

THE BOMBAY METROPOLITAN SUBURBAN RAILWAY SYSTEM

Report Submitted To The
Railway Fare & Freight Committee
Ministry of Railways (Railway Board)
Government of India

**S. SRIRAMAN
PRADEEP APTE**

*With Assistance From
Rachna Kulkarni
K. P. Mishra
Shilpa Mujumdar
B. A. Kale
and Vivek Pardeshi*

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RESERVE SECTION

GOKHALE INSTITUTE OF POLITICS AND ECONOMICS
(DEEMED TO BE UNIVERSITY)

PUNE 411004

JULY 1993

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July 20, 1993

S.SRIRAMAN

PRADEEP APTE

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ABBREVIATIONS USED

B.E.S.T.	BOMBAY ELECTRICITY SUPPLY & TRANSPORT
B.M.C.	BOMBAY MUNICIPAL CORPORATION
B.M.R.	BOMBAY METROPOLITAN REGION
B.M.R.D.A.	BOMBAY METROPOLITAN REGION DEVELOPMENT AUTHORITY
B.V.	BOOK VALUE
C.B.D.	CENTRAL BUSINESS DISTRICT
C.I.D.C.O.	CITY INDUSTRIAL DEVELOPMENT CORPORATION
C.R.	CENTRAL RAILWAY
C.R.R.I.	CENTRAL ROAD RESEARCH INSTITUTE
D.R.F.	DEPRECIATION RESERVE FUND
D.R.M.	DIVISIONAL RAILWAY MANAGER
E.M.U.	ELECTRIC MULTIPLE UNIT
E.M.U.HRS.	ELECTRIC MULTIPLE UNIT HOURS
E.T.KM.	EQUATED TRACK KILOMETRE
F.S.I.	FLOOR SPACE INDEX
G.B.	GREATER BOMBAY
G.T.KM.	GROSS TONNE KILOMETRE
H.H.	HOUSEHOLD
H.Q.	HEADQUARTER
I.M.R.B.	INDIAN MARKET RESEARCH BUREAU
I.R.R.	INTERNAL RATE OF RETURN
M.S.R.T.C.	MAHARASHTRA STATE ROAD TRANSPORT CORPORATION
M.T.P.	METROPOLITAN TRANSPORT PROJECT
N.C.Z.	NON CONFIRMING ZONE
N.O.C.	NO OBJECTION CERTIFICATE
O.R.H.	OCCUPIED RESIDENTIAL HOUSEHOLD
P.KM.	PASSENGER KILOMETRE
T.KM.	TRAIN KILOMETRE
V.KM.	VEHICLE KILOMETRE
W.E.S.A.	WORKING EXPENSES STATEMENT ABSTRACTS
W.R.	WESTERN RAILWAY

CHAPTER 1
INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 Background

Bombay's transport problem can be viewed as a single complex problem of matching the demand for and the supply of services. Such a problem is not peculiar to Bombay but is found in other urban areas in the developed as well as the developing world.

The Bombay Metropolitan Region which has a planning area of 4355 sq. kms. consists of Greater Bombay and extends beyond the Ulhas estuary in Thane district and to the Patalaganga River in Raigad district. According to the 1991 Census, the growth rate of population in the Greater Bombay area declined during 1981-91, while in the Region as a whole, about the same number of people were added. Thus, though the decline in the rate of growth appears to be a positive feature, it cannot be expected to lessen the complexity of the transport problem in Bombay since traffic continues to grow. For quite some time, a very large proportion of the population in the Bombay Region has depended on the public transport system for their travel requirements. And this situation is expected to continue, if not intensify, in the years to come. In the past few decades, no significant progress has been achieved in relocation and decongestion, with the result that the transport problem continues to be a formidable one. For example, despite the promotion of New Bombay as a counter magnet and the development of other urban areas in the Region as active nodes, the absence of basic services such as shopping, schools, hotels and above all, employment opportunities in these areas, on the one hand, and the continuous development of reclamation schemes in the island city and increasing job opportunities in the Central Business District, on the other, have continued to exert severe pressures on the north-south railway corridors.

Public transport is mainly provided by the suburban rail and bus systems. Travel needs between Greater Bombay and the adjoining urban areas are mainly provided by rail services. In almost all areas, buses provide feeder services to the rail system.

While the growth in suburban traffic on the Western and Central Railway systems has been steady, the growth in the number of trains has been very slow. Although a number of optimisation measures have been implemented, the capacity has not increased significantly. Thus, severe overcrowding is an essential feature. Though there have been persistent demands to have alternative rapid transit systems, technical groups have favoured the opening of additional corridors. And though some of these have materialised (such as the Mankhurd-Belapur line), major expansion of the network has not taken place both due to lack of finances and certain special features

in the Bombay Region which have hampered expansion and upgradation of the system. Further, since the suburban rail system is considered a losing proposition financially, more viable programmes at the national level get priority. Thus, local needs hardly ever appear important.

In the case of the bus system operated by the Bombay Electric Supply and Transport Undertaking (B.E.S.T.), nearly 4.5 million passenger trips are made daily, on an average. With increasing congestion on roads and fleet renewal lagging far behind the increase in ridership, the performance of the bus system has been steadily deteriorating in terms of travel times, comfort and reliability.

In view of the above, it is only appropriate that the Railway Fare and Freight Committee set up by the Ministry of Railways, Govt. of India in 1991 should be examining, *inter alia*, problems pertaining to suburban rail traffic in Bombay which has grown tremendously over the years causing considerable concern, especially from the point of view of mobilising additional investment to tackle emerging needs. Accordingly, in October 1992, the Committee commissioned the Gokhale Institute of Politics and Economics, Pune to undertake a study on the 'Bombay Metropolitan Suburban Railway System' with special reference to the urban transport planning process of the Region with focus on the role of the railways in a city like Bombay, in general, and on the different possible methods of financing railway commuter services in the total context of metropolitan commuter travel facilities, in particular.

1.2 Objectives and Scope of the Study

The major objectives of the study are:

- a) to critically evaluate the role played by the suburban rail systems in meeting the urban transport needs of the Region over a period of time.
- b) to identify factors which have caused the sub-optimal role of the system, if any, such as technological limitations, financial constraints or set of factors related to land-use planning, etc.
- c) to critically examine the role of the suburban rail and bus transport systems, and their mutually complementary and/or competitive operations.
- d) to examine the future development scenario pertaining to urban transport solutions on the basis of future growth patterns of the Region and location of activities with a view to delineating the scope of the suburban rail system.
- e) to examine in detail the current tariff structure of the suburban rail system, the nature and extent of subsidies and to consider feasible pricing and financial strategies / options required to be adopted to meet emerging financial requirements.

During the course of the study, a number of visits were made to Bombay and discussions held

with organisations concerned not only with transport planning and operations like the Central Railway, Western Railway, Metropolitan Transport Projects of the Railways and B.E.S.T. but also those responsible for larger issues in urban planning such as B.M.R.D.A., B.M.C., CIDCO, Govt. of Maharashtra, etc. Documents and data relating to the study were analysed and this was supplemented with additional information collected during our visits to the various organisations cited above. It was not intended to carry out any specific survey during the course of the study due to limitation of time. We have, therefore, utilised the limited data from the few surveys previously conducted. The focus has been on the preparation of a status note on the Bombay suburban rail system with an emphasis on financing the system to meet the emerging requirements.

1.3 Chapter Scheme of the Report *

In Chapter 2, the nature of the urban growth process in the Bombay Metropolitan Region in terms of the demographic and economic activity dimensions is examined. In the following chapter, the emerging transport scenario is examined in the context of evolution of demographic and economic activity. Over the period, the nature of the problem and policy responses have somewhat changed. We, therefore, assess the performance of different modes, especially public transport modes, within the framework of several policy initiatives and administrative efforts of several concerned organisations.

The suburban passenger traffic handled on the various corridors of the rail system in the Bombay Metropolitan Region varies in size, distance and customer composition. A detailed analysis of some of these demand related aspects will be found in chapter 4.

The provision of suburban services is a complex task. Apart from technological and physical complexities in the planning and provision of services, there are problematic issues relating to the costing of these services and deriving an appropriate fare structure. Besides examining these issues in detail in chapter 5, we also attempt a look at the 'alleged' problem of a hidden subsidy in the context of suburban services. Essentially, the analysis of cost and an examination of the fare structure is targeted towards identifying the nature and extent of the subsidy element. We have also undertaken an indicative exercise of estimating the capital cost per passenger km. adjusted for investments in expansion, inflation and internal rate of return. This component of capital cost when added to working expenses provides an indicative fare. This is compared with the existing fare to roughly gauge over or under-pricing of services.

Issues related to pricing strategies are relevant, *inter alia*, in defining the financial viability of the suburban railway system in the short and the long run. The existing sources and structure

of capital, institutional arrangements and conventions in raising the required capital adequately deserve a fresh look. These aspects are discussed in chapter 6. Moreover, the need for a separate local urban transit authority to account for localised benefits and costs is also considered in this chapter. It is also argued that existing institutional and financial arrangements are both inadequate and inappropriate. A few alternatives in this regard are also examined.

The final chapter provides a summary and our concluding remarks.

* Due to some unavoidable difficulties in DTP Editing, we have printed the Tables pertaining to each Chapter at the end of the respective Chapter. We sincerely regret the inconvenience which may be caused to the readers.

CHAPTER 2
THE NATURE OF THE URBAN GROWTH PROCESS
IN THE BOMBAY METROPOLITAN REGION

CHAPTER 2

THE NATURE OF THE URBAN GROWTH PROCESS IN THE BOMBAY METROPOLITAN REGION

2.1 The Setting

The idea of the Bombay Metropolitan Region was mooted by the Gadgil Committee appointed by the Govt. of Maharashtra for preparing plans of the Bombay-Panvel and Poona regions. In proposing the concept, the Committee, which submitted its Report in 1966, appeared to have taken into account the following two considerations:

- (a) the area over which the activity of the urban core is intimately influencing socio-economic life, and
- (b) the surrounding area over which it appeared necessary to plan for integrated development in the future.

The Govt. of Maharashtra accepted the delineation of the Region as suggested by the Gadgil Committee and issued a notification to this effect. This notification defined the boundaries of the Region which were set by natural features such as the Vaitarna Creek and the Tansa River in the north, Patalaganga River in the south, the foothills of the Sahyadri in the east and the Arabian Sea on the west. The north-eastern boundaries of the Region coincided with the administrative boundaries of Kalyan and Bhiwandi tehsils. The geographical area that was delineated covered an area of 3965 sq.kms. which included 943 villages and 19 urban areas including Greater Bombay. The Bombay Metropolitan Regional Planning Board, constituted in 1967, examined the delineation issue once again, in the light of emerging posers in respect of the regional boundaries, an important one relating to the exclusion of parts of the Bombay-Pune corridor (which was emerging as a predominant industrial corridor) from the Region. In the Regional Plan (1970-91) for the Bombay Metropolitan Region published in 1974, the Board suggested a fresh demarcation of the Metropolitan Region on the following criteria:

- i) the urban characteristics of areas around Bombay,
- ii) the volume of daily traffic from and to areas around Greater Bombay, and
- iii) travel line and travel time indices from the various principal locations.

The redelineation was, thus, based on certain travel characteristics also. The Board's proposals which were contained in the Regional Plan were approved by the Govt. of Maharashtra in 1973. With the enactment of the Bombay Metropolitan Region Development Authority (B.M.R.D.A.) Act in 1974 and the setting up of the B.M.R.D.A. in March 1975, the southern boundaries of the Region

were extended to include parts of Pen and Alibag tehsils of Raigad districts thereby adding an area of 399 sq.kms. including 2 urban areas and 159 villages. In the north, 12 villages from Vasai tehsil covering an area of 9.04 sq.kms. were deleted and the boundary defined as the north of the Tansa River. The Region currently encompasses a total area of 4355 sq.km. and consists of the following administrative units:

- 1) Bombay City District
- 2) Bombay Suburb District
 - (these two i.e. city & suburb districts constitute Greater Bombay).
- 3) Part of Thane District comprising
 - a) Thane, Kalyan, Bhiwandi and Ulhasnagar tehsils,
 - b) Part of Vasai tehsil, and
 - c) Part of New Bombay.
- 4) Part of Raigad District comprising
 - a) Uran tehsil,
 - b) Part of Panvel, Karjat, Khalapur, Pen and Alibag tehsils, and
 - c) Part of New Bombay.

Since the preparation of the Regional Plan in the early seventies, the number of urban centres in the Region has increased. The 1981 Census identified 38 urban centres as against 19 recorded in the Regional Plan. After 1981, a number of changes have occurred in the jurisdiction of the local authorities in the Region. A new municipal corporation for Thane was set up in 1984. The municipal councils of Kalyan, Dombivli and Ambarnath were amalgamated to form the Kalyan Municipal Corporation. New municipal councils for Khopoli, Virar, Mira-Bhayander and Nallasopara were formed and the boundaries of some municipalities namely Bhiwandi and Mira-Bhayander were enlarged. This led to the consolidation of numerous centres into a few large ones. New Bombay has a Municipal Corporation since 1990. Though in terms of area, the share of the rural segment in the Region is 64%, yet in terms of the share of population, the Region is overwhelmingly urban oriented (93%). The map of the Bombay Metropolitan Region is given in Figure 1.

2.2 Demographic Profile of the Region

For the Region as a whole, the population was 77.92 lakhs in 1971 which increased to 110.23 lakhs in 1981, the annual compound growth rate being 3.53% per annum. In the recent decade (1981-91), there was an addition of 33.91 lakhs so that, by 1991, the population in the Region was 144.14 lakhs with the growth rate having declined to 2.72%. When we consider the growth rates of the urban and rural components of the population, it is observed that the urban growth

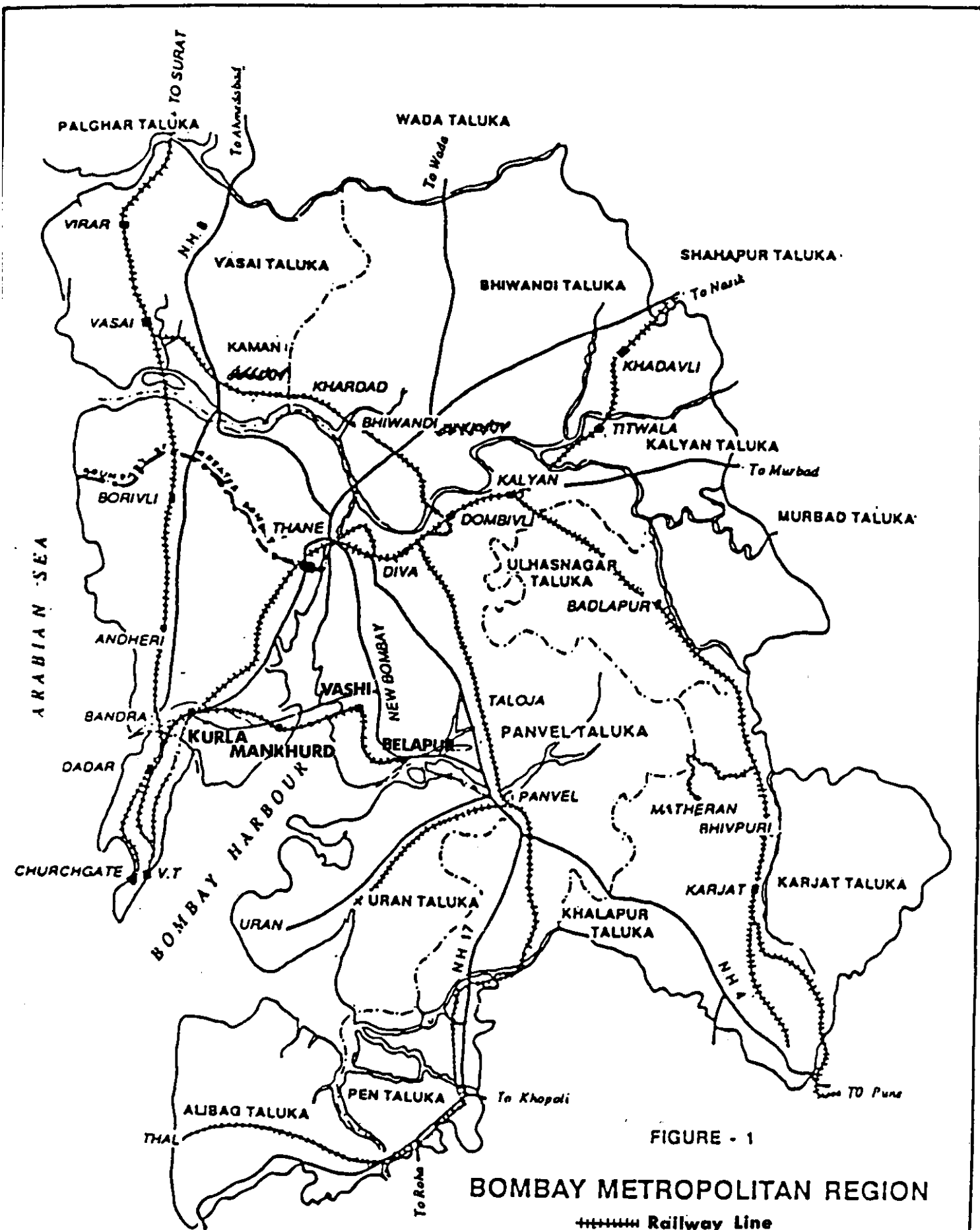


FIGURE - 1

BOMBAY METROPOLITAN REGION

SOURCE: B.M.R.D.A., DOCUMENTS.

rate declined from 3.6% in 1971-81 to 3.10% in 1981-91 while the growth rate in the case of the rural population which was 2.60% between 1971-81 fell sharply and was, in fact, negative (-1.49%) during 1981-91. The negative rate of growth is possibly the result of reclassification or change in the demarcation of urban and rural areas.

We now examine the nature of population growth in Greater Bombay which dominates the Region in terms of suburban transport requirements. Greater Bombay, comprising the island city, the western and the eastern suburbs, occupies an area 438 sq.km. Between 1971 and 1981, the population in the Greater Bombay area increased by 59.69 lakhs to 82.43 lakhs. In 1981, the share of the island city was 32.90 lakhs. Its share in the total population of Greater Bombay dropped from 51.43% in 1971 to 39.93% in 1981. On the other hand, the share of the eastern and western suburbs increased from 28.57% and 20.01% in 1971 to 34.6% and 25.48% respectively in 1991. In terms of blocks, the highest population was found in Dadar (2.43 lakhs), followed by Chembur Proper (1.99 lakhs), Byculla (1.82 lakhs), Worli (1.77 lakhs) and Sion (1.72 lakhs). For the Greater Bombay area as a whole, the growth rate for 1971-81 worked out to be 3.28%. The rates of growth of population, for the island city, western suburbs and eastern suburbs were -0.61%, 5.3% and 5.8% respectively. It may be noted that the high growth rate blocks were Magathane, Goregaon village, Karad Dindoshi, Valani, Malvani, etc. which are situated along the Western Railway corridor.

In the decade 1981-91, Greater Bombay's population increased by 18.9 lakhs to total 99.2 lakhs in 1991. The island city once again recorded a negative growth rate (-0.43%) while the growth rate for the western and eastern suburbs declined. The decline in the island city's share in the aggregate to 32% by 1991 was mainly because a number of blocks (32) registered negative growth rates. Those blocks which recorded above average growth rates were Upper Colaba (8.43%), Sion (3.16%), and Goregaon (1.57%). Once again, those blocks which were experiencing high growth rates were on the Western Railway corridor. In fact, fifteen blocks among the top twenty in terms of the growth rate are on this corridor.

It may be recalled that the Development Plan of the Bombay Municipal Corporation (1964) had envisaged a population of 32 lakhs for the island city by 1991 which was to be achieved by zoning and controls in the density of population and development. While this objective seems to have been achieved, the upper limit of 25 lakhs set by the Gadgil Committee seems a difficult goal though not impossible, given the declining trend of population in the island city.

Similar changes in regional patterns are observed in related variables such as occupied residential households (ORH), households (HH), etc. In the Greater Bombay area, the rate of growth of

ORH was 2.79% in 1971-81 and 2.42% in 1981-91. The corresponding growth rates in the case of HH were 2.16% and 2.33% respectively. It is observed that though the growth rate of ORH has declined, that of HH has increased. At a disaggregate level, it is observed that blocks in the suburbs experienced high growth rates especially those in the western suburbs adjoining the Western Railway Corridor. Again, in the case of the island city, the growth rate of ORH fell from 0.21 in 1971-81 to -0.49% between 1981-91.

We now look at the changes in the distribution of the working population in the past two decades. In 1971, the total number of workers in the Greater Bombay area was 22 lakhs and that of non-workers 37.33 lakhs. Of the workers, 55% were in the island city. Among the blocks, Dadar accounted for the highest share of workers (87710). Of the blocks having first ten ranks, eight were located in the island city. By 1981, the total working population in Greater Bombay had grown to 28.99 lakhs - a growth rate of 2.96%. In the case of the island city, the share of the working population declined to 42.7%, the growth rate being 0.224%. The working population in Greater Bombay increased to 34.99 lakhs in 1991 with the island city's share declining to 33.5% in the working population and the growth rate turning out to be negative (-0.54%). Once again, it is observed that blocks especially in the western suburbs have been attracting a larger share of the working population in the past two decades. In the Greater Bombay area, among 42 blocks classified as having higher than average growth rates, only 3 belonged to the island city. In the case of non-working population, growth rates for Greater Bombay, and the island city have fallen from 3.53% and 0.92% respectively in 1971-81 to 2.70% and -0.190% between 1981-91. Again, most of the high growth blocks in the case of non-workers are those situated along the Western Railway corridor.

We conclude this section with the observation that there is a definite change in the regional distribution of the population in Greater Bombay and the shift is occurring in favour of the Western suburbs where most of the blocks have recorded high growth rates in the demographic variables we have considered. Such a trend is increasingly imposing a heavier burden on the Western Railway suburban sections where traffic has been growing much faster than on the Central Railway sections.

We now take up a similar demographic description of those parts of Thane district which are in the Bombay Metropolitan Region. In Thane, the last two decades have seen a rapid growth in terms of the variables considered above. The total population has grown at an annual rate of 5% in 1971-81 and 5.2% in 1981-91. Other variables have grown at more or less the same rates. The total population increased from 13.51 lakhs in 1971 to 22.41 lakhs in 1981 and further to 37.70 lakhs in 1991, nearly a three fold increase in the two decades. The number of occupied

residential households increased from 2.89 lakhs in 1971 to 7.97 lakhs in 1991. In the same period, the number of households and the working population increased from 2.64 lakhs to 8.13 lakhs and 4.64 lakhs to 13.45 lakhs respectively. It may be observed that the non-working population is also increasing at 5%. Looking at the urban-rural component separately, it appears that as a result of the redelineation that took place in the early eighties in the context of the formation of the Thane Municipal Corporation, the Kalyan Municipal Corporation and other Municipal Councils, the ratio of urban to rural population which was 1.3:1 in 1971 has gone up sharply to 7.0:1 in 1991. The high growth centres are primarily urban centres such as Thane city, Mira-Bhayander, Kalyan, Vasai, Bhiwandi, etc. Most of them are situated on the suburban railway network.

In the case of Raigadh district, once again we observed that the urban areas are growing faster at 5% while the rural areas show average rates of 2% for all the variables. The high growth centres are Karjat, Panvel and Pen (around 5%) while other urban centres such as Uran, Alibag are growing at 2%.

Finally, coming to the New Bombay area, it is to be noted that it has been declared completely urban with the establishment of the New Bombay Municipal Corporation in 1989. The total population in the area in 1971 was 1.5 lakhs which increased to 2.5 lakhs in 1981 and further to 3.5 lakhs in 1991.

The population in 1991 is far below the target of 7.0 lakhs set in the Development Plan for the New Bombay area. If this growth persists, the total can be expected to reach only 10 lakhs by 2001 for which year the population envisaged in the Plan was 20 lakhs.

To summarise, we note that the major growth centres in terms of the population and workers have been the wards lying on the suburbs and extended suburbs of the Greater Bombay area and further along the Western Railway corridor, the urban areas of Thane along the Central Railway corridor and some suburban areas of Raigadh, some of which are on the Central Railway system. According to B.M.R.D.A. forecasts, in 2001, the major growth centres identified above are expected to dominate with the western areas expected to grow much faster along with the New Bombay area.

2.3 The Economic Activity Profile

Before we examine the spatial pattern of economic activity, we briefly describe the emerging land use pattern which influences spatial distribution of activity and thereby traffic flows.

2.3.1: Land-Use Profile

Urban built-up area is the first major land-use category which includes all built-up area within

municipal corporations or councils or areas otherwise treated as urban areas. It accounts for nearly 13% of the total area of the Region. Table 2.21 gives the land use distribution in the Region in 1987. The growth in urban built-up area between 1968 and 1987 is given in Table 2.22. Till 1968, Greater Bombay accounted for most of the urban built-up area in the Region. Between 1968 and 1975, the growth in urban built-up area was largely confined to the Greater Bombay area. This was done by bringing open lands under the urban framework and by reclaiming many low lying areas along Mahim Creek, Malad Creek, Thane Creek and areas around Chembur and Ghatkopar (B.M.R.D.A.,1988). After 1975, the growth in urban built-up area was significant along the transportation network beyond Greater Bombay, mainly at Mumbra, Kalyan, Bhiwandi and Belapur. In all these areas, a good amount of agricultural land was brought under non-agricultural use. After 1982, the growth was mainly in New Bombay, Thane, Panvel, etc. The area coming under the Kalyan Municipal Corporation was the main focus of urban growth process during 1968-83 followed by Thane and New Bombay. After 1983, areas around Thane grew very fast registering a growth rate of 138%. The rest of the Region also grew substantially contributing to a high overall growth rate especially during 1983-87. Such high growth rates appear to have been made possible by switching cultivable land to non-agricultural use in Thane and Raigad districts. In Thane district, nearly 322 sq. km. of land were converted for non-agricultural purposes. In Raigad, the figure was 194 sq. km.(B.M.R.D.A., 1991c).

At present, the existing development in urban centres covers 388 sq. km. which accounts for nearly 48% of the land allotted for the purpose of development. Of this area, residential zones occupy 46% of which only a third is developed. Industrial units emerge as the next largest users of urban land occupying 109 sq. km. out of a total reserved area of 163 sq. km. Nearly 44% of the developed industrial area lies in Greater Bombay. The land under industrial use has increased steadily from 53.84 sq. km. in the early seventies to 109 sq. km. at present.

2.3.2. The Employment Scenario

To begin with, we consider the employment pattern in the Region and then take a look at the growth of the industrial sector from the point of view of its spread in the Region.

Let us consider Table 2.23. For the Greater Bombay area as a whole, employment has grown annually at 4.4 % during 1981-91 which was higher than the rate of 3.46% in the earlier decade. This increase in growth rates can be attributed to the faster growth of employment in the suburbs between 1981-1991 when compared to growth rates in 1971-81. On the other hand, the Central Business District (southern parts of the island city comprising 21 blocks) experienced a negative growth rate in 1981-91 while for the rest of the island area, the growth rate, which was already

low, declined marginally. A similar picture emerges in the case of growth of establishments too.

If we consider the share of different zones in Greater Bombay, we find that the share of the C.B.D. in terms of employment and number of establishments has come down drastically. In the rest of the island also, a fall in shares is noticed though not as sharp as that of C.B.D. The share of the suburbs in terms of both variables has increased significantly.

In 1991, of the total employment, the manufacturing sector claims the largest share of 36% followed by the trade and commerce sector (12.50%). With regard to the number of establishments, the trade and commerce sector claims the largest share(45%) followed by manufacturing with 21%. At this level of disaggregation too, it is observed that in terms of employment and the number of establishments, the highest growth has been found in the suburbs.

As far as the Thane and Raigad portions of the Region are concerned, the data is very sparse (See Table 2.24 and 2.25). We have attempted to make the best use of some of the recent B.M.R.D.A. documents on employment (B.M.R.D.A., 1991a), and the evolving industrial growth policy (B.M.R.D.A.,1991b) in the BMR.

The Economic Census of 1980 listed Vasai, Kalyan, Dombivli, Ulhas Nagar, Thane, Bhivandi and Panvel as containing a significant portion of the number of establishments and employment. Nearly 75% of the establishments in the rest of BMR (i.e. other than Greater Bombay) and were situated in these urban areas and had very nearly the same share in terms of employment also. For recent years, only a partial picture is available based on Employment Market Information Surveys. These surveys cover establishments employing 10 workers and above. According to these surveys, employment in the Thane Region had gone up from 1.54 lakhs in the early eighties to 1.69 lakhs in 1988. The number of establishments recorded an increase of 70 units during the same period. Thane tehsil accounted for about 66% of the establishments and 83% of the employment followed by Kalyan and Ulhas Nagar. In Raigad, the total number of establishments had hardly increased while employment had gone up by 11%. Central Govt., Quasi-Central Govt. and local agencies account for a considerable increase in employment. Panvel tehsil had the highest number of establishments while Alibag tehsil tops in employment.

2.3.3 Industrial Location Policy

The Industrial Location Policy, which owes its origin to the Regional Plan, was announced in 1974. The Region was divided into four distinct zones which were defined as under:

Zone 1 - Island City of Bombay

Zone 2 - Suburbs of Greater Bombay, Thane and Mira-Bhayander area.

Zone 3 - New Bombay

Zone 4 - Rest of BMR.

The important provisions of the Policy were as follows:

- a) In Zone 1, no new unit or expansion / modernization of existing units was permitted.
- b) In Zone 2, only new small scale units were permitted. Even expansion / modernisation of existing medium / large units were permitted provided it did not lead to increased labour usage and additional consumption of power and water.
- c) Textile mills were allowed to expand both in Zones 1 & 2 provided they were not located in the Non-Conforming Zone (NCZ).
- d) Units in the Non-Conforming Zone in Zones 1 & 2, were requested to shift to the Conforming Zone (CZ) in zones 1,2 & 3.
- e) In Zones 3 & 4, medium and large units were allotted.

The policy also made it mandatory to obtain a ' No Objection Certificate ' (NOC) from the Directorate of Industries, Govt. of Maharashtra.

Since 1974, the Industrial Location Policy has been amended several times. The current policy in force from 1984 prohibits any new unit in Zones 1 & 2. As an exception, however, the policy permits new-small units as substitutes for old ones. Similarly, the policy permits expansion of small scale units upto an investment limit Rs. 20 lakhs. Further, it allows modernisation of any unit, irrespective of size, if it does not lead to increase in production and employment of additional labour. As before, in Zones 3 & 4, new units and expansion of existing units are allowed.

Before we proceed to analyse the effects of this policy, a summary of the growth in employment and factory units would be useful. The number of factories in Greater Bombay increased from 4064 in 1961 to 7770 in 1981 registering an annual compound growth rate of 4.6% during 1961-71 and 3.5% during 1971-81. The corresponding growth in employment was much lower. The Economic Census of 1971 & 1980 which included unregistered industrial units indicated sizable increase in number of industrial units and moderate increase in employment during 1971-80. While the growth rate of industrial units in Greater Bombay was 2.2%, it was three times more in the rest of the Region. This can be seen from Table 2.26. Between 1971-80, the number of unregistered industrial units has gone up considerably. In terms of employment, the increase has been more significant. Table 2.27 gives the employment in unregistered industrial units in the Region. Table 2.28 gives the growth of factory employment in the manufacturing sector in BMR. It is observed that there is a declining trend in factory employment in the Region.

In terms of investment, large scale industries with investment of over Rs.5 Crores accounted

for 38.6% of total investment in 1976-77. By 1986-87, their share had gone up to 65.7%. In other words, nearly 90% of the additional investment had gone into large scale industries which have recorded an annual growth of 13.79% in capital invested and 18.29% in terms of value added. Large scale industries, though accounting for only 1.82% of the units in 1986-87, have been the main source of employment also. They have accounted for 93106 jobs in the last decade. On the other hand, it is to be noted that other industries including small scale ones recorded negative growth rates in employment.

Coming back to the question of locational concentration of industries, we now consider the NOC's which were granted during 1979-89. Table 2.29 shows the break up of applications according to the purpose for which NOC's were granted. Out of a total of 7616 NOC applications, 5618 were accepted, 704 for medium and large units and the remaining for small units. These proposals led to the creation of additional employment of 2.12 lakhs, of which nearly 82% were in the medium and large units. More than half of this employment (1.15lakhs) was generated in Zone 2 and nearly 25% in Zone. 1. Zones 3 & 4 had a small share in employment generation. Of the total number of NOC's that were granted in the medium and large unit categories and in the small unit category 49% and 66% respectively were for Zone. 2. Zone 1 came next claiming 22.3% and 19.13% in the respective categories.

The distribution of proposals according to the purpose for which NOC's were granted reveals that 92% of them involved establishing a new unit or manufacturing a new product. The largest number of NOC's were granted for chemical or chemical products followed by manufacturers of electrical machinery.

The above analysis indicates that a number of new units were permitted between 1979 and 1986 in Zones 1 & 2 which was contrary to intentions of policy. This was the result of a number of exceptions permitted in the policy. This led to the addition of 1.66 lakh jobs which account for more than one-fourth of total factory employment in Region. In 1971, nearly 85% of the total factory employment in the BMR was concentrated in Greater Bombay. In 1988, this share had only marginally declined to 80%. Thus, it appears that the location policy seems to have exerted no significant impact on the in-built tendencies of locational concentration. Instead, the number of exceptions allowed and NOC's granted reveal the fact that implementation of policy is at variance with declared objectives.

The implications of the emerging patterns of the distribution of economic activity are many. We have observed the rapid increase in the number of establishments and employment in the suburbs of Bombay. While the population has spread out to the suburbs and beyond, employment continues

to be increasingly concentrated in the Greater Bombay area. The data on factory employment reveals this fact vividly. With most of the additional employment being generated in Zones where they were not expected to come up, the policy of regional dispersal of industries has not succeeded in a significant way. Thus, continuing locational imbalances have been adding to the extreme pressure on the transport system. In the past, traffic flows would be mostly towards V.T./Churchgate and further on to the CBD. Over the years, a number of intermediate stations especially those on the suburbs are experiencing high levels of originating and terminating trips. We examine these aspects in greater detail in chapter 4.

**TABLE : 2.1(a) PRIMARY CENSUS ABSTRACT, RANKED SHARES AND GROWTH RATES OF TP IN BMR
FOR 1971,1981 & 1991**

LOCATION	TP 71	TP 81	TP 91	SHARE RANK		SHARE RANK		SHARE RANK		GRTP RANK		GRTP RANK	
				1971	1981	1991	71-81	81-91	71-81	81-91			
BMR (T)	7.97	11.29	14.72	1.00	1.00	1.00			3.48		2.66		
BMR (U)	6.84	9.82	13.46	0.86	0.87	0.91			3.62		3.15		
BMR (R)	1.13	1.46	1.26	0.14	0.13	0.09			2.61		-1.49		
GREATER													
BOMBAY	5.97	8.24	9.93	0.75 (1)	0.73 (1)	0.67 (1)			3.23 (2)		1.86 (3)		
THANE DIST.(T)	1.35	2.24	3.77	0.17 (2)	0.20 (2)	0.26 (2)			5.06 (1)		5.20 (1)		
RAIGADH													
DIST.(T)	0.65	0.80	1.03	0.08 (3)	0.07 (3)	0.07 (3)			2.18 (3)		2.47 (2)		
BOMBAY CITY	3.07	3.29	3.17	0.39 (1)	0.29 (2)	0.22 (3)			0.68 (6)		-0.34 (5)		
EXTENDED													
SUBURBS	2.90	4.96	6.75	0.36 (2)	0.44 (1)	0.46 (1)			5.36 (2)		3.09 (3)		
THANE DIST.(U)	0.76	1.43	3.29	0.10 (3)	0.13 (3)	0.22 (2)			6.28 (1)		8.32 (1)		
THANE DIST.(R)	0.59	0.81	0.48	0.07 (4)	0.07 (4)	0.03 (5)			3.23 (4)		-5.15 (6)		
RAIGADH													
DIST.(U)	0.11	0.15	0.25	0.01 (6)	0.01 (6)	0.02 (6)			3.53 (3)		5.06 (2)		
RAIGADH													
DIST.(R)	0.54	0.65	0.77	0.07 (5)	0.06 (5)	0.05 (4)			1.88 (5)		1.75 (4)		

TP:TOTAL POPULATION (IN MILLIONS) GRTP:GROWTH RATE OF TOTAL POPULATION (IN MILLIONS)

**TABLE : 2.1(b) PRIMARY CENSUS ABSTRACT, RANKED SHARES AND GROWTH RATES OF HH IN BMR
FOR 1971,1981 & 1991**

LOCATION	HH71	HH81	HH91	SHARE RANK		SHARE RANK		SHARE RANK		GRTP RANK		GRTP RANK	
				1971	1981	1991	71-81	81-91	71-81	81-91			
BMR (T)	1.69	2.23	3.07	1.00	1.00	1.00			2.75		3.21		
BMR (U)	1.49	1.95	2.82	0.88	0.87	0.92			2.72		3.71		
BMR (R)	0.21	0.28	0.25	0.12	0.13	0.08			3.00		-1.23		
GREATER													
BOMBAY	1.31	1.62	2.05	0.77 (1)	0.73 (1)	0.67 (1)			2.16 (3)		2.33 (3)		
THANE DIST.(T)	0.26	0.45	0.81	0.16 (2)	0.20 (2)	0.26 (2)			5.34 (1)		5.90 (1)		
RAIGADH													
DIST.(T)	0.12	0.15	0.21	0.07 (3)	0.07 (3)	0.07 (3)			2.49 (2)		3.01 (2)		
BOMBAY CITY	0.63	0.60	0.63	0.37 (2)	0.27 (2)	0.21 (3)			-0.49 (6)		0.53 (5)		
EXTENDED													
SUBURBS	0.68	1.02	1.42	0.40 (1)	0.46 (1)	0.46 (1)			4.12 (2)		3.25 (3)		
THANE DIST.(U)	0.16	0.29	0.72	0.09 (3)	0.13 (3)	0.23 (2)			6.35 (1)		8.96 (1)		
THANE DIST.(R)	0.11	0.16	0.09	0.06 (4)	0.07 (4)	0.03 (5)			3.67 (4)		-5.30 (6)		
RAIGADH													
DIST.(U)	0.02	0.03	0.05	0.01 (6)	0.01 (6)	0.02 (6)			3.72 (3)		5.30 (2)		
RAIGADH													
DIST.(R)	0.10	0.12	0.15	0.06 (5)	0.05 (5)	0.05 (4)			2.20 (5)		2.34 (4)		

HH : TOTAL HOUSEHOLDS (IN MILLIONS) GRHH : GROWTH RATE OF TOTAL HOUSEHOLDS (IN MILLIONS)

TABLE : 2.1(c) PRIMARY CENSUS ABSTRACT, RANKED SHARES AND GROWTH RATES OF TW IN BMR

FOR 1971,1981 & 1991

LOCATION	TW71	TW81	TW91	SHARE RANK 1971	SHARE RANK 1981	SHARE RANK 1991	GRTW RANK 71-81	GRTW RANK 81-91
BMR (T)	2.92	4.04	5.29	1.00	1.00	1.00	3.26	2.69
BMR (U)	2.52	3.43	4.71	0.86	0.85	0.89	3.10	3.16
BMR (R)	0.40	0.61	0.58	0.14	0.15	0.11	4.23	-0.46
GREATER								
BOMBAY	2.20	2.90	3.50	0.75 (1)	0.72 (1)	0.66 (1)	2.76 (3)	1.89 (3)
THANE DIST.(T)	0.50	0.81	1.35	0.17 (2)	0.20 (2)	0.25 (2)	4.93 (1)	5.06 (1)
RAIGADH								
DIST.(T)	0.22	0.33	0.44	0.08 (3)	0.08 (3)	0.08 (3)	4.03 (2)	2.86 (2)
BOMBAY CITY	1.21	1.24	1.17	0.42 (1)	0.31 (2)	0.22 (2)	0.22 (6)	-0.54 (5)
EXTENDED								
SUBURBS	0.99	1.66	2.33	0.34 (2)	0.41 (1)	0.44 (1)	5.19 (2)	3.38 (3)
THANE DIST.(U)	0.28	0.48	1.12	0.10 (3)	0.12 (3)	0.21 (3)	5.28 (1)	8.44 (1)
THANE DIST.(R)	0.21	0.33	0.22	0.07 (4)	0.08 (4)	0.04 (5)	4.43 (3)	-3.90 (6)
RAIGADH								
DIST.(U)	0.03	0.05	0.08	0.01 (6)	0.01 (6)	0.02 (6)	4.26 (4)	4.73 (2)
RAIGADH								
DIST.(R)	0.19	0.28	0.36	0.06 (5)	0.07 (5)	0.07 (4)	3.99 (5)	2.47 (4)

