	Other Improvements in N.D.M.C. Area	346·5
XII.	Shakur Basti Area	116·4
XIII	Improvements in Corporation area	485·2
XIV.	National Highways	821·8
XV.	Miscellaneous Expenditure	294·5
	TOTAL	3473·3

ANNEXURE III

Estimated expenditure for Road Development Schemes during Fourth Five Year Plan

Agency for execution	Continuing Schemes	New Schemes	Total	Details on Page No
Central P.W.D.	177·17	168·70	345·87	73-74
Municipal Corporation of Delhi	130·68	244·96	375·64	75-77
New Delhi Municipal Committee	102·70	75·81	175·51	78-79
TOTAL	410·55	489·47	900·02	

NOTE : (1) Schemes to be financed from the Central Road Funds are given at pages 80-81.
(2) National Highways schemes are given at pages 82-83.

Details of Expenditure for Road Schemes during 3rd, 4th and 5th Plans

(Rs. in lakhs)

Agency for execution	Nature of Schemes	Estimated cost	Expenditure upto 3rd Plan	Proposed Expenditure during 4th Plan	Spillover to 5th Plan
C.P.W.D.	Continuing Schemes	296·04	72·84	177·17	46·03
C.P.W.D.	New Schemes	260·81	..	168·70	112·11
M.C.D.	Continuing Schemes	274·37	19·52	130·68	124·17
M.C.D.	New Schemes	453·97	..	244·96	209·01
N.D.M.C.	Continuing Schemes	281·48	40·62	102·70	138·16
N.D.M.C.	New Schemes	112·94	..	75·81	37·13
TOTAL		1679·61 +20·00*	132·98	900·02	666·61

* *Ad-hoc* provision for comprehensive traffic and transportation study and improvement of Delhi and New Delhi stations.

Central Public Works Department

CONTINUING SCHEMES

(Rs. in lakhs)

Sl. No.	Schemes	Estimated Cost	Expenditure upto the end of 3rd Plan	Proposed expenditure in 4th Plan	Spillover to 5th Plan
1	2	3	4	5	6
1	Construction of Shanti Path Extension from Junction of Ring Road to Gurgaon Road	8·24	2·56	5·00	0·68
2	Construction of 24′ wide link between Alipur Road and Ring Road outside Kashmere Gate (Rd. No. 47)	5·90	2·89	3·01	..
3	Construction of road connecting G.T. Ghaziabad Road and proposed road along eastern marginal bund (Rd. No. 58)	28·55	..	10·00	18·55
4	Construction of 24′ wide link between G.T. Ghaziabad Road and N.H. 24 by-pass (Road No. 56)	17·53	7·61	5·00	4·92
5	Construction of 24′ wide road connecting Elgin Road to Ring Road South of Red Fort (Road No. 92)	3·01	2·20	0·81	..
6	Construction of road connecting G.T. Ghaziabad Road to proposed N.H. 24 by-pass including culverts (Road No. 57)	19·11	7·38	10·00	1·73
7	Construction of approaches to overbridge on the crossing of goods avoiding line and road connecting N.H. 24 by-pass to Pasaunda Aerodrome.	16·00	..	10·00	6·00
8	Construction of Barrage over Yamuna near 'C' Power Station (Roads construction)	78·00	24·00	54·00	..
9	Construction of road bridge over Yamuna barrage near 'C' Power Station (Decking)	39·00	..	39·00	..
10	Construction of foot path on either side of Railway bridge across Yamuna river near Purana Quila	16·32	13·32	3·00	..
11	Construction of 24′ wide road joining Linlithgow Avenue Road running west of Pusa Institute (Road No. 25)	11·24	3·00	8·00	0·24
12	Construction of 24′ wide road connecting Chirag Delhi-Kalkaji Road west of Okhla Railway Station (Rd. No. 4)	14·29	9·41	4·35	0·53
13	Service Road and storm water drain along Bela Road from Yamuna Bridge crossing to Rajghat	6·85	0·47	5·00	1·38
14	Approaches to overbridge on the crossing of goods avoiding lines and the Rd. No. 57	16·00	..	10·00	6·00
15	Approaches to overbridge on the crossing of Ring Railway Line along Delhi Tail Distributory joining Ring Road to N.H. 10	16·00	..	10·00	6·00
	TOTAL	296·04	72·84	177·17	46·03

Central Public Works Department

NEW SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated Amount	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5
1.	Road connecting Mehrauli-Badarpur Road with road west of Okhla Industrial Estate (Road No. 14)	17·69	7·00	10·69
2.	Road passing West of Punjabi Bagh from Rohtak Road upto Najafgarh Nallah (Road No. 29)	12·02	6 00	6.02
3.	Road south of Madipur connecting proposed road west of Punjabi Bagh with Outer Ring Road (Road No. 30)	9·76	5·00	4·76
4.	Construction of road joining Mayapuri Industrial Area with Subhash Nagar parallel to Jail Road (Road No. 32)	11·02	5·00	6·02
5.	Road joining Ring Road with Outer Ring Road near Rampura Industrial Area (Road No. 41)	11·02	8·00	3·02
6.	Road connecting G.T. Ghaziabad Road with N.H. 1 by-pass passing along Dilshad Garden (Rd. No. 64)	12·16	6·00	6·16
7.	Road along East Jamuna Canal connecting N.H. 1 by pass (Road No. 66).	14·14	7·00	7·14
8.	Road connecting Patel Nagar to New Rohtak Road adjacent to Anand Parbat, Shadipur Road Part III (Road No. 89)	11·06	10·00	1·06
9.	Extension of road from N.H. 24 by-pass to G.T. Road to meet N.H. 1 by-pass near Pasaunda Aerodrome, P. No. II (Rd. No. 62)	7·68	0·70	6·98
10.	Construction of approaches to the road bridge over barrage near 'C' Power Station	37·00	37·00	..
11.	Construction of approaches to over bridge on crossing of Ring Railway and road joining Ring Road with Patel Road	26·00	26·00	..
12.	Underpass near Sham Lal Gupta College in Shahdara area	25·00	2·00	23·00
13.	Construction of approaches to over-bridge on the crossing of goods avoiding line and Patparganj Road.	12·00	5·00	7·00
14.	Construction of storm water drain along Ring Road from Rajghat to Indraprastha Estate.	3·00	3·00	..
15.	Construction of Bridge at School Lane (Approach Road)	45·75	20·00	25·75
16.	Surveying, Investigation and Special T & P— continuing and new schemes.	5·51	1·00	4·51
		260·81	148·70	112·11
	A. Comprehensive Traffic and Transportation Study		10·00	
	B. Improvement of Railway Stations			
	(i) Delhi Main		5·00	
	(ii) New Delhi		5·00	
	TOTAL		20·00	
			168·70	

Municipal Corporation of Delhi

CONTINUING SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated Amount	Expenditure upto the 3rd Plan	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5	6
1.	Widening of Mathura Road From Nizamuddin to Jangpura	8·50	0·52	5·17	2·81
2.	Widening of Mathura Road from Delhi gate to Nizamuddin				
	(*a*) From Delhi Gate to Tilak Bridge (*b*) From Tilak Bridge to Nizamuddin	25·00	2·61	20·00	2·39
3.	Widening of Elgin Road from Daryaganj to Queens Road.	8·73	..	8·73	..
4.	Widening of Najagfgarh Road, Phase I	9·96	5·96	4·00	..
5.	Widening of Link Road from Lodhi Road to Ring Road including over-bridge.	86·00	..	13·00	73·00
6.	Improvement of Link Road in front of C.B.R. Building	2·24	0·94	1·30	..
7.	Widening of Road No. 34 (Phase I)	7·00	3·40	3·60	..
8.	Widening of Timarpur Road leading to Wazirabad barrage (Phase I & II)	10·52	0·30	8·00	2·2
9.	Improvement of New Rohtak Road from M.M. Road to Anand Parbat.	6·81	27·1	4·10	..
10.	Widening of Pusa Road	4·46	1·85	2·61	..
11.	Approach road to over-bridge including bridge across Patel Road level crossing	60·60	..	50·30	10·30
12.	Widening of Shankar Road from Poorvi Marg to junction of Pusa Road roundabout	38·45	..	5·00	33·45
13.	Construction of Road from Corporation Pillar via Bakhtawarpur and Hiranki	6·10	1·23	4·87	..
	Total	274·37	19·52	130·68	124·17