TW: TOTAL WORKERS (IN MILLIONS)

GRTW:GROWTH RATE OF TOTAL WORKERS

T : TOTAL, U : URBAN, R :RURAL

SOURCE : PRIMARY CENSUS ABSTRACTS 1971,1981 & 1991

**TABLE:2.2 (a) SHARE OF BLOCK POPULATION IN THE TOTAL POPULATION
OF GREATER BOMBAY, 1971**

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
33. DADAR	0.041	1	2. MID.& LOW. COLABA	0.009	45
79. CHEMBUR PROPER	0.033	2	13. MARKET	0.008	46
27. BYCULLA	0.031	3	72. KANHERI	0.008	47
36. WORLI	0.030	4	25. 2nd NAGWADA	0.008	48
32. SION	0.029	5	11. KUMBHARWADA	0.008	49
60. EKSAR PAKHADI	0.025	6	82. KIROLE, GHATKOPAR	0.007	50
29. SEWRI	0.025	7	50. VILE PARLE (WEST)	0.007	51
55. ANDHERI (EAST)	0.025	8	38. LOVEGROVE	0.007	52
28. PAREL	0.024	9	5. ESPLANDE	0.007	53
35. PRABHADEVI	0.024	10	69. BORIVALI, SHIMPOLI	0.006	54
20. WALKESHWAR	0.023	11	9. DONGRI	0.006	55
48. SANTACRUZ (EAST)	0.023	12	46. SANTACRUZ (WEST)	0.006	56
85. BHANDUP	0.022	13	6. MANDVI	0.006	57
30. NAIGAUM	0.022	14	4. FORT(NORTH)	0.006	58
80. MAHUL, TROMBE, ETC.	0.020	15	10. KHARA TALAO	0.006	59
37. CHINCHPOKALI	0.019	16	1. UPPER COLABA	0.005	60
52. ANDHERI (WEST)	0.019	17	44. KHAR AND PALI	0.005	61
84. VIKROLI	0.019	18	39. SLAGUHTER HOUSE	0.005	62
43. KHAR SCHEME	0.018	19	18. GIRGAUM	0.005	63
78. BAZAR, CHURCH HALL	0.018	20	41. PALI HILL	0.005	64
34. MAHIM	0.017	21	70.EKSAR, MANDAPESHWAR	0.005	65
49. VILE PARLE (EAST)	0.017	22	86. MULUND (EAST)	0.005	66
83. PANJRAPOL	0.016	23	57. JOGESHWARI (WEST)	0.005	67
81. GHATKOPAR	0.016	24	68. POISAR AND AKURLI	0.005	68
56. JOGESHWARI (EAST)	0.016	25	47. SANTACRUZ (CENTRAL)	0.004	69
87. MULUND (WEST)	0.015	26	24. 1st NAGWADA	0.004	70
45. HILL & TURNER ROAD	0.015	27	7. CHAKALA	0.004	71
16. KHETWADI	0.013	28	65. VALANI, MALVANI,ETC.	0.004	72
22. MAZGAON	0.013	29	64. KURAD, DINDOSHI,ETC.	0.004	73

77. SWADESHI MILLS, ETC.	0.013	30	3. FORT (SOUTH)	0.004	74
8. UMERKHEDI	0.013	31	40. C'WADA & BANDRA HILL	0.004	75
63. MALAD (EAST)	0.013	32	74. DAHISAR	0.004	76
62. MALAD (WEST)	0.012	33	51. JUHU	0.004	77
23. TADWADI	0.012	34	76. STN., TAKIA, KURLA	0.004	78
19. CHAUPATY	0.012	35	53. VERSOVA	0.003	79
31. MATUNGA	0.011	36	73. MAGATHANE	0.003	80
17. TARDEO	0.011	37	59. AAREY	0.003	81
14. DHOBI TALAO	0.011	38	42. DANDA	0.002	82
75. NEW MILLS, KURLA	0.011	39	88. NAHUR, TULSI, ETC.	0.001	83
21. MAHALAXMI	0.011	40	54. MADH	0.001	84
12. BHULESHWAR	0.011	41	58. G'GAON VILL.,MAROSHI	0.001	85
26. KAMAHIPURA	0.009	42	66. MANORI ISLAND	0.001	86
15. FANSWADI	0.009	43	61. ERANGAL AND DAROLI	0.000	87
67. KANDIVLI AND CHARKOP	0.009	44	71. GORAI AND KULVEM	0.000	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.514	

TABLE:2.2(b) SHARE OF BLOCK POPULATION IN THE TOTAL POPULATION
OF GREATER BOMBAY, 1981

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
33. DADAR	0.040	1	31. MATUNGA	0.007	45
80. MAHUL, TROMBE, ETC.	0.036	2	38. LOVEGROVE	0.007	46
85. BHANDUP	0.032	3	74. DAHISAR	0.007	47
32. SION	0.031	4	8. UMERKHEDI	0.007	48
79. CHEMBUR PROPER	0.030	5	17. TARDEO	0.007	49
55. ANDHERI (EAST)	0.028	6	18. GIRGAUM	0.007	50
60. EKSAR PAKHADI	0.028	7	86. MULUND (EAST)	0.006	51
84. VIKROLI	0.025	8	50. VILE PARLE (WEST)	0.006	52
78. BAZAR, CHURCH HALL	0.024	9	2. MID.& LOW. COLABA	0.006	53
52. ANDHERI (WEST)	0.023	10	14. DHOBI TALAO	0.006	54
48. SANTACRUZ (EAST)	0.023	11	57. JOGESHWARI (WEST)	0.006	55
29. SEWRI	0.023	12	26. KAMAHIPURA	0.006	56
36. WORLI	0.022	13	46. SANTACRUZ (WEST)	0.006	57
83. PANJRAPOL	0.022	14	82. KIROLE, GHATKOPAR	0.005	58
27. BYCULLA	0.021	15	15. FANSWADI	0.005	59
56. JOGESHWARI (EAST)	0.018	16	51. JUHU	0.005	60
28. PAREL	0.018	17	53. VERSOVA	0.005	61
81. GHATKOPAR	0.017	18	41. PALI HILL	0.005	62
87. MULUND (WEST)	0.017	19	25. 2nd NAGWADA	0.005	63
35. PRABHADEVI	0.017	20	11. KUMBHARWADA	0.005	64
21. MAHALAXMI	0.017	21	5. ESPLANDE	0.004	65
43. KHAR SCHEME	0.016	22	13. MARKET	0.004	66
45. HILL & TURNER ROAD	0.016	23	1. UPPER COLABA	0.004	67
30. NAIGAUM	0.016	24	59. AAREY	0.004	68
37. CHINCHPOKALI	0.016	25	39. SLAGUHTER HOUSE	0.004	69
49. VILE PARLE (EAST)	0.015	26	47. SANTACRUZ (CENTRAL)	0.004	70
77. SWADESHI MILLS, ETC.	0.014	27	9. DONGRI	0.004	71
62. MALAD (WEST)	0.013	28	6. MANDVI	0.004	72
67. KANDIVLI AND CHARKOP	0.012	29	44. KHAR AND PALI	0.003	73

63. MALAD (EAST)	0.012	30	10. KHARA TALAO	0.003	74
34. MAHIM	0.012	31	19. CHAUPATY	0.003	75
69. BORIVALI, SHIMPOLI	0.011	32	24. 1st NAGWADA	0.003	76
20. WALKESHWAR	0.010	33	40. C'WADA & BANDRA HIL	0.003	77
75. NEW MILLS, KURLA	0.010	34	4. FORT(NORTH)	0.003	78
72. KANHERI	0.010	35	76. STN., TAKIA, KURLA	0.003	79
22. MAZGAON	0.009	36	7. CHAKALA	0.002	80
64. KURAD, DINDOSHI,ETC.	0.009	37	42. DANDA	0.002	81
73. MAGATHANE	0.009	38	88. NAHUR, TULSI, ETC.	0.002	82
23. TADWADI	0.008	39	58. G'GAON VILL.,MAROSH	0.002	83
70. EKSAR,					
MANDAPESHWAR	0.008	40	3. FORT (SOUTH)	0.002	84
16. KHETWADI	0.008	41	54. MADH	0.001	85
65. VALANI, MALVANI,ETC.	0.008	42	66. MANORI ISLAND	0.000	86
12. BHULESHWAR	0.008	43	61. ERANGAL AND DAROLI	0.000	87
68. POISAR AND THAKURLI	0.008	44	71. GORAI AND KULVEM	0.000	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.381	

**TABLE:2.2 (c) SHARE OF BLOCK POPULATION IN THE TOTAL POPULATION
OF GREATER BOMBAY, 1991**

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
80. MAHUL, TROMBE, ETC.	0.048	1	86. MULUND (EAST)	0.008	45
33. DADAR	0.039	2	20. WALKESHWAR	0.008	46
85. BHANDUP	0.038	3	46. SANTACRUZ (WEST)	0.008	47
32. SION	0.037	4	38. LOVEGROVE	0.007	48
79. CHEMBUR PROPER	0.035	5	88. NAHUR, TULSI, ETC.	0.006	49
55. ANDHERI (EAST)	0.035	6	23. TADWADI	0.006	50
78. BAZAR, CHURCH HALL	0.034	7	16. KHETWADI	0.006	51
60. EKSAR PAKHADI	0.029	8	59. AAREY	0.006	52
84. VIKROLI	0.027	9	51. JUHU	0.006	53
52. ANDHERI (WEST)	0.025	10	31. MATUNGA	0.006	54
48. SANTACRUZ (EAST)	0.023	11	17. TARDEO	0.006	55
29. SEWRI	0.019	12	50. VILE PARLE (WEST)	0.005	56
81. GHATKOPAR	0.019	13	8. UMERKHEDI	0.005	57
67. KANDIVLI AND CHARKOP	0.019	14	82. KIROLE, GHATKOPAR	0.005	58
56. JOGESHWARI (EAST)	0.019	15	18. GIRGAUM	0.005	59
36. WORLI	0.019	16	2. MID.& LOW. COLABA	0.005	60
68. POISAR AND AKURLI	0.018	17	41. PALI HILL	0.005	61
83. PANJRAPOL	0.018	18	26. KAMAHIPURA	0.005	62
64. KURAD, DINDOSHI,ETC.	0.018	19	12. BHULESHWAR	0.004	63
73. MAGATHANE	0.016	20	14. DHOBI TALAO	0.004	64
27. BYCULLA	0.016	21	15. FANSWADI	0.004	65
87. MULUND (WEST)	0.016	22	25. 2nd NAGWADA	0.004	66
49. VILE PARLE (EAST)	0.016	23	39. SLAGUHTER HOUSE	0.004	67
43. KHAR SCHEME	0.016	24	40. C'WADA & BANDRA HIL	0.003	68
45. HILL & TURNER ROAD	0.015	25	5. ESPLANDE	0.003	69
77. SWADESHI MILLS, ETC.	0.015	26	11. KUMBHARWADA	0.003	70
69. BORIVALI, SHIMPOLI	0.015	27	47. SANTACRUZ (CENTRAL)	0.003	71
21. MAHALAXMI	0.014	28	9. DONGRI	0.003	72

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
35. PRABHADEVI	0.013	29	44. KHAR AND PALI	0.003	73
62. MALAD (WEST)	0.013	30	24. 1st NAGWADA	0.002	74
65. VALANI, MALVANI,ETC.	0.013	31	6. MANDVI	0.002	75
37. CHINCHPOKALI	0.013	32	10. KHARA TALAO	0.002	76
28. PAREL	0.012	33	58. G'GAON VILL.,MAROSH	0.002	77
63. MALAD (EAST)	0.012	34	76. STN., TAKIA, KURLA	0.002	78
75. NEW MILLS, KURLA	0.012	35	13. MARKET	0.002	79
74. DAHISAR	0.012	36	19. CHAUPATY	0.002	80
30. NAIGAUM	0.011	37	4. FORT(NORTH)	0.002	81
57. JOGESHWARI (WEST)	0.010	38	42. DANDA	0.002	82
70. EKSAR,					
MANDAPESHWAR	0.010	39	7. CHAKALA	0.002	83
34. MAHIM	0.009	40	3. FORT (SOUTH)	0.002	84
53. VERSOVA	0.008	41	54. MADH	0.001	85
1. UPPER COLABA	0.008	42	66. MANORI ISLAND	0.000	86
22. MAZGAON	0.008	43	71. GORAI AND KULVEM	0.000	87
72. KANHERI	0.008	44	61. ERANGAL AND DAROLI	0.000	88
GREATER BOMBAY					
AGGREGATE	1.000		BOMBAY CITY	0.320	

**TABLE:2.3 (a) SHARE OF HOUSEHOLDS OF BLOCKS IN TOTAL NUMBER OF
HOUSEHOLDS IN GREATER BOMBAY, 1971**

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
33. DADAR	0.042	1	2. MID.& LOW. COLABA	0.009	45
79. CHEMBUR PROPER	0.035	2	26. KAMAHIPURA	0.009	46
32. SION	0.029	3	67. KANDIVLI AND CHARKO	0.008	47
85. BHANDUP	0.027	4	72. KANHERI	0.008	48
60. EKSAR PAKHADI	0.027	5	82. KIROLE, GHATKOPAR	0.008	49
36. WORLI	0.026	6	9. DONGRI	0.007	50
55. ANDHERI (EAST)	0.026	7	11. KUMBHARWADA	0.007	51
27. BYCULLA	0.024	8	38. LOVEGROVE	0.007	52
48. SANTACRUZ (EAST)	0.024	9	69. BORIVALI, SHIMPOLI	0.007	53
29. SEWRI	0.023	10	46. SANTACRUZ (WEST)	0.007	54
80. MAHUL, TROMBE, ETC.	0.023	11	50. VILE PARLE (WEST)	0.006	55
20. WALKESHWAR	0.022	12	1. UPPER COLABA	0.006	56
78. BAZAR, CHURCH HALL	0.022	13	4. FORT(NORTH)	0.006	57
28. PAREL	0.020	14	5. ESPLANDE	0.006	58
35. PRABHADEVI	0.020	15	25. 2nd NAGWADA	0.006	59
84. VIKROLI	0.019	16	44. KHAR AND PALI	0.006	60
30. NAIGAUM	0.019	17	57. JOGESHWARI (WEST)	0.006	61
52. ANDHERI (WEST)	0.018	18	10. KHARA TALAO	0.005	62
43. KHAR SCHEME	0.018	19	68. POISAR AND AKURLI	0.005	63
56. JOGESHWARI (EAST)	0.018	20	47. SANTACRUZ (CENTRAL)	0.005	64
83. PANJRAPOL	0.017	21	86. MULUND (EAST)	0.005	65
49. VILE PARLE (EAST)	0.017	22	41. PALI HILL	0.005	66
87. MULUND (WEST)	0.016	23	51. JUHU	0.005	67
81. GHATKOPAR	0.016	24	64. KURAD, DINDOSHI,ETC	0.005	68
37. CHINCHPOKALI	0.015	25	18. GIRGAUM	0.005	69
34. MAHIM	0.014	26	65. VALANI, MALVANI,ETC	0.005	70
16. KHETWADI	0.014	27	70. EKSAR, MANDAPESHWAR	0.005	71
77. SWADESHI MILLS, ETC.	0.014	28	39. SLAGUHTER HOUSE	0.005	72
45. HILL & TURNER ROAD	0.014	29	7. CHAKALA	0.005	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
63. MALAD (EAST)	0.013	30	74. DAHISAR	0.004	74
62. MALAD (WEST)	0.013	31	73. MAGATHANE	0.004	75
22. MAZGAON	0.013	32	76. STN., TAKIA, KURLA	0.004	76
75. NEW MILLS, KURLA	0.013	33	40. C'WADA & BANDRA HIL	0.003	77
19. CHAUPATY	0.012	34	24. 1st NAGWADA	0.003	78
31. MATUNGA	0.011	35	53. VERSOVA	0.003	79
12. BHULESHWAR	0.011	36	3. FORT (SOUTH)	0.003	80
14. DHOBI TALAO	0.011	37	59. AAREY	0.003	81
21. MAHALAXMI	0.011	38	42. DANDA	0.002	82
13. MARKET	0.011	39	88. NAHUR, TULSI, ETC.	0.001	83
17. TARDEO	0.010	40	58. G'GAON VILL.,MAROSH	0.001	84
8. UMERKHEDI	0.010	41	54. MADH	0.001	85
6. MANDVI	0.009	42	66. MANORI ISLAND	0.000	86
23. TADWADI	0.009	43	61. ERANGAL AND DAROLI	0.000	87
15. FANSWADI	0.009	44	71. GORAI AND KULVEM	0.000	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.482	

**TABLE:2.3(b) SHARE OF HOUSEHOLDS OF BLOCKS IN TOTAL NUMBER OF
HOUSEHOLDS IN GREATER BOMBAY, 1981**

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
33. DADAR	0.041	1	38. LOVEGROVE	0.008	45
80. MAHUL, TROMBE, ETC.	0.041	2	57. JOGESHWARI (WEST)	0.007	46
85. BHANDUP	0.036	3	86. MULUND (EAST)	0.007	47
32. SION	0.034	4	23. TADWADI	0.007	48
79. CHEMBUR PROPER	0.032	5	18. GIRGAUM	0.007	49
55. ANDHERI (EAST)	0.031	6	2. MID.& LOW. COLABA	0.007	50
60. EKSAR PAKHADI	0.030	7	50. VILE PARLE (WEST)	0.007	51
52. ANDHERI (WEST)	0.030	8	17. TARDEO	0.007	52
78. BAZAR, CHURCH HALL	0.026	9	8. UMERKHEDI	0.006	53
84. VIKROLI	0.026	10	46. SANTACRUZ (WEST)	0.006	54
48. SANTACRUZ (EAST)	0.025	11	12. BHULESHWAR	0.006	55
83. PANJRAPOL	0.023	12	14. DHOBI TALAO	0.006	56
36. WORLI	0.022	13	82. KIROLE, GHATKOPAR	0.006	57
29. SEWRI	0.021	14	51. JUHU	0.006	58
56. JOGESHWARI (EAST)	0.020	15	15. FANSWADI	0.005	59
87. MULUND (WEST)	0.019	16	26. KAMAHIPURA	0.005	60
81. GHATKOPAR	0.018	17	53. VERSOVA	0.005	61
27. BYCULLA	0.018	18	41. PALI HILL	0.005	62
28. PAREL	0.017	19	59. AAREY	0.005	63
43. KHAR SCHEME	0.017	20	1. UPPER COLABA	0.005	64
21. MAHALAXMI	0.017	21	13. MARKET	0.004	65
35. PRABHADEVI	0.016	22	11. KUMBHARWADA	0.004	66
45. HILL & TURNER ROAD	0.016	23	5. ESPLANDE	0.004	67
49. VILE PARLE (EAST)	0.016	24	47. SANTACRUZ (CENTRAL)	0.004	68
30. NAIGAUM	0.015	25	25. 2nd NAGWADA	0.004	69
77. SWADESHI MILLS, ETC.	0.014	26	39. SLAGUHTER HOUSE	0.004	70
67. KANDIVLI AND CHARKOP	0.014	27	44. KHAR AND PALI	0.004	71
37. CHINCHPOKALI	0.014	28	9. DONGRI	0.003	72

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
62. MALAD (WEST)	0.013	29	6. MANDVI	0.003	73
63. MALAD (EAST)	0.013	30	19. CHAUPATY	0.003	74
69. BORIVALI, SHIMPOLI	0.013	31	10. KHARA TALAO	0.003	75
34. MAHIM	0.012	32	40. C'WADA & BANDRA HIL	0.003	76
64. KURAD, DINDOSHI,ETC.	0.011	33	4. FORT(NORTH)	0.003	77
73. MAGATHANE	0.011	34	58. G'GAON VILL.,MAROSH	0.003	78
72. KANHERI	0.011	35	88. NAHUR, TULSI, ETC.	0.003	79
75. NEW MILLS, KURLA	0.010	36	24. 1st NAGWADA	0.003	80
20. WALKESHWAR	0.009	37	76. STN., TAKIA, KURLA	0.002	81
68. POISAR AND AKURLI	0.009	38	7. CHAKALA	0.002	82
70. EKSAR, MANDAPESHWAR	0.009	39	42. DANDA	0.002	83
65. VALANI, MALVANI,ETC.	0.009	40	3. FORT (SOUTH)	0.002	84
22. MAZGAON	0.009	41	54. MADH	0.000	85
74. DAHISAR	0.009	42	66. MANORI ISLAND	0.000	86
16. KHETWADI	0.008	43	61. ERANGAL AND DAROLI	0.000	87
31. MATUNGA	0.008	44	71. GORAI AND KULVEM	0.000	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.370	

TABLE: 2.3 (c) SHARE OF HOUSEHOLDS OF BLOCKS IN TOTAL NUMBER OF HOUSE
HOLDS IN GREATER BOMBAY, 1991

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
80. MAHUL, TROMBE, ETC.	0.048	1	22. MAZGAON	0.008	45
32. SION	0.039	2	38. LOVEGROVE	0.008	46
85. BHANDUP	0.038	3	46. SANTACRUZ (WEST)	0.008	47
33. DADAR	0.038	4	20. WALKESHWAR	0.007	48
55. ANDHERI (EAST)	0.037	5	88. NAHUR, TULSI, ETC.	0.007	49
79. CHEMBUR PROPER	0.035	6	59. AAREY	0.007	50
78. BAZAR, CHURCH HALL	0.034	7	51. JUHU	0.006	51
60. EKSAR PAKHADI	0.029	8	31. MATUNGA	0.006	52
84. VIKROLI	0.027	9	16. KHETWADI	0.006	53
52. ANDHERI (WEST)	0.024	10	41. PALI HILL	0.006	54
48. SANTACRUZ (EAST)	0.024	11	23. TADWADI	0.006	55
67. KANDIVLI AND CHARKOP	0.021	12	50. VILE PARLE (WEST)	0.005	56
68. POISAR AND AKURLI	0.020	13	17. TARDEO	0.005	57
64. KURAD, DINDOSHI, ETC.	0.020	14	18. GIRGAUM	0.005	58
81. GHATKOPAR	0.019	15	8. UMERKHEDI	0.005	59
73. MAGATHANE	0.018	16	2. MID. & LOW. COLABA	0.005	60
56. JOGESHWARI (EAST)	0.018	17	82. KIROLE, GHATKOPAR	0.005	61
36. WORLI	0.018	18	26. KAMAHIPURA	0.004	62
29. SEWRI	0.018	19	14. DHOBI TALAO	0.004	63
49. VILE PARLE (EAST)	0.017	20	15. FANSWADI	0.004	64
83. PANJRAPOL	0.016	21	12. BHULESHWAR	0.004	65
87. MULUND (WEST)	0.016	22	40. C'WADA & BANDRA HIL	0.004	66
43. KHAR SCHEME	0.015	23	39. SLAGUHTER HOUSE	0.003	67
45. HILL & TURNER ROAD	0.015	24	47. SANTACRUZ (CENTRAL)	0.003	68
27. BYCULLA	0.014	25	11. KUMBHARWADA	0.003	69
77. SWADESHI MILLS, ETC.	0.014	26	25. 2nd NAGWADA	0.003	70
65. VALANI, MALVANI, ETC.	0.014	27	5. ESPLANDE	0.003	71
21. MAHALAXMI	0.013	28	44. KHAR AND PALI	0.003	72
69. BORIVALI, SHIMPOLI	0.013	29	9. DONGRI	0.003	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
62. MALAD (WEST)	0.013	30	58. G'GAON VILL.,MAROSH	0.002	74
35. PRABHADEVI	0.013	31	24. 1st NAGWADA	0.002	75
74. DAHISAR	0.012	32	13. MARKET	0.002	76
63. MALAD (EAST)	0.012	33	6. MANDVI	0.002	77
28. PAREL	0.012	34	10. KHARA TALAO	0.002	78
37. CHINCHPOKALI	0.012	35	19. CHAUPATY	0.002	79
70. EKSAR, MANDAPESHWAR	0.011	36	76. STN., TAKIA, KURLA	0.002	80
57. JOGESHWARI (WEST)	0.011	37	4. FORT(NORTH)	0.002	81
30. NAIGAUM	0.010	38	42. DANDA	0.002	82
75. NEW MILLS, KURLA	0.010	39	3. FORT (SOUTH)	0.002	83
34. MAHIM	0.009	40	7. CHAKALA	0.001	84
86. MULUND (EAST)	0.009	41	54. MADH	0.001	85
53. VERSOVA	0.009	42	71. GORAI AND KULVEM	0.000	86
1. UPPER COLABA	0.009	43	61. ERANGAL AND DAROLI	0.000	87
72. KANHERI	0.008	44	66. MANORI ISLAND	0.000	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.309	

TABLE:2.4 (a) SHARE OF WORKING POPULATION OF BLOCKS TO TOTAL

WORKING POPULATION OF GREATER BOMBAY, 1971

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
33. DADAR	0.040	1	5. ESPLANDE	0.010	45
27. BYCULLA	0.034	2	15. FANSWADI	0.009	46
36. WORLI	0.031	3	11. KUMBHARWADA	0.009	47
79. CHEMBUR PROPER	0.029	4	25. 2nd NAGWADA	0.008	48
35. PRABHADEVI	0.026	5	6. MANDVI	0.008	49
32. SION	0.026	6	38. LOVEGROVE	0.008	50
29. SEWRI	0.026	7	67. KANDIVLI AND CHARKOP	0.007	51
28. PAREL	0.025	8	4. FORT(NORTH)	0.007	52
21. MAHALAXMI	0.025	9	3. FORT (SOUTH)	0.007	53
55. ANDHERI (EAST)	0.025	10	72. KANHERI	0.007	54
37. CHINCHPOKALI	0.024	11	82. KIROLE, GHATKOPAR	0.007	55
60. EKSAR PAKHADI	0.024	12	50. VILE PARLE (WEST)	0.006	56
85. BHANDUP	0.022	13	9. DONGRI	0.006	57
30. NAIGAUM	0.022	14	10. KHARA TALAO	0.006	58
48. SANTACRUZ (EAST)	0.021	15	1. UPPER COLABA	0.006	59
78. BAZAR, CHURCH HALL	0.019	16	46. SANTACRUZ (WEST)	0.006	60
43. KHAR SCHEME	0.018	17	69. BORIVALI, SHIMPOLI	0.006	61
80. MAHUL, TROMBE, ETC.	0.018	18	19. CHAUPATY	0.006	62
52. ANDHERI (WEST)	0.017	19	57. JOGESHWARI (WEST)	0.005	63
84. VIKROLI	0.017	20	68. POISAR AND AKURLI	0.005	64
34. MAHIM	0.017	21	44. KHAR AND PALI	0.005	65
49. VILE PARLE (EAST)	0.016	22	41. PALI HILL	0.005	66
22. MAZGAON	0.015	23	7. CHAKALA	0.004	67
16. KHETWADI	0.015	24	86. MULUND (EAST)	0.004	68
83. PANJRAPOL	0.014	25	70. EKSAR, MANDAPESHWAR	0.004	69
56. JOGESHWARI (EAST)	0.014	26	24. 1st NAGWADA	0.004	70
23. TADWADI	0.014	27	64. KURAD, DINDOSHI,ETC.	0.004	71
45. HILL & TURNER ROAD	0.013	28	39. SLAGUHTER HOUSE	0.004	72
87. MULUND (WEST)	0.013	29	47. SANTACRUZ (CENTRAL)	0.004	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
20. WALKESHWAR	0.013	30	65. VALANI, MALVANI, ETC.	0.004	74
81. GHATKOPAR	0.013	31	74. DAHISAR	0.004	75
14. DHOBI TALAO	0.013	32	40. C'WADA & BANDRA HILL	0.004	76
8. UMERKHEDI	0.013	33	51. JUHU	0.004	77
77. SWADESHI MILLS, ETC.	0.012	34	76. STN., TAKIA, KURLA	0.004	78
18. GIRGAUM	0.012	35	53. VERSOVA	0.003	79
17. TARDEO	0.011	36	73. MAGATHANE	0.003	80
12. BHULESHWAR	0.011	37	59. AAREY	0.003	81
31. MATUNGA	0.011	38	42. DANDA	0.002	82
63. MALAD (EAST)	0.011	39	58. G'GAON VILL., MAROSHI	0.001	83
13. MARKET	0.011	40	88. NAHUR, TULSI, ETC.	0.001	84
62. MALAD (WEST)	0.011	41	54. MADH	0.001	85
75. NEW MILLS, KURLA	0.011	42	66. MANORI ISLAND	0.000	86
26. KAMAHIPURA	0.010	43	61. ERANGAL AND DAROLI	0.000	87
2. MID. & LOW. COLABA	0.010	44	71. GORAI AND KULVEM	0.000	88
GREATER BOMBAY					
AGGREGATE	1.000		BOMBAY CITY	0.551	

TABLE:2.4 (b) SHARE OF WORKING POPULATION OF BLOCKS TO TOTAL WORKING
POPULATION OF GREATER BOMBAY, 1981

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
33. DADAR	0.042	1	38. LOVEGROVE	0.008	45
80. MAHUL, TROMBE, ETC.	0.033	2	74. DAHISAR	0.008	46
32. SION	0.031	3	17. TARDEO	0.008	47
85. BHANDUP	0.031	4	2. MID.& LOW. COLABA	0.008	48
55. ANDHERI (EAST)	0.030	5	18. GIRGAUM	0.008	49
60. EKSAR PAKHADI	0.029	6	65. VALANI, MALVANI,ETC	0.008	50
79. CHEMBUR PROPER	0.027	7	14. DHOBI TALAO	0.007	51
27. BYCULLA	0.025	8	57. JOGESHWARI (WEST)	0.007	52
78. BAZAR, CHURCH HALL	0.025	9	8. UMERKHEDI	0.007	53
36. WORLI	0.024	10	86. MULUND (EAST)	0.007	54
29. SEWRI	0.023	11	26. KAMAHIPURA	0.006	55
84. VIKROLI	0.023	12	50. VILE PARLE (WEST)	0.006	56
48. SANTACRUZ (EAST)	0.023	13	15. FANSWADI	0.006	57
52. ANDHERI (WEST)	0.022	14	13. MARKET	0.006	58
83. PANJRAPOL	0.021	15	46. SANTACRUZ (WEST)	0.006	59
37. CHINCHPOKALI	0.020	16	11. KUMBHARWADA	0.006	60
35. PRABHADEVI	0.020	17	51. JUHU	0.006	61
21. MAHALAXMI	0.020	18	5. ESPLANDE	0.005	62
28. PAREL	0.020	19	53. VERSOVA	0.005	63
56. JOGESHWARI (EAST)	0.018	20	82. KIROLE, GHATKOPAR	0.005	64
30. NAIGAUM	0.017	21	6. MANDVI	0.005	65
87. MULUND (WEST)	0.016	22	1. UPPER COLABA	0.005	66
81. GHATKOPAR	0.016	23	41. PALI HILL	0.005	67
43. KHAR SCHEME	0.016	24	25. 2nd NAGWADA	0.005	68
45. HILL & TURNER ROAD	0.015	25	59. AAREY	0.004	69
49. VILE PARLE (EAST)	0.015	26	9. DONGRI	0.004	70
77. SWADESHI MILLS, ETC.	0.014	27	47. SANTACRUZ (CENTRAL)	0.004	71
34. MAHIM	0.012	28	19. CHAUPATY	0.004	72

62. MALAD (WEST)	0.012	29	39. SLAGUHTER HOUSE	0.004	73
67. KANDIVLI AND CHARKOP	0.012	30	44. KHAR AND PALI	0.004	74.
20. WALKESHWAR	0.012	31	3. FORT (SOUTH)	0.004	75
69. BORIVALI, SHIMPOLI	0.012	32	4. FORT(NORTH)	0.003	76
63. MALAD (EAST)	0.012	33	10. KHARA TALAO	0.003	77
22. MAZGAON	0.011	34	40. C'WADA & BANDRA HIL	0.003	78
12. BHULESHWAR	0.011	35	76. STN., TAKIA, KURLA	0.003	79
23. TADWADI	0.010	36	24. 1st NAGWADA	0.003	80
72. KANHERI	0.010	37	7. CHAKALA	0.003	81.
75. NEW MILLS, KURLA	0.010	38	58. G'GAON VILL.,MAROSH	0.003	82
73. MAGATHANE	0.010	39	88. NAHUR, TULSI, ETC.	0.003	83
64. KURAD, DINDOSHI,ETC.	0.010	40	42. DANDA	0.002	84
16. KHETWADI	0.009	41	54. MADH	0.0011	85
70. EKSAR, MANDAPESHWAR	0.009	42	66. MANORI ISLAND	0.0004	86
68. POISAR AND AKURLI	0.008	43	71. GORAI AND KULVEM	0.0003	87
31. MATUNGA	0.008	44	61. ERANGAL AND DAROLI	0.0003	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.427	

TABLE:2.4(c) SHARE OF WORKING POPULATION OF BLOCKS TO TOTAL WORKING
POPULATION OF GREATER BOMBAY, 1991

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
80. MAHUL, TROMBE, ETC.	0.044	1	22. MAZGAON	0.009	45
33. DADAR	0.040	2	72. KANHERI	0.008	46
32. SION	0.036	3	46. SANTACRUZ (WEST)	0.008	47
55. ANDHERI (EAST)	0.036	4	38. LOVEGROVE	0.007	48
85. BHANDUP	0.034	5	23. TADWADI	0.007	49
79. CHEMBUR PROPER	0.033	6	51. JUHU	0.007	50
78. BAZAR, CHURCH HALL	0.033	7	88. NAHUR, TULSI, ETC.	0.006	51
60. EKSAR PAKHADI	0.029	8	16. KHETWADI	0.006	52
84. VIKROLI	0.024	9	59. AAREY	0.006	53
52. ANDHERI (WEST)	0.024	10	31. MATUNGA	0.006	54
48. SANTACRUZ (EAST)	0.022	11	17. TARDEO	0.006	55
29. SEWRI	0.020	12	50. VILE PARLE (WEST)	0.006	56
67. KANDIVLI AND CHARKOP	0.019	13	18. GIRGAUM	0.005	57
68. POISAR AND AKURLI	0.019	14	2. MID.& LOW. COLABA	0.005	58
36. WORLI	0.018	15	14. DHOBI TALAO	0.005	59
64. KURAD, DINDOSHI,ETC.	0.018	16	41. PALI HILL	0.005	60
56. JOGESHWARI (EAST)	0.018	17	8. UMERKHEDI	0.005	61
81. GHATKOPAR	0.018	18	82. KIROLE, GHATKOPAR	0.005	62
49. VILE PARLE (EAST)	0.017	19	12. BHULESHWAR	0.005	63
73. MAGATHANE	0.017	20	26. KAMAHIPURA	0.005	64
27. BYCULLA	0.017	21	15. FANSWADI	0.004	65
83. PANJRAPOL	0.016	22	11. KUMBHARWADA	0.004	66
87. MULUND (WEST)	0.015	23	5. ESPLANDE	0.004	67
43. KHAR SCHEME	0.015	24	40. C'WADA & BANDRA HIL	0.004	68
37. CHINCHPOKALI	0.015	25	39. SLAGUHTER HOUSE	0.003	69
21. MAHALAXMI	0.015	26	25. 2nd NAGWADA	0.003	70
69. BORIVALI, SHIMPOLI	0.015	27	47. SANTACRUZ (CENTRAL)	0.003	71
45. HILL & TURNER ROAD	0.014	28	13. MARKET	0.003	72
35. PRABHADEVI	0.014	29	44. KHAR AND PALI	0.003	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
77. SWADESHI MILLS, ETC.	0.014	30	6. MANDVI	0.003	74
28. PAREL	0.013	31	58. G'GAON VILL.,MAROSH	0.003	75
62. MALAD (WEST)	0.013	32	9. DONGRI	0.003	76
65. VALANI, MALVANI,ETC.	0.012	33	24. 1st NAGWADA	0.002	77
63. MALAD (EAST)	0.012	34	76. STN., TAKIA, KURLA	0.002	78
74. DAHISAR	0.011	35	3. FORT (SOUTH)	0.002	79
75. NEW MILLS, KURLA	0.011	36	19. CHAUPATY	0.002	80
30. NAIGAUM	0.011	37	10. KHARA TALAO	0.002	81
70. EKSAR, MANDAPESHWAR	0.011	38	4. FORT(NORTH)	0.002	82
57. JOGESHWARI (WEST)	0.011	39	42. DANDA	0.002	83
1. UPPER COLABA	0.010	40	7. CHAKALA	0.002	84
34. MAHIM	0.010	41	54. MADH	0.001	85
20. WALKESHWAR	0.009	42	71. GORAI AND KULVEM	0.001	86
86. MULUND (EAST)	0.009	43	61. ERANGAL AND DAROLI	0.000	87
53. VERSOVA	0.009	44	66. MANORI ISLAND	0.000	88
GREATER BOMBAY AGGREGATE	1.000		BOMBAY CITY	0.335	

TABLE:2.5(a) GROWTH RATE OF TOTAL POPULATION IN BLOCKS OF
GREATER BOMBAY, 1971-81

ENUMERATOR'S BLOCKS	GR.RATE	RANK	ENUMERATOR'S BLOCKS	GR.RATE	RANK
73. MAGATHANE	14.918	1	75. NEW MILLS, KURLA	2.4325	45
58. GOREGAON VILLAGE	13.500	2	50. VILE PARLE (WEST)	2.3858	46
64. KURAD, DINDOSHI,	11.717	3	49. VILE PARLE (EAST)	2.2049	47
65. VALANI,MALVANI, AKSE	10.179	4	20. WALKESHWAR	2.1536	48
88. NAHUR, TULSI,	9.9730	5	47. SANTACRUZ (CENTRAL)	2.0960	49
74. DAHISAR	9.8498	6	66. MANORI ISLAND	1.8059	50
80. MAHUL, TROMBE,	9.6614	7	37. CHINCHPOKALI	1.5744	51
69. BORIVALI, SHIMPOLI	9.2219	8	1. UPPER COLABA	1.2475	52
70. EKSAR, MANDAPESHWAR	8.8903	9	54. MADH	0.9369	53
68. POISAR AND AKURLI	8.8823	10	28. PAREL	0.9226	54
59. AAREY	8.2150	11	76. STATION, TAKIA,	0.8941	55
85. BHANDUP	7.4517	12	36. WORLI	0.7504	56
21. MAHALAXMI	7.2432	13	39. SLAGUHTER HOUSE	0.6669	57
67. KANDIVLI AND CHARKOP	7.1030	14	82. KIROLE, GHATKOPAR	0.6591	58
53. VERSOVA	7.0772	15	12. BHULESHWAR	0.6139	59
51. JUHU	6.8102	16	2. MIDDLE AND LOWER	0.5513	60
86. MULUND (EAST)	6.8019	17	40. COLWADA AND BANDRA	0.3827	61
57. JOGESHWARI (WEST)	6.6432	18	35. PRABHADEVI	0.3706	62
84. VIKROLI	6.5162	19	30. NAIGAUM	0.2571	63
78. BAZAR, CHURCH HALL	6.4857	20	23. TADWADI	0.1901	64
83. PANJRAPOL	6.4599	21	27. BYCULLA	0.1306	65
72. KANHERI	5.6410	22	22. MAZGAON	0.0861	66
52. ANDHERI (WEST)	5.5565	23	34. MAHIM	-0.231	67
56. JOGESHWARI (EAST)	5.2559	24	44. KHAR AND PALI	-0.320	68
71. GORAI AND KULVEM	5.1096	25	24. 1st NAGWADA	-0.427	69
55. ANDHERI (EAST)	5.0860	26	17. TARDEO	-0.708	70
87. MULUND (WEST)	4.9792	27	31. MATUNGA	-0.718	71
60. EKSAR PAKHADI	4.8788	28	26. KAMAHIPURA	-0.907	72
81. GHATKOPAR	4.7779	29	6. MANDVI	-1.192	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
45. HILL ROAD AND TURNER	4.5448	30	11. KUMBHARWADA	-1.232	74
77. SWADESHI MILLS,	4.3482	31	25. 2nd NAGWADA	-1.295	75
32. SION	4.3390	32	5. ESPLANDE	-1.336	76
38. LOVEGROVE	3.9329	33	19. CHAUPATY	-1.365	77
62. MALAD (WEST)	3.9174	34	16. KHETWADI	-1.404	78
48. SANTACRUZ (EAST)	3.7836	35	15. FANSWADI	-1.577	79
42. DANDA	3.6263	36	9. DONGRI	-1.722	80
33. DADAR	3.4925	37	18. GIRGAUM	-1.794	81
63. MALAD (EAST)	3.4239	38	7. CHAKALA	-1.930	82
41. PALI HILL	3.315	39	8. UMERKHEDI	-1.933	83
46. SANTACRUZ (WEST)	3.2052	40	10. KHARA TALAO	-2.186	84
61. ERANGAL AND DAROLI	2.9806	41	14. DHOBI TALAO	-2.290	85
29. SEWRI	2.7170	42	13. MARKET	-2.882	86
79. CHEMBUR PROPER	2.5614	43	3. FORT (SOUTH)	-2.986	87
43. KHAR SCHEME	2.4677	44	4. FORT(NORTH)	-3.890	88
GREATER BOMBAY					
AGGREGATE	3.665		BOMBAY CITY	0.676	