Municipal Corporation of Delhi

NEW SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated amount	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5
1.	Widening of Mathura Road from Jangpura overbridge to Ring Road crossing	2·00	2·00	..
2.	Widening of road between Shankar Road and R Block, New Rajinder Nagar	1·00	1·00	..
3.	Widening of Tilak Bridge	39·00	39·00	..
4.	Widening of New Rohtak Road beyond Anand Parbat upto Zakhira	1·68	1·68	..
5.	Widening of Rani Jhansi Road from Panchkuin Road to Idgah Road crossing	22·25	10·00	12·25
6.	Improvement to Ludlow Castle Road	6·30	6·30	..
7.	Widening of Loni Road Phase II	24·00	10·00	14·00
8.	Construction of Bridge over railway between Old and New Rohtak Roads (Sarai Rohilla overbridge)	45·16	40·00	5·16
9.	Widening of Mehrauli Road Phase II (Yusaf Sarai to I.I.T.)	40·00	14·80	25·20
10.	Improvement to Jamuna Bazar	2·00	2·00	..
11.	Improvement of City Roads	100·00	20·00	80·00
12.	Construction and improvement of approach roads to rural and urban villages.	84·00	15·00	69·00
13.	Intersection improvements	8·00	5·00	3·00
14.	Improvement of following level crossings :—			
	(*i*) Sewa Nagar including widening of culverts 2·00	6·62	6·62	..
	(*ii*) Shakurbasti 1·10			
	(*iii*) Jangpura 0·52			
	(*iv*) Shakti Nagar 1·00			
	(*v*) Mehrauli-Badarpur 1·00			
	(*vi*) On Rewari Rly. line 1·00			
15.	Land acquisition for various roads	15·00*	15·00	..
16.	Land acquisition including widening of roads in Walled City	15·00*	15·00	..
17.	Off street parking, road marking and bus bays, etc.	5·00*	5·00	..
18.	Survey and investigation for Plan works	4·00	3·60	0·40
19.	Purchase of Road machinery	10·50	10·50	..
	TOTAL	431·51	222·50	209·01

**Ad hoc* Provision

1	2	3	4	5
20.	Widening of Pambari Road from G.T. Karnal Road to Mall Road . . .	5·54	5·54	..
21.	Road from Najafgarh to Ghumenhera Via Khera	4·92	4·92	..
22.	Widening of Auchandi Road	7·00	7·00	..
23.	Sub ways/Foot over bridges	5·00	5·00	..
	TOTAL	453·97	244·96	209·01

New Delhi Municipal Committee

CONTINUING SCHEMES

(Rs. in lakhs)

Sl. No.	Schemes	Estimated Amount	Expenditure upto the end of 3rd Plan	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5	6
1.	Widening of Mehrauli Road (Main Project)	245·00	16·84	90·00	138·16
2.	Payment of Final Bills	2·70	..	2·70	..
3.	Improvement & widening of the following roads in the N.D.M.C. Area				
	(a) Widening of Mahadev Road (b) Widening of Irwin Road (c) Widening of Sardar Patel Road (d) Widening of 'I' Avenue (e) Widening of 'B' Avenue (f) Widening of Roads in Jor Bagh Colony (g) Widening of Jor Bagh Road (h) Widening of Aurangzeb Road (i) Widening of Wellington Crescent	33·78	23·78	10·00	..
	Total	281·48	40·62	102·70	138·16

New Delhi Municipal Committee

NEW SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated Amount	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5
1.	Widening of Road between Shanker Market and Super Bazar	0·80	0·80	..
2.	Widening of following Roads :			
	(*a*) Ashoka Road (*b*) Lodi Estate No. 2 (*c*) Dupleix Road (*d*) Kautilya Marg (*e*) Mehrauli Road	22·00	22·00	..
3.	Widening and improvement of Connaught Place Area	10·00	3·00	7·00
4.	Widening of Panchkuin Road (one side only)	1·00	1·00	..
5.	Construction of Subway at Parliament Street—Connaught Circus Intersection	10·00	10·00	..
6.	Widening of Chelmsford Road	3·00	3·00	..
7.	Widening and improvement of Talkatora Road	3·00	3·00	..
8.	Widening and extension of Keeling Road upto Parliament Street	10·00	5·00	5·00
9.	Underbridge at 'M' Avenue	20·00	20·00	..
10.	Construction of Cycle Tracks	20·00	2·00	18·00
11.	Improvement of intersections and installation of traffic signals and channelisation	6·00	1·76	4·24
12.	Off Street Parking and bus bays etc	0·50	0·50	..
13.	Widening of Rafi Marg	2·75	2·75	..
14.	Procurement of Special T and P on continuing and new schemes	3·89	1·00	2·89
	TOTAL	112·94	75·81	37·13

Schemes to be Financed from Central Road Fund

Agency for Execution : C.P.W.D.

CONTINUING SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated Amount	Expenditure upto the end of 3rd Plan	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5	6
1.	Construction of N.H. 2 bypass from neighbourhood of I.P. College upto Wazirabad (Road No. 45).	14·78	7·36	4·62	2·80
2.	Extension of Mall Road eastwards and connecting N.H. 2 regarding item No. 1 above (Road No. 46)	6·13	3·28	2·15	0·70
3.	Construction of road linking Ring Road with extension of N.H. 10 and running south of Wazirpur including bridge over Najafgarh Nallah (Road No. 37)	26·58	5·85	6·00	14·73
4.	Construction of road along Najafgarh Nallah linking Karnal Road with the above road (Road No. 38)	13·77	2·98	0·50	10·29
5.	Construction of Link Road connecting Qutab passing south of Hauz Khas (Road No. 8).	7·12	5·39	0·25	1·48
6.	Construction of sub-arterial road linking Ring Road and Chirag Delhi Road and the West of Greater Kailash II (Road No. 5)	18·54	5·40	10·74	2·40
7.	Construction of 150 ft. wide Road south of R. K. Puram joining M. Avenue to Shantipath extension (Road No. 10)	8·56	3·21	2·75	2·60
8.	Construction of sub-arterial road linking Chirag Delhi Road to Mehrauli Road (Road No. 7).	17·35	12·63	1·94	2·78
9.	Construction of extension of Chirag Delhi Road to Kalkaji (Road No. 13)	5·81	3·41	1·31	1·09
	TOTAL	118·64	49·51	30·26	38·87

Schemes to be Financed from Central Road Fund

Agency for Execution: C.P.W.D.

NEW SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated Amount	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5
1.	N.H. 1 bye pass from Loni Road upto Delhi Border in continuation to the road from Wazirabad (Road No. 63)	24·76	2·80	21·96
2.	Ring Road Phase I	31·00	10·50	20·50
3.	Ring Road Phase II	36·00	13·40	22·60
4.	Ring Road Phase III	62·00	7·60	54·40
5.	Permanent Link between Mathura Road and N.H. 2 by-pass near Purana Quila	24·48	21·90	2·58
6.	Outer Ring Road from Rohtak Road to G.T. Road Phase I	54·00	13·54	40·46
	TOTAL	232·24	69·74	162·50

CONTINUING SCHEMES

(Rupees in lakhs)

Sl. No.	Schemes	Estimated Amount	Expenditure upto the end of 3rd Plan	Proposed expenditure in 4th Plan
1	2	3	4	5
1.	Construction of bridges over river Yamuna and its approaches behind Humayun's Tomb including the following			
	(*a*) Main Bridge (*b*) Approaches (Eastern) (*c*) Bridges (*d*) Approaches to U.P. Border (*e*) Guide Bunds	259·31	84·31	175·00
	TOTAL	259·31	84·31	175·00

National Highways

Agency for Execution : C.P.W..

NEW SCHEMES

(Rupees in lakhs

Sl. No.	Schemes	Estimated Amount	Proposed expenditure in 4th Plan	Spill over to 5th Plan
1	2	3	4	5
1.	N.H.1 (Delhi-Karnal Road)	170·00	20·00	150·00
2.	Upper Bela Alipur Mall Road	62·00	41·00	21·00
3.	Strengthening of the crest of Mathura Road (N.H.2)	53·00	20·00	33·00
4.	N.H. 3(Delhi-Gurgaon Road)	94·00	15·00	79·00
5.	N.H. 10 (Delhi-Rohtak-Fazilka Road)	150·00	20·00	130·00
6.	N.H.2 bypass behind Friends Colony	530·00	20·00	510·00
7.	Lower Bela Road	83·00	20·00	63·00
8.	Special T & P on continuning and New Schemes	14·00	3·00	11·00
	TOTAL	1156·00	159·00	997·00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CHAPTER VI

GENERAL OBSERVATIONS


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CHAPTER VI

GENERAL OBSERVATIONS

1. *Comprehensive Development Plans and Legislative Control*

Increasing population, land development and travel demand in the metropolitan cities of Calcutta, Bombay, Delhi and Madras have led to continuous increase in transportation capacities either on suburban railways or city bus system. Yet, it is evident that the ever-growing demand for transportation continues to be in excess of supply despite the efforts of the cities to provide additional transportation capacities.

1.1. Such a situation indicates that solution of transportation problems in our metropolitan cities lies, not exclusively on the ingenuity of providing additional capacity or employing better methods of moving passangers and goods. Basically, good transportation solutions at not excessive cost, depend on the proper physical inter-relationship of functions in the metropolitan area and on the principle and practice of relative self-containment, so as to minimise the length and number of journeys necessary, especially at peak hours. Such an approach brings about economy of capital and operational expenditure as well as individual economy of fares. Traffic and transportation studies made in recent years in the West indicate that the course of attemping to supply transportation services to meet any demand arising from unplanned growth of cities seems doomed to continuing failure. It is essential, therefore, to attack the problem on the demand side.

1.2. Demand control is fundamentally a function of comprehensive physical planning of the metropolitan city. The intensity of land use set forth in the master plan will chiefly determine our future ability to rationalise metropolitan transportation system. However, more research is required to determine the relationship between traffic generation, intensity of land use and the various types of land uses in the metropolitan cities. The Area Studies made in some of the metropolitan towns of the U.S.A. have pointed the way to this type of approach.

1.3. At this stage, it may be mentioned that neither foresight nor town planning legislation has kept pace with the pressures generated by rapid urban growth of the metropolitan cities. The Town Planning Acts in operation have been inadequate in scope to deal with the complex problems of urban growth which extend beyond administrative boundaries of the cities. The municipal bodies which have neither the administrative machinery nor the resources have been unable to cope with the problems created by rapid urbanisation. The sustained failure to plan and guide urban development in the past has rendered the metropolitan cities unmanageable and the cost of providing and maintaining basic civic services and amenities has become excessively high.

1.4. This is in essence unhealthy urbanisation as it involves enormous waste of time and energy ; it diverts scarce resources to unnecessary transportation overheads and in the long run it retards economic growth. In the coming years, the metropolitan cities of Calcutta, Bombay, Delhi and Madras will grow into unmanageable super complexes. This has to be prevented by developing towns in the surrounding regions of the metropolitan cities as counter-magnets to the metropolis.

1.5. The Third Five Year Plan had stressed the need for balanced area planning and development and emphasised that as far as possible, new industries should be located away from large and congested cities on a regional basis. However, no coherent measures were adopted nor the necessary administrative machinery created towards achieving these objectives.

1.6. The Team is, therefore, of the view that drawing up of metropolitan regional plans of which transportation is an integral part, should be immediately taken up where a start has not been made and expedited in cases where the work is in progress; and a positive action programme of urban development in the surrounding regions of the metropolitan cities be undertaken. This would necessitate large scale acquisition of undeveloped land in anticipation of development needs. The essential aspect of the urban development should be the provision

of necessary infra-structure ahead of development so as to deflect the new industries from locating themselves in the metropolitan cities. For this purpose, the necessary legislation, planning organisation and enforcement and development machinery should be provided.

1.7. The conceptual approach of planning metropolitan regions on comprehensive basis is of recent origin in India. It was only during the Third Five Year Plan that a beginning has been made for preparation of comprehensive development plans for metropolitan areas.

1.8. The Team, however, feels that not much progress has been made towards comprehensive planning and development of metropolitan regions of Calcutta, Bombay, Delhi and Madras. This has been mainly due to the limitations imposed by the Town Planning Acts in operation in these cities which confine planning activities within municipal limits and secondly, due to the dearth of qualified personnel. Realising the inherent defects of the existing Town Planning Acts, the Government of India has prepared a Model Town Country Planning Law which is a Comprehensive piece of Town and Country Planning Legislation, far wider in scope than the existing Acts. The Model Law provides a framework on the basis of which the State Governments are expected to enact a comprehensive law for physical planning which will supersede the existing piecemeal statutes as well as Town Planning Act which are inadequate to deal with the complex problems of the expanding metropolitan cities.

1.9. On the basis of the Model Law, the Government of Maharashtra has recently enacted a new Law—the Maharashtra Regional and Town Planning Act, 1966—which replaces the previous Bombay Town Planning Act of 1954. The Act provides for the establishment of Regional Planning Boards for specified regions. Under the Act, the Government of Maharashtra has already decided to set up a Regional Planning Authority for planning of the Bombay Region. While endorsing the progressive step taken by the Maharashtra Government, the Team suggests that the constitution of the Regional Planning Authority as well as the preparation of comprehensive development plan for Bombay metropolitan region be expedited, in view of the pressure for land development in the immediate areas around Bombay.

1.10. Unlike Bombay, Calcutta and Madras whose metropolitan boundaries are within their respective States, the National Capital Region of Delhi extends into the territories of the States of Uttar Pradesh and Haryana. Since Delhi Development Authority is not competent (as per D.D.A. Act of 1957) to extend its planning activities beyond the Union Territory of Delhi, a 'High Power Board' was set up in 1961 which presently consists of the Union Home Minister as its Chairman and Chief Ministers of Uttar Pradesh and Haryana and the Chief Executive Councillor of the Delhi Metropolitan Council etc., as its members. The Board being non-statutory, has its obvious limitations. First of all, the decisions of the Board are not necessarily obligatory. Besides, since its inception the Board has met only twice which clearly reflects its other limitations. Planning is a continuous function of Government. It is a process of formulating policies and programmes for accomplishing accepted goals. The guarantee of accomplishment of plan objectives lies mostly in the administrative machinery for planning, established under the Planning Law. The High-powered Board can, therefore, be no substitute to a planning agency for the whole area created by an agreement, under the statute. This has also been emphasised in the Master Plan for Delhi.

1.11. While the plan for Delhi urban area has taken into account the growth potentials and rate of development of the surrounding towns, to obtain a balanced overall economic development of the region, no purposeful or systematic direction to the comprehensive development of Delhi Region has yet been achieved. Consequently, urban population of Delhi continues to increase at the rate of over one hundred thousand per year. This clearly indicates the inadequacy of the measures being employed for planning and guiding development of the Delhi Metropolitan Region.

1.12. The Town Planning activity in the State of Madras is governed by the Madras Town Planning Act of 1920. The Act is limited in scope in so far as the preparation of the Comprehensive Development Plan for Madras metropolitan area is concerned. First, the Act makes no provision for the establishment of a unified regional planning authority for planning and development of metropolitan regions within the State. The primary planning authority, as provided for in the Act, is the municipal body. The Town Planning Department of the Govern-

ment of Madras is nearing completion of an interim development plan for the Madras metropolitan area. The interim plan, however, has no legal basis. Consequently, even while the plan was being prepared, haphazard development activities beyond the limits of Madras city have taken place in the absence of effective regulatory and control measures, rendering the plan almost meaningless after its completion. Because of the shortcomings of the existing Act, the Town Planning Department of the Government of Madras prepared sometime back a draft legislation for town and country planning, based on the Model Law. It is suggested that the enactment of a new comprehensive planning legislation to replace the existing Madras Town Planning Act of 1920 should be expedited for enabling comprehensive planning and development of the metropolitan area.

1.13. West Bengal is one of the few States still without a Town and Country Planning Act. The Basic Development Plan for Calcutta Metropolitan District was prepared in 1966 by the Calcutta Metropolitan Planning Organisation which was established by notification of the West Bengal Governmet. The C.M.P.O. is however, not a statutory body and it is not yet formally vested with adequate status and authority for the effective review and co-ordination of development programmes undertaken by various implementing agencies within the metropolitan area of Calcutta. The plans prepared by the C.M.P.O. cannot be statutorily enforced at present, except to the extent possible under the Calcutta Area (Use and Development of Land) Control Act, 1965 which is an interim legislation on land use controls for limited purpose.*

1.14. However, the report on Basic Development Plan for C.M.D. states that if substantial proposals for the Plan are to be implemented, major administrative changes will be required. It, therefore, proposes the establishment of a metropolitan planning agency with statutory powers and responsibilities within the framework of a State Planning Law to be enacted, for planning of C.M.D. as a continuing process. In addition, it proposes the organisation of a rational framework of functional and area development and improvement programme in the Calcutta Metropolitan District. While endorsing the proposals of the C.M.P.O. for establishing appropriate administrative machinery for planning, the Team would like to stress the urgency of bringing about the necessary administrative changes in C.M.D. without much delay.

2. *Need for a Metropolitan Traffic and Transport Authority.*

One of the most complex aspects of metropolitan transportation today is the absence of any single co-ordinated transport authority for the planning and administration of public policy. Separate units of Government are responsible for providing transportation facilities in the metropolitan towns. People have been used to consider metropolitan transportation as made up of separate and well-defined segments such as roads, bridges, tunnels, railways, road transport, traffic control, etc. This concept is due to the different facilities having been built up piece meal over a period of time, more as a remedy to a particular problem. The existing facilities have been largely constructed to serve only a part of the total transportation need and have hardly any relationship to the functioning of other components. Thus, there is virtually no unified transportation plan or policy in each of the metropolitan cities. It has already been pointed out earlier in the Report, how the quality of roads in the cities suffer due to lack of co-ordination amongst various concerned agencies. Complicated and time-consuming negotiations between various bodies tend to be necessary before any agreed project is brought to reality.