**TABLE:2.5(b) GROWTH RATE OF TOTAL POPULATION IN BLOCKS OF GREATER
BOMBAY, 1981-91**

ENUMERATOR'S BLOCKS	GR.RATE	RANK	ENUMERATOR'S BLOCKS	GR.RATE	RANK
88. NAHUR, TULSI,ETC.	12.170	1	87. MULUND (WEST)	0.7508	45
68. POISAR AND AKURLI	10.000	2	54. MADH	0.6953	46
1. UPPER COLABA	8.3438	3	82. KIROLE, GHATKOPAR	0.5275	47
64. KURAD, DINDSHI,ETC.	8.2847	4	22. MAZGAON	0.0682	48
73. MAGATHANE	7.9409	5	50. VILE PARLE (WEST)	-0.015	49
53. VERSOVA	6.6951	6	29. SEWRI	-0.017	50
57. JOGESHWARI (WEST)	6.6582	7	47. SANTACRUZ (CENTRAL)	-0.245	51
65. VALANI,MALVANI, ETC.	6.1887	8	36. WORLI	-0.265	52
74. DAHISAR	6.0753	9	72. KANHERI	-0.325	53
67. KANDIVLI AND CHARKOP	5.6636	10	76. STATION, TAKIA, ETC.	-0.351	54
59. AAREY	5.4620	11	24. 1st NAGWADA	-0.367	55
78. BAZAR,CHURCH HALL,..	4.9433	12	83. PANJRAPOL	-0.491	56
71. GORAI AND KULVEM	4.3715	13	20. WALKESHWAR	-0.601	57
80. MAHUL, TROMBE,ETC.	4.2731	14	37. CHINCHPOKALI	-0.617	58
69. BORIVALI, SHIMPOLI	3.9586	15	21. MAHALAXMI	-0.668	59
70. EKSAR, MANDAPESHWAR	3.8885	16	17. TARDEO	-0.795	60
46. SANTACRUZ (WEST)	3.8422	17	31. MATUNGA	-0.810	61
86. MULUND (EAST)	3.6802	18	35. PRABHADEVI	-0.963	62
55. ANDHERI (EAST)	3.5453	19	44. KHAR AND PALI	-0.972	63
40. COLWADA & BANDRA HIL	3.1971	20	34. MAHIM	-1.055	64
32. SION	3.1576	21	5. ESPLANDE	-1.103	65
75. NEW MILLS, KURLA	3.1149	22	25. 2nd NAGWADA	-1.178	66
79. CHEMBUR PROPER	3.0744	23	27. BYCULLA	-1.314	67
51. JUHU	3.0580	24	3. FORT (SOUTH)	-1.371	68
85. BHANDUP	2.9364	25	26. KAMAHIPURA	-1.417	69
61. ERANGAL AND DAROLI	2.9127	26	2. MID. AND LOW. COLABA	-1.467	70
58. G'GAON VILLAGE,MARO.	2.4483	27	9. DONGRI	-1.525	71
81. GHATKOPAR	2.3214	28	16. KHETWADI	-1.549	72
84. VIKROLI	2.2454	29	23. TADWADI	-1.555	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
49. VILE PARLE (EAST)	2.1636	30	18. GIRGAUM	-1.636	74
52. ANDHERI (WEST)	2.1351	31	15. FANSWADI	-1.713	75
62. MALAD (WEST)	1.7898	32	8. UMERKHEDI	-1.901	76
77. SWADESHI MILLS,ETC.	1.6897	33	11. KUMBHARWADA	-2.031	77
56. JOGESHWARI (EAST)	1.6720	34	10. KHARA TALAO	-2.147	78
38. LOVEGROVE	1.5698	35	42. DANDA	-2.176	79
60. EKSAR PAKHADI	1.5061	36	30. NAIGAUM	-2.200	80
48. SANTACRUZ (EAST)	1.3563	37	28. PAREL	-2.412	81
33. DADAR	1.3086	38	14. DHOBI TALAO	-2.675	82
63. MALAD (EAST)	1.2325	39	19. CHAUPATY	-2.712	83
43. KHAR SCHEME	1.0985	40	7. CHAKALA	-3.008	84
66. MANORI ISLAND	1.0131	41	4. FORT(NORTH)	-3.085	85
39. SLAGUHTER HOUSE	1.0030	42	6. MANDVI	-3.231	86
45. HILL & TURNER ROAD	0.9679	43	12. BHULESHWAR	-4.759	87
41. PALI HILL	0.948	44	13. MARKET	-5.621	88
GREATER BOMBAY AGGREGATE	1.418		BOMBAY CITY	-0.341	

**TABLE:2.6 (a) GROWTH RATE OF HOUSEHOLDS IN BLOCKS OF
GREATER BOMBAY, 1971-81**

ENUMERATOR'S BLOCKS	GR.RATE	RANK	ENUMERATOR'S BLOCKS	GR.RATE	RANK
58. GOREGAON VILLAGE	14.165	1	46. SANTACRUZ (WEST)	1.302	45
73. MAGATHANE	12.878	2	37. CHINCHPOKALI	0.874	46
64. KURAD, DINDOSHI,	10.280	3	40. COLWADA AND BANDRA	0.705	47
74. DAHISAR	8.839	4	28. PAREL	0.699	48
88. NAHUR, TULSI,	8.582	5	66. MANORI ISLAND	0.600	49
70. EKSAR, MANDAPESHWAR	8.422	6	34. MAHIM	0.561	50
65. VALANI,MALVANI, AKSE	8.254	7	20. WALKESHWAR	0.498	51
69. BORIVALI, SHIMPOLI	8.161	8	36. WORLI	0.160	52
80. MAHUL, TROMBE,	7.863	9	35. PRABHADEVI	0.004	53
68. POISAR AND AKURLI	7.843	10	1. UPPER COLABA	-0.102	54
59. AAREY	7.616	11	2. MIDDLE AND LOWER	-0.253	55
52. ANDHERI (WEST)	7.259	12	21. MAHALAXMI	-0.284	56
67. KANDIVLI AND CHARKOP	7.163	13	39. SLAGUHTER HOUSE	-0.333	57
53. VERSOVA	6.422	14	23. TADWADI	-0.336	58
86. MULUND (EAST)	5.623	15	24. 1st NAGWADA	-0.407	59
84. VIKROLI	5.229	16	30. NAIGAUM	-0.479	60
57. JOGESHWARI (WEST)	4.973	17	47. SANTACRUZ (CENTRAL)	-0.572	61
72. KANHERI	4.964	18	75. NEW MILLS, KURLA	-0.588	62
85. BHANDUP	4.926	19	27. BYCULLA	-0.630	63
83. PANJRAPOL	4.778	20	19. CHAUPATY	-0.741	64
71. GORAI AND KULVEM	4.433	21	18. GIRGAUM	-1.025	65
78. BAZAR, CHURCH HALL	3.983	22	5. ESPLANDE	-1.327	66
87. MULUND (WEST)	3.969	23	31. MATUNGA	-1.468	67
81. GHATKOPAR	3.864	24	82. KIROLE, GHATKOPAR	-1.492	68
55. ANDHERI (EAST)	3.787	25	22. MAZGAON	-1.608	69
32. SION	3.743	26	76. STATION, TAKIA,	-1.837	70
45. HILL ROAD AND TURNER	3.608	27	54. MADH	-2.040	71
61. ERANGAL AND DAROLI	3.403	28	25. 2nd NAGWADA	-2.289	72
38. LOVEGROVE	3.402	29	8. UMERKHEDI	-2.646	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
56. JOGESHWARI (EAST)	3.325	30	44. KHAR AND PALI	-2.705	74
51. JUHU	3.220	31	26. KAMAHIPURA	-2.724	75
60. EKSAR PAKHADI	3.199	32	17. TARDEO	-2.886	76
50. VILE PARLE (WEST)	2.871	33	15. FANSWADI	-3.030	77
48. SANTACRUZ (EAST)	2.499	34	11. KUMBHARWADA	-3.148	78
62. MALAD (WEST)	2.446	35	3. FORT (SOUTH)	-3.354	79
77. SWADESHI MILLS,	2.310	36	16. KHETWADI	-3.371	80
63. MALAD (EAST)	2.231	37	10. KHARA TALAO	-3.635	81
41. PALI HILL	2.061	38	14. DHOBI TALAO	-3.917	82
33. DADAR	2.041	39	12. BHULESHWAR	-4.119	83
42. DANDA	1.844	40	7. CHAKALA	-4.485	84
43. KHAR SCHEME	1.530	41	4. FORT(NORTH)	-5.280	85
29. SEWRI	1.385	42	9. DONGRI	-5.335	86
49. VILE PARLE (EAST)	1.324	43	13. MARKET	-6.668	87
79. CHEMBUR PROPER	1.311	44	6. MANDVI	-8.090	88
GREATER BOMBAY AGGREGATE	2.160		BOMBAY CITY	-0.490	

**TABLE: 2.6 (b) GROWTH RATE OF HOUSEHOLDS IN BLOCKS OF
GREATER BOMBAY, 1981-91**

ENUMERATOR'S BLOCKS	GR.RATE	RANK	ENUMERATOR'S BLOCKS	GR.RATE	RANK
88. NAHUR, TULSI, ETC.	12.025	1	22. MAZGAON	1.253	45
68. POISAR AND AKURLI	10.082	2	63. MALAD (EAST)	1.239	46
64. KURAD, DINDSHI, ETC.	7.928	3	87. MULUND (WEST)	0.897	47
1. UPPER COLABA	7.830	4	37. CHINCHPOKALI	0.832	48
53. VERSOVA	7.679	5	82. KIROLE, GHATKOPAR	0.705	49
73. MAGATHANE	7.537	6	29. SEWRI	0.631	50
65. VALANI, MALVANI, ETC	6.505	7	36. WORLI	0.625	51
67. KANDIVLI AND CHARKO	6.295	8	3. FORT (SOUTH)	0.455	52
57. JOGESHWARI (WEST)	6.082	9	50. VILE PARLE (WEST)	0.410	53
74. DAHISAR	6.068	10	47. SANTACRUZ (CENTRAL)	0.345	54
71. GORAI AND KULVEM	5.982	11	17. TARDEO	0.247	55
59. AAREY	5.530	12	21. MAHALAXMI	0.213	56
78. BAZAR, CHURCH HALL, ..	4.827	13	52. ANDHERI (WEST)	0.205	57
46. SANTACRUZ (WEST)	4.578	14	31. MATUNGA	0.173	58
70. EKSAR, MANDAPESHWAR	4.517	15	35. PRABHADEVI	0.150	59
40. COLWADA & BANDRA HI	4.397	16	25. 2nd NAGWADA	0.143	60
86. MULUND (EAST)	4.385	17	20. WALKESHWAR	-0.042	61
80. MAHUL, TROMBE, ETC.	4.002	18	44. KHAR AND PALI	-0.184	62
55. ANDHERI (EAST)	3.945	19	23. TADWADI	-0.218	63
51. JUHU	3.937	20	26. KAMAHPURA	-0.314	64
61. ERANGAL AND DAROLI	3.908	21	76. STATION, TAKIA, ETC	-0.324	65
32. SION	3.726	22	34. MAHIM	-0.366	66
41. PALI HILL	3.410	23	72. KANHERI	-0.387	67
79. CHEMBUR PROPER	3.178	24	27. BYCULLA	-0.387	68
54. MADH	2.937	25	8. UMERKHEDI	-0.424	69
69. BORIVALI, SHIMPOLI	2.936	26	9. DONGRI	-0.454	70
85. BHANDUP	2.924	27	11. KUMBHARWADA	-0.463	71
81. GHATKOPAR	2.833	28	16. KHETWADI	-0.685	72
49. VILE PARLE (EAST)	2.693	29	15. FANSWADI	-0.913	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
84. VIKROLI	2.656	30	83. PANJRAPOL	-0.936	74
75. NEW MILLS, KURLA	2.465	31	18. GIRGAUM	-1.164	75
38. LOVEGROVE	2.266	32	10. KHARA TALAO	-1.179	76
62. MALAD (WEST)	2.266	33	5. ESPLANDE	-1.179	77
77. SWADESHI MILLS,ETC.	2.101	34	2. MID. AND LOW. COLAB	-1.354	78
60. EKSAR PAKHADI	1.924	35	30. NAIGAUM	-1.361	79
24. 1st NAGWADA	1.884	36	42. DANDA	-1.584	80
48. SANTACRUZ (EAST)	1.801	37	28. PAREL	-1.735	81
45. HILL & TURNER ROAD	1.684	38	14. DHOBI TALAO	-1.844	82
39. SLAGUHTER HOUSE	1.623	39	6. MANDVI	-2.351	83
33. DADAR	1.545	40	19. CHAUPATY	-2.538	84
56. JOGESHWARI (EAST)	1.538	41	12. BHULESHWAR	-2.581	85
66. MANORI ISLAND	1.482	42	4. FORT(NORTH)	-2.758	86
58. G'GAON VILLAGE,MARO	1.446	43	7. CHAKALA	-2.821	87
43. KHAR SCHEME	1.333	44	13. MARKET	-3.992	88
GREATER BOMBAY AGGREGATE	2.330		BOMBAY CITY	0.530	

**TABLE: 2.7 (a) GROWTH RATE OF TOTAL WORKERS IN BLOCKS OF
GREATER BOMBAY, 1971-81**

ENUMERATOR'S BLOCKS	GR.RATE	RANK	ENUMERATOR'S BLOCKS	GR.RATE	RANK
73. MAGATHANE	15.103	1	79. CHEMBUR PROPER	2.2523	45
58. GOREGAON VILLAGE	11.360	2	47. SANTACRUZ (CENTRAL)	2.2358	46
88. NAHUR, TULSI,	11.317	3	75. NEW MILLS, KURLA	2.0115	47
64. KURAD, DINDOSHI,	11.242	4	12. BHULESHWAR	1.9809	48
69. BORIVALI, SHIMPOLI	10.332	5	43. KHAR SCHEME	1.7384	49
74. DAHISAR	10.066	6	29. SEWRI	1.7206	50
70. EKSAR, MANDAPESHWAR	10.033	7	39. SLAGUHTER HOUSE	1.5170	51
65. VALANI, MALVANI, AKSE	9.4180	8	1. UPPER COLABA	1.2593	52
80. MAHUL, TROMBE,	8.9656	9	76. STATION, TAKIA,	1.1745	53
68. POISAR AND AKURLI	8.0391	10	37. CHINCHPOKALI	1.1371	54
67. KANDIVLI AND CHARKOP	7.7644	11	40. COLWADA AND BANDRA	1.0201	55
53. VERSOVA	7.6961	12	20. WALKESHWAR	0.8707	56
51. JUHU	7.3255	13	82. KIROLE, GHATKOPAR	0.4279	57
59. AAREY	7.2380	14	2. MIDDLE AND LOWER	0.3203	58
86. MULUND (EAST)	7.0223	15	36. WORLI	0.2964	59
72. KANHERI	6.8440	16	21. MAHALAXMI	0.1816	60
83. PANJRAPOL	6.2977	17	28. PAREL	0.0975	61
85. BHANDUP	6.0619	18	30. NAIGAUM	-0.003	62
57. JOGESHWARI (WEST)	5.9521	19	35. PRABHADEVI	-0.032	63
84. VIKROLI	5.8606	20	34. MAHIM	-0.124	64
78. BAZAR, CHURCH HALL	5.5256	21	44. KHAR AND PALI	-0.284	65
52. ANDHERI (WEST)	5.4260	22	23. TADWADI	-0.291	66
81. GHATKOPAR	5.1928	23	27. BYCULLA	-0.318	67
87. MULUND (WEST)	5.0964	24	31. MATUNGA	-0.517	68
56. JOGESHWARI (EAST)	5.0265	25	17. TARDEO	-0.578	69
55. ANDHERI (EAST)	4.7419	26	22. MAZGAON	-0.617	70
60. EKSAR PAKHADI	4.7127	27	19. CHAUPATY	-0.627	71
32. SION	4.6139	28	18. GIRGAUM	-0.795	72
45. HILL ROAD AND TURNER	4.3236	29	11. KUMBHARWADA	-1.050	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
62. MALAD (WEST)	4.1208	30	6. MANDVI	-1.074	74
71. GORAI AND KULVEM	4.0240	31	24. 1st NAGWADA	-1.087	75
77. SWADESHI MILLS,	3.9132	32	15. FANSWADI	-1.465	76
66. MANORI ISLAND	3.5641	33	26. KAMAHIPURA	-1.530	77
41. PALI HILL	3.4428	34	16. KHETWADI	-1.771	78
63. MALAD (EAST)	3.4293	35	7. CHAKALA	-1.790	79
48. SANTACRUZ (EAST)	3.3730	36	9. DONGRI	-1.962	80
38. LOVEGROVE	3.3279	37	25. 2nd NAGWADA	-2.100	81
61. ERANGAL AND DAROLI	3.3030	38	14. DHOBI TALAO	-2.586	82
42. DANDA	3.2223	39	5. ESPLANDE	-3.104	83
46. SANTACRUZ (WEST)	3.1776	40	8. UMERKHEDI	-3.112	84
54. MADH	3.0662	41	13. MARKET	-3.208	85
33. DADAR	3.0469	42	10. KHARA TALAO	-3.397	86
50. VILE PARLE (WEST)	2.7383	43	3. FORT (SOUTH)	-3.836	87
49. VILE PARLE (EAST)	2.5579	44	4. FORT(NORTH)	-5.164	88
GREATER BOMBAY AGGREGATE	2.762		BOMBAY CITY	0.224	

**TABLE: 2.7 (b) GROWTH RATE OF TOTAL WORKERS IN BLOCKS OF
GREATER BOMBAY, 1981-91**

ENUMERATOR'S BLOCKS	GR.RATE	RANK	ENUMERATOR'S BLOCKS	GR.RATE	RANK
88. NAHUR, TULSI, ETC.	11.053	1	43. KHAR SCHEME	1.1414	45
68. POISAR AND AKURLI	9.7692	2	50. VILE PARLE (WEST)	0.8310	46
1. UPPER COLABA	8.7680	3	82. KIROLE, GHATKOPAR	0.7487	47
64. KURAD, DINDSHI, ETC.	8.1282	4	29. SEWRI	0.6568	48
71. GORAI AND KULVEM	8.0834	5	47. SANTACRUZ (CENTRAL)	0.1246	49
73. MAGATHANE	7.2418	6	24. 1st NAGWADA	0.1211	50
53. VERSOVA	6.9534	7	22. MAZGAON	-0.416	51
65. VALANI, MALVANI, ETC.	6.7776	8	83. PANJRAPOL	-0.530	52
67. KANDIVLI AND CHARKOP	6.4032	9	72. KANHERI	-0.536	53
74. DAHISAR	5.8378	10	76. STATION, TAKIA, ETC.	-0.542	54
57. JOGESHWARI (WEST)	5.7800	11	20. WALKESHWAR	-0.555	55
59. AAREY	5.1596	12	36. WORLI	-0.717	56
80. MAHUL, TROMBE, ETC.	4.7938	13	42. DANDA	-0.820	57
78. BAZAR, CHURCH HALL, ...	4.7584	14	34. MAHIM	-0.828	58
46. SANTACRUZ (WEST)	4.6403	15	44. KHAR AND PALI	-0.833	59
86. MULUND (EAST)	4.4871	16	21. MAHALAXMI	-0.934	60
61. ERANGAL AND DAROLI	4.2793	17	17. TARDEO	-0.948	61
70. EKSAR, MANDAPESHWAR	3.9738	18	54. MADH	-0.976	62
79. CHEMBUR PROPER	3.9037	19	31. MATUNGA	-1.012	63
69. BORIVALI, SHIMPOLI	3.8788	20	37. CHINCHPOKALI	-1.171	64
55. ANDHERI (EAST)	3.6573	21	26. KAMAHIPURA	-1.236	65
51. JUHU	3.4795	22	35. PRABHADEVI	-1.416	66
32. SION	3.3787	23	18. GIRGAUM	-1.487	67
40. COLWADA & BANDRA HIL	3.1894	24	25. 2nd NAGWADA	-1.522	68
75. NEW MILLS, KURLA	3.1145	25	5. ESPLANDE	-1.527	69
85. BHANDUP	2.8963	26	2. MID. AND LOW. COLABA	-1.816	70
49. VILE PARLE (EAST)	2.8945	27	15. FANSWADI	-1.837	71
81. GHATKOPAR	2.7689	28	28. PAREL	-1.994	72
52. ANDHERI (WEST)	2.7030	29	8. UMERKHEDI	-2.085	73

ENUMERATOR'S BLOCKS	SHARE	RANK	ENUMERATOR'S BLOCKS	SHARE	RANK
84. VIKROLI	2.4468	30	9. DONGRI	-2.086	74
62. MALAD (WEST)	2.3691	31	27. BYCULLA	-2.190	75
56. JOGESHWARI (EAST)	2.0525	32	11. KUMBHARWADA	-2.221	76
77. SWADESHI MILLS,ETC.	2.0099	33	14. DHOBI TALAO	-2.223	77
58. G'GAON. VILLAGE,MARO.	1.9004	34	16. KHETWADI	-2.328	78
60. EKSAR PAKHADI	1.8913	35	30. NAIGAUM	-2.409	79
63. MALAD (EAST)	1.8574	36	23. TADWADI	-2.416	80
48. SANTACRUZ (EAST)	1.7282	37	10. KHARA TALAO	-2.512	81
33. DADAR	1.5990	38	3. FORT (SOUTH)	-2.820	82
41. PALI HILL	1.5108	39	19. CHAUPATY	-3.175	83
39. SLAGUHTER HOUSE	1.3701	40	4. FORT(NORTH)	-3.218	84
45. HILL & TURNER ROAD	1.2706	41	7. CHAKALA	-4.080	85
38. LOVEGROVE	1.2441	42	6. MANDVI	-4.643	86
87. MULUND (WEST)	1.1796	43	13. MARKET	-4.688	87
66. MANORI ISLAND	1.1573	44	12. BHULESHWAR	-6.398	88
GREATER BOMBAY AGGREGATE	1.89		BOMBAY CITY	-0.54	

**TABLE:2.8(a) SHARE OF LOCATION VARIABLE TO THE TOTAL POPULATION
OF THANE, 1971**

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
ULHASNAGAR (U)	0.175	1	KALWA	0.011	12
THANE (U)	0.161	2	VIRAR	0.009	13
KALYAN (U)	0.127	3	BHAYANDAR	0.008	14
BHIVANDI (R)	0.123	4	MUMBRA	0.006	15
VASAI (R)	0.115	5	MANIKPUR	0.006	16
THANE (R)	0.085	6	SANDOR	0.005	17
KALYAN (R)	0.076	7	SOPARA	0.001	18
BHIVANDI (U)	0.059	8	GHANSOLI	0.0003	19
VASAI (U)	0.043	9	KOLSHET	0.0003	20
ULHASNAGAR (R)	0.036	10	BALKUM	0.0002	21
MAJIVADE	0.016	11			
THANE TOTAL	1.000				

**TABLE:2.8(b) SHARE OF LOCATION VARIABLE TO THE TOTAL POPULATION
OF THANE, 1981**

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
THANE (U)	0.208	1	KALWA	0.014	12
ULHASNAGAR (U)	0.171	2	BHAYANDAR	0.011	13
KALYAN (U)	0.147	3	VIRAR	0.010	14
BHIVANDI (R)	0.101	4	MUMBRA	0.010	15
VASAI (R)	0.089	5	KOLSHET	0.005	16
THANE (R)	0.077	6	MANIKPUR	0.004	17
BHIVANDI (U)	0.076	7	BALKUM	0.004	18
KALYAN (R)	0.065	8	GHANSOLI	0.004	19
VASAI (U)	0.036	9	SANDOR	0.004	20
ULHASNAGAR (R)	0.031	10	SOPARA	0.002	21
MAJIVADE	0.022	11			
THANE TOTAL	1.000				

TABLE:2.8(c) SHARE OF LOCATION VARIABLE TO THE TOTAL POPULATION

OF THANE, 1991

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
THANE (U)	0.3413	1	SOPARA	0.0180	10
KALYAN (U)	0.2691	2	ULHASNAGAR (R)	0.0165	11
BHIVANDI (U)	0.1065	3	VIRAR	0.0146	12
ULHASNAGAR (U)	0.0979	4	KALYAN (R)	0.0122	13
NEW BOMBAY	0.0816	5	NAUGHAR	0.0067	14
BHIVANDI (R)	0.0596	6	THANE (R)	0.0028	15
VASAI (U)	0.0566	7	MANIKPUR	0.0027	16
MIRA-BHAYANDAR	0.0466	8	SANDOR	0.0023	17
VASAI (R)	0.0375	9	GOKHIVARE C.T.	0.0018	18

THANE TOTAL . 1.0000

NOTE : T : TOTAL, U : URBAN, R : RURAL

TABLE:2.9(a) SHARE OF LOCATION VARIABLE TO TOTAL HOUSEHOLDS

FOR THANE, 1971

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
ULHASNAGAR (U)	0.1821	1	KALWA	0.0118	12
THANE (U)	0.1771	2	VIRAR	0.0094	13
KALYAN (U)	0.1376	3	BHAYANDAR	0.0075	14
BHIVANDI (R)	0.1153	4	MUMBRA	0.0071	15
VASAI (R)	0.0975	5	MANIKPUR	0.0055	16
THANE (R)	0.0893	6	SANDOR	0.0043	17
KALYAN (R)	0.0740	7	SOPARA	0.0005	18
BHIVANDI (U)	0.0528	8	BALKUM	0.0003	19
VASAI (U)	0.0403	9	GHANSOLI	0.0003	20
ULHASNAGAR (R)	0.0339	10	KOLSHET	0.0002	21
MAJIVADE	0.0211	11			
THANE TOTAL	1.0000				

TABLE:2.9(b) SHARE OF LOCATION VARIABLE TO TOTAL HOUSEHOLDS

FOR THANE, 1981

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
THANE (U)	0.2232	1	KALWA	0.0143	12
ULHASNAGAR (U)	0.1685	2	BHAYANDAR	0.0120	13
KALYAN (U)	0.1584	3	MUMBRA	0.0108	14
BHIVANDI (R)	0.0942	4	VIRAR	0.0106	15
VASAI (R)	0.0802	5	KOLSHET	0.0055	16
THANE (R)	0.0794	6	BALKUM	0.0046	17
BHIVANDI (U)	0.0687	7	MANIKPUR	0.0043	18
KALYAN (R)	0.0660	8	GHANSOLI	0.0039	19
VASAI (U)	0.0340	9	SANDOR	0.0035	20
ULHASNAGAR (R)	0.0273	10	SOPARA	0.0015	21
MAJIVADE	0.0248	11			
THANE TOTAL	1.0000				

TABLE:2.9(c) SHARE OF LOCATION VARIABLE TO TOTAL HOUSEHOLDS
FOR THANE, 1991

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
THANE (U)	0.3641	1	SOPARA	0.0186	10
KALYAN (U)	0.2826	2	VIRAR	0.0161	11
BHIVANDI (U)	0.0912	3	ULHASNAGAR (R)	0.0146	12
ULHASNAGAR (U)	0.0910	4	KALYAN (R)	0.0101	13
NEW BOMBAY	0.0881	5	NAUGHAR	0.0070	14
VASAI (U)	0.0578	6	MANIKPUR	0.0027	15
BHIVANDI (R)	0.0521	7	THANE (R)	0.0025	16
MIRA-BHAYANDAR	0.0472	8	SANDOR	0.0023	17
VASAI (R)	0.0339	9	GOKHIVARE C.T.	0.0018	18
THANE TOTAL	1.0000				

NOTE: T :TOTAL, U : URBAN, R : RURAL

TABLE:2.10(a) SHARE OF LOCATION VARIABLE TO THE TOTAL WORKERS

OF THANE, 1971

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
THANE (U)	0.161	1	VIRAR	0.009	12
ULHASNAGAR (U)	0.147	2	BHAYANDAR	0.007	13
BHIVANDI (R)	0.140	3	MUMBRA	0.006	14
VASAI (R)	0.123	4	SANDOR	0.005	15
KALYAN (U)	0.117	5	MANIKPUR	0.005	16
VASAI (U)	0.117	6	KALWA	0.002	17
THANE (R)	0.087	7	SOPARA	0.001	18
KALYAN (R)	0.075	8	GHANSOLI	0.000	19
BHIVANDI (U)	0.072	9	KOLSHET	0.000	20
ULHASNAGAR (R)	0.030	10	BALKUM	0.000	21
MAJIVADE	0.019	11			
THANE TOTAL	1.000				

TABLE:2.10(b) SHARE OF LOCATION VARIABLE TO THE TOTAL WORKERS

OF THANE, 1981

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
VASAI (R)	0.226	1	KALWA	0.012	12
THANE (U)	0.194	2	BHAYANDAR	0.011	13
ULHASNAGAR (U)	0.142	3	VIRAR	0.010	14
KALYAN (U)	0.135	4	MUMBRA	0.009	15
BHIVANDI (R)	0.124	5	KOLSHET	0.005	16
BHIVANDI (U)	0.090	6	SANDOR	0.004	17
THANE (R)	0.080	7	MANIKPUR	0.004	18
KALYAN (R)	0.065	8	BALKUM	0.004	19
VASAI (U)	0.034	9	GHANSOLI	0.003	20
ULHASNAGAR (R)	0.033	10	SOPARA	0.002	21
MAJIVADE	0.020	11			
THANE TOTAL	1.000				

**TABLE:2.10(c) SHARE OF LOCATION VARIABLE TO THE TOTAL WORKERS
OF THANE, 1991**

LOCATION	SHARE	RANK	LOCATION	SHARE	RANK
THANE (U)	0.3203	1	ULHASNAGAR (R)	0.0196	10
KALYAN (U)	0.2525	2	SOPARA	0.0175	11
BHIVANDI (U)	0.1223	3	KALYAN (R)	0.0155	12
ULHASNAGAR (U)	0.0837	4	VIRAR	0.0147	13
BHIVANDI (R)	0.0796	5	NAUGHAR	0.0064	14
NEW BOMBAY	0.0795	6	THANE (R)	0.0037	15
VASAI (U)	0.0560	7	SANDOR	0.0028	16
VASAI (R)	0.0469	8	MANIKPUR	0.0027	17
MIRA-BHAYANDAR	0.0455	9	GOKHIVARE C.T.	0.0019	18
THANE TOTAL	1.0000				

NOTE: T :TOTAL, U : URBAN, R : RURAL

**TABLE:2.11(a) RANKING OF GROWTH RATES FOR TOTAL POPULATION
OF THANE, 1971-81**

LOCATION	GRTP	RANK	LOCATION	GRTP	RANK
BHIVANDI (U)	7.626	1	ULHASNAGAR (R)	3.440	16
THANE (U)	7.586	2	KALYAN (R)	3.435	17
KOLSHET	7.303	3	VASAI (U)	3.286	18
THANE (T)	6.539	4	KALWA	3.215	19
KALYAN (U)	6.533	5	BHIVANDI (R)	3.052	20
GHANSOLI	6.348	6	THANE (U.A.)	2.741	21
SOPARA	6.059	7	VASAI (T)	2.685	22
KALYAN (T)	5.482	8	VIRAR	2.632	23
ULHASNAGAR (U)	4.842	9	THANE CITY (M)	2.590	24
BHIVANDI (T)	4.771	10	VASAI (R)	2.452	25
ULHASNAGAR (T)	4.615	11	BALKUM	1.738	26
MUMBRA	4.414	12	MANIKPUR	0.978	27
THANE (R)	4.174	13	SANDOR	0.727	28
BHAYANDAR	3.838	14	VASAI (U.A.)	0.670	29
MAJIVADE	3.488	15	VASAI (M)	0.577	30
THANE TOTAL	5.060				

**TABLE:2.11(b) RANKING OF GROWTH RATES FOR TOTAL POPULATION
OF THANE, 1981-91**

LOCATION	GRTP	RANK	LOCATION	GRTP	RANK
SOPARA	27.4838	1	VASAI (T)	2.4085	12
MIRA-BHAYANDAR	19.2389	2	VASAI (M)	1.2976	13
KALYAN (U)	11.2351	3	SANDOR	1.0913	14
THANE (U)	10.1701	4	MANIKPUR	0.5123	15
VASAI (U)	9.7999	5	BHIVANDI (R)	-0.0538	16
THANE (M)	9.5260	6	ULHASNAGAR (U)	-0.3784	17
VIRAR	8.6044	7	ULHASNAGAR (T)	-0.4720	18
BHIVANDI (U)	8.5567	8	ULHASNAGAR (R)	-1.0094	19
KALYAN (T)	8.0367	9	VASAI (R)	-3.4068	20
THANE (T)	7.0879	10	KALYAN (R)	-11.5109	21
BHIVANDI (T)	4.5688	11	THANE (R)	-27.8249	22
THANE DISTRICT	5.2024				

NOTE: T :TOTAL, U : URBAN, R : RURAL

TABLE:2.12(a) RANKING OF GROWTH RATES FOR TOTAL HOUSEHOLDS
OF THANE, 1971-81

LOCATION	GRHH	RANK	LOCATION	GRHH	RANK
BHIVANDI (U)	7.975	1	VASAI (U)	3.628	16
THANE (U)	7.652	2	VASAI (T)	3.455	17
KOLSHET	7.282	3	VASAI (R)	3.382	18
KALYAN (U)	6.745	4	BHIVANDI (R)	3.318	19
THANE (T)	6.611	5	ULHASNAGAR (R)	3.180	20
SOPARA	6.519	6	KALWA	3.170	21
GHANSOLI	6.449	7	MAJIVADE	3.019	22
KALYAN (T)	5.927	8	VIRAR	2.831	23
BHIVANDI (T)	5.027	9	THANE (U.A.)	2.728	24
ULHASNAGAR (T)	4.561	10	THANE CITY (M)	2.641	25
BHAYANDAR	4.365	11	BALKUM	1.749	26
ULHASNAGAR (U)	4.357	12	SANDOR	1.371	27
KALYAN (R)	4.199	13	MANIKPUR	1.258	28
THANE (R)	4.157	14	VASAI (U.A.)	0.812	29
MUMBRA	4.132	15	VASAI (M)	0.561	30
THANE TOTAL	5.340				

TABLE:2.12(b) RANKING OF GROWTH RATES FOR TOTAL HOUSEHOLDS
OF THANE, 1981-91

LOCATION	GRHH	RANK	LOCATION	GRHH	RANK
SOPARA	30.8155	1	VASAI (T)	3.7145	12
MIRA-BHAYANDAR	19.6046	2	SANDOR	1.8867	13
KALYAN (U)	11.6870	3	VASAI (M)	1.7576	14
VASAI (U)	11.2179	4	MANIKPUR	1.4679	15
THANE (U)	10.7915	5	BHIVANDI (R)	-0.0149	16
THANE (M)	10.3039	6	ULHASNAGAR (U)	-0.2584	17
VIRAR	10.0532	7	ULHASNAGAR (T)	-0.2737	18
BHIVANDI (U)	8.7274	8	ULHASNAGAR (R)	-0.3686 ^o	19
KALYAN (T)	8.5572	9	VASAI (R)	-2.7047	20
THANE (T)	7.8173	10	KALYAN (R)	-12.8270	21
BHIVANDI (T)	4.6190	11	THANE (R)	-28.6416	22
THANE DISTRICT	5.9007				

NOTE: T :TOTAL, U : URBAN, R : RURAL

**TABLE:2.13(a) RANKING OF GROWTH RATES FOR TOTAL WORKERS
OF THANE, 1971-81**

LOCATION	GRTW	RANK	LOCATION	GRTW	RANK
BHAYANDAR	9.860	1	BHIVANDI (T)	5.676	16
MUMBRA	9.363	2	ULHASNAGAR (U)	5.250	17
BHIVANDI (U)	7.770	3	ULHASNAGAR (T)	5.081	18
GHANSOLI	7.549	4	THANE (R)	4.753	19
KALWA	7.502	5	KOLSHET	4.610	20
THANE (U)	7.475	6	BHIVANDI (R)	4.396	21
KALYAN (U)	6.993	7	KALYAN (R)	4.217	22
VIRAR	6.763	8	VASAI (R)	3.808	23
SOPARA	6.763	9	VASAI (T)	3.758	24
THANE (U.A.)	6.681	10	SANDOR	3.174	25
THANE (T)	6.601	11	MANIKPUR	2.847	26
ULHASNAGAR (R)	6.461	12	VASAI (U.A.)	1.863	27
THANE CITY (M)	6.154	13	VASAI (M)	1.314	28
KALYAN (T)	6.003	14	BALKUM	-0.322	29
MAJIVADE	5.765	15	VASAI (U)	-6.632	30
THANE TOTAL	5.580				

**TABLE:2.13(b) RANKING OF GROWTH RATES FOR TOTAL WORKERS
OF THANE, 1981-91**

LOCATION	GRTW	RANK	LOCATION	GRTW	RANK
SOPARA	29.5312	1	VASAI (T)	2.1681	12
MIRA-BHAYANDAR	18.9863	2	MANIKPUR	1.6733	13
KALYAN (U)	11.3254	3	SANDOR	1.5881	14
THANE (U)	10.0741	4	VASAI (M)	1.1403	15
VASAI (U)	9.9332	5	BHIVANDI (R)	0.6145	16
THANE (M)	9.0265	6	ULHASNAGAR (R)	-0.0476	17
VIRAR	8.6141	7	ULHASNAGAR (T)	-0.2031	18
BHIVANDI (U)	8.1568	8	ULHASNAGAR (U)	-0.2392	19
KALYAN (T)	7.9866	9	VASAI (R)	-2.8132	20
THANE (T)	6.7387	10	KALYAN (R)	-9.2888	21
BHIVANDI (T)	4.4821	11	THANE (R)	-25.6407	22
THANE DISTRICT	5.0599				

NOTE: T :TOTAL, U : URBAN, R : RURAL

**TABLE:2.14(a) SHARE OF LOCATION TO TOTAL POPULATION
OF RAIGADH, 1971**

LOCATION	TP 71	RANK	LOCATION	TP 71	RANK
ALIBAG(R)	0.193	1	PANVEL(U)	0.044	7
PANVEL(R)	0.186	2	ALIBAG(U)	0.029	8
KARJAT(R)	0.144	3	KHALAPUR(U)	0.028	9
PEN(R)	0.137	4	KARJAT(U)	0.027	10
URAN(R)	0.091	5	URAN(U)	0.020	11
KHALAPUR(R)	0.084	6	PEN(U)	0.018	12
RAIGADH	1.000				

**TABLE:2.14(b) SHARE OF LOCATION TO TOTAL POPULATION
OF RAIGADH, 1981**

LOCATION	TP 81	RANK	LOCATION	TP 81	RANK
PANVEL(R)	0.100	1	PANVEL(U)	0.025	7
ALIBAG(R)	0.089	2	KHALAPUR(U)	0.020	8
KARJAT(R)	0.067	3	URAN(U)	0.014	9
PEN(R)	0.065	4	KARJAT(U)	0.013	10
URAN(R)	0.042	5	ALIBAG(U)	0.013	11
KHALAPUR(R)	0.041	6	PEN(U)	0.009	12
RAIGADH	1.000				

**TABLE:2.14(c) SHARE OF LOCATION TO TOTAL POPULATION
OF RAIGADH, 1991**

LOCATION	TP 91	RANK	LOCATION	TP 91	RANK
PANVEL(R)	0.084	1	KARJAT(U)	0.038	7
ALIBAG(R)	0.079	2	PANVEL(U)	0.029	8
KARJAT(R)	0.064	3	KHALAPUR(U)	0.022	9
PEN(R)	0.062	4	ALIBAG(U)	0.012	10
KHALAPUR(R)	0.048	5	URAN(U)	0.012	11
URAN(R)	0.040	6	PEN(U)	0.011	12
RAIGADH	1.000				