2.1. In foreign countries, it has been widely realised that there ought to be a single authority responsible for planning, financing and operation of the entire transportation system in a metropolitan town. In the first policy statement issued by the U.S. Research and Policy Committee on the problems of metropolitan areas, 'Guiding Metropolitan Growth', it was observed that "in most metropolitan areas there is no single public agency able to study the relative needs for highway, mass transit or rail. There is no single body able to allocate costs among users, businesses and the general tax funds. No authoritative body is able to balance transportation capacity and traffic-generating uses of land". Briefly, the above observations of the U.S. Research and Policy Committee clearly define the main functions of a Central authority for metropolitan transport.

2.2. Calcutta is already contemplating the establishment of a transport authority. However, a decision on the type of administrative authority will require careful study. Experience in some of the foreign countries in regard to the functioning of such agencies may help the Team in drawing up the detailed set-up of a unified transport authority for a metropolitan city.

* *Basic Development Plan for Calcutta Metropolitad District—Calcutta Metropolitan Planning Organisation.*

3. *Economic and financial aspects.*

In the foregoing section, need has been stressed for setting up a Metropolitan Transport Authority which should be responsible for planning, financing and operation of the total transportation system in the metropolitan cities. The entire transportation programme for each city when finalised, would involve heavy capital and operating expenditure. It may not be possible to finance such projects out of existing local resources. The transportation programme would have to compete against many other requirements such as schools, hospitals, etc. which find place in the local Government budget.

3.1. The essential ingredient of modern transport is its speed and reliability. If modern transportation facilities are available which permit speedy movement of men and materials, it will reduce not only the costs of transport but also the inventory costs and costs of production and distribution, thereby providing an impetus to the development of the economy. The costs of transport are very sensitive to the speed of transport, particularly because the transport vehicle as well as the track, are expensive and lock up considerable amount of scarce resources, like capital and foreign exchange. By increasing the speed of vehicle and thus reducing its turn-round time, it will be possible to perform more vehicle-kilometres of traffic. This will not only reduce the cost of transport in terms of cost per vehicle-kilometre or tonne-kilometre substantially, but also bring down the costs of the track or road per unit of transport on account of intensive use of the road or the rail track. This reduction in transport cost reflects itself in reduction of cost of production and distribution many times over, that is, there is a sort of multiplier effect, due to the fact that transport appears as an input in almost every economic activity, and direct and indirect content of transport per unit product in any sector is several times over the direct transportation input.

3.2. Provision of modern transport facilities is rather expensive. This is particularly true of transport facilities in and around metropolitan areas. The road development programme for Bombay drawn up by Wilbur Smith and Associates is alone estimated to cost about Rs. 100 crores. Similarly, the schemes relating to roads and bridges prepared by the C.M.P.O. for Calcutta and the C.R.R.I. for Delhi are estimated to cost about Rs. 50 crores and Rs. 34 crores respectively. The exact cost of providing rapid transit system in these cities which is likely to be substantial, is not yet known. However, the benefits generated by modern transport should more than compensate for the costs of providing the transportation facilities. This is, of course, true for only such transportation facilities which are well chosen and well-planned.

3.3. While it is generally appreciated that the benefits generated by modern transportation facilities are indeed substantial, there might be a difference of opinion as to whether transport facilities should be expected to pay for themselves or they should be subsidised by the community. The question of financing of metropolitan transport has been discussed in literature on the subject fairly extensively. The general view that seems to prevail is that metropolitan transport should be expected to pay for itself directly and that as far as possible, it should not be subsidised by the community. This should be done mainly through proper pricing policies for transport services provided. Thus an authority on metropolitan transport, Wilfred Owen* has stated that—

> "the accomplishment of a self-supporting urban transportation system is well within the bounds of feasibility. Three steps are necessary. First, urban areas should be granted a fair share of state-collected highway user revenues, in the form of either cash grants from the states or by more adequate state construction programmes in urban areas. Second, a more sicentific pricing of transportation services is called for to maximise revenues and to achieve the most effective use of facilities. Third, the pooling of transportation revenues suggests a promising means of supporting high standards of service for the transportation system as a whole, including mass transit."

> "The low fare policy that has led to low standards in the transportation field must be replaced by a transportation price policy that makes high standards possible. Depressed rates have preserved obsolete roads, antiquated railroads and transit equipment, and inadequate service. General tax support has been no solution. It has generally resulted in inadequate funds, uneconomic operations, and an absence of long-range physical and planning".

* *Wilfred Owen—The Metropolitan Transportation Problem* (1966)—*a Brookings Institution Study.*

3.4. The above observations might appear to be valid for Indian metropolitan transport also. While modern transportation facilities in the metropolitan areas in India may be expected to pay for themselves, mainly through adoption of more scientific pricing policies, it might be necessary to supplement their resources by taxing those who are the direct beneficiaries of modern transportation system. Thus, it would be found that if a speedy transportation link is provided, many more areas on the fringes would come within the influence of the city and can participate more effectively in the benefits generated by economic activity in the city. The first result would be that the property values in these areas, which were remote and beyond reach, would increase, thereby leading to enormous amount of economic rent, not only for the areas on the fringes of the city but also those within the city as well. It might appear logical to expect that at least a part of the values generated by the modern transportation facilities should be appropriated and made available to finance the transportation system itself.

3.5. The main beneficiary of better roads would be the vehicle owners or operators, since it will reduce the turn-round time of the vehicle. By making it possible for the speed of operation to increase and enabling him to produce more vehicle kilometres out of the same vehicle in the same time, it will reduce its cost of transport and leads to a considerable amount of surplus for him. He should then share a part of this surplus to pay for the improved roads which generated the surplus. The above argument should be equally true for private automobile owners whose travel time would be cut short, thus reducing the cost of transport and generating additional value for him by releasing his precious time for other productive purposes. It might be logical, therefore, to expect the road-users to pay for the improved road facilities. This could be done by levying a municipal road surcharge on the fuel consumed by him or perhaps a higher motor vehicles tax or charging him for this facility in other forms, like parking charges for automobiles and for terminal facilities for buses and trucks at the place of loading and unloading.

3.6. Another main beneficiary of the modern transportation facilities in the city is the businessman or the trader. As already pointed out, by reducing transportation and inventory costs, modern transportation facilities generate higher surplus for the businessman/trader. It should be possible for the community to appropriate at least a part of these surpluses to pay for modern transportation facilities which made these surpluses possible. This potential reservoir could be tapped for instance, through authorising Municipal bodies to levy a turnover tax which need not be very high.

3.7. Some of the metropolitan areas in India, for example, Bombay and Delhi still retain the octroi and terminal taxes. According to a study made by Research Division of the Ministry of Transport, every rupee of net revenue collected from octroi and similar taxes, leads to a gross burden of the order of 3 to 4 rupees for the community. The main ingredients of this extra burden are:

(i) very high cost of collection (as much as 30 percent estimated for Maharashtra).

(ii) the enormous costs due to the delays caused to the vehicles, subjected to checking for the collection of octroi which is not confined to the waiting at the borders of the city itself (for example, Mulund Naka in Bombay) but also delays caused to the vehicle en-route, having had to stop in each and every town or even village en-route for the purpose of octroi;

(iii) the increase in the cost of inventory due to the reduced speed of transport vehicles and also the unreliability of the delivery times due to the obstructions to free flow of transport;

(iv) considerable amount of illegal gratification which is being paid at present to the octroi collecting staff with a view to reducing the delays and other harassment; and

(v) large amount of leakage in the collection of octroi duties.

The net result is that the community has to bear a burden of 3 to 4 times the amount of net revenue realised from the octroi at present. If octroi and such taxes were abolished and substituted by other forms of taxation, and on this it is understood that the Road Transport Taxation Enquiry Committee set up by the Ministry of Transport has made some recommendations, it should be possible for the community to recover a substantial portion of the gross burden borne by it to-day. In short, it might be possible for cities like Bombay and Delhi to collect two to three times the revenue being obtained from Octroi today, by abolishing octroi and adopting other suitable methods of taxation, like the municipal turnover tax or a surcharge on sales-tax etc.

3.8. The above are some of the suggestions which deserve consideration. The Team will study this matter further and expects to make concrete recommendations in its Final Report.