NOTE: T :TOTAL, U :URBAN, R:RURAL

**TABLE:2.15(a) SHARE OF LOCATION TO TOTAL HOUSEHOLDS
OF RAIGADH, 1971**

LOCATION	HH 71	RANK	LOCATION	HH 71	RANK
ALIBAG(R)	0.205	1	PANVEL(U)	0.046	7
PANVEL(R)	0.171	2	KHALAPUR(U)	0.035	8
KARJAT(R)	0.137	3	ALIBAG(U)	0.032	9
PEN(R)	0.137	4	KARJAT(U)	0.026	10
URAN(R)	0.090	5	URAN(U)	0.021	11
KHALAPUR(R)	0.081	6	PEN(U)	0.020	12
RAIGADH	1.000				

**TABLE:2.15(b) SHARE OF LOCATION TO TOTAL HOUSEHOLDS
OF RAIGADH, 1981**

LOCATION	HH 81	RANK	LOCATION	HH 81	RANK
PANVEL(R)	0.096	1	PANVEL(U)	0.027	7
ALIBAG(R)	0.094	2	KHALAPUR(U)	0.023	8
KARJAT(R)	0.064	3	URAN(U)	0.015	9
PEN(R)	0.063	4	ALIBAG(U)	0.014	10
URAN(R)	0.041	5	KARJAT(U)	0.014	11
KHALAPUR(R)	0.040	6	PEN(U)	0.010	12
RAIGADH	1.000				

**TABLE:2.15(c) SHARE OF LOCATION TO TOTAL HOUSEHOLDS
OF RAIGADH, 1991**

LOCATION	HH 91	RANK	LOCATION	HH 91	RANK
ALIBAG(R)	0.084	1	KARJAT(U)	0.040	7
PANVEL(R)	0.079	2	PANVEL(U)	0.030	8
PEN(R)	0.062	3	KHALAPUR(U)	0.022	9
KARJAT(R)	0.059	4	URAN(U)	0.012	10
KHALAPUR(R)	0.048	5	ALIBAG(U)	0.012	11
URAN(R)	0.040	6	PEN(U)	0.011	12
RAIGADH	1.000				

NOTE: T :TOTAL, U : URBAN, R : RURAL

**TABLE:2.16(a) SHARE OF LOCATION TO TOTAL WORKERS
OF RAIGADH, 1971**

LOCATION	TW 81	RANK	LOCATION	TW 81	RANK
ALIBAG(R)	0.191	1	PANVEL(U)	0.038	7
PEN(R)	0.160	2	KHALAPUR(U)	0.028	8
KARJAT(R)	0.154	3	ALIBAG(U)	0.026	9
PANVEL(R)	0.150	4	KARJAT(U)	0.025	10
KHALAPUR(R)	0.084	5	URAN(U)	0.017	11
URAN(R)	0.083	6	PEN(U)	0.014	12
RAIGADH	1.000				

**TABLE:2.16(b) SHARE OF LOCATION TO TOTAL WORKERS
OF RAIGADH, 1981**

LOCATION	TW 81	RANK	LOCATION	TW 81	RANK
PANVEL(R)	0.097	1	PANVEL(U)	0.0207	7
ALIBAG(R)	0.097	2	KHALAPUR(U)	0.0165	8
KARJAT(R)	0.073	3	KARJAT(U)	0.0115	9
PEN(R)	0.072	4	URAN(U)	0.0111	10
URAN(R)	0.0437	5	ALIBAG(U)	0.0109	11
KHALAPUR(R)	0.0401	6	PEN(U)	0.0073	12
RAIGADH	1.0000				

**TABLE:2.16(c) SHARE OF LOCATION TO TOTAL WORKERS
OF RAIGADH, 1991**

LOCATION	TW 91	RANK	LOCATION	TW 91	RANK
ALIBAG(R)	0.084	1	KHALAPUR(R)	0.052	7
ALIBAG(U)	0.010	2	KHALAPUR(U)	0.015	8
URAN(R)	0.041	3	KARJAT(R)	0.071	9
URAN(U)	0.010	4	KARJAT(U)	0.010	10
PANVEL(R)	0.085	5	PEN(R)	0.072	11
PANVEL(U)	0.042	6	PEN(U)	0.008	12
RAIGADH	1.000				

NOTE: T :TOTAL, U:URBAN, R:RURAL

**TABLE:2.17(a) RANKING OF GROWTH RATES FOR TOTAL POPULATION
OF RAIGADH, 1971-81**

LOCATION	GRTP	RANK	LOCATION	GRTP	RANK
KHALAPUR(U)	5.7014	1	KHALAPUR(R)	1.9958	10
URAN(U)	5.4708	2	PEN(T)	1.7180	11
PANVEL(U)	3.5271	3	PEN(R)	1.6401	12
PANVEL(T)	3.0664	4	KARJAT(T)	1.6203	13
KHALAPUR(T)	3.0642	5	KARJAT(R)	1.5012	14
PANVEL(R)	2.9530	6	URAN(R)	1.4914	15
URAN(T)	2.3204	7	ALIBAG(R)	1.3699	16
PEN(U)	2.2854	8	ALIBAG(T)	1.3641	17
KARJAT(U)	2.2439	9	ALIBAG(U)	1.3155	18
RAIGADH TOTAL	2.1755				

**TABLE:2.17(b) RANKING OF GROWTH RATES FOR TOTAL POPULATION
OF RAIGADH, 1981-91**

LOCATION	GRTP	RANK	LOCATION	GRTP	RANK
KARJAT(U)	12.957	1	KARJAT(R)	1.945	10
KARJAT(T)	4.812	2	URAN(R)	1.911	11
KHALAPUR(R)	4.093	3	URAN(T)	1.705	12
KHALAPUR(T)	3.867	4	PANVEL(T)	1.371	13
PEN(U)	3.794	5	ALIBAG(U)	1.303	14
PANVEL(U)	3.705	6	ALIBAG(T)	1.265	15
KHALAPUR(U)	3.386	7	ALIBAG(R)	1.261	16
PEN(T)	2.221	8	URAN(U)	1.034	17
PEN(R)	1.977	9	PANVEL(R)	0.682	18
RAIGADH (TOTAL)	2.467				

NOTE: T : TOTAL, U : URBAN, R : RURAL

TABLE:2.18(a) RANKING OF GROWTH RATES FOR HOUSEHOLDS
OF RAIGADH, 1971-81

LOCATION	GRHH	RANK	LOCATION	GRHH	RANK
URAN(U)	5.9582	1	KHALAPUR(R)	2.3900	10
KHALAPUR(U)	5.1850	2	KARJAT(T)	1.9802	11
PANVEL(U)	3.8892	3	PEN(T)	1.8237	12
PANVEL(T)	3.7311	4	KARJAT(R)	1.7910	13
PANVEL(R)	3.6877	5	PEN(R)	1.7327	14
KHALAPUR(T)	3.3209	6	ALIBAG(R)	1.5943	15
KARJAT(U)	2.9216	7	URAN(R)	1.5902	16
URAN(T)	2.5684	8	ALIBAG(T)	1.5356	17
PEN(U)	2.4312	9	ALIBAG(U)	1.1479	18
RAIGADH TOTAL	2.4878				

TABLE:2.18(b) RANKING OF GROWTH RATES FOR HOUSEHOLDS
OF RAIGADH, 1981-91

LOCATION	GRHH	RANK	LOCATION	GRHH	RANK
KARJAT(U)	13.677	1	PEN(R)	2.764	10
KARJAT(T)	5.352	2	URAN(T)	2.483	11
KHALAPUR(R)	4.905	3	KARJAT(R)	2.122	12
PANVEL(U)	4.272	4	ALIBAG(R)	1.920	13
PEN(U)	4.257	5	ALIBAG(T)	1.876	14
KHALAPUR(T)	4.184	6	PANVEL(T)	1.847	15
PEN(T)	2.978	7	ALIBAG(U)	1.576	16
URAN(R)	2.867	8	URAN(U)	1.320	17
KHALAPUR(U)	2.787	9	PANVEL(R)	1.056	18
RAIGADH TOTAL	3.014				

NOTE: T : TOTAL, U : URBAN, R : RURAL

**TABLE:2.19(a) RANKING OF GROWTH RATES FOR TOTAL WORKERS
OF RAIGADH, 1971-81**

LOCATION	GRTW	RANK	LOCATION	GRTW	RANK
URAN(U)	6.6928	1	ALIBAG(R)	3.8321	10
PANVEL(R)	6.3091	2	ALIBAG(T)	3.6358	11
KHALAPUR(U)	5.2544	3	KHALAPUR(R)	3.3187	12
URAN(T)	4.6644	4	KARJAT(R)	3.1641	13
PANVEL(U)	4.6190	5	KARJAT(T)	3.1221	14
PANVEL(T)	4.4830	6	KARJAT(U)	2.8603	15
URAN(R)	4.2071	7	PEN(T)	2.7613	16
PEN(U)	3.8750	8	PEN(R)	2.6558	17
KHALAPUR(T)	3.8448	9	ALIBAG(U)	2.0403	18

RAIGADH TOTAL 3.7242

**TABLE:2.19(b) RANKING OF GROWTH RATES FOR TOTAL WORKERS
OF RAIGADH, 1981-91**

LOCATION	GRTW	RANK	LOCATION	GRTW	RANK
KARJAT(U)	12.148	1	KARJAT(T)	2.487	10
KHALAPUR(R)	5.404	2	URAN(R)	2.297	11
KHALAPUR(T)	4.572	3	KHALAPUR(U)	2.201	12
PEN(U)	3.871	4	URAN(T)	2.162	13
PANVEL(T)	3.660	5	ALIBAG(U)	1.744	14
PANVEL(U)	3.418	6	URAN(U)	1.610	15
PEN(T)	2.946	7	PANVEL(R)	1.586	16
PEN(R)	2.848	8	ALIBAG(T)	1.517	17
KARJAT(R)	2.691	9	ALIBAG(R)	1.491	18

RAIGADH TOTAL 2.876

NOTE: T : TOTAL, U : URBAN, R : RURAL

TABLE:2.20 ALIGNMENT OF BLOCKS TO WESTERN/CENTRAL

RAILWAY CORRIDOR			
ENUMERATOR'S BLOCK	RAILWAY	ENUMERATOR'S BLOCK	RAILWAY
1. UPPER COLABA	WR	50. VILE PARLE (WEST)	WR
2. MIDDLE AND LOWER COLABA	WR	51. JUHU	WR
3. FORT (SOUTH)	WR	52. ANDHERI (WEST)	WR
4. FORT(NORTH)	WR	53. VERSOVA	WR
5. ESPLANDE	WR,CR	54. MADH	WR
6. MANDVI	CR	55. ANDHERI (EAST)	WR
7. CHAKALA	CR	56. JOGESHWARI (EAST)	WR
8. UMERKHADI	CR	57. JOGESHWARI (WEST)	WR
9. DONGRI	CR	58. GOREGAON VILLAGE MAROSHI	WR
10. KHARA TALAO	CR	59. AAREY	WR
11. KUMBHARWADA	CR	60. EKSAR PAKHADI	WR
12. BHULESHWAR	CR	61. ERANGAL AND DAROLI	WR
13. MARKET	CR	62. MALAD (WEST)	WR
14. DHOBI TALAO	WR	63. MALAD (EAST)	WR
15. FANSWADI	WR	64. KURAD, DINDOSHI, CHINCHOLI & VADHWAN	WR
16. KHETWADI	WR	65. VALANI,MALVANI, AKSE AND MARVE	WR
17. TARDEO	WR	66. MANORI ISLAND	WR
18. GIRGAUM	WR	67. KANDIVLI AND CHARKOP	WR
19. CHOUPATY	WR	68. POISAR AND AKURLI	WR
20. WALKESHWAR	WR	69. BORIVALI, SHIMPOLI	WR
21. MAHALAXMI	WR	70. EKSAR, MANDAPESHWAR	WR
22. MAZGAON	CR	71. GORAI AND KULVEM	WR
23. TADWADI	CR	72. KANHERI	WR
24. 1st NAGPADA	CR	73. MAGATHANE	WR
25. 2nd NAGPADA	CR	74. DAHISAR	WR
26. KAMATHIPURA	WR	75. NEW MILLS, KURLA	CR
27. BYCULLA	CR/WR		
28. PAREL	CR/WR		

29. SEWRI	CR	76. STATION, TAKIA, KURLA	CR
30. NAIGAUM	CR/WR		
31. MATUNGA	CR,WR	77. SWADESHI MILLS, CHUNA BHATTI,KHAJURI	CR
32. SION	CR	BHATTI AND KASAIWADA	
33. DADAR	CR,WR	78. BAZAR, CHURCH HALL NAUPADA AND VILLAGES	CR
34. MAHIM	WR	79. CHEMBUR PROPER	CR
35. PRABHADEVI	WR/CR	80. MAHUL, TROMBE, GOVANDI, VADAVALI,	CR
36. WORLI	WR	BORLA, MANKHURD AND MANDALA	
37. CHINCHPOKALI	WR/CR	81. GHATKOPAR	CR
38. LOVEGROVE	WR	82. KIROLE, GHATKOPAR	CR
39. SLAGUHTER HOUSE	WR	83. PANJRAPOL	CR
40. COLWAD AND BANDRA HILL	WR	84. VIKROLI	CR
41. PALI HILL	WR	85. BHANDUP	CR
42. DANDA	WR	86. MULUND (EAST)	CR
43. KHAR SCHEME	WR	87. MULUND (WEST)	CR
44. KHAR AND PALI	WR	88. NAHUR, TULSI, GUNDGAON, VIHAR,	CR
45. HILL ROAD AND TURNER ROAD	WR	SAI, KLEROBAD	
46. SANTACRUZ (WEST)	WR		
47. SANTACRUZ (CENTRAL)	WR		
48. SANTACRUZ (EAST)	WR/CR		
49. VILE PARLE (EAST)	WR/CR		

TABLE:2.21 URBAN SPRAWL IN BMR (BUILT UP AREA IN SQ.KM.)

ZONE	1968	1983	1987	ANNUAL GROWTH RATE	
				1968-83	1983-87
1. GREATER BOMBAY	220.61	255.01	301.29	0.6	4.3
a) C.B.D	23.13	23.13	23.13	NIL	NIL
b) ISLAND CITY	53.48	53.48	53.48	NIL	NIL
c) EASTERN SUB.	64.81	78.75	95.43	1.3	4.5
d) WESTERN SUB.	78.75	99.65	129.25	1.6	6.7
2. THANE M.C.	0.36	1.48	48.11	9.7	138.8
3. KALYAN M.C	1.54	25.39	74.43	20.5	30.8
4. NEW BOMBAY	4.61	15.71	75.91	8.5	48.3
5. REST OF BMR	8.43	20.37	75.75	6.05	38.7
TOTAL	235.09	317.95	575.48	2.1	15.6

SOURCE: B.M.R.D.A., BOMBAY.

TABLE:2.22 EXISTING LAND USE DISTRIBUTION IN BMR,1987

LAND USE	AREA IN SQ.KM.	PERCENTAGE
1) URBAN BUILT-UP LAND	561.45	12.68
2) AGRICULTURAL LAND	1856.92	41.93
3) FOREST LAND	1140.55	25.81
4) SALT-PANS	80.05	1.81
5) COASTAL WETLANDS	315.11	7.12
6) WASTE LAND	348.21	7.86
7) WATER BODIES	124.02	2.81
TOTAL	4428.31	100%

SOURCE:- B.M.R.D.A., BOMBAY.

TABLE:2.23 SPATIAL DISTRIBUTION OF EMPLOYMENT IN GREATER BOMBAY

IN 1971,1981 & 1991.

YEAR		AGR. & MIN.	MANFG.	CONST.	TRADE	TRANSPORT	OTHER SERVICES	TOTAL	SHARE in G.B. (%)
CBO	1971 EST.	27	10752	278	44233	2235	5632	63157	37.52
	EMP.	250	67216	2538	284472	58504	102413	515393	33.72
	1981 EST.	79	13231	795	52627	4045	15487	86264	30.35
	EMP.	914	93508	6751	317964	104526	183394	707057	32.15
	1991 EST.	387	10925	1024	20658	1163	8952	43109	8.80
	EMP.	4476	77208	8697	124812	30058	106010	351261	10.23
REST OF ISLAND	1971 EST.	81	15490	79	26041	2676	7242	51609	30.67
	EMP.	853	359601	902	104733	40576	76782	583447	38.18
	1981 EST.	252	22919	405	37070	3758	11617	76021	26.75
	EMP.	804	357519	2102	142295	44311	145224	692255	31.47
	1991 EST.	795	19529	4416	49435	8715	14392	97282	19.87
	EMP.	2535	304635	22918	189759	102761	179919	802527	23.37
SUBURBS	1971 EST.	1388	13593	106	28735	1228	8480	53530	31.81
	EMP.	10729	243129	2085	80365	28256	64860	429424	28.11
	1981 EST.	2582	35261	1572	61611	3905	16991	121922	42.91
	EMP.	22291	340053	5175	224181	61046	147323	8333069	36.38
	1991 EST.	2516	91469	34485	148606	16374	53800	347250	70.92
	EMP.	21717	882120	113924	540726	255975	466482	2280984	66.41
GREATER BOMBAY	1971 EST.	1496	39835	463	99009	6139	21354	168296	
	EMP.	11832	669946	5525	469570	127336	244055	1528264	
	1981 EST.	2913	71411	2772	151308	11708	44095	284207	
	EMP.	24009	791080	14028	684440	209883	475941	2199381	
	1991 EST.	3698	121923	39925	218699	26252	77144	489641	
	EMP.	28728	1263963	145539	855297	388794	752411	34732	

NOTE: EST-ESTABLISHMENT,EMP-EMPLOYMENT.

GROWTH RATES (ANNUAL,COMPOUND)

	EMPLOYMENT		ESTABLISHMENT	
	1971-81	1981-91	1971-81	1981-91
CBD	3.16	-7.00	3.12	-6.94
REST OF ISLAND	1.71	1.48	3.87	2.47
SUBURBS	6.22	10.48	8.23	10.47
GREATER BOMBAY	3.64	4.46	5.24	5.44

SOURCE: B.M.R.D.A.,1991.

**TABLE:2.24 TEHSIL-WISE ESTABLISHMENT AND EMPLOYMENT
IN THANE DISTRICT IN B.M.R. - 1988.**

TEHSIL	ESTABLISHMENTS		MALE	EMPLOYMENT		% TO TOTAL
	NO.	%		FEMALE	TOTAL	
THANE	619	64.95%	113842	13935	127777	75.60%
KALYAN	113	11.86%	12714	1272	13986	8.28%
BHIVANDI	77	8.08%	4110	909	5019	2.97%
VASAI	47	4.93%	1343	586	1929	1.14%
U NAGAR	97	10.18%	17485	2819	20304	12.01%
TOTAL(*)	953	100.00%	149494	19521	169015	100.00%

(*) INCLUDES 10 ESTABLISHMENTS WHICH ARE CLOSED DOWN.

SOURCE: B.M.R.D.A.DOCUMENTS,1991.

**TABLE : 2.25 TEHSIL-WISE ESTABLISHMENTS AND
EMPLOYMENT IN RAIGAD DISTRICT IN B.M.R.-1989**

TEHSIL	ESTABLISHMENTS		EMPLOYMENT		TOTAL	% TO TOTAL
	NO.	%	MALE	FEMALE		
ALIBAGH	75	29.07%	13774	5247	19021	37.88%
PANVEL	105	40.70%	12818	993	13811	27.50%
PEN	23	8.91%	5877	269	6146	12.24%
KHALAPUR	24	9.30%	7067	203	7270	14.48%
KARJAT	13	5.04%	512	94	606	1.21%
URAN	18	6.98%	3139	227	3366	6.70%
TOTAL	258	100.00%	43187	7033	50220	100.00%

SOURCE: B.M.R.D.A.DOCUMENTS,1991.

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**TABLE:2.26 INDUSTRIAL ESTABLISHMENTS AND EMPLOYMENT
BASED ON ECONOMIC CENSUS 1971 AND 1980.**

AREA	NO.OF ESTABLISHMENTS		ANNUAL GROWTH RATE(%)	EMPLOYMENT IN LAKHS		ANNUAL GROWTH RATE(%) 1971-80
	1971	1980		1971	1980	
ISLAND CITY	26242	36150	3.60	4.27	4.51	0.60
SUBURBS	13593	35261	11.17	2.42	3.40	3.85
GR.BOMBAY	39835	71411	6.70	6.69	7.91	2.23
REST BMR	N.A	28896	—	1.51	3.32	9.15
TOTAL BMR	—	171718	—	8.21	11.23	3.54

SOURCE: B.M.R.D.A.DOCUMENTS,1991.

TABLE:2.27 EMPLOYMENT IN UNREGISTERED INDUSTRIAL UNITS IN BMR

AREA	EMPLOYMENT IN LAKHS				ANNUAL GROWTH RATE(%) 1971-80
	1971	%	1980	%	
GR.BOMBAY	0.76	66.1	1.87	48.4	10.52
REST BMR	0.42	33.9	2.00	51.6	18.93
TOTAL	1.18	100.0	3.87	100.0	14.10

SOURCE: B.M.R.D.A.DOCUMENTS,1991.

TABLE:2.28 GROWTH OF FACTORY EMPLOYMENT IN MANUFACTURING SECTOR IN BMR.

AREA	EMPLOYMENT IN LAKHS			ANNUAL GROWTH RATE(%)		
	1976-77	1980-81	1986-87	1976-77 TO 1980-81	1980-81 TO 1986-87	1976-77 TO 1986-87
GR.BOMBAY	5.62	5.69	4.65	0.3	-3.3	1.88
REST BMR	1.64	1.62	1.11	-0.3	-6.11	-3.82
TOTAL BMR	7.26	7.31	5.76	0.02	-3.89	-2.29
INDIA	58.63	68.00	64.19	3.8	-0.98	0.91

SOURCE: B.M.R.D.A. DOCUMENTS, 1991.

Table 2.29 BREAK-UP OF APPLICATIONS ACCORDING TO THE PURPOSE FOR WHICH NOC GRANTED DURING 1979-89.

PURPOSE	SCALE	ZONE-I CITY	ZONE-II SUBURBS, THNE ETC.	ZONE-III NEW BOMBAY	ZONE-IV KALYAN- COMPLEX	ZONE-IV REST OF BMR	TOTAL
1. SETTING UP NEW UNITS	M&L.	157	338	85	35	80	695
	%	22.59	48.63	12.23	5.04	11.51	100.00
	SSI	823	3023	94	149	436	4525
	%	18.19	66.81	0.08	3.29	9.89	100.00
	TOTAL	980	3361	179	184	516	5220
	%	18.77	64.39	3.43	3.52	9.89	100.00
2. EXPANSION OF EXIST- ING UNITS	M&L.	0	0	0	0	0	0
	%	0.00	0.00	0.00	0.00	0.00	0.00
	SSI	68	150	2	5	12	237
	%	28.69	63.29	0.84	2.11	5.06	100.00
	TOTAL	68	150	2	5	12	237
	%	28.69	63.29	0.84	2.11	5.06	100.00
3. SHIFTING OF EXIST- ING UNITS	M&L.	0	1	1	0	0	2
	%	0.00	50.00	50.00	0.00	0.00	100.00
	SSI	24	35	0	0	1	60
	%	40.00	58.33	0.00	0.00	1.67	100.00
	TOTAL	24	36	1	0	1	62
	%	38.71	58.06	1.56	0.00	1.61	100.00
4. SHIFTING AND EXPANSION	M&L.	0	0	0	0	0	0
	%	0.00	0.00	0.00	0.00	0.00	0.00
	SSI	21	39	1	2	1	64
	%	32.81	60.94	1.56	3.13	1.56	100.00
	TOTAL	21	39	1	2	1	64
	%	32.81	60.94	1.56	3.13	1.56	100.00
5. NOT STATED	M&L.	0	6	0	0	1	7
	%	0.00	85.71	0.00	0.00	14.29	100.00
	SSI	4	22	0	1	1	28
	%	14.29	78.57	0.00	3.57	3.57	100.00
	TOTAL	4	28	0	1	2	35
	%	11.43	80.00	0.00	2.86	5.71	100.00
6. GRAND TOTAL	M&L.	157	345	86	35	81	704
	%	22.3	49.01	12.22	4.97	11.51	100.00
	SSI	940	3269	97	157	451	4914
	%	19.13	66.52	1.91	3.19	9.18	100.00
	TOTAL	1097	3614	183	192	532	5618
	%	19.53	64.33	3.26	3.42	9.47	100.00

SOURCE: B.M.R.D.A. DOCUMENTS, 1991.

NOTE : 1) M & L refers to medium and large industries.
2) SSI refers to small-scale industries.

CHAPTER 3
THE NATURE AND SIGNIFICANCE OF THE SUBURBAN TRANSPORT
PROBLEM IN THE BOMBAY METROPOLITAN REGION

CHAPTER 3

THE NATURE AND SIGNIFICANCE OF THE SUBURBAN TRANSPORT PROBLEM IN THE BOMBAY METROPOLITAN REGION

3.1. Transport Profile

A characteristic feature of passenger movements in the Region has been the overwhelming dependence of the travelling public on the mass transport system comprising the suburban railway systems and the bus services. This is seen from the modal distribution of passengers trips for 1969 and 1979 given in Table 3.1. The modal split for 2001 which is also given in the same table is not expected to be very different. In terms of passenger trips, the two modes have nearly equal shares. Table 3.2 gives the growth of Mass Transit Trips in terms of bus and rail trips for the Region.

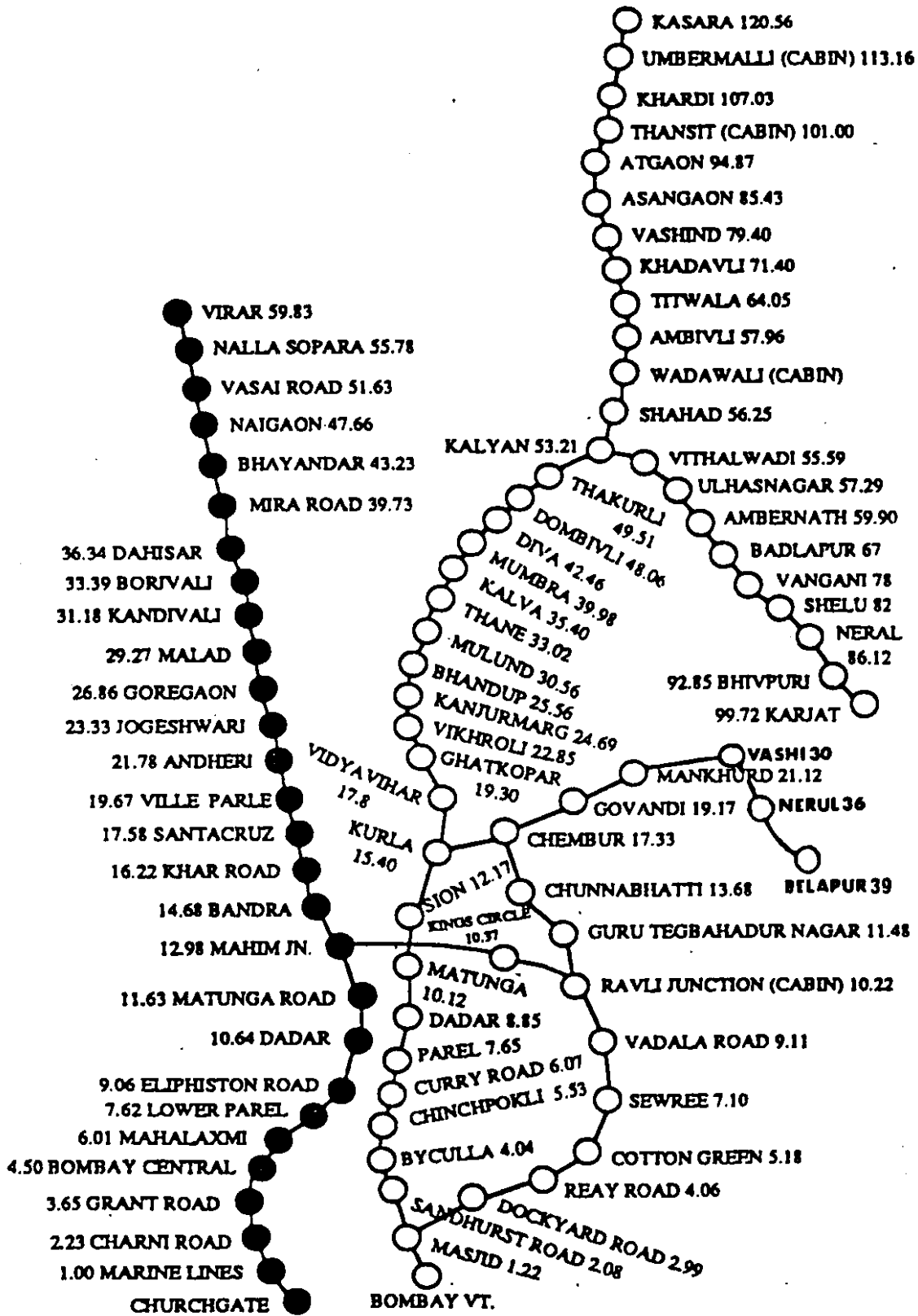
3.1.1 The Suburban Rail System

The suburban rail needs of BMR especially in Greater Bombay and Thane areas are currently being met by five railway corridors, two on the Western Railway system and three on the Central Railway system. Each corridor comprises two tracks, one for 'up' trains and the other for 'down' trains. The two corridors (out of three) on the Central Railway system are between Bombay V.T. and Kalyan (a distance of 53 kms.) which extends further as a single corridor from Kalyan to Karjat (a distance of 67 kms.) in the north-east. In addition, this system has a third corridor on the Harbour side between Bombay V.T. and Bandra/Kurla which runs parallel to the harbour from Masjid to Wadala Road where one section forks off from Raoli Junction towards Mahim/Bandra sections of Western Railway while the other proceeds from Raoli Junction to Kurla to join the main line. Further, a section takes off to the east from Kurla to Mankhurd and then to Vashi, Nerul and Belapur CBD in New Bombay across the Thane Creek. The two corridors of Western Railway extend from Churchgate to Borivali (a distance of 33 kms.) and beyond Borivali a single corridor goes up to Virar (a distance of 27 kms.). Table 3.3 gives some of the main parameters of suburban rail services on Central and Western Railways. A map of the suburban railway system in Bombay is given in Figure 2.

The urbanization and structure of growth of Bombay has been largely influenced by the physical limitations of the island city, the increasing use of the Central Business District (CBD) for commercial purposes and the strong north-south rail corridors. Accordingly, there has always been a huge influx of people into Bombay city in the mornings and a similar movement out of it in the evenings. The location of new industries away from the island and particularly in the suburbs and in Thane

FIGURE:2

MAP OF THE SUBURBAN RAILWAY SYSTEM IN BOMBAY



Note : Figures indicated against the names of stations show distances in Kms. from Churchgate on Western Railway and Bombay VT. on Central Railway ○ System

Source: Status paper on Bombay Suburban Railway System; Need For New Initiatives, Ministry of Railway

and beyond has, no doubt, created reverse commuter flows which has resulted in suburban trains being crowded in both directions, in the mornings as well as in the evenings. Taking into account these characteristics of traffic flows, the railways have been attempting to provide the requisite services. In Table 3.4, we present the total number of suburban trains arriving at and departing from V.T. and Churchgate stations on a day in 1992. Also given in the same table are corresponding figures for the year 1968. It is observed that while the number of scheduled trains on the Central Railway system has increased by 50%, the number on the Western Railway system has doubled. On Central Railway, 68 trains arrive at V.T. between 9 to 11 a.m. with an average frequency of 1.76 minutes and 60 trains leave V.T. between 5 and 7 p.m. to average a 1.93 minute service frequency (as against 2.5 and 3 minutes respectively in 1968). On Western Railway, the average frequency turns out to be 1.8 minutes in the morning and 2.4 minutes in the evening (as against 3.6 minutes in the morning and evening in 1968). Though a majority of these services are run between V.T. and Kalyan on the Central Railway sections and Churchgate and Borivili on the Western Railway sections, there has been an increasing trend in services to other terminals on both the systems. This data is given in Table 3.5 for the past five years. Some additional information by way of frequency of trains to the various terminals on Central Railway is given in Table 3.6.

To cater to heavy traffic flows especially during peak hours, a number of trains are accelerated by elimination of halts. These trains are referred to as "fast" trains as against "slow" trains which halt at every station. A major consideration for providing "fast" trains is to cater to passengers traffic originating from longer distances, for example, from stations beyond Kalyan on Central Railway and stations beyond Borivali on Western Railway. Further, most "fast" trains are made "slow" for a portion of their journey. On Central Railway, trains from Kalyan and beyond are "slow" upto Thane and "fast" for the journey between Thane and V.T. As there is a lot of originating and terminating traffic on stations between Churchgate and Bombay Central on Western Railway, "fast" trains are normally operated between Bombay Central and Borivali. Table 3.7 gives some idea of scheduled "fast" trains from and to V.T. and Churchgate station during the day in 1992.

We now turn to a consideration of the growth of suburban passenger traffic alongwith the growth of train services on the Bombay suburban sections of Central and Western Railways. Table 3:8 and 3.9 give details of passengers carried, passenger kilometers, average lead of traffic, train kilometres, vehicle kilometers and the average number of trains run on the two suburban systems for the period 1970-71 to 1991-92. Looking at the indices for Central Railway, it is observed that while the number of passengers carried doubled during the period, the number of trains increased by 50% only. This does not quite reflect the complete picture since we see that passenger kilometers

have gone up by more than 150% . Thus, the number of trains running longer distances has been increasing which is also revealed by figures relating to Train kilometres. Further, over a period of time, the size and composition of the rakes have been changing with the result that vehicle kilometres have also doubled. Considering the trend in the number of rakes in service it can be inferred that, given the present coverage of the network, a major problem in increasing the number of trains has been the inadequacy in terms of rakes.

Looking at the Western Railway data, the growth of traffic in terms of passengers carried and passenger kilometres has been relatively much higher than on Central Railway. We have already noted the growth rates in population in the western suburbs and beyond along this railway corridor which has been considerably higher thereby imposing greater and an ever increasing burden on the rail system. It is also observed that while the growth in passengers carried was 80% during 1971-81, it has declined considerably during 1981-91. On the other hand, while passenger kms. went up by only 96% between 1971-81, these had increased by more than 120% in 1981-91. It is in the latter decade that the average lead went up sharply from 17.3 kms. to 22.9 kms. When looked at from the point of view of growth in train services, the index rose by 100% with other relevant and concomitant variables also growing at similar rates. Compared to the growth in passengers carried and passenger kms, growth in train services has lagged behind considerably on both the systems. Ideally, it is necessary to observe the growth in capacity (train capacity) in relation to the growth in the demand for services. Unfortunately, capacity figures are not available on a consistent basis over a period of time since the capacity of each train varies with the composition and type of rake and these have changed considerably during the period under consideration. Typically, a nine-car Jessop rake which is in widespread use on suburban rail systems in India (Broad Gauge) has a carrying capacity of 1726 people. Table 3.10 gives details of accommodation on a present day suburban train.

Given these capacity figures, even a simple calculation based on the number of trains run every day gives us an idea of the excess demand situation prevailing in the context of suburban rail services in Bombay. Taking the average number of trains operated daily on Central Railway along with the capacity of each train, we have a figure of 1.86 millions which the system can handle compared to the figure of 2.38 millions handled everyday, given that the traffic is evenly spread between trains and over the day. On the Western Railway, the figures turns out to be 1.6 millions compared to the actual figure of 2.5 millions. If we consider the fact that a significant portion of the travel is in the peak hours 8.30 a.m. to 11.00 a.m. in the morning and 5.00 p.m. to 8.00 p.m. in the evening (taking the mass transportation system as a whole the hourly variation of trips

for work is peaked around 6.00 - 9.00 a.m. in the morning and 4.00 --7.00 p.m. in the evening - Figure 3 gives hourly variation of mass transport trips by purpose), then it does appear reasonable to conclude that suburban passengers are travelling in conditions of extreme overcrowding and the number of passengers actually traveling far exceeds the carrying capacity of trains. These conditions are referred to as "crush load" conditions. We are not aware of any systematic study made on this aspect on either of the Railways and only rough estimates based on occasional counts have been made. On the basis of some trials conducted on Western Railway in 1967, the crush load capacity of a 9 car rake was around 3000. From recent observations, it appears that during the peak periods as many as 3500 (perhaps more) are being accommodated in one train. Consequently, as many as 10 passengers are being squeezed into the space of a single square metre.(Mokashi, 1992).

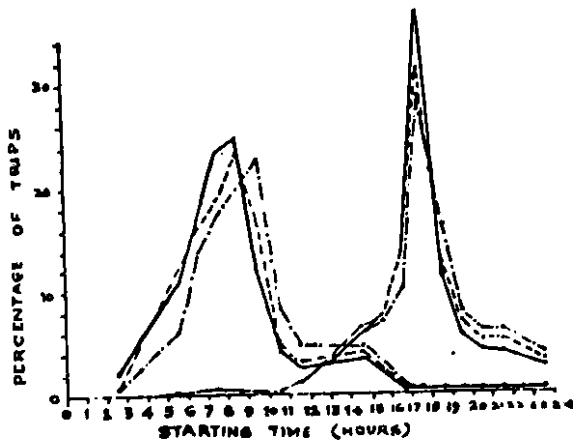
3.1.2. The Role of B.E.S.T.

Though the principal means of travel between Bombay island and the adjoining urban centres have been provided mainly by suburban rail services, travel between the island and the suburbs has been catered to by B.E.S.T. and suburban rail systems. The B.E.S.T. is owned and operated by the Bombay Municipal Corporation. Its jurisdiction is: a) the Greater Bombay area and b) such annexed regions where it is authorised to operate. It is one of the better managed city bus transport undertaking in the country. Table 3.11 gives some salient features of B.E.S.T.

Historically, B.E.S.T. service have greatly supplemented the mass transportation facilities provided by the railways to meet the travel needs of an increasing number of commuters. Because of the limitations imposed by fixed track alignments, Western and Central Railway suburban services have not been able to cater to the needs of passenger trips having origins or destinations at more than convenient walking distance from a suburban railway station. B.E.S.T. currently operates more than 300 routes which are categorized as 'Ordinary' and 'Limited' services. This categorization is given in Table 3.12. In order to understand the relationship of B.E.S.T. services with those of the suburban railway systems, these routes can be further classified into three groups: (a) Feeder Routes, (b) East-West Routes and (c) Trunk Routes. The Feeder routes are those which provide the link between residential areas and the nearest suburban railway stations. Most of these routes are less than 6 kms. in length. Obviously, these routes supplement or complement suburban rail services. Similarly, east-west routes which are not possible along suburban rail corridors also supplement the suburban rail systems. It is primarily the Trunk Routes which can be deemed parallel and substitutes to the suburban railway services. In Table 3.13, we give the classification of major B.E.S.T. routes into these categories. We provide in Table 3.14 the frequency distribution of

FIGURE: 3

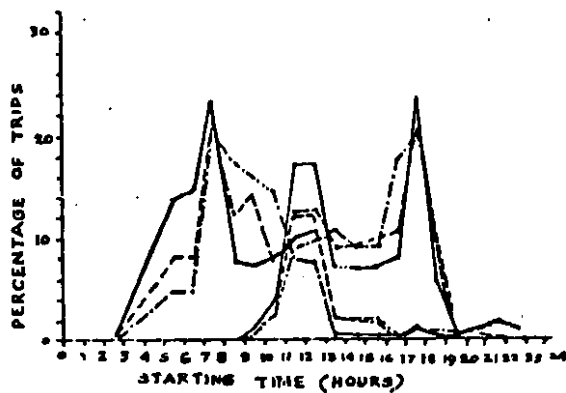
HOURLY VARIATION OF MASS TRANSPORT TRIPS BY PURPOSE



HOURLY VARIATION OF MASS TRANSPORT TRIPS FOR WORK

LEGEND

WORK ISLAND SUBURBS REGION



HOURLY VARIATION OF MASS TRANSPORT TRIPS FOR EDUCATION

LEGEND

EDUCATION RETURN ISLAND SUBURBS REGION



HOURLY VARIATION OF MASS TRANSPORT TRIPS FOR OTHER PURPOSES

LEGEND

OTHERS ISLAND REGION SUBURBS RETURN

SOURCE: B.M.R.D.A., DOCUMENTS.

passengers by distances and the corresponding fare slabs for the year 1992-93. As most of the Trunk routes have distances exceeding 14 kms. ,the number of passengers in the fare classes of 133.3 millions and above can be taken as the frequency on these routes. Also provided in Table 3.15 are figures on the number of tickets issued on the Trunk routes.

The growth of B.E.S.T. services is largely demand driven. Usually, existing routes are extended or new connections are established according to the pressure of demand experienced. The criterion that is presently applied in deciding the establishment of a new route is that the collections on a daily basis must equal Rs.3000. B.E.S.T. also classifies routes on the basis of profits/losses such as :

a) A routes - those routes which cover fixed and variable costs only, b) B routes - which cover variable costs only and c) C routes - which cover neither i.e purely loss making units. Table 3.16 gives the classification of routes under these categories for February 1993. It is obvious that nearly 85% of the routes are loss making.

B.E.S.T. fares are fixed within the limits prescribed under the Transport Worker's Act by the State Transport Commissioner. These are formulated by the appropriate B.E.S.T. Committee and then approved by the Bombay Municipal Corporation. The current fare structure (in force from May 15,1992) is given in Table 3.17. Generally,it is difficult to compare the fare structure of the two suburban services, bus and rail, for the following reasons:

a) quality of services which includes comfort, accessibility, etc. are obviously superior in the case of B.E.S.T. services, b) bulk of suburban rail commuters use season tickets which provide for any number of journeys at costs equal to 8-20 single journey fares on Railways - no such fare alternative is available on B.E.S.T. The only concessions offered are for school going children and handicapped persons. and c) single fares are also much lower on B.E.S.T.

We now consider the growth in the various parameters of the bus system. Table 3.18 gives these figures for the two decades 1971-1991. While the number of passengers carried has nearly doubled, passenger kilometres have grown only at a slightly faster rate reflecting the fact that average distances have not increased. This is revealed by figures on average lead which shows an increase for three years in the mid-eighties. However, a substantial part of the growth in passengers carried took place between 1971-81. On the other hand, the number of routes increased by only 50% between 1971-81, while during 1981-91, there was nearly a 100% expansion of the route network. In the case of the number of buses in service, the expansion has been fairly steady in 1971-81, but after 1983-84 the fleet remained more or less the same with a steep rise occurring in 1992-93.

When we consider the rapid expansion of the network in 1981-91 alongwith the almost negligible increase in average lead (except for 3 yrs.), it appears that the expansion has been mostly in terms of the shorter, feeder routes. Moreover, we find that the proportion of passengers carried on the Trunk routes has been steady in the past three years i.e. around 25%. In our discussions with B.E.S.T. officials, we were given to understand that the share of Trunk routes has hardly changed. However, in absolute terms, traffic on these routes has been steadily increasing at about the same rate as on other routes. Between the years 1982-83 and 1986-87, there appears to have been a shift to the railways which is often believed to be an effect of steep hikes in B.E.S.T. fares (1982 & 1984) especially in the shorter distance slabs. This may have contributed to the higher leads. We may thus expect greater substitution in short distance routes. Finally, we observe that vehicle utilization has hardly shown any appreciable increase reflecting extreme congestion on roads which increases the non-productive running components of bus services. To get an idea of the speed of travel on some of the major arterial roads in Greater Bombay, we need to look at Table 3.19 which indicates the rapid decline in speeds.

3.2. An Assessment

Any assessment of the performance of the transport system should take into account the size of the demand, changing spatial patterns of economic activity and the evolving policy framework in the Region. We have already examined the demographic and economic activity profiles with a view to understanding the emerging requirements for mass transport. We now examine the policy framework within which the transport sector evolved with a focus on emerging issues in the context of suburban railway operations. For our analysis, we confine ourselves to that framework that has been in place since the formation of the Bombay Metropolitan Region in the late sixties.

The major policy makers in the Region as far as the transport sector is concerned are the Zonal Railways, B.E.S.T., State Government organisations like the Bombay Metropolitan Region Development Authority (B.M.R.D.A.), the City Industrial Development Corporation (CIDCO), the Bombay Municipal Corporation and the other municipal corporations and councils of the Region.

A major common recommendation of several Committees which were constituted to examine the basic problem of increasing household and economic activity in Greater Bombay, was to develop a major metro centre on the mainland across the Thane Creek. Accordingly, the development of New Bombay on the Twin City was taken up by CIDCO in 1970. The development plan for New Bombay projected a population level of 2 millions and 0.8 million jobs by 2000 A.D. This was a part of the Regional Plan for the Region which was finally formalised in 1973. With the establishment of the B.M.R.D.A. in 1975, the stage was set for the implementation of the Plan.

Soon thereafter, the B.M.R.D.A. adopted a plan for an Optimal Regional Structure (1977) for the future development of the Region. Under this plan, which incorporated the Regional Plan, an alternative structure of regional growth was envisaged. The pattern of development was to be in terms of a poly-nucleated structure where, besides South Bombay & New Bombay, the Bandra-Kurla Complex and the Kalyan Complex were to be developed as major regional growth centres. The quantitative analysis that was undertaken in the context of identifying the Optimal Regional Structure revealed " that the perpetration of the existing monocentric pattern of development (scenario 2) as against the poly-nucleated pattern of development would imply an additional cost of about Rs.1200 crores over the next two and half decades, just to maintain the present standards of quality of life ".(B.M.R.D.A., 1977,p.1). Even mass transportation costs in terms of investments costs differed significantly between the two scenarios. " These cost figures illustrate the enormous gains that could be obtained in reducing public transportation investments in Bombay, if action is taken now initiate determined efforts to move towards scenario 2 type of development" (Mukherjee,1979, p,52). For the purpose of control of development and economic activity in south Bombay, the notification under section 13 of the BMRDA Act 1974 (issued in 1977) was recommended to be included in the revised Development Plan of Greater Bombay as a permanent feature of development control.

The growth of New Bombay after twenty years of efforts has been modest and the population, as we saw earlier, is only a fraction of what was targeted. On the other hand, significant growth has occurred along the Western rail corridor (Mira Bhayander to Virar). The decentralised industrial location policy of the State Govt. in the early years of the Fifth Plan has had some success with a shift in employment opportunities to areas in the Eastern suburbs and beyond as far as Thane and Kalyan. But the policy has not had a significant impact on the overall regional concentration of economic activity. Moreover, the pace of development of the Bandra-Kurla Complex has been tardy. At the same time, the pace of development around Nariman Point in South Bombay has not stopped since the control of development was within the jurisdiction of municipal authorities and was not included in statutory development plans. According to a recent assessment of the Regional Plan for the Region (B.M.R.D.A., 1992), resources for infrastructure investment required for supporting and promoting polycentric development especially those required for mass transportation facilities have not been forthcoming easily.

We now turn our attention to the supply side with a focus on railways' efforts to meet emerging requirements. The planning for expansion of services can be looked at from the point of view of long term strategies to expand the network and short term plans to upgrade the capacity of

the existing system. To meet the long term requirements of north-south traffic in Greater Bombay, Metropolitan Transport Project (MTP) of the Railways had, in 1972, recommended the following additional corridors:

i) an integrated scheme (a sixth corridor) comprising an independent corridor from Goregaon on the Western Railway to Fort Market in the Central Business District making use of the existing intermediate link between Bandra to Raoli junction alongwith an extension northwards of the Central Railway Harbour Branch by a new pair of lines to Bhandup with a grade free bifurcation of the Kurla - Mankhurd Branch at Kurla;

ii) rapid transit corridor (a seventh corridor) from Kurla to Bandra and south to Churchgate, V.T. and further to the south to serve Bombay area with a section in the north to serve the university area, airport, etc.

It is obvious that both these schemes were intended to provide easy access to the southern parts at a time when the need was to decongest the Region. Both schemes fitted scenario 1 considered by B.M.R.D.A. in its attempt to formulate an Optimal Regional Structure which would have been an expensive proposition, as pointed out earlier.

Neither of these projects has been accepted in its entirety. Only a few individual projects, mainly parts of the sixth corridor project, have been taken up. A fly over connecting the Harbour branch of Central Railway with the slow corridor of the Western Railway has been completed in 1983. This enables direct services between V.T. and Andheri. However, the construction of an additional pair of lines from Bandra to Andheri, which was taken up in 1983, is yet to be completed.

The MTP had also recommended a rail link from Bandra to Kurla which was to form part of an east-west corridor going across the Thane Creek from Mankhurd to Panvel via Vashi and Belapur. The purpose of this corridor was to serve the Bandra-Kurla complex with a view to provide relief to existing corridors around Kurla on Central Railway and Bandra on the Western Railway and also to provide easy access between the Twin City and Greater Bombay. At present, only the Mankhurd-Belapur link has been established and this too has been possible only with active participation from CIDCO.

In regard to short term options, the relevant strategies have been to undertake optimisation works on existing corridors to increase train frequency. On the Western Railway, Phase I of the plan to quadruple the section between Grant Road and Churchgate and other works were completed in the late seventies to enable 4 minute services. However, it was only in the eighties, with the acquisition of additional rakes, that four minute services have been possible. Obviously, Phase II of the plan to optimise further to enable 3 minute services (which was to cost Rs. 19.52 crores

in 1972 prices) has been delayed. In the case of Central Railway, Phase I which was to involve an outlay of Rs. 37.41 crores (at 1972 prices) and enable a five minute service was completed only in the mid eighties. "In view of the backlog of their works programme in this regard, it would not be possible for the Central Railway to achieve optimisation beyond five minutes frequency in the Seventh Plan period " (B.M.R.D.A., 1985, p.60).

A major problem in achieving higher frequencies has been heavy shortfalls in the acquisition of rakes. Table 3.20 gives figures for acquisition of EMU units for the Indian Railways in terms of targets and achievements. Table 3.21 provides a disaggregate picture of the holdings Electric Multiple Coaches and Trailers of the Central and Western Railways. It is obvious that additions to the stock have been substantial only in the latter half of eighties. For the Central Railway this increase is clearly reflected in the increase in number of rakes in service during the same period. (See Table 3.8). Thus, shortages in production and procurement of EMU rakes have been a significant limiting factor in expansion of services.

While the capacity of the mass transit system to cope with peak period demand is a major problem, the question of efficiency in provision is also increasingly being viewed with concern. In particular, there is the problem of financing unprofitable services that has lately come to the surface in a prominent way. In this context, the tariff policy assumes significance. This policy is the other important factor, besides land use policy, which determines transportation demand. Public urban transportation by rail and bus are heavily subsidized all over the world (Button, 1984). In developed countries, a subsidized fare is required to attract people from personalised modes. On the other hand, in many developing countries, the dominant emerging problem being the excessive growth of large cities especially metropolitan ones and where, consequently, the situation is one of excess demand, it has been found difficult to rationalize the fare structure to contain demand. The provision of subsidized public transport facilities has resulted in a distortion of the urban structure by introducing long distances between home and job - a process of suburbanisation, extended suburbanization (as it took place in Bombay) and so on, leading to huge urban agglomerations with concomitant problems of urban poverty, unemployment, inadequacy of housing and other deficiencies of infrastructure, especially transport facilities. Thus, there has arisen quite often in the past an argument for policies to contain urbanization and, thereby, the size of cities. More specifically, the relevant question is : Is it not possible to restrict growth of cities to an optimum size? The idea of an optimal city is based upon a comparison of hypothetical cost and benefit curves with city size (population) measured on the horizontal axis. Adopting the common assumption of an S-shaped benefit curve and a U-shaped cost curve, it is presumed that net benefits will

become zero at some finite city size. Hence, this is the optimal city size. However, this is not easy since a bewildering set of alternative optima can be identified. Moreover, the meaning of benefit and cost curves is rather obscure. The economic and social benefits of large relative to small cities appear stronger in developing than in developed countries. Furthermore, social cost will probably remain lower in developing countries despite increase in pollution, congestion, etc. There is, thus, a basis for arguing that the 'hypothetical' critical city size that provides maximum net benefits, if these could be measured, would be greater in developing countries (Richardson, 1977).

Urbanisation is very often accompanied by rapid growth in income and employment opportunities and that it might not even be in the best interests of the concerned countries to stop economic growth of cities like, for example, Bombay. Further, it is being increasingly realised that it is not possible to stop or arrest migration into cities even if it is desirable to do so. " The presence of poverty, pollution, inadequate housing and other metropolitan symptoms has no direct impact on the attractiveness of cities to business " (Richardson,1977,p.67). It is more likely that it is possible to influence the growth of urban areas in desirable ways by a reorientation of land use policies in such a way that the city grows into an organic and vital agglomeration node (Mukherjee, 1979). In the case of the Bombay Metropolitan Region, the Region was expected to evolve as a series of nodes of which there is a core which is highly urbanized, other intermediate areas with lesser degree of urbanization and also predominantly agricultural and rural areas at the periphery. While the core areas and its suburbs were expected to retain their importance in a number of ways, the other nodes were expected to assume greater significance in terms of economic activity levels. In such a situation, planning at the regional level is required even in regard to the transport system. This is true in the case of all other major urban agglomerations in the country where the concept of regional planning is increasingly taken to be the proper unit for socio-economic planning. Accordingly, the concept of the suburb and its spread is no longer important for the purpose of planning the rail system.

The following question then arises: Is such a framework emerging in India ? To answer this, we need to look backwards. Historically, rail transport which emerged in the metropolitan suburbs in India got merged into the framework of the national railway system. There were no differences in the rolling stock characteristics for meeting suburban and inter-city demands. The two were dealt with on the same lines. The resulting complexities were many. The growth of cities was not accompanied by the required reorganisation and necessary expansion of the suburban railway network. As the railways were meeting transport demands and were a separate organisation, the

role of local agencies which were responsible for the growth of the city and, therefore, generation of transport demand in the city got virtually eliminated, resulting in haphazard growth without proper thought for land use pattern and urban form. In fact, it is felt that if local bodies had been actively associated with the provision of all mass transit modes, a better land use pattern would have emerged. The point is that the demand for suburban rail services is distinct in the sense that it differs from the demand for freight and non-suburban services. Moreover, suburban rail services generate localised benefits for local economic activities. These features necessitate a response that is typically local in character. For example, in a large metropolitan city like Bombay, the size of the demand is so large that there is obviously a need for a distinct network of assets, separate maintenance, and a specific menu of rail services. Within a local framework even with a subsidized tariff structure, it should be possible to ensure financial stability by attempting to internalize the externalities. At present, the tariff structure is based on the 'Ordinary' class fare structure which is based on national parameters. Again in the context of investment, national priorities receive overriding importance while local needs often remain neglected. Given the present set up, regional needs would suffer the same fate. We take up these issues in greater detail in Chapter 6 where financial and organisational options for the future are take up for discussion.

**TABLE : 3.1 MODAL SPLIT OF PASSENGER TRIPS
IN THE BOMBAY METROPOLITAN REGION(%)**

	1969	1979	2001
MASS TRANSIT	78.00	85.00	84.00
CAR	10.00	6.50	7.50
TAXI	10.00	6.50	5.50
OTHER PASSENGER MODES	2.00	2.00	3.00

NOTE: FIGURES FOR 1969 ARE FOR GREATER BOMBAY

SOURCE: 1. THE MASS TRANSPORTATION STUDY, BOMBAY, 1969.
2. PLANNING OF ROAD SYSTEM FOR BOMBAY
METROPOLITAN REGION, VOL.2, C.R.R.I.,
NEW DELHI, 1983.

TABLE : 3.2 MASS TRANSIT TRIPS IN THE BOMBAY METROPOLITAN REGION**METROPOLITAN REGION (MILLIONS)**

YEAR	BUS	RAIL	TOTAL
1970-71	23.48	23.31	46.79
1971-72	24.81	24.47	49.28
1972-73	25.31	26.51	51.82
1973-74	29.46	27.51	56.97
1974-75	29.71	26.21	55.92
1975-76	30.73	30.85	61.58
1976-77	33.03	33.35	66.38
1977-78	35.46	36.22	71.68
1978-79	39.46	40.26	79.72
1979-80	41.52	36.47	77.99
1980-81	42.95	38.69	81.64
1981-82	40.61	39.76	80.37
1982-83	36.41	39.12	75.52
1983-84	36.52	36.35	72.87
1984-85	34.87	37.58	72.45
1985-86	38.44	37.91	76.35
1986-87	41.98	38.56	80.54
1987-88	42.98	41.99	84.97
1988-89	45.43	39.63	85.06
1989-90	41.79	41.59	83.38
1990-91	41.19	44.88	86.07
1991-92	45.36	47.81	93.17

SOURCE: BASIC TRANSPORT AND COMMUNICATION

STATISTICS FOR BOMBAY

METROPOLITAN REGION, B.M.R.D.A., 1992.

**TABLE : 3.3 MAIN PARAMETERS OF SUBURBAN RAIL
SERVICES IN THE BOMBAY AREA,1992**

	CENTRAL RAILWAY	WESTERN RAILWAY
1. Route Kilometrage (kms)	200	60
2. Corridors	3	2
3. Terminals	16	10
4. Total No.of Stations	55	28
5. No.of rakes in service	75	60
6. No.of trains run daily	1080	923
	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; border-radius: 50%; padding: 5px; margin-right: 10px;"> Main Line-658 Harbour Line-422 </div> <div style="font-size: 2em;">}</div> </div>	
7. *Passengers carried (daily in millions)	2.28	2.50
8. Trains run during peak hours	<div style="display: flex; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">}</div> <div> Morning Peak 93 (Main Line:64) (Harbour Line:29) Evening Peak 103 (Main Line:69) (Harbour Line:34) </div> </div>	<div style="display: flex; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">}</div> <div> 199 182 </div> </div>
9. *Average Passenger lead (km)	20.6	22.9

*Based on annual figures for 1991-92

SOURCE : CENTRAL AND WESTERN RAILWAYS,1992

**TABLE : 3.4 NUMBER OF TRAINS ARRIVING AT AND LEAVING
BOMBAY V.T. AND CHURCHGATE SUBURBAN STATIONS.**

HOURS	V.T. (CENTRAL RAILWAY)				CHURCHGATE (WESTERN RAILWAY)			
	ARRIVALS		DEPARTURES		ARRIVALS		DEPARTURES	
	1968	1992	1968	1992	1968	1992	1968	1992
12.00-5.00 am		18		19		17		13
5.00-6.00 am	48	16		16		11		10
6.00-7.00 am		23	56	20	26	16	28	16
7.00-8.00 am		25		27		18		18
8.00-9.00 am	17	27	16	26	13	24	13	29
9.00-10.00 am	26	34	26	34	17	38	18	33
10.00-11.00 am	21	34	17	34	16	29	13	25
11.00-12.00 pm	38	25		23		22		23
12.00-13.00 pm		20	43	21	33	18	29	17
13.00-14.00 pm		20		20		18		19
14.00-15.00 pm	27	22	28	20	19	19	19	16
15.00-16.00 pm		20		22		18		20
16.00-17.00 pm	16	23	13	22	9	18	10	19
17.00-18.00 pm	20	31	22	33	16	22	17	22
18.00-19.00 pm	20	29	21	29	15	25	16	28
19.00-20.00 pm	17	28	19	27	13	25	13	26
20.00-21.00 pm	51	20		21		28		25
21.00-22.00 pm		22		21		20		19
22.00-23.00 pm		29	47	20	38	16	34	15
23.00-24.00 am		18		18		12		12
Total	301	484	308	473	215	429	210	403

SOURCE : 1. THE MASS TRANSPORTATION STUDY, BOMBAY,1969
2. CENTRAL RAILWAY TIME TABLE,1992

**TABLE : 3.5 INCREASE IN DAILY SERVICES TO AND FROM
IMPORTANT STATIONS ON CENTRAL & WESTERN RAILWAYS**

CENTRAL RAILWAY

YEAR	KJT	BUD	ABH	KSRA	ASO	TLA	KYN	MNKD
1984-85	28	42	106	10	22	59	242	162
1985-86	30	46	112	12	24	61	266	168
1986-87	32	48	114	12	24	65	274	174
1987-88	34	52	126	14	28	73	294	176
1988-89	34	54	128	16	30	75	316	180
1989-90	34	54	132	16	30	77	328	188
1990-91	38	58	138	16	33	82	337	190
1991-92	38	62	140	20	37	86	353	212

NOTE : KJT-KARJAT, BUD-BADLAPUR, ABH-AMRNATH, KSRA-KASARA
ASO-ASANGAON, TLA-TITWALA, KYN-KALYAN, MNKD-MANKHURD,
BA-BANDRA, ADH-ANDHERI, VSH-VASHI.

WESTERN RAILWAY

YEAR	VR	BSR	BYR	BVI	MDD	GMN	ADH	BA
1987-88	138	6	-	407	7	9	181	37
1988-89	140	6	4	420	7	9	179	37
1989-90	144	6	10	449	7	9	163	33
1990-91	148	6	12	450	9	9	163	33
1991-92	150	6	24	470	11	9	163	31
1993-93	164	6	24	468	11	9	161	31

NOTE : VR-VIRAR, BSR-VASAI ROAD, BYR-BHAYANDER
BVI-BORIVALI, MDD-MALAD, GMN-GOREGAON, ADH-ANDHERI
BA-BANDRA, BCT-BOMBAY CENTRAL, V.T.- VICTORIA TERMINUS.

SOURCE : CENTRAL AND WESTERN RAILWAYS

**TABLE : 3.6 PRESENT SCHEDULE OF SUBURBAN TRAIN
ON CENTRAL RAILWAY DURING PEAK PERIODS (1992)**

DESTINATION PEAK	MORNING (HR'.MIN")	FREQUENCY	EVENING (HR'.MIN")	FREQUENCY
MAIN LINE				
KASARA	2	1.15"	2	1.30"
ASANGAON	1	.50"	2	.45"
TITWALA	5	18.08"	5	.20
KARJAT	3	.50"	4	.45"
BADLAPUR	2	.30"	1	.36"
AMBARNATH	6	13.6"	8	13.8"
KALYAN	15	4.4"	16	4.7"
THANE	23	2.6"	25	2.9"
GHATKOPAR.	2	2.8"	-	3.2"
KURLA	4	2.7"	6	2.7"
DADAR	1	2.4"	-	2.6"
SUB-TOTAL	64	2.3"	69	2.6"
HARBOUR LINE				
VASHI	7	21.4"	9	.20"
MANKHURD	8	.10"	11	.9"
CHEMBUR	2	8.8"	-	.9"
KURLA	1	8.3"	-	.9"
ANDHERI	2	1.15"	3	1.00"
BANDRA	9	13.6"	11	12.8"
SUB-TOTAL	29	5.2"	34	5.3"
TOTAL	93	1.6"	103	1.7"

SOURCE; CENTRAL RAILWAY

**TABLE : 3.7 NUMBER OF "FAST" TRAINS FROM AND TO
V.T AND CHURCHGATE STATIONS IN BOMBAY,1992**

HOUR	V.T.		CHURCHGATE	
	ARRIVAL	DEPARTURE	ARRIVAL	DEPARTURE
12.00-5.00 AM	-	-	1	1
5.00-6.00 AM	-	1	1	3
6.00-7.00 AM	-	3	3	7
7.00-8.00 AM	2	7	4	6
8.00-9.00 AM	7	6	12	16
9.00-10.00 AM	12	11	19	13
10.00-11.00 AM	10	10	14	11
11.00-12.00 PM	6	2	10	7
12.00-13.00 PM	-	1	5	4
13.00-14.00 PM	1	2	4	3
14.00-15.00 PM	1	1	3	4
15.00-16.00 PM	2	2	5	5
16.00-17.00 PM	2	2	3	6
17.00-18.00 PM	8	9	8	8
18.00-19.00 PM	10	10	12	11
19.00-20.00 PM	6	7	10	10
20.00-21.00 PM	5	3	15	9
21.00-22.00 PM	1	-	7	6
22.00-23.00 PM	3	-	4	1
23.00-00.00 AM	1	-	-	-
	77	77	140	131

SOURCE: CENTRAL AND WESTERN RAILWAY TIME TABLES, 1992

TABLE : 3.8 CENTRAL RAILWAY SUBURBAN TRAFFIC

YEAR	PASSENGERS CARRIED		PASSENGER KILOMETERS		AVERAGE LEAD	
	NOS.	INDEX	NOS.	INDEX	NOS.	INDEX
	(MILLIONS)	(BASE 1970-71=100)	(MILLIONS)	(BASE 1970-71=100)	(MILLIONS)	(BASE 1970-71=100)
1970-71	482.97	100	8252.42	100	17.1	100
1971-72	518.20	107	8885.17	107	17.1	100
1972-73	595.01	122	10147.25	122	17.1	100
1973-74	587.19	121	10437.70	126	17.8	104
1974-75	537.19	111	9667.02	117	18.0	105
1975-76	651.18	134	11644.58	141	17.9	104
1976-77	687.00	142	12902.50	156	18.8	109
1977-78	738.43	152	13809.03	167	18.7	109
1978-79	812.78	168	15459.55	187	19.0	111
1979-80	722.10	149	13071.13	158	18.1	105
1980-81	757.94	156	13866.80	168	18.3	107
1981-82	753.48	156	13940.31	168	18.5	108
1982-83	771.91	159	14789.25	179	19.2	112
1983-84	735.73	152	13933.81	168	18.9	110
1984-85	754.09	156	14715.07	178	19.5	114
1985-86	773.55	160	15424.63	186	19.9	116
1986-87	800.12	165	16344.23	198	20.4	119
1987-88	873.53	180	17971.47	217	20.6	120
1988-89	816.93	169	17237.66	208	21.1	123
1989-90	857.49	177	17969.92	217	21.0	122
1990-91	925.60	191	18971.42	227	20.5	119
1991-92	990.14	205	20445.18	247	20.6	120

TABLE: 3.8 (CONTINUED) CENTRAL RAILWAY SUBURBAN TRAFFIC

YEAR	TRAIN KILOMETRES		VEHICLE KILOMETRES		AVERAGE NO.OF TRAINS SCHEDULED DAILY		RAKES IN SERVICE	
	NOS.	INDEX	NOS.	INDEX	NOS.	INDEX	NOS.	INDEX
	(THOUSANDS)	(BASE: 1970-71=100)	(THOUSANDS)	(BASE: 1970-71=100)	(BASE: 1970-71=100)	(BASE: 1970-71=100)	(BASE: 1970-71=100)	(BASE: 1970-71=100)
1970-71	15353.65	100	61366.85	100	703	100	41	100
1971-72	16069.89	104	64279.56	104	717	101	N.A	N.A
1972-73	N.A	N.A	N.A	N.A	741	105	N.A	N.A
1973-74	N.A	N.A	N.A	N.A	784	111	N.A	N.A
1974-75	N.A	N.A	65385.47	106	790	112	N.A	N.A
1975-76	19390.89	126	77563.58	126	790	112	47	114
1976-77	20558.78	133	82235.14	134	839	119	51	124
1977-78	21861.05	142	87444.20	142	853	121	52	126
1978-79	21988.00	143	87953.00	143	853	121	52	126
1979-80	21834.00	142	87325.00	142	864	122	52	126
1980-81	21676.00	141	86704.00	141	862	122	52	126
1981-82	21275.00	138	85099.00	138	839	119	51	124
1982-83	21087.00	137	84349.00	137	805	114	50	121
1983-84	21567.00	140	86268.00	140	821	116	51	124
1984-85	N.A	N.A	N.A	N.A	850	120	53	129
1985-86	N.A	N.A	N.A	N.A	913	129	55	134
1986-87	25341.00	165	101362.00	165	941	133	61	148
1987-88	28356.00	184	113021.00	184	959	136	62	151
1988-89	29765.00	193	117622.00	191	983	139	65	158
1989-90	30234.00	196	120937.00	197	1015	144	69	168
1990-91	30660.00	199	121891.00	198	1023	145	69	168
1991-92	30691.00	199	123143.00	200	1082	153	75	182

NOTE: N.A - NOT AVAILABLE

SOURCE : ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS,
GOVT. OF INDIA

TABLE : 3.9 WESTERN RAILWAY SUBURBAN TRAFFIC

YEAR	PASSENGERS CARRIED		PASSENGER KILOMETRES		AVERAGE LEAD	
	NOS.	INDEX	NOS.	INDEX	NO.	NDEX
	(MILLIONS)	(BASE:	(MILLIONS)	(BASE:	(KMS.)	(BASE:
		1970-71=100)		1970-71=100)		1970-71=100)
1970-71	432.63	100	6871.14	100	15.9	100
1971-72	445.39	102	7211.85	104	16.2	101
1972-73	471.88	109	7420.2	107	15.7	101
1973-74	511.71	118	8368.63	121	16.4	103
1974-75	509.91	117	8430.08	122	16.5	103
1975-76	584.98	135	9787.38	142	16.7	105
1976-77	651.57	150	10979.76	159	16.9	106
1977-78	711.66	164	11960.82	174	16.8	105
1978-79	807.08	186	13582.69	197	16.8	105
1979-80	737.61	170	12566.1	182	17.0	106
1980-81	784.89	181	13525.15	196	17.1	108
1981-82	836.08	193	14951.6	217	17.9	112
1982-83	809.29	187	15395.6	224	19.0	119
1983-84	739.77	170	14309.31	208	19.3	121
1984-85	782.41	180	15363.4	223	19.6	123
1985-86	776.12	179	15614.59	227	20.1	126
1986-87	819.83	189	16232.97	236	19.8	124
1987-88	847.63	195	16601.91	241	19.6	123
1988-89	834.48	192	18480.4	268	22.1	138
1989-90	869.5	200	10314.92	281	22.2	139
1990-91	948.65	219	21490.87	312	22.7	142
1991-92	985.79	228	22616.8	329	22.9	144

TABLE : 3.9 (CONTINUED) WESTERN RAILWAY SUBURBAN TRAFFIC

YEAR	TRAIN KILOMETRES		VEHICLE KILOMETRES		AVERAGE NO. OF TRAINS SCHEDULED DAILY	
	NOS.	INDEX	NOS.	INDEX	NO.	INDEX
	(THOUSANDS)	(BASE :	(THOUSANDS)	(BASE :	(BASE :	
		1970-71=100)		1970-71=100)		1970-71=100)
1970-71	11981.37	100	47915.50	100	465	100
1971-72	12658.47	105	50633.91	105	479	103
1972-73	N.A	N.A	N.A	N.A	501	107
1973-74	N.A	N.A	N.A	N.A	535	115
1974-75	12289.11	102	49156.47	102	565	121
1975-76	14690.69	122	58762.80	122	616	132
1976-77	16867.58	140	67470.14	140	661	142
1977-78	18357.20	153	73428.81	153	N.A.	N.A.
1978-79	18954.00	158	78815.00	164	N.A.	N.A.
1979-80	18962.00	158	75852.00	158	N.A.	N.A.
1980-81	19100.00	159	76402.00	159	N.A.	N.A.
1981-82	18997.00	158	75987.00	158	N.A.	N.A.
1982-83	19068.00	159	76271.00	159	N.A.	N.A.
1983-84	19165.00	159	76661.00	159	N.A.	N.A.
1984-85	N.A	N.A.	N.A	N.A.	N.A.	N.A.
1985-86	N.A	N.A.	N.A	N.A.	N.A.	N.A.
1986-87	20437.00	170	81747.00	170	N.A.	N.A.
1987-88	21306.00	177	85223.00	177	819	176
1988-89	21820.00	182	87279.00	182	836	179
1989-90	22517.00	187	90067.00	187	857	184
1980-91	23100.00	192	02399.00	192	866	186
1991-92	24446.00	204	97782.00	204	900	193

SOURCE: ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS,
GOVT. OF INDIA.

TABLE : 3.10 ACCOMMODATION ON A SUBURBAN TRAIN

	SEATS	STANDING	% OF ACCOMMODATION
I CLASS LADIES (ONE END)	13	15	3.2
I CLASS LADIES (OTHER END)	13	15	14.7
I CLASS GENERAL (ONE END)	88	92	
I CLASS GENERAL (OTHER END)	38	36	
II CLASS LADIES (ONE END)	86	92	20.3
II CLASS LADIES (MIDDLE COMPARTMENT)	62	62	
II CLASS LADIES NEXT TO LUGGAGE COMPARTMENT	26	22	
II CLASS GENERAL	530	536	61.8
TOTAL	856	870	100.00

SOURCE: CENTRAL RAILWAY.

**TABLE : 3.11 BOMBAY ELECTRIC SUPPLY AND TRANSPORT
UNDERTAKING (B.E.S.T.) - A PROFILE (1992)**

1. FLEET OWNED	:	3009 (2205 SD & 804 DD)
2. DAILY AVERAGE NO.OF BUSES IN SERVICE (DAILY)	:	2548 (1888 SD & 660 DD)
3. VEHICLES UTILISATION (KMS)	:	200.1
4. PASSENGERS CARRIED (DAILY)	:	45.36 LAKHS
5. NO.OF ROUTES	:	324
6. AVERAGE ROUTE MILEAGE (KMS)	:	14.2
7. AVERAGE LEAD OF TRAFFIC (KM)	:	6.4

NOTE: SD- SINGLE DECKER, DD- DOUBLE DECKER.

SOURCE: B.E.S.T.,BOMBAY, 1992

TABLE : 3.12 ROUTE SPAN DISTRIBUTION (POSITION AS ON - 11/04/93) B.E.S.T.

ROUTE SPAN KMS.	ORDINARY ROUTES		LIMITED ROUTES	
	ROUTE NO.	TOTAL	ROUTE NO.	TOTAL
0.0-2.5	411,248,254,261,264,		618	
	283,284,293,299,300,			
	316,394,406.	13		1
2.6-4.0	249,257,260,285,296,		604,616,622,621,	
	397,274,275,279,414,		631,SPL-3,F15	
	282,286,462,291,297,		SPL-6,SPL-7,	
	317,369,370,301,216,		SPL-9.	
	441,387,401,402,413,			
	415,288,417.	28		6
4.1-6.0	155,162,206,214,220,		601,606,SPL-1,	
	231,240,242,250,251,		608,642.	
	262,265,266,270,273,			
	389/390,292,294,452,			
	311,313,442,443,360,			
	278,391,393,243,404,			
	407,416,289/290,298.	33		4
6.1-10.0	41,42,48,101,107,122,		188,627,641,	
	130,135,136,138,366,		SPL-8,602.	
	172,184,186,219,221,			
	258,268,272,152,52,			
	310,318,319,323,325,			
	281,326,327,329,331,			
	332,333,338,340,343,			
	347,361,362,367,379,			
	383,392,395,209,CBD-2,			
	430,320,224/235,334.	49		4

TABLE 3.12 CONTINUED -

10.1-14.0	3,103,47,49,64,69, 71,82,89,104,105,106, 108,123,126,134,137, 153/154,168,169,171, 211,212,252,253,244, 287,295,322,328,335, 339,342,345,350,352, 410,364,376,381,121, 308	42	151,421,603, SPL-2.	3
14.1-18.0	1,43,45,46,50,256, 380,66,70,74,75,102, 68,124,125,165,207, 215,222,232,267,271, 344,44,205.	25	702,321,356,213, 375,701.	6
18.1-22.0	5,61,63,65,67,85, 132/133,182,14,201, 303,312,351,353,355, 384,15,88,62.	19	1,8,87,97,204, 210,306,324,330, 354,382,304,396, 203	14
22.1-28.0	72/73,81,83,161,200, 302,314/315,385,28,29, 357,363,100,59,9,86, 32,35.	18	N.SPL-1,N.SPL-5, 2,10,11,19,22, 24,31,N.SPL-3, 12,76,80,81, 84,90,91,92, 93,166,202,233, 255,307,309,352, 341,359,399.502, 503,506,707, N.SPL-2.	30

TABLE 3.12 CONTINUED

28.1-34.0	422,424,337,180,39,		4,6,7,521,	
	38		16,20,21,25,	
			30,33,34,40-EXP,	
			305,374,241,346,	
			348,358,368,373,	
			388,398,504,505,	
		6	507,N.SPL-4,510.	26
34.1-ABOV E	336,377,371.		501,511,522,526,	
			811,812,708,709,	
		3	523	9
TOTAL		236		103

SOURCE : B.E.S.T. BOMBAY

TABLE : 3.13 B.E.S.T CLASSIFICATION OF MAJOR ROUTES

FEEDER ROUTES		EAST-WEST ROUTES	TRUNK ROUTES
155	294	328	1
162	296	324LTD	1L
206	297	339	2L
214	298	233LTD	4L
220	299	358LTD	5
231	300	359LTD	6L
240	301	388LTD	7L
242	316	374LTD	8L
245	333	309LTD	9
248	360	39	10L
250	361	91LTD	11L
251	362	321LTD	12L
254	370	352LTD	14
257	387	356LTD	15
260	389	371LTD	16L
261	390	373LTD	19L
264	391	375LTD	20L
265	393	377LTD	21L
266	394	523LTD	22L
268	262	384	24L
270	273	422	25L
273	311	424	29
274	313		30L
275L	278		31L
280	411		32
282	406		33L
283	442		34L
284	443		35
285	404		39
234	407		40E

TABLE 3.13 CONTINUED -

286	416	43	505LTD
289		65	506LTD
290		66	507LTD
291		76L	510LTD
292		80L	511LTD
293			701LTD
			702LTD
			707LTD
			708LTD

NOTE : 1) L & LTD : LIMITED

2) E : EXPRESS

SOURCE : B.E.S.T, BOMBAY.

TABLE : 3.14 B.E.S.T. FREQUENCY DISTRIBUTION OF PASSENGERS CARRIED

DIST. SLAB IN KM	DENOMINATION IN PAISE	ORDINARY		LIMITED	
		NO. (MILLIONS)	%	NO. (MILLIONS)	%
2.5	95	358.4	39.90	21.2	5.75
4.1	145	256.9	28.60	29.6	8.04
6.1	195	122.6	13.60	12.5	3.39
10.1	245	109.9	12.20	121.4	32.93
14.1	295	22.1	2.40	52.7	14.31
18.1	345	19.2	2.10	85.5	23.19
22.1	395	1.7	0.10	1.9	0.52
18.1	420	0.6	0.07	18.7	5.07
28.1	445	3.6	0.41	1.4	0.4
34.1	495	0.6	0.06	11.9	3.24
28.1	545	0.2	0.03	8.4	2.28
34.1	595	0.1	0.01	2.9	0.81
TOTAL	--	896.4	100%	368.7	100%

SOURCE : B.E.S.T., BOMBAY.

TABLE : 3.15 B.E.S.T. PASSENGERS CARRIED ON TRUNK ROUTES. (MILLIONS)

ROUTES	1990-91	1991-92	1992-93
1LTD	4.3	4.2	1.6
1	16.7	16.7	14.2
2LTD	4.8	5.3	2.7
4LTD	9.5	9.2	8.5
5	14.3	5.3	6.6
6LTD	6.9	7.9	4.9
7LTD	13.3	6.1	6.9
8LTD	5.6	5.1	4.3
9	8.7	8.9	8.1
10LTD	6.1	7.6	5.9
11LTD	5.1	6.3	4.9
12LTD	3.1	4.5	4.1
16LTD	0.8	2.2	1.9
19LTD	2.3	2.5	1.9
20LTD	3.6	4.1	3.1
21LTD	0.0	1.7	2.9
22LTD	0.0	1.9	2.5
25LTD	0.0	0.0	1.9
30LTD	0.0	0.9	2.4
31LTD	0.8	3.5	3.2
33LTD	0.0	3.2	3.1
34LTD	0.0	0.0	1.4
43	5.1	9.1	7.6
65	11.6	7.9	7.2
66	19.5	20.6	17.5
76LTD	1.7	3.9	3.5
80LTD	3.5	5.1	13.3
81	9.6	9.1	3.9
81LTD	2.9	3.7	5.1
83	19.1	10.3	9.7
84LTD	5.4	10.4	9.9
85	8.3	7.8	6.6
86LTD	0.0	2.2	3.5

TABLE 3.15 CONTINUED -

87LTD	4.8	5.8	4.5
90LTD	8.1	7.5	5.9
91LTD	4.8	5.9	5.4
92LTD	4.7	5.5	4.4
93LTD	2.4	3.6	2.7
202LTD	8.1	7.6	5.8
305LTD	0.05	3.1	6.4
374LTD	5.9	5.6	3.6
241LTD	0.0	3.7	4.3
346LTD	1.6	3.7	3.2
348LTD	3.2	4.1	3.8
353	4.5	4.4	3.8
354LTD	3.2	3.6	2.6
355	3.4	3.3	2.8
368LTD	0.9	0.9	0.8
385	4.7	5.3	6.3
396LTD	11.1	12.6	10.8
398LTD	7.9	9.3	9.5
501LTD	1.8	1.7	1.6
502LTD	4.7	4.3	3.2
503LTD	0.9	9.1	2.2
504LTD	0.5	3.7	2.8
505LTD	0.2	2.9	4.1
506LTD	0.0	1.1	1.7
507LTD	0.0	4.1	5.7
510LTD	0.01	1.7	2.1
511LTD	0.0	7.2	9.2
701LTD	0.0	2.7	4.7
702LTD	0.0	0.7	1.4
707LTD	0.0	0.0	4.1
708LTD	0.0	2.8	6.7
TOTAL	282.1	337.8	323.2

SOURCE : B.E.S.T,BOMBAY.