Some Special Aspects

4.1. *Problems of transport undertaking in the metropolitan cities*: Public road transport in this country as also all over the world, face certain common problems arising mainly out of increasing costs due to the wages and taxation liabilities. The City transport Undertakings have lately been experiencing financial difficulties because of the ever-increasing operational costs. The main problems of the urban transport undertakings may be summarised as follows :—

(a) increasing short-fall between revenue and expenditure, due *inter-alia* to a very high incidence of wages and dearness allowance and empty running in the non-peak direction;

(b) non-availability of heavy duty large capacity vehicles, particularly double-deckers;

(c) inability to carry out expansion-cum-replacement programmes on a long term basis with the result that there is a backlog of unroadworthy vehicles, which is mainly due to the non-availability of imported spares;

(d) the necessity of running a large number of uneconomic routes on existing fare structure which is not proportionately related to distance commuted; and

(e) due to heavy congestion on roads, the speed varies from 13 to 16 kilometres per hour on most of the important and busy roads in the metropolitan cities and this results in increased cost of operation. (Roughly, an increase in speed by 1.6 kilometres per hour can reduce operational costs to the extent of about 10 per cent).

Fleet condition: The fleet in Bombay and Calcutta mostly consists of imported double-deckers and heavy-duty single deckers, though lately some medium-duty single deckers of Indian manufacture have been added. The Delhi fleet consists of imported heavy-duty single deckers and locally made medium-duty single deckers, the proportion of the latter being quite substantial. Medium-duty single-deckers do not stand up to the requirements of heavy traffic. As their carrying capacity is smaller, their earning potential is also not too satisfactory. The heavy duty buses are getting old. Most of them require thorough overhauling and their maintenance cost is becoming too heavy. All these factors are affecting efficiency of operation and the earning capacity of these undertakings.

Inadequacy of spares: The Central Government allows import of spares at the rate of Rs. 350/- half yearly per diesel vehicle. This amount is barely adequate for meeting the requirements of the Indian made medium duty vehicles. The heavy duty vehicles which are in use in Bombay, Calcutta and Delhi are all imported and the standard all India quota is quite inadequate as most of the essential spares and accessories for the imported vehicles are not manufactured in the country. Their total demand is too small to attract Indian automobile ancilliary industries to manufacture such spares. At least for sometime to come, most of these spares will have to be imported. In the past *ad-hoc* quotas were granted by the Central Government from time to time on special representation from these undertakings. However, the allotment has never been adequate.

Besides, there is inordinate delay in the supply of spare parts from overseas suppliers with the result that a large number of vehicles are out of repairs. Due to limited fleet strength the undertakings have been obliged to keep such buses on the road resulting in frequent breakdowns, interruptions in service schedules and increased cost of operation. The situation has further deteriorated after devaluation. The Team feels that adequate foreign exchange should be made available for spares for public road undertakings and the sanctions should be made regularly. There is also need for setting up a suitable purchase machinery for timely procurement of spares and accessories at reasonable price.

Bus Depots: It has also been represented that on account of route expansion, it is necessary to provide a number of new depots and sub-depots. In the absence of such facilities, buses are parked near existing depots, entailing a considerable dead mileage daily before going into service. Here also, the undertakings would require land and other facilities at several places in the metropolitan areas. The Team recommends that the requirements of the undertakings in this matter should be met by the local authorities, where possible.

Mention may also be made about the difficulties faced by some undertakings in getting land for bus halts at railway stations, so that the

bus service could function as feeder to railway traffic. The Team recommends that while designing/improving the layout of growing suburban stations, provision should be made for bus halts at convenient nearby places.

4.2. *The need for proper construction and maintenance of roads in the metropolitan cities* : The phenomenal growth of motor vehicles in the metropolitan towns which has occurred during the last three decades has created a great demand for roads of adequate standards. While the materials and design standards adopted in the past for the metropolitan roads were adequate for light traffic, they are not fit for heavy service vehicles. It is noticed that stripping of the surface is fairly common, indicating insufficient strength of the adhesive bond both between the individual particles of the mineral aggregate, and also between the surfacing and the base layer supporting the wearing carpet. This is particularly, noticed where bitumen surfacing provides the running-on wearing coat. In a bitumenous carpetted road, the load bearing is largely done and distributed by the base and the sub-grade. Besides, the regular undulations on some of the roads examined, indicate that the sub-grades and the foundations of the roads have not been able to bear and distribute their super-imposed loads. Possibly, drainage of the sub-grade has not been good. Both on account of local disintegration of the wearing carpet and because of a waviness in the longitudinal and cross levels of the road, there is an adverse effect on the riding quality of vehicles, even at speeds much below the design speed for the particular highway.

The heavy traffic which moves on main roads does impose excessive stresses resulting in structural failures. Investigations into road failures have confirmed that excessive continuous stresses on road foundations have often led to the failure of the road structure, even though there is no excessive deformation of the sub-grade. It is also observed that the light and thin carpets of pre-coated stone chips are being used for surfacing of important roads which carry heavy axled and dense traffic. The continuation of the use of such lighter type of bitumen carpeting when dense asphaltic concrete mixes are absolutely indicated, both from the point of view of load bearing and economy in annual costs, is an undue perpetuation of old practice. Even on important trunk roads road-side heating of aggregates for the preparation of open grade lighter type bitumen pre-mixes is noticed. It is suggested that the city roads should be built with the help of mechanical equipment.

It is possible that the smaller-sized civic units responsible for construction and maintenance of roads may not individually be able to procure and economically maintain such road making and repairing plants. It is recommended that the smaller units in a metropolitan area should pool their resources for procuring such machinery for common use. With proper co-ordination between the smaller units, the maximum ultilisation of the plant could be ensured.

There is another problem created on account of the dilatory and unco-ordinated methods with which road repairs are being carried out. A little effort in phasing road repair work so as to avoid obstruction to traffic during peak hours would go a long way in reducing the difficulties of the motor vehicle users. The possession of statutory rights by public utility undertakings like the electric supply, telephones, water supply and drainage and gas companies to lay their mains along or across public highways, points emphatically to the need for an effective co-ordination between the Highways Department and these public bodies.

In order to have scientific quality control, it will be necessary to have laboratories in the metropolitan cities, exclusively for metropolitan road works. This will ensure proper quality of materials and timely testing of sample mixes for advice on the design mix.

4.3. *Provision of grade-separated road and rail crossing*: The Study Team in the earlier Chapters has stressed the need for providing grade-separated crossings which will remove major traffic bottlenecks in the metropolitan areas. In general principle, the Railways undertake such replacements, under provision of para. 1119 of the Railway General Code which provides that if a level crossing is to be replaced by an over/under bridge for reasons of growth of both road and rail traffic, the Railways would have to bear the cost of the bridge structure (excluding the approaches) and the cost of diversion of all sewers, cables, gas and water mains, *within railway limits* and that the road authority would have to bear the cost of the approaches within or without railway limits and the cost of diverting all sewers, cables, gas and water mains outside the railway limits, and the cost of land for approaches outside the railway limits.

While agreeing to bear the cost of all works outside railway limits, the State Governments have represented that a heavy burden is thrown on their finances because the railways do not accept liability for any extra width of the grade-separated arrangements between the level crossing gate posts. It has been pointed out that the

spirit in which this particular provision in the Code was made, did not envisage the enormous growth of road and rail traffic and also the metropolisation of the areas around the old cities which were served by Railways. One of the arguments is that the clause in regard to accommodation works was drawn up for the purpose of ensuring that the old Railway Companies were required to give guaranteed dividends as paying commercial enterprises. It has been urged that such circumstances have since changed and the enforcement of the provision of the Act and insistance on the apportioning of costs according to the Railway Code, is out of context in the metropolitan cities which have grown tremendously both in area and population.

The Study Team feels that the rules regarding allocation of expenditure in this connection need to be reviewed at the highest level.

4.4 *Development of technical know-how in connection with traffic studies*: The need for long-range transportation planning through comprehensive studies and surveys has already been stressed in the earlier Chapters. The basic data such as, the present traffic needs, land usage and the changes that are likely to take place in the pattern and composition of the needs and development over the next 20 to 25 years, is not available. The Team has, therefore, suggested comprehensive traffic and transportation studies in the cities of Bombay, Madras and Delhi. In Calcutta, however, detailed mass transit studies have already been done through a foreign consulting agency. The Team has proposed two engineering feasibility surveys—one for providing an electrified railway dispersal line and the other for a rapid transit system.

Technical know-how for conducting comprehensive traffic and transportation studies is rather limited in the country. As the demand for such studies is continuously increasing, the Team stresses the need for developing an organisation which can provide facilities for adequate training of personnel. The Team is of the view that the Traffic Engineering Division of the Central Road Research Institute, with the co-operation of the Ministries of Transport and Works, Housing and Urban Development could be of assistance in developing such training facilities. In addition to this, engineering colleges in the country should provide graduate as well as post-graduate facilities for studies on traffic engineering and transportation economics. For practical training, the students should also be associated with different study projects for adequate period of time.