**TABLE : 3.16 ANALYSIS OF FINANCIAL POSITION OF B.E.S.T. ROUTES
FOR THE MONTH OF JANUARY 1993.**

SR. NO.	DEPOT	A	B	C
	CITY			
1	BACKBAY	11LTD., 89	3,4LTD,7LTD,21LTD,31LTD,45,103, 108,122,134,136,137,138	8LTD,14,20LTD, 38LTD,123,126.
2	COLABA	43,103,130	2LTD,6LTD,8LTD,22LTD,44,100,101, 106,107,122,132,133	4LTD,9,12LTD, 28,75,83.
3	CENTRAL	168	4LTD,48,63,67,105,123,126,151LTD, 154,155	35LTD,41,42,67, 62,64,72,73,84LTD, 102,104,121,130, 135,153.
4	WORLI	165	44,50,82,86LTD,89,162,168,171, 172	68,70,84LTD,124, 125,161,351,357, 363
5	BANDRA	NIL	1LTD,97LTD,202LTD,211,212,214,215, 219,220,221,222,321LTD,373LTD, 375LTD,422LTD,505LTD	NIL
	EASTERN SUB.			
6	WADALA	40LTD.	1,29,45,61,69,74,88,172,255LTD, 385,504LTD,506LTD	1LTD,10LTD,43,46, 71,166LTD,353,355.
7	ANIK	NIL	63,85,169,352,360,361,367,374LTD	5,6LTD,15,65, 348LTD,362.
8	DHARAVI	NIL	11LTD,66,76LTD,87LTD,165,302,314, 315,317	213,255LTD,312, 316,341LTD,376.
9	DEONAR	NIL	6LTD,19LTD,92LTD,93LTD,364,369, 382LTD,383	6LTD,59,233LTD, 358LTD,366,374LTD,376.
10	GOVANDI	NIL	90LTD,350,352,374LTD,399LTD,501LTD 502LTD,503LTD,506LTD,510LTD	371,377,380, 515LTD,521LTD,526LTD.
11	GHATKOPAR	NIL	368LTD,370,379,381,384,388LTD,	10LTD,16LTD,24LTD,

TABLE 3.16 CONTINUED -

			390,392,394,397,401,404,433, 511LTD	354LTD,385.
	CENTRAL SUB.			
12	KURLA	332	25LTD,303,304LTD,305LTD,308LTD,310 311,313,318,320,322,323,324LTD, 325,326,330LTD,389,507LTD,618LTD.	23LTD,91,327,411, 615LTD,616LTD.
13	MAROL	NIL	39,184,186,329,319,332,333,335, 336,337,338,340,396LTD,410,415 441,442,443.	307LTD,374LTD,602LTD.
14	VIKROLI	NIL	306LTD,387,391,393,395,402,407, 413,414,416,417,604LTD,606LTD.	7LTD,30LTD,406,603LTD.
15	DINDOSHI	NIL	264,328,334,341LTD,342,343,345, 346LTD,347,398LTD,601LTD.	182,267,331,452, 621LTD.,629LTD.
16	MAGTHANE	NIL	204LTD,209,282,287,291,293,298,299, 300,344,348LTD,398LTD,462,622LTD, 631LTD,701LTD,702LTD,708LTD.	40LTD,188LTD.
	WESTERN SUB.			
17	SANTACRUZ	NIL	81,81LTD,86,231,252,253,339, 356LTD.	32LTD,627LTD.
18	GOREGAON	231	12LTD,31LTD,33LTD,201,204LTD,205, 210LTD,256,261,262,265,424,707LTD.	374LTD.
19	OSHIWARA	NIL	4LTD,80LTD,84LTD,200,231,232,234, 235,242,248,249,250,251,254,257, 258,260,266,352LTD.	NIL
20	MALWANI	NIL	34LTD,180,207,243,271,272,273, 274,275,359LTD.	241LTD.
21	POISAR	NIL	203LTD,206,240,244,268,270,278, 279,281,283,284,285,286,289,290, 292,294,295,296,297,309,LTD., 358LTD.,388LTD.	280.

NOTE : LTD refers to Limited Services

SOURCE : B.E.S.T., BOMBAY

TABLE: 3.17 B.E.S.T. BUS FARES**(EFFECTIVE FROM 15.5.1992)**

ORDINARY SERVICE (FARE IN PAISE)			LIMITED SERVICE (FARE IN PAISE)		
KMS.	ADULT	CONCESSIONAL	KMS.	ADULT	CONCESSIONAL
	FARE			FARE	
2.5	95	50	2.5	120	50
4	145	70	4	170	70
6	195	95	6	245	120
10	245	120	10	295	145
14	295	145	14	345	145
18	345	145	18	420	195
22	395	195	22	495	245
28	445	195	28	545	245
34	495	245	34	595	295

NOTE : ABOVE 34 KMS. (MAXIMUM) 50 PAISE EXTRA FOR EVERY
ADDITIONAL 6 KMS. OR PART THEREOF.

SOURCE : B.E.S.T., BOMBAY.

TABLE : 3.18 BOMBAY ELECTRIC SUPPLY AND TRANSPORT UNDERTAKING (B.E.S.T.)

YEAR	PASSENGER CARRIED		PASSENGER KILOMETRES		AVERAGE LEAD	
	NO.	INDEX	NO.	INDEX	NO.	INDEX
	(MILLIONS)	(BASE: 1970-7=100)	(MILLIONS)	(BASE: 1970-71=100)	(KMS.)	(BASE: 1970-71=100)
1970-71	857.1	100	4773.5	100	5.56	100
1971-72	907.5	105	5045.1	105	5.55	100
1972-73	905.9	105	5059.7	105	5.58	100
1973-74	1066.5	124	5983.1	125	5.61	100
1974-75	1078.3	125	5590.5	117	5.18	107
1975-76	1129.1	131	5961.9	124	5.28	105
1976-77	1205.1	140	6622.5	138	5.49	101
1977-78	1290.8	150	7024.6	147	5.44	102
1978-79	1440.3	168	7800.6	163	5.41	102
1979-80	1519.9	177	8266.7	173	5.43	102
1980-81	1567.7	182	8577.6	179	5.47	101
1981-82	1482.1	172	8344.6	174	5.63	101
1982-83	1328.6	155	7780.5	162	5.83	104
1983-84	1336.7	155	8165.7	171	6.11	109
1984-85	1272.6	148	8770.8	183	6.89	123
1985-86	1403.3	163	10825.1	226	7.71	138
1986-87	1532.5	178	11816.7	247	7.71	138
1987-88	1573.2	183	9599.4	201	6.11	109
1988-89	1658.4	193	10136.4	212	6.11	109
1989-90	1525.4	177	8293.2	173	5.43	102
1990-91	1503.6	175	9204.7	192	5.81	104
1991-92	1660.3	193	9642.3	201	N.A.	N.A.

TABLE : 3.18 CONTINUED -

YEAR	NO.OF ROUTES		VEHICLE UTILISATION		AVERAGE CARRYING CAPACITY		AVERAGE NO. OF BUSES IN SERVICE	
	NO.	INDEX	NO.	INDEX	NO.	INDEX	NO.	INDEX
	(BASE: 1970-71=100)		(KMS.) (BASE: 1970-71=100)		(BASE: 1970-71=100)		(BASE: 1970-71=100)	
1970-71	120	100	212.2	100	69.2	100	1166	100
1971-72	124	103	212.2	100	71.4	103	1190	102
1972-73	136	113	213.9	100	72.2	104	1185	101
1973-74	141	117	218.1	102	73.3	105	1257	107
1974-75	145	120	214.3	100	73.7	106	1307	112
1975-76	144	120	217.1	102	75.2	108	1370	117
1976-77	138	115	221.8	104	75.6	109	1486	127
1977-78	146	121	222.2	104	75.8	109	1541	132
1978-79	161	134	219.6	103	76.2	110	1665	142
1979-80	166	138	218.6	103	77.2	111	1739	149
1980-81	176	146	216.1	101	76.7	110	1787	153
1981-82	184	153	210.9	100	76.5	110	1878	161
1982-83	193	160	211.6	100	75.3	108	1964	168
1983-84	197	164	208.2	101	75.7	109	2070	177
1984-85	203	169	210.4	100	75.2	108	2026	173
1985-86	N.A	N.A	213.1	100	75.9	109	2019	173
1986-87	N.A	N.A	221.4	104	75.8	109	2043	175
1987-88	224	186	220.1	103	76.8	111	2071	177
1988-89	232	193	215.2	101	77.1	111	2076	178
1989-90	251	209	202.4	104	77.6	112	2051	175
1990-91	282	235	208.9	101	76.7	110	2143	183
1991-92	324	270	200.1	106	75.8	109	2548	218

NOTE : N.A MEANS NOT AVAILABLE.

SOURCE : B.E.S.T., BOMBAY.

TABLE: 3.19 JOURNEY SPEED ON MAJOR ARTERIALS IN BOMBAY

ROAD	CORRIDOR	SPEED (KM/hr)		
		1962	1979	1990
NETAJI SUBHASH ROAD	WESTERN	56	40	25
PURANDARE MARG	WESTERN	48	27	N.A.
LALA LAJPAT RAI ROAD	WESTERN	48	40	27
ANNIE BESANT ROAD	WESTERN	48	31	28
VEER SAVARKAR MARG	WESTERN	48	33	28
MAHATMA GANDHI ROAD	CENTRAL	40	25	N.A.
D.N. ROAD	CENTRAL	24	24	11
MOHAMMED ALI ROAD	CENTRAL	16	14	14
JAMSHEDJI ROAD	CENTRAL	32	16	12
AMBEDKAR ROAD	CENTRAL	32	30	24
BHAGAT SINGH MARG	EASTERN	32	27	N.A.
P.D MELLO ROAD	EASTERN	24	18	10
NATH PAI ROAD	EASTERN	32	20	18

SOURCE: 1) PLANNING OF ROAD SYSTEM FOR BOMBAY METROPOLITAN
REGION VOL. 11 BY C.R.R.I., NEW DELHI, 1983.

2) SPEED & DELAY. SURVEY CONDUCTED BY B.M.R.D.A. IN 1990.

TABLE: 3.20 ACQUISITION OF ELECTRICAL MULTIPLE UNITS ON INDIAN RAILWAYS

YEAR	TARGET	ACHIEVEMENT
1984-85	193	101
1985-86	185	169
1986-87	180	96
1987-88	177	87
1988-89	152	139
1989-90	218	197
1990-91	222	174
1991-92	231	136

SOURCE : MINISTRY OF RAILWAYS, BUDGET DOCUMENTS.

**TABLE : 3.21 ACQUISITION OF ELECTRIC MOTOR COACHES
AND TRAILERS ON CENTRAL & WESTERN RAILWAYS**

YEAR	E.M.C				E.M.T			
	C.R.		W.R		C.R.		W.R.	
	NO.	INDEX	NO.	INDEX	NO.	INDEX	NO.	INDEX
1970-71	178	100	131	100	262	100	87	100
1971-72	170	104	137	104	270	103	90	103
1972-73	N.A.	N.A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1973-74	N.A.	N.A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1974-75	N.A.	N.A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1975-76	254	142	181	138	377	143	337	387
1976-77	260	146	197	150	415	158	371	426
1977-78	260	146	211	161	413	157	385	442
1978-79	257	144	205	156	406	154	378	434
1979-80	249	139	205	156	404	154	376	432
1980-81	243	136	202	154	404	154	376	432
1981-82	242	135	202	154	413	157	376	432
1982-83	246	138	202	154	432	164	374	426
1983-84	261	146	202	154	442	168	376	432
1984-85	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1985-86	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1986-87	278	156	205	156	519	198	398	457
1987-88	274	153	213	162	521	198	417	479
1988-89	282	158	222	169	542	206	438	503
1989-90	276	155	230	175	542	206	451	518
1990-91	286	160	225	171	560	213	431	495
1991-92	298	167	223	170	584	222	431	495

NOTE : E.M.C. MEANS ELECTRIC MOTOR COACHES.

E.M.T. MEANS ELECTRIC MOTOR TRAILERS

N.A. MEANS NOT AVAILABLE

SOURCE : ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS.

CHAPTER 4
ANALYSIS OF DEMAND ON THE BOMBAY
SUBURBAN RAILWAY SYSTEM

CHAPTER 4

ANALYSIS OF DEMAND ON THE BOMBAY SUBURBAN RAILWAY SYSTEM

4.1 Demand for Travel

Demand for urban passenger transport as a whole is governed by three inter-related aspects: a) demographic, b) spatial and c) economic. The first of these influences the volume of passengers which can be further differentiated by age, sex, worker/non-worker categories, etc. The expansion in these results from natural growth as well as from migration. Any distribution will be in terms of Residential and/or Economic Activity Zones. Normally, certain areas of a region offer better infrastructural facilities, for example, communication systems, and have positive externalities. These, therefore, become economic gravity centres leading to concentration. Congestion results when the volume of activities expand and outpace the growth of facilities. These gravity centres are often referred to as Central Business Districts (CBD). The spatial pattern of residential areas is often governed by the transport network accessibility criterion.

In Figure-4, we present a schematic view of the complex set of determinants which influence urban transport demand. This summarises a macro view of the problem. A similar set of factors enter an individual's decision on the choice of a mode of transport (or a mix of them). This is presented in Figure-5.

Theoretically, an individual's demand for a transport mode may be written as follows:

$$D_{ik} = f (F_i, F_j, Y_k, Q_i)$$

where

D_i = Demand for travel by mode 'i' of the 'k'th individual.

F_i = Fare on mode 'i'.

F_j = Fare on mode 'j'.

Y_k = Income of individual 'k'.

Q_i = Index of qualities e.g. comfort
accessibility and frequency of mode 'i'.

4.2 Insights from Past Surveys

Before we take up the analysis of the nature of travel demand on the suburban rail system and attempt to estimate some aspects of the above-mentioned function, we feel it would be useful to provide some characteristics of a 'typical' Bombay commuter based on some of the surveys

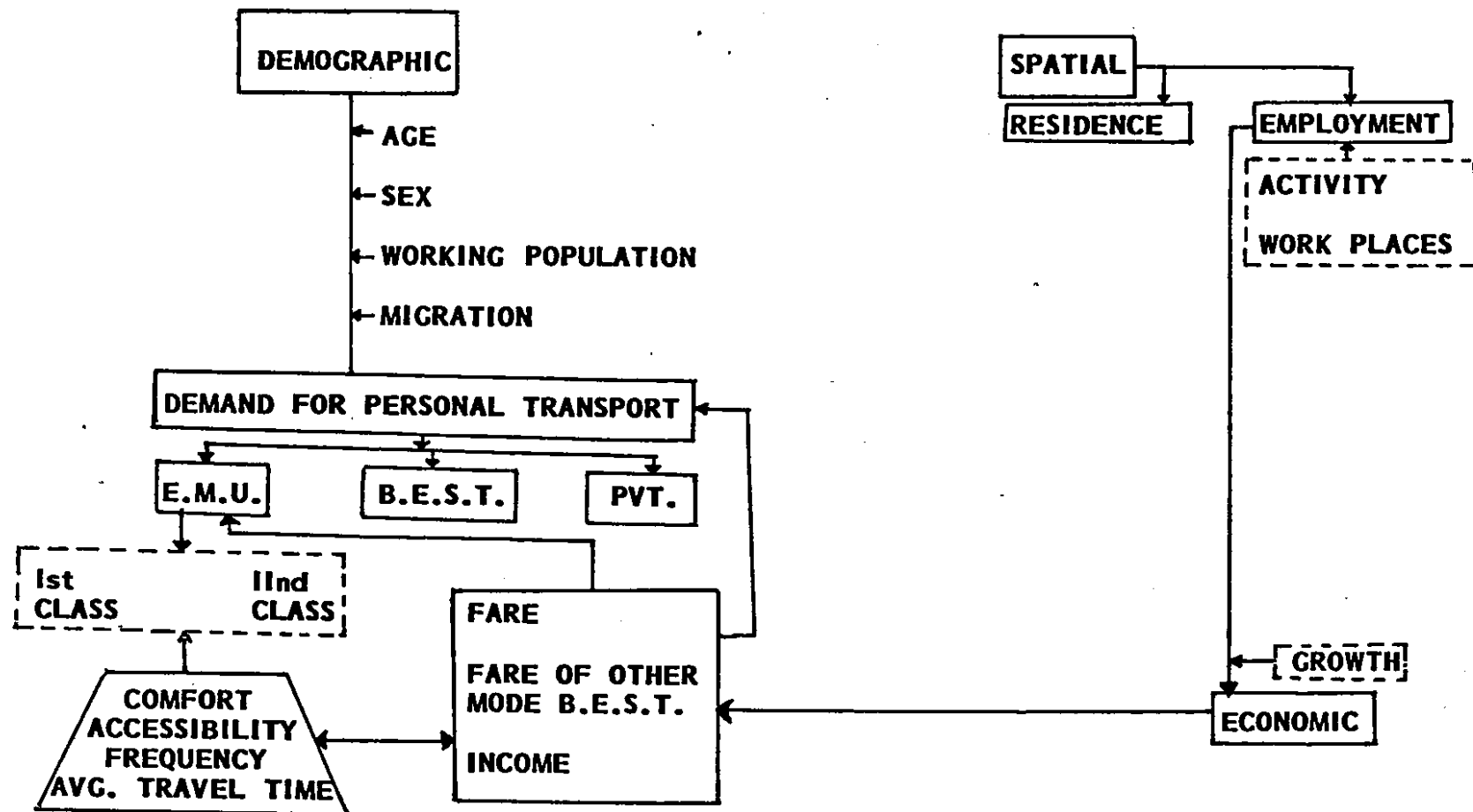


FIGURE 4 : COMPLEX OF NETWORK DETERMINANTS OF TRANSPORT DEMAND

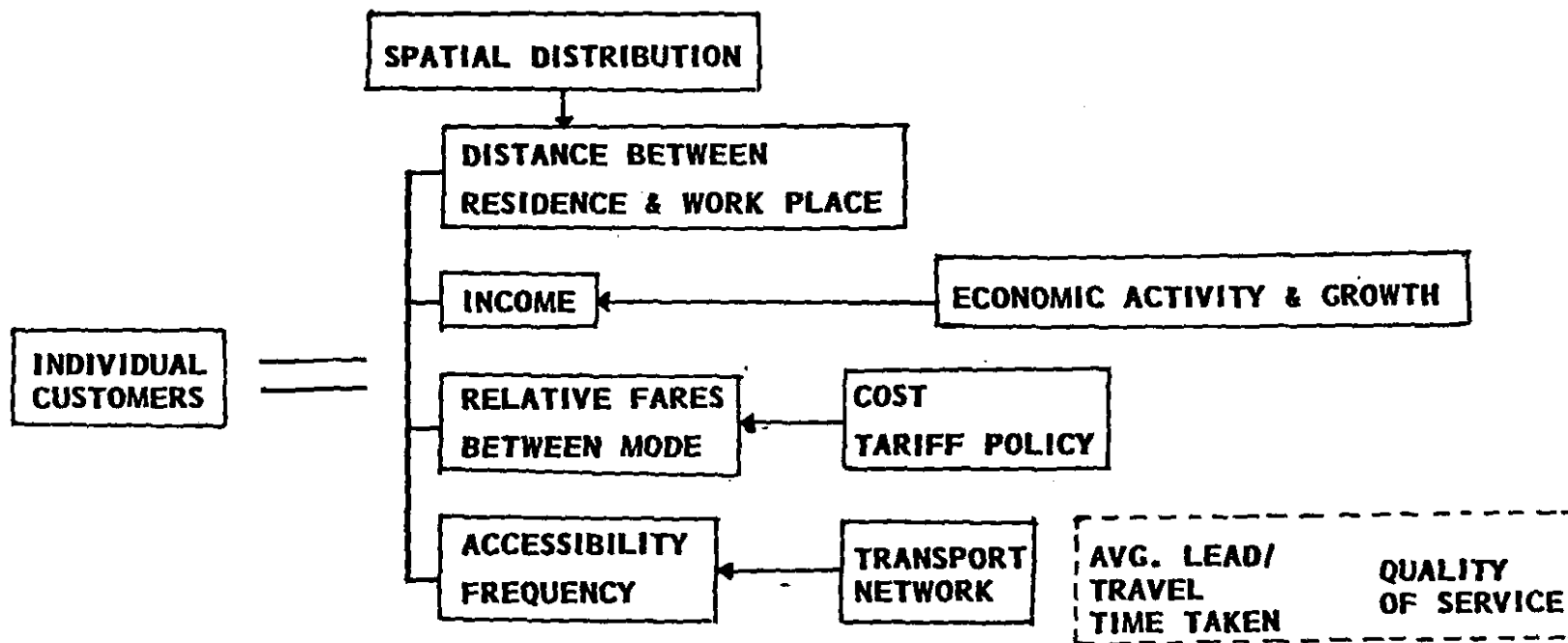


FIGURE 5 : DECISION MAKING PROCESS OF THE INDIVIDUAL COMMUTER

which have been undertaken in the past decade or so. We report below some of the findings of these surveys that are relevant to our purpose.

As part of their study designed to evolve a road network for the BMR, the Central Road Research Institute, (C.R.R.I.) Delhi, undertook (between 1979-1983) a number of surveys which included a household survey and a work survey. These two surveys revealed certain micro and macro characteristics of travel patterns in the Region. At the level of the individual household, it was observed that besides the economic structure of the household, occupation also exerted a significant influence on modal choice. Table 4.1 reveals this. It is obvious that walking trips for all categories of employees decreased with income. Further, trips by bus increased in the case of commercial and industrial employees with increase in income as against trips by rail which decreased with rise in income. Trips by other modes increased with increase in income, in general. Finally, category of employment has an influence on the choice of mode irrespective of income. The location factor (whether located in the island, suburbs or the rest of the Region) was also observed to influence shift in modal choice (see C.R.R.I. study (1979) for details). An important macro level factor is that 70% of mass transport trips in the Region are of a regular nature such as journey to work and education (see Table 4.2). Further, while half the mass transport trips are generated in the suburbs which hardly attract one third of the trips, the island portion generates only one third of mass transit trips while attracting two thirds. These figures are given in Table 4.3. In short, the flow pattern of mass transport trips showed that there was a tremendous flow from the suburbs to the island. Table 4.4. gives the estimated pattern of home-bound trips in 2000 which are compared with base year (1979) movements. All purpose mass transport trips between zones for the year 2001 are given in Table 4.5. It can be noted that the trips between the island and the remaining areas of the Region would be 56-65 lakhs, out of which 80% would be between the island and the suburbs.

The work place survey revealed certain features relating to the proximity of employment centres and residences to railway corridors. Tables 4.6 and 4.7 shows these classifications. It was observed that the concentration of employment on the Central Railway Corridor was higher than that on the Western Railway corridor. On both corridors a significant proportion of employment was within the island segment of the networks. Nearly the same percentage (i.e.45%), of the workers employed in the region were living close to the Western and Central Railway corridors and the remaining situated close to the Harbour line. A greater spread of the residential population and employment along the Central Railway corridor towards the suburbs and beyond was also noticed. In the case of the Western Railway corridor, the spread of work places away from the core area was found

insignificant. It may be recalled from our earlier analysis that the areas on the western suburbs and beyond are growing faster in terms of population. Such a spread and increase of the population only, but not in economic activity has naturally resulted in higher loads on Western Railways.

In the multi-purpose household survey of the Region conducted in 1990 by the Operation Research Group (ORG), Baroda at the instance of the B.M.R.D.A., one of the objectives was to estimate the demand for services including transport. The survey had an urban and rural component. We focus on the former. In terms of traffic flows between various zones of the region, the same pattern as that observed in the C.R.R.I. study emerges. The island zone attracts a significant amount of trips and mass transport modes account for more than 80% of the trips. When mode usage by purpose and income is considered, it is observed that the use of modes other than bus and train are significant only in the higher income groups and for purposes other than work. An interesting finding is that a large proportion of travellers by train and bus spend less than Re.1 for travel in a day whereas those having their own vehicles spend about Rs.3 a day on travel. This was also revealed by the C.R.R.I. survey. Further, when duration of trip, especially work trip, is considered, as the duration increases there is a perceptible shift from using one's own vehicle to a hired vehicle, bus and train. Fifty percent of trips by owned and hired vehicles are made for duration of less than 30 minutes. Travel time on bus accounted for a major portion of the total travel time on any type of trip. This was true even for trip duration of over one hour (see Table 4.8). This is surprising since the bus system does not cater to such trips in a significant way. Even the CRRRI study reveals that the rail mode is preferred for long duration trips. It is most likely that the extreme congestion on roads results in higher time spent on bus trips which does not in any way indicate a preference for the bus mode for longer trips.

From the point of view of accessibility to transport services, the ORG survey revealed that over two-thirds of the respondents felt fully satisfied with the existing rail system with some dissatisfaction emerging in Kalyan and other urban areas in the Region. As far as the bus system (B.E.S.T.) was concerned, 80% of the respondents expressed full satisfaction while the remaining felt that this facility was not easily available. A common emerging idea was that the bus service should act only as a feeder service and to this end, the level of service of the railways needed to be improved.

In 1992, the Indian Market Research Bureau conducted a survey for the Western Railway. The scope of the survey was narrowed down to ascertain what proportion of season ticket holders were compensated for their expenses of commuting in some way or the other by their employees. It was observed that a significant portion of season ticket holders (64%) were employed by private

sector firms. These firms provide at least some compensation for expenses incurred in travelling from place of residence to place of work and back. However, only a half of these would get a hike in compensation if fares were raised. In other words, about one fifth of the total season tickets holders would get an immediate hike in compensation.

4.3 Nature of Demand on the Suburban Rail System

Railways cater to the demand for these services by distinguishing their customers on a distance wise, class-wise and daily/season ticket wise basis.

Tables 4.9 to 4.15 give figures regarding growth of suburban traffic on the two classes, namely, 1st class and 2nd class and also in terms of the season ticket component. On Central Railway, we observe that traffic has increased by more than 75% on both classes with most of the increase on 2nd class occurring in the earlier decade (1971-81). The same pattern of movement has emerged on Western Railway though traffic has more than doubled. Considering the share of the two classes, it is observed that the variation is not significant on both systems except in the late seventies when the share of 2nd class went up. These shares have been fairly stable in the recent past. At present, the shares of 1st and 2nd class are 7.4% and 92.6% respectively on Central Railways and 9.1% and 90.9% respectively on Western Railway. In the case of average leads, the figures are much higher for both classes on the Western Railways which has a much lesser spread in terms of coverage of the network. This reflects greater dispersal of economic activity as well as population along the Central Railway corridor which results in shorter leads.

Looking at the other aspect of the market, namely, the season ticket/daily ticket component, it is observed that over 95% of 1st class traffic is on account of season ticket holders while on 2nd class only 70% of travel is accounted by season ticket holders. On both systems, the share of 2nd class season tickets travel to the total travel on 2nd class has declined to 70% in recent years. Accordingly, the share of 2nd class daily ticket trips have increased over the years. When average leads are considered, they are much higher for season ticket holders on both systems. It appears that a significant portion of daily travel on the two systems is in the nature of short-distance trips. But considering the fact that the share of 2nd class daily ticket travel is nearly the same on the two systems and that the lead is higher on Western Railways, it is only reasonable to suppose that the absence of substitutes on the Western Railway sections results in higher leads for daily traffic. Looking at the Trunk routes on B.E.S.T., we observe that 60% of these routes are close to the Central Railway network with an additional 10% to 15% touching both the networks.

Considering the distance dimension, we may characterise the demand for suburban rail travel in terms of season ticket trips. The data on 1st and 2nd classes is available on a distance basis

at 5 kilometre intervals at the lower levels and 10 kilometres intervals at higher levels. The last distance category is open-ended with negligible frequency. All the data on the chosen variables are annuals totals derived by cumulating monthly or quarterly season tickets. Data are maintained under three basic heads : a) passengers, b) passengers kilometres and c) passenger earnings. The ratio of passenger kilometres to the number of passengers gives the average lead for each distance interval. Similarly, the ratio of passenger earnings to the number of passengers gives the average rate per passenger for each distance interval. The data for the year 1987-88 to 1991-92 on both systems is set out in Tables 4.16 to 4.20. When plotted, the figures reveal a left skewness in the frequency distribution. For 1st class, the mean distance traveled (derived from group data weighted by frequency of passengers in the distance interval) ranges between 25.2 to 27.2 kms. on Western Railway and 26.04 to 26.75 kms. on Central Railway. Mean distance travelled is lower for 2nd class and ranges between 22 and 23.9 kms on both systems. We have already noted these features of season ticket traffic earlier. Given the skewness and spread, between distance intervals, the coefficient of variation is generally high, often about 45%.

Another peculiar feature of the frequency distributions over distance intervals may be noted. Neither the number of passengers nor passengers kilometres can be characterised by any single smooth curve. The plotted data clearly shows two or more peaks. This indicates that the underlying distribution cannot be characterised by any single probability or frequency function. Instead, the distribution has to be viewed as a mixture of at least two or three frequency functions induced by spatial spread. Even when one views the frequencies as proportions, these have not remained stable. Thus, there is a remarkable redistribution in the pattern of traffic taking place where means or standard derivations for grouped data do not change dramatically yet frequency distributions in terms of proportions cannot be considered as statistically stable. Both the chi-square test as well as test for independence indicate this.

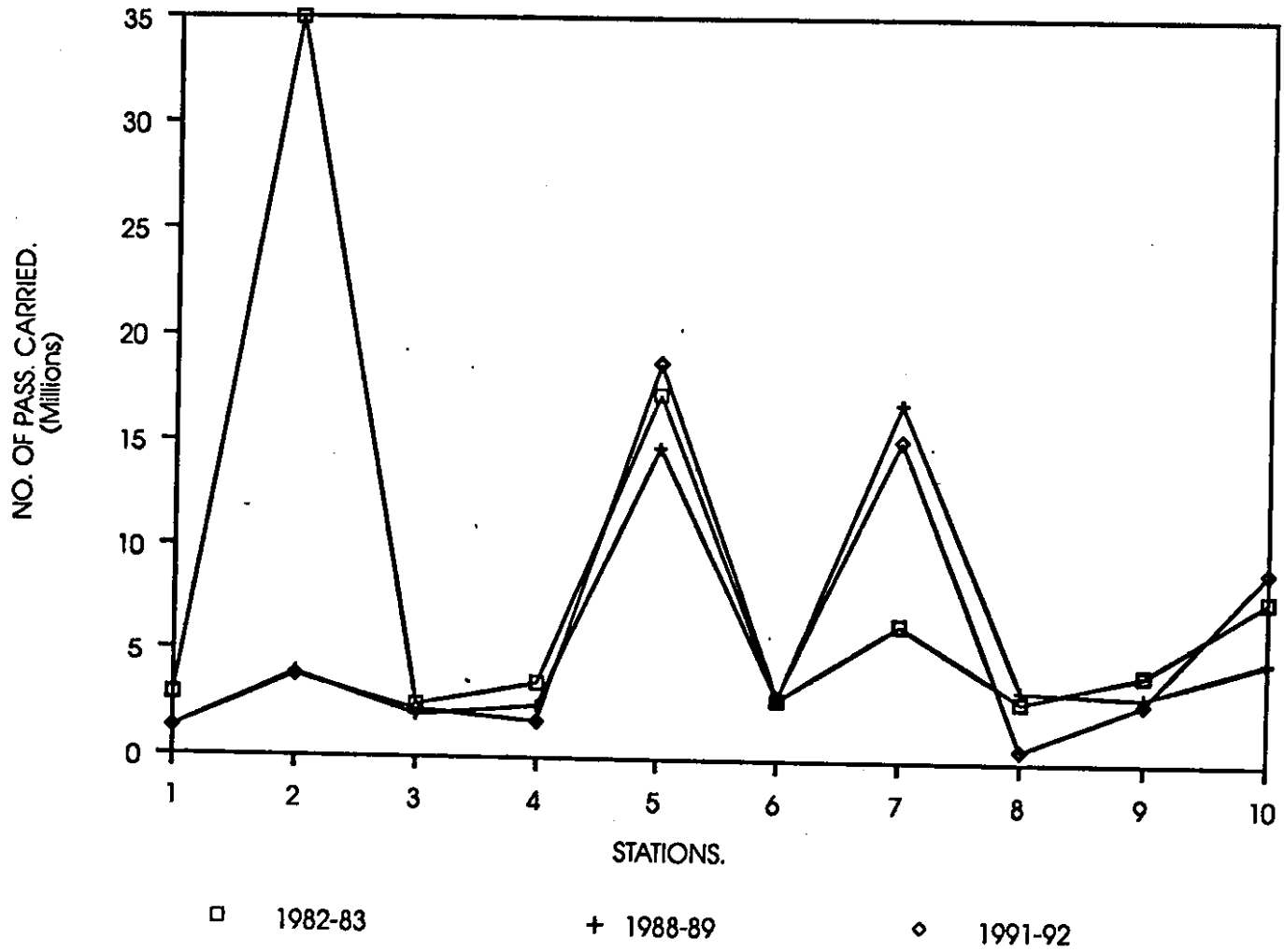
It is illuminating to note the distance intervals where 'peaks' occur. For 1st class, these are mostly in the distance interval mid-points 13, 23, 33, and 55 kms for Western Railway and 23, 33, 43 and 75 kms for Central Railway. Similarly, 13, 33, and 48 kms are the peaks on 2nd class on Western Railway. In the last two years on the Western Railway, frequencies in the 20-25 kms has gone up making the distribution more uniform than earlier. On Central Railway too, 13, 23, and 55.5 kms are the peaking points. But 15-20 (midpoint is 18) and 25-30 are also important. The distributional pattern of traffic on Central Railway is somewhat more stable when compared with the Western Railway.

Yet another significant aspect of the demand for the suburban rail system is the spatial distribution

of traffic on the network. More specifically, originating and terminating traffic at the level of each stations (or at least major stations) needs to be examined over a period of time in order to provide a basis for planning of services. We planned to obtain such data for a year in the early eighties, for one year in the late eighties and for a recent year. We have obtained such data only from Central Railway for the years 1982-83, 1988-89 and 1991-92. Accordingly, we made use of this data to identify major originating and destination stations. Apart from the availability of data, more fundamental problems relating to the data were observed. The data which comes under the title "Analysis of Suburban Traffic Originating on Central Railway by Originating and Terminating Stations" appears in a highly contrived form. Since tickets, both season and daily, are issued on a distance slab basis, railway authorities impute these tickets (trips) sold for the different stations is resorted to. In the case of season tickets, the procedure is even more ambiguous. Each season ticket holder is assumed to make 50 trips in a month. This number of trips forms part of the originating trips at the station where the ticket is issued. Taking the average of trips at the origin and destination is the only meaningful proxy for the total number of trips at the destination. We did precisely this, fully aware that the process is still arbitrary in the sense that it does not take into account other stations in a particular distance slab from where trips can originate or terminate making use of tickets issued at the extreme ends of a particular distance slab. In short, the information system has an inbuilt aggregation bias and unreliable imputation. Given these data problems, we undertook an exercise to examine the season ticket trips between major stations on the Central Railway network. Table 4.21 gives these figures. V.T. enjoys a predominant position accounting for nearly 35% of the trips in 1982-83 and 1988-89 with its share falling to 29% in 1991-92. Ghatkopar and Thane also account for a substantial portion of trips. While traffic at Ghatkopar has trebled between 1982-83 & 1991-92, in Thane, it has doubled. Traffic from Chembur and Wadala Road stations on the Harbour line has also increased rapidly in the last decade. The growth in traffic from Dadar has been substantial between 1982-83 & 1988-89 but apparently not sustained later.

When plotted, the figures reveal certain interesting features. Over a period of time, the peaks are shifting to the suburbs and beyond, at Chembur, Vikhroli and Thane. It must be noted, though, that V.T. continues to attract increasing numbers. We present only some of these (see figures 6 & 7). In these figures, one station is considered as the origin while those stations along the horizontal axis are terminating points. We also note from the figures that traffic from Byculla and Dadar towards the south (V.T.) has fallen over the years. All these features only reinforce the observation made earlier on the dispersal of activities on the Central Railway corridor towards the suburbs and the use of the bus mode for shorter routes as a substitute for rail travel.

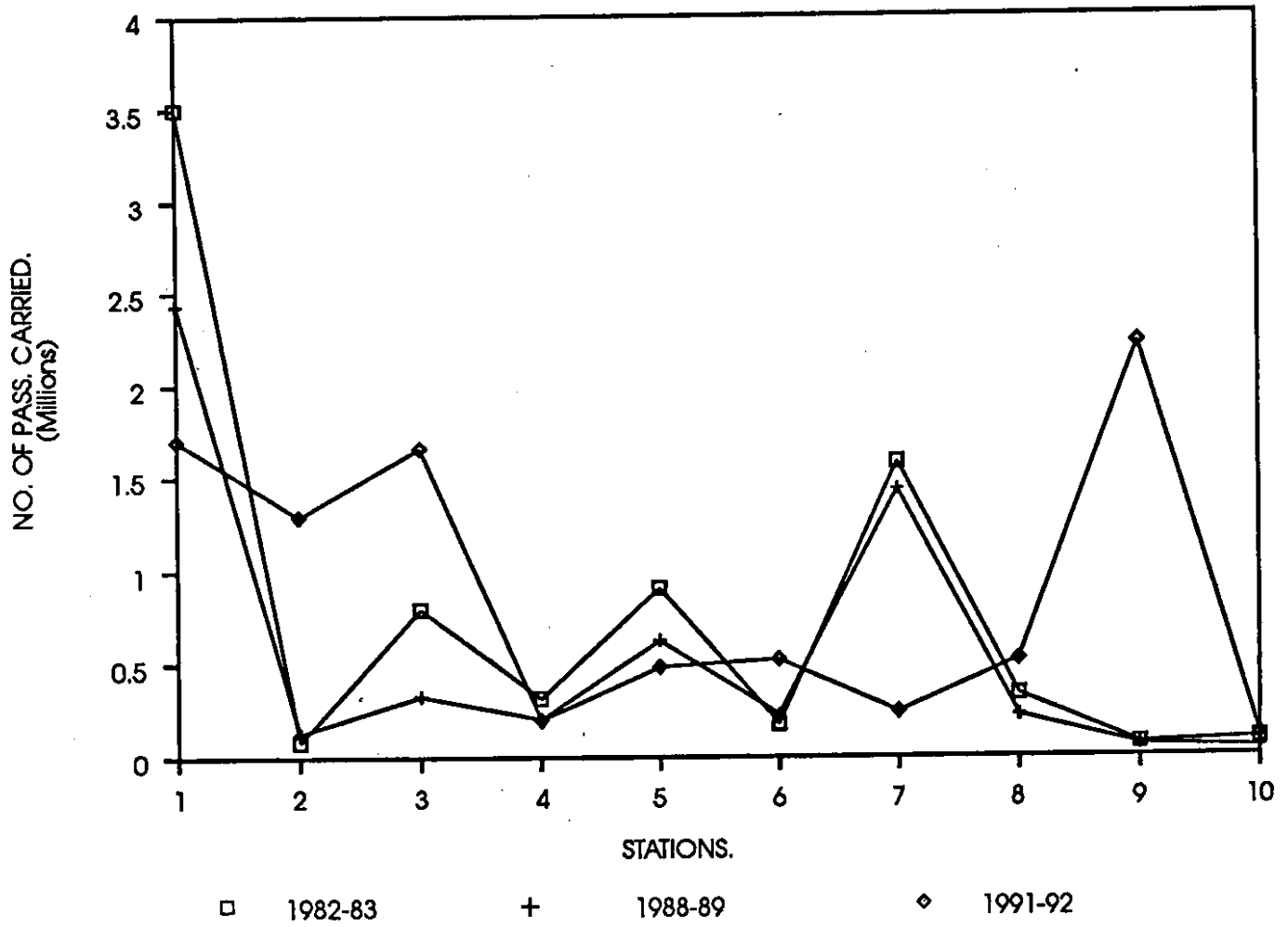
ORIGINATING: V.T.



NOTE :- 1 : BYCULLA, 2 : DADAR, 3 : SION, 4 : KURLA, 5 : GHATKOPAR
 6 : VIKHROLI, 7 : THANE, 8 : KALYAN, 9 : CHEMBUR, 10 : WADALA ROAD.

FIGURE 6

ORIGINATING: CLA.



NOTE : - 1 : VICTORIA TERMINUS, 2 : BYCULLA, 3 : DADAR, 4 : SION, 5 : GHATKOPAR,
6 : VIKHROLI, 7 : THANE, 8 : KALYAN, 9 : CHEMBUR, 10 : WADALA ROAD.