Traffic engineering problems in other big towns are likely to arise in future which will make it necessary to give encouragement to indigenous engineering consulting firms, by assigning them traffic studies for some of the cities. The graduate and post-graduate trained traffic engineers from the colleges could provide the technical fabric for such indigenous consulting firms. It may perhaps be necessary in the beginning to utilise the services of individual foreign experts for short periods to assist in some of the specific tasks, and also to train Indian personnel, particularly in connection with the rapid transit-systems in the metropolitan cities.

4.5. *Traffic control and regulatory devices for exploiting maximum capacity*: The main objective of application of traffic control and regulatory devices is to obtain maximum utilisation of existing roadway facilities. These regulations are limitations imposed upon users of traffic facilities to ensure smooth flow of traffic in congested areas. These measures include a one-way street system, the regulation of slow-moving traffic, prevention of excessive weaving movements by channelisation, design and lane markings, prohibition of 'U' turns on all major streets, etc. Provision and synchronisation of automatic electric signals at important road intersections will also go a long way in the smooth flow of traffic.

All the metropolitan cities are faced with the peak-hour problems of road congestion and transportation. Traffic studies conducted in these cities indicate that between 45 to 50 per cent of the total daily passenger trips are performed during the peak hours and 60 to 70 per cent of these are for journey to work. The peak conditions in the movement pattern of any metropolitan centre, occur during a certain period of the day, barely extending over three hours at a time. Such peak conditions in any transportation system can be stretched in time and space. Staggering of working hours are necessary to reduce congestion by diffusing the peak traffic load. The Government Offices in some cities have already introduced staggering of office hours. There is, however, need for wider acceptance of this principle, particularly by shops and business establishments.

Traffic education also plays an important role in ensuring safe and smooth flow of traffic. Much of the road mishaps could be avoided through proper traffic education of the road users. It means education of the road users according to the Highway Code to help them in modifying their standards of behaviour on the

roads. The process of traffic education starts right from the pre-school stage, till one gives up using the road. At school stage, it is of utmost importance to introduce this subject. It should be taught by selected and trained instructors through audio-visual aids.

Traffic training parks for the children of the age group 3-12 years can go a long way to help and promote traffic safety among them where they can learn the traffic rules, regulations and basic principles of road safety.

A. V. D'COSTA	*Leader.*
HARKIRAT SINGH	*Member.*
K. K. NAMBIAR	*Member.*
B. DATTA	*Member.*
J. M. TREHAN	*Member.*
K. L. LUTHRA	*Member.*
K. A. KHAN	*Member,*
B. G. FERNANDES	*Member.*
V. G. BHATIA	*Member.*
K. DEVANATHAN	*Member.*
S. B. SAHARYA	*Secretary.*

May 31, 1967.


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MAIN CONCLUSIONS

AND

RECOMMENDATIONS


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MAIN CONCLUSIONS AND RECOMMENDATIONS

CHAPTER I : *Metropolitan Growth and Transportation Problems*

1. The problems of metropolitan growth cannot be satisfactorily resolved if physical planning confines itself within urban municipal limits, as metropolitan problems transcend the local political boundaries. None of the Acts relating to town planning in the four metropolitan cities of Calcutta, Bombay, Madras and Delhi are as comprehensive and forward-looking as necessary. (Para 3.2).

2. It is essential to expedite the enactment of comprehensive planning which will extend the present scope of planning beyond the city limits into the surrounding regions. (Para 3.3).

3. Two important aspects of physical planning and urbanisation need to be stressed. The first is the limiting of the size of the geographical area and the population of the metropolis. What is necessary is the provision of urban infra-structure facilities in the towns around the metropolis which would serve as counter-magnets and thereby arrest the existing trend of migration to the metropolitan centres. Such a strategy of dispersal is important, especially in view of the fact that the big push in urbanisation is yet to come.

The second is the imperative need for the comprehensive and systematic urban renewal of the core areas of the metropolitan cities which have become derelict and functionally obsolete to provide for the efficient movement of traffic. Through urban renewal, a balance between developed land and space required for movement of traffic could be restored. (Para 3.4).

4. The key to the solution of transportation problems is proper physical planning of the metropolis and surrounding region. The fact that demand for transportation in cities continues to outrun supply, regardless of our efforts to increase transportation capacity at excessively high capital cost indicates the need for directing more attention to this neglected side of the problem. (Para 3.5).

5. While comprehensive development plans for the four metropolitan areas are being formulated, there is an urgent need to determine the relationship between traffic generation and intensity and various types of land uses in our metropolitan cities through survey and research. (Para 3.6).

6. Comprehensive region-wise planning, development, management and operation of all metropolitan transport facilities are necessary. Since different transportation modes available in these cities are closely inter-related, it is essential that the principal means of mass passenger transportation operations be co-ordinated to provide efficient and convenient services to the travelling public. (Para 4.0).

7. This requires public action at Central, State and local levels for setting up a single metropolitan transportation authority representing various concerned interests, to achieve the required co-ordination. Legislation will have to be enacted to empower the authority to act promptly and effectively. (Para 4.1).

CHAPTER *II*: *CALCUTTA*

8. In the Fourth Plan, it is proposed to have a new bridge over the Hooghly near Princep Ghat and a north-south Howrah Expressway linking the new Hooghly river crossing to Varanasi Road. Another bridge over the Hooghly has been proposed at Kalyani with proper approach roads to connect the proposed Eastern Metropolitan By-pass with National Highway No. 2. (Para 5.1).

9. One of the important schemes which has been proposed is the construction of the Eastern Metropolitan By-pass—Narkel Danga Main Road to Lower Circular Road and link connector to Lower Circular Road. The other arterial road proposed for construction during the Fourth Plan, is an extension of Amherst Street upto Park Street which will greatly improve north-south traffic circulation on the east bank. (Para 5.2).

10. It is suggested that necessary improvements should be carried out as early as possible in the Howrah and Sealdah railway station areas and the approaches to the Howrah bridge. (Para 5.3).

11. It is suggested that atleast six important level crossings should be immediately replaced by grade-separated arrangements. Since no provision has been made for the replacement of these level crossings in the State's Fourth Five Year Plan, the Team feels that it is necessary to make additional financial provision for the purpose. In case, it is not possible to find additional funds, the Team suggests postponement of the lesser urgent schemes in favour of level crossings. (Para 5.4).

12. It is suggested that proposals regarding off-street parking contained in the report prepared by the C.M.P.O. should be implemented early which would greatly increase overall parking capacity and rationalise kerb space usage. (Para 5.5).

13. It is understood that a pilot fee-parking project has been developed for the New Market area and is now under consideration of the State Government. This scheme would encourage short-term parking and bring in revenue and should be extended to the shopping areas along Chowringhee and Park Street. (Para 5.5).

14. It is suggested that till permanent truck terminal facilities along Kona Expressway (as recommended in the Basic Development Plan for C.M.D.) are developed, the land recently reclaimed by filling in the New Cut Canal in the Salt Lake Area might be utilised temporarily for parking of trucks. (Para 5.5).

15. In order to improve traffic operations which are obviously in need of betterment to come up to modern efficiency standards, intensive and immediate application of traffic engineering treatment are recommended. (Para 5.6).

16. In Calcutta city, responsibilities for various aspects of traffic engineering works are shared by several different agencies. A traffic engineering agency does not yet exist in Calcutta. It is necessary that this work be carried out in the framework of an overall traffic operations plan for the city. (Para 5.6).

17. The traffic operation plan should include comprehensive signalisation, channelisation and redesigning and pavement markings and street lighting. (Para 5.6).

Further action programme

18. In order to have an idea of the destination of commuter season ticket holders alighting at Howrah and Sealdah stations, and the further mode of transport used by them for reaching their places of work in the city area, a traffic demand survey has been suggested.

19. For the suburban dispersal railway line, it is felt that a preliminary engineering feasibility study of the suggested alignment is necessary. The study will relate to two sections—one from Dum-Dum to Princep Ghat and the second to serve the Salt Lake area, where the State Government have plans to settle about a million people.

20. The suburban railway dispersal line proposed earlier, will have to be supplemented by a grade-separated rapid transit line for better, quicker and convenient intra-city travel. The Team is of the view that a feasibility study is necessary before a decision in regard to the form of a rapid transit system is reached. Of major importance in the decision are the physical characteristics of the area, the cost of construction and operation, and the ability to absorb such costs in the economy of the country.