FIGURE 7

4.4 Fare - Distance Responsiveness

The extent of responsiveness of the demand for suburban rail travel to the fare level and the changes thereof is an issue of utmost importance to the policymaker. We now attempt to tackle this important question in as comprehensive a manner as was made feasible by the given data. We may recall the factors that influence an individual's choice of mode for travel such as a) fare level of the mode under consideration, b) fare level of the substitute mode, c) income of the individual, d) average inevitable distance to be travelled every day, e) spatial distribution of economic activity and residential zones and f) attributes relating to comfort, accessibility, congestion related to one mode in comparison with the other mode(s). Some of these are obviously related to each other such as, for example, qualitative factors are related to income as well as relative fares. At the same time, the extent of substitution may not be entirely reflected in the fare of the substitute mode. Similarly, income and spatial distribution of residences are likely to be related. For example, many middle class and upper middle class groups would invest in their own housing which will be increasingly located in developing or expanding suburban areas. However, empirical estimation of such relationships poses several problems and difficulties. Most of these arise out of the nature and the quality of the data maintained and made available. Most of the available data are collected for one or another administrative purpose. Little information is collected, generated or maintained to characterise and estimate the kind of relationships that we have described earlier. Even at the cost of repetition, let us examine the available data once again. All that we have are figures on : a) no. of passengers, b) passenger kms., c) passenger earnings and d) average lead for each distance interval. Evidently, we cannot hope to have data on average income as related to distance intervals! Nor can we hope to relate these intervals to the spatial residential profile since all the figures reflect only distance based characteristics. The influence of such factors cannot be gauged without special surveys conducted with some such specific objectives.

We have already indicated that some 'trunk routes' of B.E.S.T. could be considered as substitutes for suburban rail travel. No credible estimation of responsiveness to fares will be possible without eliminating such concomitant effects. Such estimation appears feasible with regression analysis. But here too, we have faced problems. Firstly, distance interval data for the four variables mentioned above are available for the last five years. Thus, even after pooling Central and Western Railway data for each distance interval, we have only ten observations. Moreover, pooling cross-section (i.e. distance interval data for a given year) data for the five year period, 1987-88 to 1991-92 (in which period the fare structure remained unchanged for two years) suffers from an in-built positive correlation between average lead and fare charged.

There is also the question of choosing an appropriate variable to measure demand. 'Demand' for travel can be measured either by passenger kilometres or the average lead. Of this, the average lead has been stable with minor fluctuations in all the distance intervals. Passenger kilometres, on the other hand, have grown because of the rise in the travelling population. This imparts spurious positive correlation between fares (which have increased over time) and passenger kilometres in each distance interval. Thus, in either case, the effect of fare changes on travel demand cannot be unambiguously measured. Moreover, as pointed out earlier, the effects of variables like income and spatial distribution cannot be easily separated. The B.E.S.T. fare which represents the price of a close substitute (on some routes at least) lacks any season ticket equivalent. B.E.S.T. also follows different distance intervals for fare charges. These problems pose enormous difficulties in developing and using a 'proxy' for 'substitute prices'.

Given these inherent data limitations, we were, naturally, apprehensive about any fundamental insight being obtained from regression analysis. Yet, we attempted to estimate the following relationships:

Demand for travel = f (Fares, No. of passengers).

Demand was alternatively measured either as average lead or as passenger kilometres. We used several functional forms including a) Log-linear, b) Linear-log, c) Log-log, d) First difference data, and e) growth rates of the relevant variables with inverse of 'fares' and 'number of passengers' being tried out as alternative specifications. But none of these attempts yielded consistent credible estimates of marginal/average (i.e. elasticity) response of demand for travel with respect to fare rise.

We, therefore, prefer to report results obtained from the use of the modified form of the conventional 'two point arc-elasticity' formula to incorporate all the three data points on incremental changes. Hence, implicitly we are postulating a demand curve whose slope is equal to

$$\frac{\sum \Delta Y_i}{\sum \Delta X_i} \text{ where } i=1,2,3.$$

This is, in turn, multiplied by

$$\frac{\sum X_i}{\sum Y_i} \text{ where } i=1,2,3. \text{ and } \Delta \text{ refers to the change in variables.}$$

This is necessary to avoid undue influence of year specific variations which make elasticity values excessively high. These estimates are found in Table 4.22. Except for distance interval 81-90 on Western Railway (1st class), 111-120 (Central Railway 1st class) and 141 & above for Central Railway 2nd class, all the elasticity values are less than one.

One may easily notice the difficulty posed by 'positive' elasticity. Ceteris paribus, these should have negative signs. But as pointed above, due to limitations of data we cannot control the influence

of other factors like price of the substitute, income, etc. Yet another effect can be conjectured but cannot be easily measured. Let us assume that at least some part of daily travel is essential and unavoidable. The only part where an individual can economize is given in the spread of destinations in a distance slab. For example, individuals purchase season tickets for travel between his place of residence and not necessarily upto work place but instead the maximum distance that would be covered in the relevant distance slab. When fares are changed, this part of the 'travel' perhaps gets greatly modified which may include switching distance-intervals induced by a change in 'fare-tapering' along rising distance slabs. As a result, some distance intervals would register a decline in traffic while adjacent ones would record more flows. This may be investigated using Markov chain type transition probabilities with the constraint that switching occurs only between adjacent categories. But even this requires some more 'observations' than what was made available to us. Available data on tapering of season ticket fares over distance slabs is presented in Table 4.23. Generally, it is observed that incremental fares are high in those distance intervals where higher peaks occur. In many of these distances intervals, negative signs are noticed. However, the reswitching between distances slabs cannot be firmly established.

4.5 Congestion Pricing

Congestion can be viewed in a time profile as well as in its spatial or area profile. Congestion during certain hours in the day, especially in communication systems is often handled through peak hour pricing. (The literature on peak hour pricing is vast. Some useful readings are Boiteux(1960), Mohring(1970), Behbehani(1984), Newbery(1986)). In the case of a transport system, peak hour pricing supposedly provides a disincentive to travel during these hours. There always exists the possibility that an individual may buy his tickets in the non-peak hours and use a peak hour train. But the person would have to bear the cost in terms of greater inconvenience of travel, early booking, etc. And not many are expected to undertake such a switching unless the difference between peak & non-peak fares is excessively high.

To decide the feasibility of such a pricing mechanism in the case of Bombay is not easy due to the lack of relevant data. The time profile of the season and daily ticket travel is not available. It may be safely assumed that most of the season ticket holders will usually undertake their journeys during peak hours. Issuing different season tickets for non-peak hour traffic can be expected to be both administratively difficult and impossible to monitor (such a scheme for monthly commuter travel tickets does not seem to be in operation anywhere but has been suggested [(see, for example, Kessler and Simonsen(1982))]. Hence, the peak pricing option could be confined to daily tickets only. However, the desirability or otherwise of such a scheme depends on the proportion of daily

ticket travellers during peak hours. If this proportion is already low, not much would be gained by the introduction of peak/non-peak distances in fares.

It would be easier to identify regions along the suburban rail corridors which happen to be gravity centres and/or account for a large share of originating/terminating trips. For example, trips to and from stations falling within the island city may be levied a surcharge. In other words, any trip made to or from a station within a certain zone will have to bear a certain burden. This surcharge can be levied on both season as well as daily tickets. At present, fares are defined on a distance slab basis and not on a station to station basis. However, there evidently exists correspondence between a destination station (for which the ticket is demanded) and distance slabs. Therefore, though fares are defined by distance slabs at the ticket windows, they are implicitly converted to a station to station basis. In other words, combinations of stations are classified in a certain distance interval and the relevant fare is charged. Since this correspondence between distance intervals and station combinations is unavoidable, another class of combinations of stations where surcharge is to be levied can be similarly devised. Such a surcharge can be levied by the State Government, collected by the railways and earmarked for consolidation or expansion of the suburban railway network. A similar arrangement/experiment appears to have been successfully implemented on the Mankhurd-Belapur sections on Central Railway which have been developed with active financial participation of CIDCO on behalf of the State government. See CIDCO (1992) for details. To what extent and in what capacity should the government participate in such a process raises other issues like operating the suburban rail system under a distinct rail authority etc. which are taken up in chapter 6.

TABLE: 4. 1

**DISTRIBUTION OF TRIPS BY MODE OF TRANSPORT FOR VARIOUS
CATEGORIES OF EMPLOYEES WITHIN DIFFERENT INCOME GROUPS.**

INCOME GROUP (MONTHLY INCOME IN Rs.)	CATEGORY OF EMPLOYMENT	MODE OF TRAVEL			
		WALK	BUS	RAIL	OTHERS
Up to 500	GOVERNMENT	5	20	74	1
	COMMERCIAL	5	33	60	2
	INDUSTRIAL	7	24	69	-
	ALL	6	25	68	1
-499	GOVERNMENT	2	2	76	2
	COMMERCIAL	1	36	60	3
	INDUSTRIAL	6	27	66	1
	ALL	4	27	67	2
1001-1500	GOVERNMENT	1	22	74	3
	COMMERCIAL	2	38	55	5
	INDUSTRIAL	2	35	58	5
	ALL	2	33	60	5
1501-2000	GOVERNMENT	1	28	64	7
	COMMERCIAL	1	33	58	8
	INDUSTRIAL	3	44	49	4
	ALL	1	35	57	7
2001 & ABOVE	GOVERNMENT	-	23	54	23
	COMMERCIAL	8	34	51	14
	INDUSTRIAL	5	45	35	15
	ALL	1	37	48	14
ALL	GOVERNMENT	2	21	75	2
	COMMERCIAL	2	35	58	5
	INDUSTRIAL	6	27	66	1

SOURCE : PLANNING OF THE ROAD SYSTEM FOR BOMBAY METROPOLITAN REGION,
C.R.R.I., NEW DELHI, 1983.

TABLE: 4. 2

**DISTRIBUTION OF MASS TRANSPORT TRIPS BY PURPOSE
IN THE B.M.R.**

	TRIPS (IN LAKHS)	PERCENT OF TOTAL
HOME BASED WORKS*	38.6	54.2
HOME BASED EDUCATION*	11.4	16.0
HOME BASED OTHERS*	10.2	14.3
NON-HOME BASED ALL PURPOSE TRIPS	6.0	8.5
MISCELLANEOUS TRIPS	5.0	7.0
TOTAL TRIPS	71.2	100.0

*INCLUDES RETURN ALSO.

SOURCE : PLANNING OF THE ROAD SYSTEM FOR BOMBAY METROPOLITAN REGION,
C.R.R.I., NEW DELHI, 1983.

TABLE: 4. 3

**DISTRIBUTION OF TRIPS AMONGST DIFFERENT SECTORS
OF B.M.R.**

FROM/TO	ISLAND	SUBURBS	REGION
ISLAND	9.15 (84)	1.53 (14)	0.23 (2)
SUBURBS	8.15 (51)	7.42 (46)	0.54 (3)
REGION	1.07 (35)	0.51 (16)	1.51 (49)

- NOTE : 1. TRIPS ARE IN LAKHS.
2. FIGURES IN BRACKETS INDICATE PERCENTAGES OF THE TOTAL TRIPS PRODUCED.
3. REGION REFERS TO AREAS OUTSIDE GREATER BOMBAY.

SOURCE : AS ABOVE.

TABLE: 4.4

**GROWTH IN PATTERN OF MOVEMENTS IN B.M.R.
(HOME-BASED UP TRIPS 2001/1979)**

(TRIPS IN 000s)

AREA	ISLAND	SUBURBS	REGION
	840	168	110
ISLAND	----- = 0.92 (915)	----- = 1.10 (153)	----- = 4.78 (23)
	1777	1339	634
SUBURBS	----- = 2.18 (815)	----- = 1.80 (742)	----- = 11.53 (55)
	455	203	820
ISLAND	----- = 4.25 (107)	----- = 3.98 (51)	----- = 5.36 (153)

NOTE : FIGURES IN BRACKETS REFER TO TOTAL MOVEMENTS IN 1979

SOURCE : PLANNING OF THE ROAD SYSTEM FOR BOMBAY METROPOLITAN
REGION, C.R.R.I., NEW DELHI, 1983

TABLE: 4.5

**EXCHANGE OF MASS TRANSPORT TRIPS AMONG
DIFFERENT SECTORS**

(IN 000s)

AREA	ISLAND	SUBURBS	NEW BOMBAY	REGION
ISLAND	3079	4535	390	740
SUBURBS	----	2851	604	1070
NEW BOMBAY	----	----	578	260
REGION	----	----	----	802

SOURCE : PLANNING OF THE ROAD SYSTEM FOR BOMBAY METROPOLITAN
REGION, C.R.R.I., NEW DELHI, 1983

TABLE: 4. 6
EMPLOYEES CLASSIFIED ACCORDING TO PROXIMITY TO RAILWAY CORRIDORS AND
EMPLOYMENT CENTRES
FOR DIFFERENT AREA AND CATEGORY OF EMPLOYMENT

(PERCENTAGE)

RAILWAY CORRIDORS	EMPLOYMENT IN			SUBURBS INDUSTRIAL	REGION INDUSTRIAL
	GOVERNMENT	COMMERCIAL	INDUSTRIAL		
WESTERN					
RAILWAY					
ISLAND	32.64	61.72	56.13	—	—
SUBURB	—	—	—	26.53	—
REGION	—	—	—	—	—
CENTRAL RAILWAY					
ISLAND	67.36	38.28	35.9	—	—
SUBURB	—	—	—	73.47	—
REGION	—	—	—	—	100.00
HARBOUR LINE					
ISLAND	—	—	7.97	—	—
	100.00	100.00	100.00	100.00	100.00

SOURCE : PLANNING OF THE ROAD SYSTEM IN BOMBAY METROPOLITAN REGION,
C.R.R.I. STUDY, NEW DELHI, 1983.

TABLE: 4.7

**EMPLOYEES CLASSIFIED ACCORDING TO PROXIMITY TO RAILWAY CORRIDOR
TO RESIDENCE
FOR DIFFERENT AREA AND CATEGORY OF EMPLOYMENT**

(PERCENTAGE)

RAILWAY CORRIDORS	AREA AND CATEGORY OF EMPLOYMENT					TOTAL
	ISLAND			SUBURB	REGION	
	GOVERNMENT	COMMERCIAL	INDUSTRIAL	INDUSTRIAL	INDUSTRIAL	
WESTERN RAILWAY	17.59	27.21	37.39	9.21	8.61	100.01
PORTION IN ISLAND	28.23	38.92	39.32	22.07	12.95	33.41
SUBURB	63.21	58.18	58.01	72.45	38.21	58.59
REGION	8.56	2.91	2.68	5.48	48.85	8.01
	100.00	100.00	100.00	100.00	100.00	100.00
CENTRAL RAILWAY	18.58	14.78	25.82	14.28	26.54	100.00
PORTION IN ISLAND	30.88	31.26	29.51	23.93	0.74	21.61
SUBURB	37.43	38.92	55.81	50.91	35.68	43.85
REGION	31.69	29.82	14.68	25.17	63.58	34.55
	100.00	100.00	100.00	100.00	100.00	100.00
HARBOUR LINE	27.15	18.31	29.56	12.41	12.58	100.00
PORTION IN ISLAND	46.79	40.51	38.83	24.66	13.64	36.37
SUBURB	53.21	59.49	61.17	75.34	86.63	63.63
	100.00	100.00	100.00	100.00	100.00	100.00
OVER ALL						
WESTERN RAILWAY	42.71	60.04	54.56	35.96	23.28	45.96
CENTRAL RAILWAY	43.82	31.71	36.62	54.22	69.76	44.66
HARBOUR LINE	13.47	8.26	8.82	9.82	6.96	9.38
	100.00	100.00	100.00	100.00	100.00	100.00

SOURCE : PLANNING OF THE ROAD SYSTEM FOR BOMBAY METROPOLITAN REGION,
C.R.R.I., NEW DELHI, 1983.

TABLE: 4.8

**MULTI-PURPOSE HOUSEHOLD SURVEY FOR B.M.R.D.A.
DISTRIBUTION OF TRIPS BY DURATION & MODE**

DURATION/MODE	TOTAL	BUS	TRAIN	OWN VEHICLE	HIRED VEHICLE
TOTAL	100.00	54	39	4	2
UPTO 15	100.00	52	23	19	5
15 - 30	100.00	62	30	5	3
31 - 45	100.00	56	39	3	2
46 - 60	100.00	49	47	3	2
1 - 2 HRS	100.00	51	47	1	1
2 - 3 HRS	100.00	49	45	6	1
3 - 5 HRS	100.00	63	19	0	19
> 5 HRS	100.00	75	25	0	0

SOURCE : ORG HOUSEHOLD SURVEY 1989.

TABLE: 4.9

**CENTRAL RAILWAY
SUBURBAN TRAFFIC**

PASSENGERS ORIGINATING						
YEAR	IstCLASS		IIndCLASS		TOTAL	
	NO. (MILLIONS)	INDEX BASE : 1970-71=100	NO. (MILLIONS)	INDEX BASE : 1970-71=100	NO. (MILLIONS)	INDEX BASE : 1970-71=100
1970-71	30.71(6.8)	100	421.05(93.2)	100	451.75	100
1971-72	33.49(6.9)	109	450.46(93.1)	106	483.95	107
1972-73	35.70(6.6)	116	501.56(93.4)	119	537.27	118
1973-74	35.90(6.6)	116	502.01(93.4)	119	537.91	119
1974-75	34.57(7.1)	112	451.41(92.9)	107	485.97	107
1975-76	31.31(5.3)	101	559.49(94.7)	132	590.81	130
1976-77	33.77(5.4)	109	588.21(94.6)	139	621.99	137
1977-78	38.17(5.6)	124	635.06(94.4)	150	673.23	149
1978-79	46.26(6.2)	150	690.21(93.8)	163	736.46	162
1979-80	42.23(6.4)	137	613.38(93.6)	145	655.62	145
1980-81	44.71(6.5)	145	642.51(93.5)	152	687.21	152
1981-82	48.32(7.1)	157	633.03(93.0)	150	681.35	150
1982-83	54.32(7.8)	176	639.93(92.2)	151	694.25	153
1983-84	55.18(8.4)	179	601.23(91.6)	142	656.42	145
1984-85	42.46(6.4)	138	617.34(93.6)	146	659.81	146
1985-86	45.22(6.5)	147	640.33(93.5)	152	685.55	151
1986-87	45.81(6.3)	149	672.62(93.7)	159	718.43	159
1987-88	47.59(6.1)	154	726.17(93.9)	172	773.77	171
1988-89	49.09(7.1)	159	649.32(93.0)	154	698.42	154
1989-90	54.72(7.4)	178	679.54(92.6)	161	734.26	162
1990-91	57.98(7.4)	188	718.16(92.6)	170	776.14	171
1991-92	64.10(7.6)	208	769.35(92.4)	182	833.46	184

NOTE : FIGURES IN BRACKETS GIVE SHARE IN TOTAL SUBURBAN TRAFFIC

SOURCE : ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS.

TABLE : 4.10

**WESTERN RAILWAY
SUBURBAN TRAFFIC**

PASSENGERS ORIGINATING						
YEAR	IstCLASS		IIndCLASS		TOTAL	
	NO. (MILLIONS)	INDEX BASE : 1970-71=100	NO. (MILLIONS)	INDEX BASE : 1970-71=100	NO. (MILLIONS)	INDEX BASE : 1970-71=100
1970-71	37.11(9.3)	100	361.45(90.7)	100	398.56	100
1971-72	39.18(9.5)	105	370.21(90.5)	102	409.39	102
1972-73	40.18(9.4)	108	389.75(90.6)	107	430.21	107
1973-74	41.06(8.7)	110	428.15(91.3)	118	469.22	117
1974-75	36.34(7.7)	102	434.34(92.3)	120	470.68	118
1975-76	34.43(6.4)	107	500.52(93.6)	138	534.96	134
1976-77	36.84(6.1)	100	558.36(93.9)	154	595.21	149
1977-78	40.48(6.2)	109	608.10(93.8)	168	648.58	162
1978-79	48.48(6.6)	130	684.49(93.4)	189	732.98	183
1979-80	44.58(6.5)	120	634.55(93.5)	175	679.14	170
1980-81	52.62(7.2)	141	672.42(92.8)	186	725.04	181
1981-82	59.30(7.7)	159	710.55(92.3)	196	769.86	193
1982-83	65.23(8.8)	175	668.43(91.2)	184	733.66	184
1983-84	52.78(7.8)	142	621.35(92.2)	171	674.13	169
1984-85	59.82(8.4)	161	651.96(91.6)	180	711.78	178
1985-86	59.21(8.4)	159	638.99(91.6)	176	698.21	175
1986-87	61.62(8.3)	166	674.24(91.7)	186	735.86	184
1987-88	63.57(8.3)	171	699.65(91.7)	193	763.23	191
1988-89	65.81(8.7)	177	682.39(91.3)	188	748.21	187
1989-90	71.26(9.0)	192	712.36(91.0)	197	783.62	196
1990-91	76.62(9.0)	206	770.76(91.0)	213	847.39	212
1991-92	82.53(9.0)	222	830.83(91.0)	229	913.37	229

NOTE : FIGURES IN BRACKETS GIVE SHARE IN TOTAL SUBURBAN TRAFFIC.

SOURCE : ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS.

TABLE: 4.11

**CENTRAL & WESTERN RAILWAYS
SUBURBAN TRAFFIC**

AVERAGE LEAD								
YEAR	CENTRAL RAILWAY				WESTERN RAILWAY			
	1st class		2ndclass		1st class		2ndclass	
	NO.	INDEX	NO.	INDEX	NO.	INDEX	NO.	INDEX
1970-71	17.3	100	17.1	100	15.7	100	15.9	100
1971-72	17.2	100	17.1	100	15.7	100	16.2	101
1972-73	17.3	100	17.1	100	15.9	101	15.7	101
1973-74	18.4	106	17.7	103	16.1	101	16.4	103
1974-75	19.4	112	17.9	104	17.4	110	16.5	103
1975-76	19.4	112	17.8	104	18.1	115	16.6	104
1976-77	19.1	110	18.8	109	18.1	115	16.8	105
1977-78	20.1	116	18.6	108	18.5	117	16.7	105
1978-79	20.2	116	18.9	110	18.8	119	16.7	105
1979-80	20.8	120	17.9	104	19.2	122	16.9	106
1980-81	20.7	120	18.1	105	19.9	126	17.1	106
1981-82	20.8	120	18.3	107	20.7	131	17.6	110
1982-83	20.6	119	19.1	111	21.4	136	18.8	118
1983-84	19.4	112	18.9	110	21.3	135	19.2	120
1984-85	20.8	120	19.1	111	22.5	143	19.7	123
1985-86	20.9	120	19.8	115	22.6	143	19.9	125
1986-87	21.3	123	20.4	119	24.1	152	19.4	122
1987-88	21.7	125	20.5	118	23.3	148	19.2	120
1988-89	22.2	128	21.1	122	24.2	154	21.9	137
1989-90	20.9	120	21.1	122	24.9	158	22.1	138
1990-91	21.5	124	20.4	119	26.1	166	22.3	140
1991-92	20.5	118	20.6	120	24.4	155	22.9	144

SOURCE: ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS.

TABLE : 4.12

**CENTRAL RAILWAY
SUBURBAN TRAFFIC
PASSENGERS ORIGINATING
(SEASON TICKETS)**

YEAR	1st CLASS			2nd CLASS			TOTAL	
	NO. (Millions)	INDEX (BASE : 1970-71 =100)	AV.LEAD (Km)	NO. (Millions)	INDEX (BASE : 1970-71 =100)	AV.LEAD (Km)	NO. (Millions)	INDEX (BASE : 1970-71 =100)
1970-71	29.82 (8.7)	100	18.88	309.18 (91.3)	100	18.92	339.00	100
1971-72	32.43 (8.9)	108	18.80	330.40 (91.1)	106	19.07	362.83	107
1972-73	35.15 (8.6)	117	N.A.	369.18 (91.4)	119	N.A.	404.33	119
1973-74	35.51 (8.7)	119	N.A.	372.12 (91.3)	120	N.A.	407.63	120
1974-75	34.43 (8.9)	115	N.A.	351.18 (91.1)	113	N.A.	385.62	113
1975-76	31.22 (6.8)	104	22.96	421.36 (97.2)	136	20.66	452.58	133
1976-77	33.68 (7.2)	112	22.53	431.21 (92.8)	139	22.22	464.89	137
1977-78	33.07 (6.6)	110	23.46	459.80 (93.4)	148	22.00	497.88	146
1978-79	46.14 (8.5)	154	23.71	495.25 (91.5)	160	22.51	541.40	159
1979-80	42.09 (9.2)	141	23.34	412.57 (90.8)	133	21.16	454.67	134
1980-81	44.54 (9.5)	149	24.68	422.59 (90.5)	136	21.63	467.14	137
1981-82	48.16 (10.5)	161	25.09	409.29 (89.5)	132	21.71	457.46	134
1982-83	54.18 (10.4)	181	25.83	463.28 (89.6)	149	22.10	517.46	152
1983-84	55.01 (11.2)	184	22.52	433.27 (88.8)	140	22.00	488.28	144
1984-85	42.29 (8.8)	141	N.A.	438.24 (91.2)	141	N.A.	480.54	141
1985-86	45.04 (9.7)	151	N.A.	418.83 (90.3)	135	N.A.	463.88	136
1986-87	45.56 (9.6)	152	26.16	426.07 (90.4)	137	22.71	471.63	139
1987-88	47.38 (9.4)	158	26.85	452.45 (90.6)	146	23.48	499.83	147
1988-89	48.93 (9.5)	164	27.49	461.38 (90.5)	149	24.13	510.31	150
1989-90	54.53 (10.3)	182	27.03	469.90 (89.7)	151	24.42	524.44	154
1990-91	57.87 (10.2)	193	26.89	507.58 (89.8)	164	24.82	565.36	166
1991-92	63.81 (10.0)	213	26.11	574.59 (90.0)	185	25.11	638.40	188

NOTE : FIGURES IN BRACKETS GIVE SHARE IN TOTAL SUBURBAN SEASON TICKET TRAFFIC.

SOURCE : ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS.

TABLE: 4.13

**WESTERN RAILWAY
SUBURBAN TRAFFIC
PASSENGERS ORIGINATING
(SEASON TICKETS)**

YEAR	1st CLASS			2nd CLASS			TOTAL	
	NO. (Millions)	INDEX (BASE : 1970-71 =100)	AV.LEAD (Km)	NO. (Millions)	INDEX (BASE : 1970-71 =100)	AV.LEAD (Km)	NO. (Millions)	INDEX (BASE : 1970-71 =100)
1970-71	35.61(12.1)	100	17.05	257.12(87.9)	100	18.04	292.78	100
1971-72	37.80(12.4)	106	17.13	264.76(87.6)	102	18.45	302.56	103
1972-73	39.04(12.2)	109	N.A	279.79(87.8)	108	N.A	318.83	108
1973-74	40.61(10.6)	114	N.A	313.58(89.4)	121	N.A	382.21	130
1974-75	36.21(9.9)	101	N.A	325.48(90.1)	126	N.A	361.69	123
1975-76	34.35(8.4)	103	19.9	370.88(91.6)	144	19.11	405.24	138
1976-77	36.75(8.1)	103	20.18	412.90(91.9)	160	19.39	449.66	153
1977-78	40.40(8.2)	113	20.69	448.35(91.8)	174	19.46	488.75	166
1978-79	48.39(8.6)	135	21.28	511.23(91.4)	198	19.35	559.62	191
1979-80	44.45(9.1)	124	21.42	442.35(91.9)	172	19.56	486.81	166
1980-81	52.45(10.4)	147	21.92	451.20(89.6)	175	19.72	503.66	172
1981-82	59.13(11.5)	166	22.94	452.98(88.5)	176	20.51	512.12	174
1982-83	65.06(11.9)	182	23.91	479.95(88.1)	186	21.59	545.01	186
1983-84	52.51(10.4)	147	23.32	450.33(89.6)	175	21.55	502.84	171
1984-85	59.61(11.2)	167	N.A	469.70(88.8)	182	N.A	529.08	180
1985-86	58.87(11.7)	165	N.A	441.04(88.3)	171	N.A	499.91	170
1986-87	61.40(12.3)	172	26.95	435.84(87.7)	169	23.22	497.24	169
1987-88	63.36(12.3)	177	26.15	448.31(87.7)	174	23.09	511.68	174
1988-89	65.62(12.2)	184	27.17	471.44(87.8)	183	25.21	537.06	183
1989-90	71.02(12.6)	199	27.07	492.34(87.4)	191	25.21	563.37	192
1990-91	76.28(12.5)	214	28.96	530.40(87.5)	206	25.89	606.69	207
1991-92	82.14(12.5)	230	32.49	571.66(87.5)	222	24.47	653.81	223

NOTE : FIGURES IN BRACKETS GIVE SHARE IN TOTAL SUBURBAN SEASON TICKET TRAFFIC.

SOURCE: ANNUAL STATISTICAL STATEMENTS, MINISTRY OF RAILWAYS.

TABLE : 4.14

**CENTRAL RAILWAY
SUBURBAN TRAFFIC**

PROPORTION OF SEASON TICKETS TO PASSENGERS ORIGINATING.			
YEAR	1st CLASS	2nd CLASS	TOTAL
1970-71	0.97	0.73	0.75
1971-72	0.96	0.73	0.74
1972-73	0.98	0.73	0.75
1973-74	0.98	0.74	0.75
1974-75	0.99	0.77	0.79
1975-76	0.99	0.75	0.76
1976-77	0.99	0.73	0.74
1977-78	0.86	0.72	0.73
1978-79	0.99	0.71	0.73
1979-80	0.99	0.67	0.69
1980-81	0.99	0.65	0.67
1981-82	0.99	0.64	0.67
1982-83	0.99	0.72	0.74
1983-84	0.99	0.72	0.74
1984-85	0.99	0.70	0.72
1985-86	0.99	0.65	0.67
1986-87	0.99	0.63	0.65
1987-88	0.99	0.62	0.64
1988-89	0.99	0.71	0.73
1989-90	0.99	0.69	0.71
1990-91	0.99	0.70	0.72
1991-92	0.99	0.74	0.76

TABLE : 4.15

WESTERN RAILWAY
SUBURBAN TRAFFIC

PROPORTION OF SEASON TICKETS TO PASSENGERS ORIGINATING			
YEAR	IstCLASS	IIndCLASS	TOTAL
1970-71	0.95	0.71	0.73
1971-72	0.96	0.71	0.73
1972-73	0.97	0.71	0.74
1973-74	0.98	0.73	0.81
1974-75	0.99	0.74	0.76
1975-76	0.99	0.74	0.75
1976-77	0.99	0.73	0.75
1977-78	0.99	0.73	0.75
1978-79	0.99	0.74	0.76
1979-80	0.99	0.69	0.71
1980-81	0.99	0.67	0.69
1981-82	0.99	0.63	0.66
1982-83	0.99	0.71	0.74
1983-84	0.99	0.72	0.74
1984-85	0.99	0.72	0.74
1985-86	0.99	0.69	0.71
1986-87	0.99	0.64	0.67
1987-88	0.99	0.64	0.67
1988-89	0.99	0.69	0.71
1989-90	0.99	0.69	0.71
1990-91	0.99	0.68	0.71
1991-92	0.99	0.68	0.71

TABLE : 4.16(a)

ANNUAL STATEMENT OF PASSENGER ZONAL STATISTICS FOR 1987-88 C.R.

FIRST CLASS SUBURBAN SEASON							SECOND CLASS SUBURBAN SEASON						
ZONE	PASS.	P.KM.	PASS. ERN.	AV. LEAD	AV. RATE	FARE	ZONE	PASS.	P.KM.	PASS. ERN.	A.V. LEAD	A.V. RATE	FARE
1-5	954	3948	1316	4.14	1.38	68	1-5	41527	139047	12873	3.83	0.31	17
6-10	3618	33462	6318	9.25	1.71	84	6-10	66782	605175	25317	9.87	0.38	21
11-15	6677	96212	13488	13.54	2.82	100	11-15	77477	1076165	34865	13.89	0.45	25
16-20	11036	213099	26817	19.31	2.02	120	16-20	70288	1343197	38658	19.11	0.55	30
21-25	5394	127996	14456	23.73	2.43	132	21-25	49067	1156011	29440	23.16	0.60	33
26-30	2228	63822	6366	28.65	2.68	140	26-30	29930	852393	19468	28.46	0.65	35
31-35	8005	270898	25257	33.84	2.83	156	31-35	42659	1445712	30714	33.89	0.72	39
36-40	1871	70817	6550	37.85	3.16	172	36-40	12729	489101	9919	38.47	0.78	43
41-45	603	26804	2194	44.45	3.50	180	41-45	6180	274703	5848	44.45	0.82	45
46-50	2369	116727	9025	49.27	3.64	188	46-50	15022	886530	15499	49.19	0.86	47
51-60	4898	238538	17292	58.21	3.81	208	51-60	31925	1852915	3648	58.84	0.96	52
61-70	366	24626	1748	67.28	4.21	236	61-70	3837	204248	3216	67.15	1.06	59
71-80	12	930	64	79.17	4.78	256	71-80	591	45384	617	76.79	1.18	64
81-90	69	5797	398	83.93	5.33	280	81-90	758	64983	969	86.53	1.29	70
91-100	82	8187	980	99.78	5.65	304	91-100	1376	136907	1927	99.50	1.40	76
101-110	0	0	0	0.00	6.17	320	101-110	47	4950	69	105.32	1.47	80
111-120	0	0	0	0.00	0.00	340	111-120	17	1948	16	114.59	1.53	85
121-130	0	0	0	0.00	0.00	352	121-130	24	2871	38	118.63	1.58	88
131-140	0	0	0	0.00	0.00	372	131-140	0	0	0	0.00	0.00	93
>141	0	0	0	0.00	0.00	400	>141	8	1418	14	176.15	1.75	100
TOTAL	48182	1301863	132269	---	---	---	TOTAL	450044	10583658	233115	----	----	----

NOTE : IN TABLES 4.16 TO 4.20(a) PASS., P.KM. AND PASS. ERN. ARE IN THOUSANDS.

TABLE : 4.16(b)

ANNUAL STATMENT OF PASSENGER ZONAL STATISTICS FOR YEAR 1987-88 W.R.

FIRST CLASS SUBURBAN SEASON							SECOND CLASS SUBURBAN SEASON						
ZONE	PASS.	P.KM.	PASS.	AV.	AV.	FARE	ZONE	PASS.	P.KM.	PASS.	A.V.	A.V.	FARE
			ERN.	LEAD	RATE					ERN.	LEAD	RATE	
1-5	1172	4279	1365	3.65	1.16	68	1-5	34475	154793	9998	4.49	0.29	17
6-10	3956	31410	5736	7.94	1.45	84	6-10	54829	506617	19997	9.24	0.36	21
11-15	9650	137925	16409	14.30	1.70	100	11-15	76240	1095576	31391	14.40	0.42	25
16-20	7002	134690	14376	19.20	2.05	120	16-20	44697	865762	22943	19.40	0.51	30
21-25	12273	290616	27503	23.70	2.24	132	21-25	60208	1413082	34323	23.50	0.57	33
26-30	9138	262711	21608	28.80	2.36	140	26-30	44786	1303725	27323	29.10	0.61	35
31-35	13407	463621	35635	34.60	2.66	156	31-35	85071	2892408	56942	34.00	0.67	39
36-40	1876	69964	5576	37.30	2.97	172	36-40	9773	372743	7311	38.10	0.75	43
41-45	1280	54722	3950	42.80	3.09	180	41-45	10446	458535	8062	43.90	0.77	45
46-50	494	23800	1597	48.20	3.23	188	46-50	5021	248038	4091	49.60	0.81	47
51-60	2845	152221	10020	53.50	3.52	208	51-60	21833	1285243	19609	58.90	0.90	52
61-70	73	4626	290	63.40	3.98	236	61-70	623	42558	654	68.30	1.05	59
71-80	6	461	29	72.80	4.58	256	71-80	179	13707	206	76.40	1.15	64
81-90	0	0	0	0.00	0.00	280	81-90	45	3944	60	88.00	1.34	70
91-100	51	4656	276	91.90	5.44	304	91-100	45	4344	62	96.90	1.38	76
101-110	121	12401	683	103.00	5.67	320	101-110	33	3418	48	103.80	1.47	80
111-120	0	0	0	0.00	0.00	340	111-120	5	590	8	114.50	1.55	85
121-130	25	3143	159	124.00	6.30	352	121-130	1	14	0	125.90	1.59	88
131-140	0	0	0	0.00	0.00	372	131-140	1	116	2	133.00	1.70	93
> 141	0	0	0	0.00	0.00	400	>141	2	234	3	141.00	1.87	100
TOTAL	63369	1651246	145212	----	----	----	TOTAL	448312	10665447	243033	----	----	----

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.17(a)

ANNUAL STATMENT OF PASSENGER ZONAL STATISTICS FOR 1988-89 C.R.

FIRST CLASS SUBURBAN SEASON						SECOND CLASS SUBURBAN SEASON							
ZONE	PASS.	P.KM.	PASS. ERN.	AV. LEAD	AV. RATE	FARE	ZONE	PASS.	P.KM.	PASS. ERN.	A.V. LEAD	A.V. RATE	FARE
1-5	955	3924	1318	4.11	1.38	75	1-5	39745	156184	15112	3.93	0.38	21
6-10	3562	32948	6091	9.25	1.71	93	6-10	69796	634444	32814	5.69	0.47	26
11-15	6113	82955	12349	13.57	2.02	110	11-15	71272	988336	39912	13.87	0.56	31
16-20	1162122	4391	28237	19.31	2.43	132	16-20	74528	1425580	49128	19.86	0.66	36
21-25	5437	129024	14626	23.73	2.69	146	21-25	51565	1215392	37643	23.57	0.73	40
26-30	2458	70378	6938	28.63	2.83	154	26-30	31048	884877	23397	28.50	0.76	42
31-35	8626	291918	27209	33.84	3.16	172	31-35	43866	1484854	37724	33.85	0.86	47
36-40	1888	71793	6617	38.03	3.56	190	36-40	13883	534078	12911	38.47	0.93	51
41-45	718	31842	2613	44.35	3.64	198	41-45	7253	322548	6963	44.47	0.96	53
46-50	2733	134563	14414	49.35	3.81	207	46-50	19632	965102	19632	49.16	1.00	55
51-60	4332	252222	18239	98.22	4.21	229	51-60	32648	1885597	35577	57.77	1.09	60
61-70	326	21591	1528	67.47	4.78	260	61-70	2992	201021	3651	67.19	1.22	67
71-80	14	1091	72	77.86	5.14	282	71-80	685	52817	887	77.11	1.31	72
81-90	77	6494	438	84.34	5.69	308	81-90	866	74828	1238	86.43	1.42	78
91-100	78	7720	478	98.97	6.13	335	91-100	1469	146035	2247	99.41	1.53	84
101-110	0	0	0	0.00	0.00	352	101-110	75	7901	110	385.35	1.61	88
111-120	0	0	0	0.00	0.00	374	111-120	26	8986	43	114.85	1.65	93
121-130	0	0	0	0.00	0.00	388	121-130	39	4799	65	123.05	1.77	96
131-140	0	0	0	0.00	0.00	410	131-140	0	0	0	0.00	0.00	101
> 141	0	0	0	0.00	0.00	440	>141	5	849	12	169.80	2.40	108
TOTAL	48938	1362854	141167	----	----	----	TOTAL	461393	10994228	319066	----	----	----

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.17(b)

ANNUAL STATMENT OF PASSENGER ZONAL STATISTICS FOR 1988-89 W.R.