CHAPTER III : *BOMBAY*

21. The main scheme included for implementation during the Fourth Plan are parts of East Island Freeway and the West Island Freeway (Malabar Hill Tunnel), construction of link roads joining two expressways, construction of Chembur—Mankhurd Road link to join the approach to Thana Creek bridge. The East Island Freeway is expected to give immediate relief to the section between Carnac Bunder Road and the point where D'Mellow Road ends and Reay Road commences. The traffic congestion in this area is due to lot of inlet and exit of heavy trucks, going into and coming from docks and godowns. It is proposed to construct an elevated freeway on this length. The Study Team also suggests to the State Government that a separate full-time technical cell should be set up immediately to undertake detailed engineering studies of the works included in the Programme. (Para 7.0).

22. In connection with the proposal of the State Government to develop about 600 acres of the Backbay Reclamation area, it is suggested that before the State Government go ahead with their plans for intense commercial development in the Reclamation area, proper study should be conducted to analyse the local traffic and transportation problems that are likely to be created as a result of such development. Past experience shows that commercial areas generate the highest amount of traffic more than any other urban land use. (Para 7.1).

23. The important level crossings on the Western and Central Railways be replaced by road over/under bridges, as early as possible. (Para 7.2).

24. Enough space should be provided for parking facilities otherwise kerb-side parking would lead to unnecessary congestion on the

roads and would reduce the carriageway capacity of the existing roads and streets. Multi-storeyed parking facilities in the Central Business District should be provided at an early date and the provision of the Development Control Rules followed strictly. (Para 7.3).

25. A well designed and adequately sized terminal, away from the C.B.D., should be constructed to accommodate trucks. The movement of trucks in the C.B.D. should be restricted to non-peak hours of the day and loading and unloading should be encouraged during the night. (Para 7.4).

26. The modernisation of traffic operations as suggested by M|s. Wilbur Smith, should be undertaken and efforts should be made to complete the improvements at these intersections as early as possible. (Para 7.5).

Further action programme

27. Systematic surveys and studies should be conducted to study various aspects of mass transportation. The purpose of the study is to develop a comprehensive and long-term plan for mass transport for the Bombay metropolitan area. The study area should include the entire Bombay metropolitan region as recommended by the Gadgil Committee in the Bombay Regional Plan.

28. Since the traffic problem is very acute in the central business area, the Team has asked the State Study Group to give top priority to the Work Place Survey in the C.B.D. This would enable the Team to suggest immediate relief measures for dispersal of traffic in the C.B.D.

CHAPTER IV : *MADRAS*

29. The Fourth Plan programme includes schemes relating to the construction and improvement of roads and bridges, provision of over/under bridges at important level crossings, subways across main streets, measures for providing traffic signals and other road safety devices. (Para 5.0).

30. One of the important road schemes included in the Fourth Plan is the construction of a new road which will connect Ennore with the proposed Oil Refinery at Manali, and the Fertilizer and Petrochemical complex which will be adjacent to the refineries. An outer ring road has also been suggested which will serve as city by-pass for through traffic using the three National Highways (N.H. 4, 5 and 45). (Para 5.0).

31. It has also been proposed to widen three bridges on N.H. 5. These bridges are located within the city limits on the main traffic route between Madras and Calcutta. Widening of the bridges will enable free movement of traffic. (Para 5.0).

32. It is recommended that construction of all the six over/under bridges be completed, as early as possible. This will remove serious congestion and delays at the city's main level crossings. (Para 5.0).

33. The traffic operation plan includes provision of pedestrian guard rails, traffic control devices, bus-bays, parking lots, traffic safety, traffic education and improvements of important intersections. (Para 5.0).

34. It is necessary to establish the need for providing a circular railway on the alignment suggested by the State Government on the basis of a travel demand survey. The State Town Planning Organisation has been asked to conduct necessary studies. (Para 6.1).

Further action programme

35. The Study Team has felt the need for having a comprehensive traffic and transportation study for the Madras metropolitan area which would help in identifying the problems and prepare a base to evolve a practical and flexible long-term plan for meeting the future traffic needs of the metropolitan city.

CHAPTER V : *DELHI*

36. A comprehensive development programme for the Fourth Plan has been worked out on the basis of a preliminary study which would ensure an efficient traffic circulation system in the Delhi urban area. The programme includes proposals for development of the road system which would suitably fit in the future road network (Para 5.5).

37. In view of the reduced outlay, the schemes relating to the construction of over/under bridges at (i) School lane, (ii) Link Road, (Defence Colony) (iii) Patel Road (iv) Sarai Rohilla, and (v) Mehrauli Road could not be fully provided in the revised programme. These schemes are of major importance which will go a long way in removing the serious traffic bottlenecks. Since the additional funds required amount to Rs. 2.52 crores only, the Team strongly recommends that additional provision should be made for these schemes in the Fourth Plan. If, however, it is not possible to find additional money for the purpose, lesser urgent schemes may be postponed. (Para 6.0).

38. In order to facilitate dispersal of a large number of passengers being disgorged at both the Delhi Main and New Delhi railway stations, the Study Team has requested the Town and Country Planning Organisation to draw up a detailed scheme for the improvements and remodelling of these stations in consultation with the railway authorities. As regards the provision of terminal facilities for buses and trucks and the improvement of the existing Inter-State Bus Terminal at Kashmere Gate, the Team is of the view that the scheme already prepared by the Delhi Development Authority should be implemented as early as possible. (Para 6.1).

Further action programme

39. The Study Team has suggested comprehensive traffic and transportation studies for the Delhi metropolitan area. The main object of the studies is to develop practical and flexible long-term plan for meeting future traffic and transportation needs of the entire metropolitan area of Delhi. The data collected from these studies would be analysed to find out the factors effecting modal distribution, effects of different land uses on traffic generation and also other characteristics of travel, as this would help in forecasting scientifically future travel demands. Further, analytical studies would be conducted to achieve desirable modal balance, and assignment would be done to determine the future demand on the road network.

CHAPTER VI: *GENERAL OBSERVATIONS*

40. The Team is of the view that drawing up of metropolitan regional plans of which transportation is an integral part, should be immediately taken up where a start has not been made and expedited in cases where the work is in progress; and a positive action programme of urban development in the surrounding regions of the metropolitan cities be undertaken. The essential aspect of the urban development should be the provision of necessary infra-structure ahead of development so as to deflect the new industries from locating themselves in the metropolitan cities. For this purpose, the necessary legislation, planning organisation and enforcement and development machinery should be provided. (Para 1.6).

41. While endorsing the progressive step taken by the Maharashtra Government, the Team suggests that the constitution of the Regional Planning Authority as well as the preparation of comprehensive development plan for Bombay metropolitan region be expedited, in view of the pressure for land development in the immediate areas around Bombay. (Para 1.9).

42. The Study Team is of the view that the High-powered Board as has been set up for Delhi, can be no substitute to a planning agency for the whole area created by an agreement, under a statute. (Para 1.10).

43. The Study Team suggests that the enactment of a new comprehensive planning legislation to replace the existing Madras Town Planning Act of 1920 should be expedited for enabling comprehensive planning and development of the metropolitan area. (Para 1.12).

44. While endorsing the proposals of the Calcutta Metropolitan Planning Organisation for establishing appropriate administrative machinery for planning, the Team would like to stress the urgency of bringing about the necessary changes in the administrative machinery for the Calcutta Metropolitan District without much delay. (Para 1.14).

45. Need for a unified Metropolitan Traffic and Transport Authority is stressed which should be responsible for planning, financing and operation of the entire transportation system. However, a decision on the type of administrative authority will require careful study. (Para 2).

46. The entire transportation programme for each city would involve heavy capital and operating expenditure. It may not be possible to finance such projects out of existing local resources. The question of financing of metropolitan transport has, therefore, to be carefully studied. (Para 3).

47. While it is generally appreciated that the benefits generated by modern transport facilities are indeed substantial, there might be a difference of opinion as to whether these facilities should be expected to pay themselves or should be subsidised by the community. The general view that seems to prevail is that metropolitan transport should be expected to pay for itself directly and that as far as possible, it should not be subsidised by the community. This could be done mainly through adoption of more scientific pricing policies and supplement their resources by taxing those who are direct beneficiaries of modern transportation system. (Para 3.3).

48. By reducing transportation costs and the inventory costs, modern transport facilities generate higher surplus for the trader as well as the road user. It should be possible for the community to appropriate at least a part of these surpluses to pay for modern transport facilities which made it possible. (Para 3.6).

49. Some of the metropolitan areas in India, for example, Bombay and Delhi, still retain the octroi and terminal taxes. According to a study made by the Research Division of the Ministry of Transport, every rupee of net revenue collected from octroi and similar taxes leads to a gross burden of the order of 3 to 4 rupees for the community. It should be possible for these cities to collect two to three times the revenue being obtained from octroi today, by abolishing octroi and adopting other suitable methods of taxation, like municipal turn-over tax, or the surcharge on sales-tax etc. (Para 3.7).

50. The city transport undertakings have lately been experiencing financial difficulties because of the ever-increasing operational costs. The heavy-duty vehicles which are in use in Bombay, Calcutta and Delhi are all imported and the standard all-India quota for most of the essential spares and accessories is inadequate. The Team feels that adequate foreign exchange requirements for spares for public road undertakings should be made available and the sanctions should be made regularly. Besides, there is also need for setting up suitable purchase machinery, for timely procurement of spares and accessories at a reasonable price. (Para 4.1).

51. The Team recommends that the requirements of the undertakings for providing new depots and sub-depots should be met by the local authorities, where possible. (Para 4.1).

52. The Team recommends that while designing/improving the layout of growing suburban stations, provision should be made for bus halts at convenient nearby places. (Para 4.1).

53. It is recommended that smaller units in a metropolitan area should pool their resources for procuring mechanical road making and maintaining plant for common use. With proper co-ordination between the smaller units and a full rationalisation of the use of such plants, maximum utilisation of the machinery could be ensured so that the fullest use is made of it throughout the year for the benefit of all. (Para 4.2).

54. In order to have scientific quality control, it will be necessary to have laboratories in the metropolitan cities, exclusively for metropolitan road works. This will ensure proper quality of materials, and timely testing of sample-mixes for advice on the design mix. (Para 4.2).

55. The Study Team feels that the rules regarding allocation of expenditure for the provision of grade-separated road and rail crossings need to be reviewed at the highest level. (Para 4.3).

56. As the demand for comprehensive traffic and transportation surveys and studies is continuously increasing, the Team stresses the need for developing an organisation which can provide facilities for adequate training of personnel. The Team is of the view that the Traffic Engineering Division of the Central Road Research Institute, with the co-operation of the Ministries of Transport and Works, Housing and Urban Development could be of assistance in developing the training facilities. In addition to this, engineering colleges in the country should provide graduate as well as post-graduate facilities for studies on traffic engineering and transportation economics. For practical training, such students should also be associated with different study projects for adequate period of time. (Para 4.4).

57. The Study Team feels that traffic control and regulatory devices for exploiting the maximum capacity of the existing roadway system are necessary. (Para 4.5).

58. The Team recommends that staggering of working hours are necessary to reduce congestion by diffusing the peak traffic load. (Para 4.5).

59. Traffic education should be imparted at the school stage by selected and trained instructors through audio-visual aids. (Para 4.5).

60. Traffic training parks for the children of the age-group 3—12 years can go a long way to help and promote traffic safety among them where they can learn the traffic rules, regulations and basic principles of road safety. (Para 4.5).


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APPENDICES


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APPENDIX—I

Government of India Resolution dated, October 1, 1965 regarding the appointment of the study Team on Metropolitan Transport.

Problems of metropolitan transport have grown rapidly in recent years and have become increasingly complex and urgent, specially in the cities of Calcutta, Bombay, Madras and Delhi. The requirements of mass tranportation in a large city are bound up to a considerable extent, with the shape and direction of the future plan of urban development and location of industrial and other activities. It is necessary, therefore, to take a long-term view of the transportation requirements for cities such as Bombay, Calcutta, Madras and Delhi. Problems of metropolitan transportation have already received intensive study in recent years in foreign countries and experience abroad can also be usefully drawn upon. Accordingly the Committee on Plan Projects, Planning Commission, have set up with effect from the 23rd September, 1965, a Study Team on Metropolitan Transport. The Study Team will commence its work with the study of problems of metropolitan transport in Calcutta, to be followed by similar studies for other cities.

2. The composition of the Study Team is as follows:—

Leader

1. Shri P. H. Sarma, former General Manager, Northern Railway and Member, Railway Rates Tribunal.

Members:

2. Shri A. V. D'Costa, Retired Chief Engineer, Central Railway.
3. Shri Govardhan Lal, Additional Consulting Engineer, Ministry of Transport.
4. Shri K. K. Nambiar, Associated Cement Companies.
5. Shri K. A. Khan, General Manager, India Tourism Corporation, Ministry of Transport.
6. Shri K. L. Luthra, Director, Transport Division, Planning Commission.
7. Dr. V. G. Bhatia, Director, Transport Research, Ministry of Transport.
8. Shri B. G. Fernandes, Town and Country Planner, Town and Country Planning Organisation, Ministry of Health.

Shri S. B. Saharya from the Planning Commission will be Secretary of the Study Team.

3. The terms of reference of the Team will be as follows :—

(1) to assess the adequacy and limitation/deficiency of existing transport facilities in relation to present needs in the cities of Calcutta, Bombay, Madras and Delhi, including roads, road transport and rail transport ;

(2) to determine the long-term requirements of passanger and goods transport in these cities, having due regard to the overall plans of metropolitan development and location of industrial, commercial and other activieies ;

(3) to study the feasibility of various proposals for meeting requirements for different media of transport and to recommend phased programmes for the development of the facilities needed, including estimates of costs and returns, methods of financing and scheme of execution ;

(4) to propose appropriate administrative and other arrangements for the operation of metropolitan transport services ; and

(5) to make such other recommendations as may be necessary.

4. The Headquarters of the Study Team will be at New Delhi though the Headquarters of a Member and his staff may be fixed at a different place at the discretion of the Committee on Plan Projects.

Ordered that the RESOLUTION may be published in the Gazette of India for general information.

Sd./- J. M. KITCHLU,
Secretary,
Committee on Plan Projects.

Appendix II

Composition of the State Study Groups

Calcutta

1. Shri A. B. Ganguli, I.C.S., Chairman, State Transport Corporation, Calcutta.
2. Shri S. B. Ray, I.A.S., Commissioner, Calcutta Metropolitan Planning Organisation, Calcutta.
3. Shri P. C. Bose, Executive Director, Calcutta Metropolitan Planning Organisation, Calcutta.
4. Shri R. S. Bhattacharyya, Director General of Movements, Calcutta.
5. Shri T. M. Malkani, Chief Engineer, Office of Port Commissioners, Calcutta.
6. Shri N. K. Roy, Additional Member, (Retd.) Railway Board.
7. Prof. S. K. Roy, Adviser, Traffic and Transportation, Calcutta Metropolitan Planning Organisation, Calcutta.

Bombay

1. Shri L. G. Rajwade, I.C.S., Secretary, Urban Development, Public Health and Housing Department.
2. Shri P. S. Nadkarni, Director, Regional Transport Survey.
3. Shri K. V. Joglekar, Chief Engineer (Communications), B. & C. D. and Member, Steering Committee.
4. Shri N. S. Pandit, Deputy Secretary, Urban Development, Public Health and Housing Department.
5. Shri J. B. D'Souza, General Manager, BEST Undertaking, Bombay.
6. Shri S. M. Vidhwans, Director, Bureau of Economics and Statistics.
7. Shri S. V. Desai, City Engineer, Bombay Municipal Corporation.
8. Shri R. P. E. Vajifdar, Chief Engineer, Bombay Port Trust.
9. Shri M. L. Gupta, Officer on Special Duty, Transport Survey, Western Railway.
10. Shri J. T. F. Gurr, Deputy Commissioner (Traffic), Bombay.
11. Shri J. G. Keskar, Deputy Director of Transport Planning, Regional Plans, Bombay.

Madras

1. Shri M. Singaravelu, I.P.S., Commissioner of Police, Madras.
2. Shri K. Ramaswami Reddy, Director, Highways Research Station, Guindy Madras.
3. Shri R. Thillainayagam, Divisional Engineer, Traffic Engineering Cell Madras.
4. Shri T. V. Sabapathy, Joint Director, Town Planning, Madras.
5. Shri J. A. Ambasankar, I.A.S., Commissioner, Corporation of Madras Madras.
6. Shri K. Sreekumara Menon, Deputy Commissioner of Police, (Traffic and Licensing), Madras.
7. Shri C. Ramdas, I.A.S., Deputy Secretary to Government, Public Works Department, Madras.

Delhi

1. Shri K. Kishore, Chief Secretary, Delhi Administration, Delhi.

2. Shri U. S. Shrivastuv, Director of Transport, Delhi Administration, Delhi.

3. Shri K. Ramavaraman, Additional Chief Engineer, Delhi Administration, C.P.W.D., Delhi.

4. Shri C. S. Gupte, Member (Planning), Delhi Development Authority, Delhi.

5. Shri D. D. Mathur, Town Planner, Municipal Corporation of Delhi, Delhi.

6. Shri M. D. Dittia, Superintendent of Police (Traffic), Delhi Administration, Delhi.

7. Dr. N. S. Srinivasan, Head, Traffic Division, Central Road Research Institute, New Delhi.

GMGIPND—L.—26 P.C.—26-10-67—3000


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