FIRST CLASS SUBURBAN SEASON						SECOND CLASS SUBURBAN SEASON							
ZONE	PASS.	P.KM.	PASS.	AV.	AV.	FARE	ZONE	PASS.	P.KM.	PASS.	A.V.	A.V.	FARE
			ERN.	LEAD	RATE					ERN.	LEAD	RATE	
1-5	1244	5548	1594	4.45	1.28	75	1-5	37554	172717	14742	4.59	0.39	21
6-10	4306	39786	6899	9.24	1.60	93	6-10	55009	524247	25830	9.53	0.48	26
11-15	10266	149680	19181	14.57	1.86	110	11-15	79324	1134986	44436	14.30	0.56	31
16-20	7162	137367	16328	19.17	2.27	132	16-20	48486	933852	31064	19.25	0.64	36
21-25	12346	284708	31287	23.06	2.53	146	21-25	62169	1453758	44152	23.38	0.71	40
26-30	9345	272395	25057	29.15	2.68	154	26-30	47967	1424003	35971	29.68	0.75	42
31-35	13949	473438	41185	33.94	2.95	172	31-35	88283	2982881	74458	23.79	0.84	47
36-40	1893	71359	6261	37.69	3.30	190	36-40	10152	398429	9234	39.24	0.91	51
41-45	1291	56741	4445	43.95	3.44	198	41-45	10653	468432	10007	43.97	0.94	53
46-50	528	26066	1896	49.31	3.58	207	46-50	6344	303379	6219	47.81	0.98	55
51-60	2980	174434	11863	58.53	3.98	229	51-60	24072	1313475	25420	54.55	1.06	60
61-70	81	5449	366	67.40	4.52	260	61-70	919	62404	1099	67.90	1.19	67
71-80	10	767	53	76.35	5.26	282	71-80	272	20932	347	76.90	1.27	72
81-90	0	0	0	0.00	0.00	308	81-90	76	6811	106	88.50	1.38	78
91-100	62	5624	379	91.00	6.13	335	91-100	74	7248	112	96.96	1.49	84
101-110	127	13040	819	103.00	6.38	352	101-110	66	7025	104	105.56	1.56	88
111-120	0	0	0	0.00	0.00	374	111-120	11	1291	19	114.20	1.65	93
121-130	31	3788	215	124.00	7.02	388	121-130	2	321	4	126.05	1.69	96
131-140	0	0	0	0.00	0.00	410	131-140	3	476	6	132.23	1.79	101
> 141	0	0	0	0.00	0.00	440	>141	4	692	9	141.32	1.91	108
TOTAL	65621	1720190	167828	---	---	---	TOTAL	471440	11217359	323339	---	---	---

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.18(a)

ANNUAL STATEMENT OF PASSENGER ZONAL STATISTICS FOR 1989-90 C.R.

FIRST CLASS SUBURBAN SEASON							SECOND CLASS SUBURBAN SEASON						
ZONE	PASS.	P.KM.	PASS.	AV.	AV.	FARE	ZONE	PASS.	P.KM.	PASS.	A.V.	A.V.	FARE
			ERN.	LEAD	RATE					ERN.	LEAD	RATE	
1-5	1069	4437	1473	4.15	1.38	75	1-5	35573	146203	13518	4.11	0.38	21
6-10	4361	39336	7457	9.82	1.71	93	6-10	14986	671904	35206	8.97	0.47	26
11-15	6386	86846	17899	13.64	1.02	110	11-15	70465	977347	39465	13.87	0.56	31
16-20	14321	275113	34801	19.28	2.43	132	16-20	73111	1394210	48153	19.87	0.66	36
21-25	5878	139244	15811	23.69	2.69	146	21-25	53129	1253843	38784	23.60	0.73	40
26-30	2748	78579	7771	28.59	2.83	154	26-30	31897	986790	24273	28.51	0.76	42
31-35	8997	304363	18430	33.83	3.16	172	31-35	46303	1566906	39121	33.84	0.86	47
36-40	1778	68292	4215	38.45	3.50	190	36-40	15023	579234	13970	38.56	0.93	51
41-45	789	84981	2873	44.34	3.64	198	41-45	7861	313433	6778	44.39	0.96	53
46-50	2796	137883	14654	49.34	3.81	207	46-50	19972	983884	19972	49.22	1.00	55
51-60	4733	275372	19426	58.26	4.21	229	51-60	16087	2098574	39748	58.06	1.09	60
61-70	476	92898	2277	66.84	4.78	260	61-70	3815	256693	4634	67.29	1.22	67
71-80	33	2588	172	78.42	5.21	282	71-80	682	46557	789	77.34	1.31	72
81-90	101	9487	571	84.48	5.65	308	81-90	864	75124	1227	86.95	1.42	78
91-100	62	6197	384	99.95	6.19	335	91-100	1146	114047	1194	99.52	1.53	84
101-110	0	0	0	0.00	0.00	352	101-110	58	5321	80	106.42	1.60	88
111-120	0	0	0	0.00	0.00	374	111-120	18	2136	33	118.67	1.72	93
121-130	0	0	0	0.00	0.00	388	121-130	11	6250	96	122.55	1.76	96
131-140	0	1762	104	835.54	8.08	410	131-140	0	0	0	0.00	0.00	101
> 141	13	0	0	0.00	0.00	440	>141	2	408	5	200.08	2.50	108
TOTAL	54541	1607378	148318	---	---	---	TOTAL	391003	11478864	327046	---	---	---

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.18(b)

ANNUAL STATMENT OF PASSENGER ZONAL STATISTICS FOR 1989-90

FIRST CLASS SUBURBAN SEASON							SECOND CLASS SUBURBAN SEASON						
ZONE	PASS.	P.KM.	PASS. ERN.	AV. LEAD	AV. RATE	FARE	ZONE	PASS.	P.KM.	PASS. ERN.	A.V. LEAD	A.V. RATE	FARE
1-5	1392	6431	1757	4.62	1.26	75	1-5	34470	167348	13788	4.85	0.40	21
6-10	4498	43014	6936	9.56	1.54	93	6-10	58545	575125	29111	9.83	0.50	26
11-15	10654	157459	19905	14.78	1.87	110	11-15	76038	1128730	42749	14.84	0.56	31
16-20	7385	140684	16769	19.05	2.27	132	16-20	49886	987825	32426	19.80	0.65	36
21-25	12739	296994	32356	23.03	2.59	146	21-25	69627	1731051	49435	24.86	0.71	40
26-30	9411	275836	24883	29.31	2.64	154	26-30	49457	1479257	37587	29.91	0.76	42
31-35	16288	547235	47881	33.60	2.94	172	31-35	91015	3141499	76872	34.52	0.84	47
36-40	2169	83761	7146	38.62	3.30	190	36-40	12132	482689	11432	39.79	0.93	51
41-45	1727	76621	5938	44.36	3.38	198	41-45	11795	521921	11086	44.25	0.95	53
46-50	707	34934	2560	49.42	3.61	207	46-50	6504	323714	6374	49.77	0.98	55
51-60	3602	210137	14293	58.34	3.97	229	51-60	30887	1850581	33049	59.91	1.07	60
61-70	129	8827	584	68.39	4.53	260	61-70	1077	74668	1282	69.32	1.19	67
71-80	22	1702	110	76.12	4.91	282	71-80	568	44764	728	78.62	1.27	72
81-90	0	0	0	0.00	0.00	308	81-90	110	9868	139	89.39	1.32	78
91-100	80	7344	1469	91.56	5.85	335	91-100	92	9015	139	97.59	1.50	84
101-110	175	17964	1072	102.66	6.12	352	101-110	111	11992	173	108.00	1.56	88
111-120	0	0	0	0.00	0.00	374	111-120	21	2440	35	117.86	1.64	93
121-130	35	9371	238	124.00	6.75	388	121-130	3	381	5	127.00	1.70	96
131-140	7	1000	51	138.79	7.08	410	131-140	4	532	7	133.00	1.80	101
> 141	19	1270	68	141.15	9.57	440	>141	5	846	11	159.02	1.91	108
TOTAL 7103919 20584 184016 --- --- ---							TOTAL 492347 12544246 346428 --- --- ---						

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.19(a)

ANNUAL STATEMENT OF PASSENGER ZONAL STATISTICS FOR 1990-91 C.R.

FIRST CLASS SUBURBAN SEASON						SECOND CLASS SUBURBAN SEASON							
ZONE	PASS.	P.KM.	PASS. ERN.	AV. LEAD	AV. RATE	FARE	ZONE	PASS.	P.KM.	PASS. ERN.	A.V. LEAD	A.V. RATE	FARE
1-5	1677	7274	2666	4.34	1.59	87	1-5	39370	162206	17323	4.12	0.44	24
6-10	4075	35954	8232	8.82	2.02	109	6-10	79159	728261	42746	9.20	0.54	30
11-15	6890	91866	16468	13.33	2.39	130	11-15	76710	1060139	49862	13.82	0.65	36
16-20	14508	274393	43832	18.91	2.98	156	16-20	75434	1435502	57330	19.03	0.76	42
21-25	6197	144088	19108	23.25	3.18	170	21-25	57445	1354547	47679	23.58	0.83	46
26-30	2813	78981	9509	28.08	3.38	182	26-30	33863	968148	30138	28.59	0.89	49
31-35	10230	338976	37543	33.14	3.67	200	31-35	52471	1774052	51422	33.81	0.98	54
36-40	2327	86824	9449	37.31	4.06	222	36-40	18467	711137	19759	38.51	1.07	59
41-45	834	36226	3601	43.44	4.32	234	41-45	6916	306937	7883	44.38	1.14	62
46-50	3104	149826	13999	48.27	4.51	243	46-50	23537	1155413	27538	49.09	1.17	64
51-60	4558	261254	22428	57.32	4.92	265	51-60	36229	2116162	45287	58.41	1.25	69
61-70	354	23197	1953	65.53	5.52	296	61-70	3155	210059	4385	66.58	1.39	76
71-80	38	2849	223	74.97	5.87	318	71-80	900	69673	1360	77.41	1.51	81
81-90	112	9443	704	84.31	6.29	344	81-90	1888	160956	3059	85.25	1.62	87
91-100	61	5963	427	97.75	7.00	371	91-100	1556	155093	2708	99.67	1.74	93
101-110	0	0	0	0.00	0.00	388	101-110	117	12266	208	104.84	1.78	97
111-120	3	313	22	104.33	7.33	410	111-120	306	34355	588	112.27	1.92	102
121-130	0	0	0	0.00	0.00	424	121-130	62	7509	121	121.11	1.95	105
131-140	0	0	0	0.00	0.00	446	131-140	0	0	0	0.00	0.00	110
> 141	0	0	0	0.00	0.00	476	>141	0	231	4	115.50	2.00	117
TOTAL 57781	1547427	190164	----	----	----	----	TOTAL 507585	12422646	409400	----	----	----	----

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.19(b)

ANNUAL STATMENT OF PASSENGER ZONAL STATISTICS FOR 1990-91 W.R.

FIRST CLASS SUBURBAN SEASON						SECOND CLASS SUBURBAN SEASON											
ZONE	PASS.	P.KM.	PASS. ERN.	AV. LEAD	AV. RATE	FARE	ZONE	PASS.	P.KM.	PASS. ERN.	A.V. LEAD	A.V. RATE	FARE				
1-5	1535	6951	2286	4.53	1.49	87	1-5	33649	157419	14742	4.68	0.44	24				
6-10	4664	41474	8769	8.89	1.88	109	6-10	66420	661253	36579	9.96	0.55	30				
11-15	10702	12294	23972	12.36	2.24	130	11-15	81435	120595	53081	14.80	0.65	36				
16-20	8482	141673	23017	16.70	2.71	156	16-20	52040	1033548	39293	19.86	0.63	42				
21-25	14091	305736	41685	21.70	2.96	170	21-25	70601	1757598	57613	24.89	0.74	46				
26-30	8815	236782	27868	26.86	3.16	182	26-30	54669	1596323	48205	29.20	0.80	49				
31-35	16609	524049	58003	31.55	3.49	200	31-35	94831	3274773	91986	34.53	0.86	54				
36-40	2482	94051	9570	37.89	3.86	222	36-40	15600	611094	16157	39.17	0.94	59				
41-45	3213	136989	13035	42.61	4.06	234	41-45	15021	670494	16674	44.64	1.03	62				
46-50	778	38430	3277	49.38	4.21	243	46-50	7219	355949	8229	49.31	1.08	64				
51-60	4094	212763	18672	51.97	4.56	265	51-60	36847	2173801	45317	59.00	1.12	69				
61-70	119	8081	613	67.51	5.16	296	61-70	1149	78058	1551	67.94	1.21	76				
71-80	26	1969	141	76.99	5.53	318	71-80	512	40449	732	78.97	1.33	81				
81-90	0	0	0	0.00	0.00	344	81-90	168	14799	259	88.16	1.42	87				
91-100	80	7305	519	91.00	6.46	371	91-100	104	10150	174	97.77	1.52	93				
101-110	185	19063	1249	103.00	6.75	388	101-110	100	10435	172	104.14	1.63	97				
111-120	0	0	0	0.00	0.00	410	111-120	24	2785	43	115.71	1.70	102				
121-130	363	45028	2687	124.00	7.40	424	121-130	5	674	10	127.00	1.78	105				
131-140	40	5364	306	136.00	7.77	446	131-140	7	961	14	133.00	1.84	110				
> 141	6	1118	47	197.12	8.31	476	>141	8	1300	17	156.95	1.92	117				
TOTAL 76284						1839120235716	TOTAL 530409						12572458	430848	---	---	---

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.20(a)

ANNUAL STATEMENT OF PASSENGER ZONAL STATISTICS FOR 1991-92 C.R.

FIRST CLASS SUBURBAN SEASON						SECOND CLASS SUBURBAN SEASON							
ZONE	PASS.	P.KM.	PASS. ERN.	AV. LEAD	AV. RATE	FARE	ZONE	PASS.	P.KM.	PASS. ERN.	A.V. LEAD	A.V. RATE	FARE
1-5	1953	9764	3671	5.00	1.88	103	1-5	44424	222118	22656	5.00	0.51	28
6-10	4765	42794	11389	8.98	2.39	129	6-10	89522	817334	56399	9.13	0.63	35
11-15	7851	110153	22219	14.03	2.83	154	11-15	86530	1189795	65763	13.75	0.76	42
16-20	15698	285544	52274	18.19	3.33	184	16-20	85271	1580934	75892	18.54	0.89	49
21-25	6859	160436	25928	23.39	3.78	202	21-25	64382	1517477	62450	23.57	0.97	54
26-30	3021	86647	13021	28.68	4.31	218	26-30	38774	1105047	40712	28.50	1.05	58
31-35	11190	379660	49234	33.93	4.40	240	31-35	59326	2009955	68818	33.88	1.16	64
36-40	2538	96986	12358	38.21	4.87	266	36-40	19881	764618	25249	38.46	1.27	70
41-45	938	40451	4865	43.12	5.19	282	41-45	7884	349430	10723	44.32	1.36	74
46-50	3425	168976	18703	49.34	5.46	295	46-50	27281	1337051	38467	49.01	1.41	77
51-60	4959	292604	29454	59.00	5.94	321	51-60	42439	2564183	46259	60.42	1.09	83
61-70	382	25534	2526	66.84	6.61	356	61-70	3474	235187	5767	67.70	1.66	91
71-80	42	3233	301	76.98	7.17	382	71-80	819	62204	1122	75.95	1.37	97
81-90	115	9750	858	84.78	7.46	408	81-90	2307	203164	4430	88.06	1.92	103
91-100	72	7171	587	99.60	8.15	435	91-100	1775	176505	3621	99.44	2.04	109
101-110	0	0	0	0.00	0.00	452	101-110	121	12753	250	105.40	2.07	113
111-120	3	386	30	128.67	10.00	474	111-120	311	35023	690	112.61	2.22	118
121-130	0	0	0	0.00	0.00	488	121-130	73	8804	164	120.60	2.25	121
131-140	0	0	0	0.00	0.00	510	131-140	0	0	0	0.00	0.00	126
> 141	0	0	0	0.00		540	> 141	0	0	0	0.00	0.00	133
TOTAL	63811	1720089	247418	----	----	----	TOTAL	574594	14191582	529432	----	----	----

SOURCE : CENTRAL AND WESTERN RAILWAYS

TABLE : 4.20(b)

ANNUAL STATMENT OF PASSENGER ZONAL STATISTICS FOR 1991-92 W.R.

FIRST CLASS SUBURBAN SEASON						SECOND CLASS SUBURBAN SEASON							
ZONE	PASS.	P.KM.	PASS.	AV.	AV.	FARE	ZONE	PASS.	P.KM.	PASS.	A.V.	A.V.	FARE
			ERN.	LEAD	RATE					ERN.	LEAD	RATE	
1-5	2894762	12368860	3160163	4.27	1.09	103	1-5	54922128	252276348	21019633	4.59	0.38	28
6-10	14716866	142738654	10375031	9.69	0.70	129	6-10	82118139	774351812	41512359	9.42	0.50	35
11-15	32756102	401767330	27945659	12.26	0.85	154	11-15	95094796	1366508148	63586596	14.36	0.66	42
16-20	10178046	195341274	23575277	19.19	2.31	184	16-20	72909415	1401162243	45856194	19.21	0.62	49
21-25	17647138	405711888	47504090	22.99	2.69	202	21-25	82783185	1952773216	75652963	23.58	0.91	54
26-30	8825706	257147974	31434136	29.13	3.56	218	26-30	54399027	1579835500	53218588	29.04	0.97	58
31-35	18295222	621629276	71674207	33.97	3.91	240	31-35	128718526	4369265931	120301864	33.94	0.93	64
36-40	2874080	109420734	12535037	38.07	4.36	266	36-40	18938362	729839110	21743709	38.54	1.14	70
41-45	3650700	160549500	15779783	43.97	4.32	282	41-45	33957654	1493936280	35156281	43.99	1.03	74
46-50	813152	40115594	3870561	49.33	4.75	295	46-50	8094797	399569996	10818950	49.36	1.33	77
51-60	4043750	236903200	21645643	58.58	5.35	321	51-60	42862754	2506531246	55920680	58.47	1.30	83
61-70	134250	9162000	772282	68.24	5.75	356	61-70	1802386	123274298	2066355	68.39	1.14	91
71-80	30548	2360198	194839	77.26	6.37	382	71-80	670150	51622850	962476	77.03	1.43	97
81-90	4300	357800	19633	83.20	4.56	408	81-90	265800	23136600	364640	87.04	1.37	103
91-100	83050	7587550	554746	91.36	6.67	435	91-100	161900	15643750	283550	96.62	1.75	109
101-110	210600	21691800	2541970	103.00	12.07	452	101-110	142074	14785420	378338	104.06	2.66	113
111-120	0	0	0	0	0	474	111-120	103200	12049050	70311	116.75	0.68	118
121-130	48250	5983000	376276	124.00	7.79	488	121-130	8000	994150	15818	124.26	1.97	121
131-140	12800	1740800	106827	136.00	8.34	510	131-140	4100	556700	8315	135.78	2.03	126
>141	616900	122210750	6856924	198.10	11.11	540	>141	9162	1338126	77565	146.05	8.46	133
TOTAL 117836222 2754788182 280923084						TOTAL 677965555 17069450774 549015185							

SOURCE : CENTRAL AND WESTERN RAILWAYS

Table : 4.21

**Matrix of Suburban Season Ticket Trips Between
Major Stations on Central Railway.**

1982-83											
	V.T.	BYC.	DDR.	SN.	CLA.	GC.	VKI.	TN.	KYN.	CMBR.	WDR.
V.T.	0	2861625	4989625	2485750	3501725	586895	2811800	6381175	2816300	4104125	7691800
BYC.	2861625	0	1632950	1410825	82225	38075	1651600	1776375	288750	354350	102075
DDR.	4989625	1632950	0	687225	793375	435950	1096850	3719350	912250	140250	300
SN.	2485750	1410825	687225	0	314050	225700	19425	554150	1775	468200	0
CLA.	3501725	82225	793375	314050	0	906200	175175	1580525	331350	66300	89150
GC.	586895	38075	435950	225700	906200	0	926200	3577725	687475	39950	39350
VKI.	2811800	1651600	1096850	19425	175175	926200	0	43650	1675	187000	319200
TN.	6381175	1776375	3719350	554150	1580525	3577725	43650	0	65775	540175	167525
KYN.	2816300	288750	912250	1775	331350	687475	1675	65775	0	44350	14525
CMBR.	4104125	354350	140250	468200	66300	39950	187000	540175	44350	0	262950
WDR.	7691800	102075	300	0	89150	39350	319200	167525	14525	262950	0
SUM	38230820	10198850	14408125	6167100	7840075	7463520	7232575	18406425	5164225	6207650	8686875

1988-89											
	V.T.	BYC.	DDR.	SN.	CLA.	GC.	VKI.	TN.	KYN.	CMBR.	WDR.
V.T.	0	1325275	3921050	2008875	2434350	14784550	2857050	16931375	3324075	3094375	4775775
BYC.	1325275	0	867025	1314250	129305	39050	1124800	2299450	519900	347175	86625
DDR.	3921050	867025	0	517325	328675	145275	4271225	3844050	1193250	808250	25
SN.	2008875	1314250	517325	0	204975	102715	61525	37800	0	266925	0
CLA.	2434350	129305	328675	204975	0	622825	229675	1434025	219925	59625	43450
GC.	14784550	39050	145275	102715	622825	0	710675	3348050	841025	42800	17400
VKI.	2857050	1124800	4271225	61525	229675	710675	0	180625	0	169425	127450
TN.	16931375	2299450	3844050	37800	1434025	3348050	180625	0	60500	439950	180300
KYN.	3324075	519900	1193250	0	219925	841025	0	60500	0	153050	45425
CMBR.	3094375	347175	808250	266925	59625	42800	169425	439950	153050	0	178225
WDR.	4775775	86625	25	0	43450	17400	127450	180300	45425	178225	0
SUM	55456750	8052855	15896150	4514390	5706830	20654365	9732450	28756125	6357150	5559800	5454675

1991-92											
	V.T.	BYC.	DDR.	SN.	CLA.	GC.	VKI.	TN.	KYN.	CMBR.	WDR.
V.T.	0	1308175	3791525	2238650	1702000	18822700	2978550	15180050	593875	2799350	9036125
BYC.	1308175	0	1003600	1430825	1292850	37275	885150	6587425	1186300	1294325	97300
DDR.	3791525	1003600	0	638525	1658275	211675	1070000	3149125	774375	2102475	100
SN.	2238650	1430825	638525	0	200775	135450	26050	95900	0	523000	0
CLA.	1702000	1292850	1658275	200775	0	481075	518800	238650	516125	2221575	108200
GC.	18822700	37275	211675	135450	481075	0	1061900	2894825	503125	219425	25100
VKI.	2978550	885150	1070000	26050	518800	1061900	0	2281350	0	374800	124025
TN.	15180050	6587425	3149125	95900	238650	2894825	2281350	0	191250	268925	3258175
KYN.	593875	1186300	774375	0	516125	503125	0	191250	0	132125	21600
CMBR.	2799350	1294325	2102475	523000	2221575	219425	374800	268925	132125	0	184525
WDR.	9036125	97300	100	0	108200	25100	124025	3258175	21600	184525	0
SUM	58451000	15123225	14399675	5289175	8938325	24392550	9320625	34145675	3918775	10120525	12855150

NOTE:- V.T.:Victoria Terminus, BYC.:Byculla, DDR.:Dadar, SN.:Sion, CLA.:Kurla, GC.:Ghatkopar, VKI.:Vikhroli, TN.:Thane, KYN.:Kalyan, CMBR.:Chembur, WDR.:Wadala Road.

SOURCE : CENTRAL RAILWAY.

TABLE : 4.22

**ARC ELASTICITY OF FARES w.r.t.A.L OF SUBURBAN
TICKET HOLDERS**

ARC ELAS. ZONE	FOR C.R.I-CLASS A.E.	ARC ELAS. ZONE	FOR W.R.I-CLASS A.E.
1-5	0.465	1-5	0.349
6-10	-0.069	6-10	0.451
11-15	0.082	11-15	-0.349
16-20	-0.137	16-20	-0.001
21-25	-0.034	21-25	-0.072
26-30	0.002	26-30	0.026
31-35	0.006	31-35	-0.043
36-40	0.022	36-40	0.046
41-45	-0.066	41-45	0.059
46-50	0.003	46-50	0.050
51-60	0.026	51-60	0.207
61-70	-0.016	61-70	0.174
71-80	-0.070	71-80	0.144
81-90	0.026	81-90	10.469
91-100	-0.005	91-100	-0.016
101-110	NA	101-110	0.000
111-120	6.586	111-120	NA
121-130	NA	121-130	0.000
131-140	NA	131-140	6.297
>141	NA	>141	6.645

ARC ELAS. ZONE	FOR C.R.II-CLASS A.E.	ARC ELAS. ZONE	FOR W.R.II-CLASS A.E.
1-5	0.567	1-5	0.045
6-10	-0.175	6-10	0.038
11-15	-0.020	11-15	-0.005
16-20	-0.062	16-20	-0.020
21-25	0.036	21-25	0.007
26-30	0.003	26-30	-0.004
31-35	-0.001	31-35	-0.004
36-40	-0.001	36-40	0.023
41-45	-0.006	41-45	0.004
46-50	-0.007	46-50	-0.010
51-60	0.057	51-60	-0.016
61-70	0.019	61-70	0.003
71-80	-0.026	71-80	0.019
81-90	0.045	81-90	-0.028
91-100	-0.002	91-100	-0.008
101-110	0.001	101-110	0.007
111-120	-0.053	111-120	0.059
121-130	0.051	121-130	-0.040
131-140	NA	131-140	0.068
>141	-5.298	>141	0.120

NOTE : 1. AVERAGE OF INCREMENTAL CHANGES TAKEN AS AVERAGE SLOPE.

2. A.E. : ARC ELASTICITY.

3. A.L.: AVERAGE LEAD

TABLE : 4.23

TAPERING OF FARES OVER DISTANCES.

FARE FOR 1st CLASS					TAPERING OF 1st CLASS FARES.				
1987-88	1988-89	1989-90	1990-91	1991-92	1987-88	1988-89	1989-90	1990-91	1991-92
68.00	75.00	75.00	87.00	103.00					
84.00	93.00	93.00	109.00	129.00	16	18	18	22	26
100.00	110.00	110.00	130.00	154.00	16	17	17	21	25
120.00	132.00	132.00	156.00	184.00	20	22	22	26	30
132.00	146.00	146.00	170.00	202.00	12	14	14	14	18
140.00	154.00	154.00	182.00	218.00	8	8	8	12	16
156.00	172.00	172.00	200.00	240.00	16	18	18	18	22
172.00	190.00	190.00	222.00	266.00	16	18	18	22	26
180.00	198.00	198.00	234.00	282.00	8	8	8	12	16
188.00	207.00	207.00	243.00	295.00	8	9	9	9	13
208.00	229.00	229.00	265.00	321.00	20	22	22	22	26
236.00	260.00	260.00	296.00	356.00	28	31	31	31	35
256.00	282.00	282.00	318.00	382.00	20	22	22	22	26
280.00	308.00	308.00	344.00	408.00	24	26	26	26	26
304.00	335.00	335.00	371.00	435.00	24	27	27	27	27
320.00	352.00	352.00	388.00	452.00	16	17	17	17	17
340.00	374.00	374.00	410.00	474.00	20	22	22	22	22
352.00	388.00	388.00	424.00	488.00	12	14	14	14	14
372.00	410.00	410.00	446.00	510.00	20	22	22	22	22
400.00	440.00	440.00	476.00	540.00	28	30	30	30	30

FARE FOR IInd CLASS					TAPERING OF IInd CLASS FARES.				
1987-88	1988-89	1989-90	1990-91	1991-92	1987-88	1988-89	1989-90	1990-91	1991-92
17.00	21.00	21.00	24.00	28.00					
21.00	26.00	26.00	30.00	35.00	4	5	5	6	7
25.00	31.00	31.00	36.00	42.00	4	5	5	6	7
30.00	36.00	36.00	42.00	49.00	5	5	5	6	7
33.00	40.00	40.00	46.00	54.00	3	4	4	4	5
35.00	42.00	42.00	49.00	58.00	2	2	2	3	4
39.00	47.00	47.00	54.00	64.00	4	5	5	5	6
43.00	51.00	51.00	59.00	70.00	4	4	4	5	6
45.00	53.00	53.00	62.00	74.00	2	2	2	3	4
47.00	55.00	55.00	64.00	77.00	2	2	2	2	3
52.00	60.00	60.00	69.00	83.00	5	5	5	5	6
59.00	67.00	67.00	76.00	91.00	7	7	7	7	8
64.00	72.00	72.00	81.00	97.00	5	5	5	5	6
70.00	78.00	78.00	87.00	103.00	6	6	6	6	6
76.00	84.00	84.00	93.00	109.00	6	6	6	6	6
80.00	88.00	88.00	97.00	113.00	4	4	4	4	4
85.00	93.00	93.00	102.00	118.00	5	5	5	5	5
88.00	96.00	96.00	105.00	121.00	3	3	3	3	3
93.00	101.00	101.00	110.00	126.00	5	5	5	5	5
100.00	108.00	108.00	117.00	133.00	7	7	7	7	7

SOURCE : CENTRAL RAILWAY TIME-TABLE.

CHAPTER 5
COST OF SUBURBAN RAIL SERVICES

CHAPTER 5

COST OF SUBURBAN RAIL SERVICES

The level and the structure of fares are governed by demand as well as cost considerations. We have already dealt with demand related factors of EMU services. We now examine issues and problems related to the determination of the costs of EMU services.

Like all costing procedures, allocation of common & overhead costs gives rise to many difficulties in ascertaining the costs of EMU operations. The railways, at present, follow elaborately specified procedures for accounting and imputation of costs of EMU services. We, therefore, begin with a summary review of the present prescribed procedures and point out some conceptual as well as computational difficulties thereof. We also present an alternative set of estimates based on a different method of allocation and imputation. These estimates are then compared with the prevalent composition of costs on Western & Central Railways. This is followed by a tentative illustration of the application of the long-run marginal cost principle based on data relating to the Mankhurd-Belapur project.

5.1 Review of Present Costing Procedures

The Western and Central Railways calculate the cost of EMU operations as per prescribed forms and schedules which are as follows:

- a) The analysis of working expenses relating to the division where EMU services operate, i.e., Working Expenses Statement Abstracts -[WESA],
- b) Depreciation Reserve Fund Annual Statement (DRF Stat.), and
- c) Statement showing the distribution of interest charges to various services (Int. Stat.).

Many of the heads of expenditure in the above mentioned statements are common to EMU as well as non EMU operations. Hence, these need to be allocated between services on the basis of one or the other criterion of attribution and distribution. We, therefore, present the data on costs of EMU services as follows: (i) as per the items in the prescribed form (see Tables 5.1a & 5.1b), (ii) as per the abstract heads distributed according to respective footnotes and apportionment factor (see Table 5.2), and (iii) apportionment of EMU expenses under the various allocation modes i.e., GTKM, ETKM, etc., according to footnote (see Tables 5.3a, 5.3b & 5.4).

Before we discuss problems relating to the choice of allocation criteria, we may point out certain inaccuracies and/or inconsistencies in the data supplied to us which are as follows

i) There are considerable differences in the values of proportions employed in the allocation criteria for EMU services in WESA, DRF Stat. and Int. Stat..

For example:

	CENTRAL RAILWAY			WESTERN RAILWAY	
	WESA	DRF/INT.STAT.		WESA	DRF/INT.STAT.
GTKM	42.443%	4.278%	GTKM	28.511%	5.999%
TKM	63.387%	13.590%	TKM	54.888%	18.785%

We suspect that the shares reported in DRF Stat. and Int. Stat. relate to zonal shares and not divisional shares. On the other hand, working expenses are allocated on the basis of divisional shares. We were informed that balance sheets are prepared only at the zonal levels and no balance sheet as such exists for divisional operations. Our discussions with the concerned authorities could not throw much light on procedures and methods employed for identifying capital-at-charge for the division and its subdivisions by the nature of services, i.e. EMU & non-EMU. It was, therefore, decided to retain DRF & Interest allocations as they are. We, however, note a sense of confusion and unease in this regard.

ii) The allocation criterion for items under footnote 12 in the WESA is not specified. There seems to be a difference in the basis of distribution of expenses to the items attached to this footnote i.e. G-510, G-530 and G-540 between the Western and Central Railways. While a distribution ratio of 61.446% is used on Western Railway, these items are being allocated according to provisions made by the DRM (Budget) on the Central Railway.

iii) The values listed in 'Ratio 13' of DRF Stat. for Central Railway do not agree with the actual figures under the respective abstract heads. The figure obtained after summing the various expenses under these heads [i.e. (E1171 to E1177)] is not the same as the one obtained by the authorities. The ratios thus obtained are also different from their ratios.

iv) In the Western Railway DRF Stat. and Int. Stat. EMU shares under items E-1171 and E-1172 have been ascertained on the basis of 'footnote 5' i.e. the basis of distribution among services is the share in engine hours. In the Central Railway DRF and Int. Stat., no allocations have been made to EMU under these heads.

v) The headquarter share in absolute terms in WESA of Central Railway under the abstracts D,F and H do not agree with the ratios allotted as headquarters share under the respective heads.

E.g:-

Abstract	HQshare (%)	Share of EMU	HQshare (as given)	* HQshare (as calculated)
D	-1.415	216957000	-10152	-306984
F	-1.516	63274544	-432736	-959242
H	-1.318	294427258	-44755	-3880551

* HQ share in expenses = Share of EMU expenses multiplied by HQ share (in percentage).

vi) The expenditure incurred on item G-510 in the WESA (Western Railway) is higher (2,24,53,909) than what is listed (1,85,42,666) if the allocation ratio (61.446) allotted to it is correct.

vii) Form 111 explains the allocation of expenditure of headquarters as follows:

“The share of expenditure of headquarter office under each abstract shall be in the percentage ratio of headquarters office expenses to total zonal railways expenditure excluding those of HQ office”.

Curiously, the allocations supposedly based on this method are reported to be negative! This can be noted from Table 5.5. Negative costs have no economic meaning and practical significance. The costs so allocated should not violate the accounting identity of total expenditures of the division and HQ expenditures before allocation. Unless the value of the ratio for each abstract is given from outside the possibility of a negative sign for allocated expenditures is ruled out. This can occur only when, apart from the accounting identity of expenditures, the value of the ratio extraneously specified acts as an additional simultaneous constraint.

Moreover, some of the items in different abstracts are reported to be negative. These relate mostly to the transactions where the activity performed implies expenses incurred which are to be duly recovered from other entities, and hence, not to be recovered as part of the incurred costs. However, the notes on the procedures to be followed lacks any explanation in this regard. We have, therefore, taken them at their face value.

We may now examine the different bases used to identify and allocate costs to EMU services. There are certain costs which unambiguously arise out of EMU operations. As these emerged exclusively out of EMU operations, they are termed as “direct” costs due to EMU. All item heads appearing under abstract ‘D’, F-400, G-785 and H-322 constitute direct costs of EMU services. They account for 64 percent of total working expenses on Central as well as on Western Railways. Hence, a little more than one-third of the costs are incurred collectively. These costs have to be allocated among EMU and non-EMU services (i.e coaching and goods) on the basis of one or

another criterion.

Under the present procedures, seven such distinct bases of allocations or their combinations are employed. These are, 1. Share of EMU in GTKM 2. Share of EMU in ETKM.3. Share of EMU in Train Kms. 4. Share of EMU in EMU Hours.5. Share of EMU in Passenger Vehicle/Wagon Kms. 6. Share of EMU in Engine Hours. 7. Share of EMU in 'other' expenditures. The last head of allocation, No.7-"Others" needs some explanation. It comprises items G-510, G-530 and G-540 which relate to ticket checking staff and squad. For Western Railway, the referred footnote 12 and annexure-11 fail to explain the basis of identification and allocation for these items. However, in the case of Central Railway, the basis of allocation is reported to be "as per DRM (Budget)". For the lack of relevant information, we have classified them as "others".

Evidently, each of these bases of allocation and/or attributions have their own rationale. GTKM and passenger kms. are measures of output of services generated. They are, in fact, related to each other by the following formula:

$$\text{GTKM} = (\text{Passenger km.} \times 0.04 \text{ Tonnes}) + (\text{Weight of train including weight of engine \& departmental movement}).$$

Except for 'signalling and telecommunication' related working expenses, GTKM has been used as a measure of output for all other similar expenditures. The logic of this item alone being allocated on the basis of passenger vehicle kms and train km. rather than on GTKM basis remains unexplained. On the other hand, other similar items involving overhead equipment related working expenses are classified on the basis of train kms.. Rest of the bases of allocation measure utilisation and/or occupancy of installed facility. This refers to the occupancy of installed facility rather than the resultant output.

All multiproduct firms face a problem of assigning cost of the installed facility which is common between products. Allocations are often decided and changed by 1) taking into account the nature of demand elasticities and size of demand or 2) share in the value or physical measure of output. or 3) alternatively, occupancy time and utilisation of the installed facility. It seems that the present procedures follow the last of the principles mentioned above. Train kms. as well as equated track kms., i.e. ETKM, are neither comprehensive nor natural measures of the installed facility. They are artifact measures useful for some other purposes but inadequate proxies of capacities and process-measures. It would, therefore, be just and sensible to allocate the items covered under these bases of allocation by share in output principle i.e., share in GTKM. We, therefore, undertake an exercise of allocating common and overhead costs by "share in output" principle i.e. share in GTKMs. However, expenditure on items G-510, G-530 and G-540 which have been shown as "others", as

well as headquarter share in Tables 5.3a & 5.3b have not been reallocated by GTKM for the lack of unambiguous and transparent data. We present the cost estimates based on this criterion in Table 5.6. It may be noted that expenditures for EMU services, according to this procedure, are considerably different. The estimated cost under this procedure are lower than the present procedure for both Central as well as Western Railways. The costs turn out to be lower by Rs. 7.26 crores and Rs. 3.343 crores for Western Railway and Central Railway respectively. Evidently, indicators such as Train kms and EMU hours which are process based or measures used for facility utilisation impute a much higher share of cost to EMU services. Over-imputation of costs due to Train kms and EMU hours and under-imputation of the same due to ETKM could be eliminated by using GTKM, which is a measure of output. Generally, each abstract contains heads of costs which are similar but expenses related to them are being allocated by different allocation modes. The difference between them is often too fine to apply such highly differentiated criterion. Hence, we believe that the present procedure may be defensible but is neither obvious nor entirely desirable. Given such ambiguities in the choice of allocation criterion, neither surpluses nor deficits of EMU services can be ascertained with confidence. Our estimates, which are based on alternative justifiable criterion, i.e. GTKM, are intended to suggest the sensitivity of surplus or deficit to the choice of criteria.

We have, at our disposal, data on costs pertaining to the year 1991-92 only. Hence, analysis of variability of costs of items over a period with respect to output (short-run marginal cost) could not be undertaken. Similarly, variability in the allocation indicators themselves over a period of time could not be analysed.

As costs due to EMU operations under the suggested criterion (i.e. GTKM) are lower, it results in raising the surplus (profits) due to EMU operations on Western Railway by Rs. 7.726 crores. Similarly, expenses of Central Railway EMU operations are reduced by Rs. 3.343 crores which imply a surplus of Rs 1.4639 crores!

As we had pointed out earlier, neither Western nor Central Railways could provide us with unambiguous statements reflecting assets and liabilities of the Division. During our discussions with concerned officials, we gathered the impression that 1) no separate statements of assets and liabilities are prepared at the divisional level, 2) there exists no well defined method and procedure for calculating and/or identifying 'capital-at-charge' assignable to the division. This renders the task of estimating 1) capitalisation factor, 2) incremental capital-output ratio, and 3) ascertaining the adequacy or otherwise of the DRF allocations made to EMU services very difficult. The only element in DRF and the Interest Statements which exclusively pertains to EMU services is D-2133, EMU.

Its value is arrived at by adding bookvalue and "share of common capital". The basis of computing the 'share of common capital' has not been made clear to us. Moreover, depreciation is calculated on a straight line basis i.e., dividing the book value (inclusive of share of common costs) by age of the asset. (Refer to Table 5.7) This, in turn, is multiplied by "procurement price factor", presumably reflecting change in the price level of the concerned asset. The procurement price factor in the case of EMU units is 5.90. However, it was found that this same factor has been applied for all types of assets, and some of them with widely different ages and physical character. If the age of the asset is assumed to be 25 years, this procurement factor implies 7.35 percent price rise on annual basis and if it is assumed to be 10 years, the price rise as implied by the procurement factor is 19.11 percent. We could not elicit a convincing explanation for applying the same procurement factor for diverse types of assets.

This data, therefore, can be used neither for estimating future capital requirements nor for revaluating the present stock of capital. Hence, we refrain from making use of this data for estimating long run marginal cost. An alternative set of values of capital requirements could be derived by using data of Mankhurd-Belapur project. However, the available data are too aggregative and in a summarised form. It has been indicated that the total cost of this project with 18km length of 2-way electrified track is 287.11 crores. This includes cost of buildings, platforms, stations, overhead equipment and rolling stock. The project report shows 9 EMU rakes as the necessary operational rolling stock. We have been informed that 15% of the total project cost is for EMU rakes. Thus, the cost of a single EMU rake is 4.785 crores at 1991-92 prices. This implies that Rs.244.0435 crores is the cost of assets other than EMU units for a 2-way 18 km electrified track. Assuming that the fixed costs are linearly related to distance, we may work out a rough revaluation of Western Railway assets. This would imply Rs. 287.11 crores for 60 rakes and Rs. 813.4783 crores for other fixed assets. In other words, if the EMU operations are to be delegated to any other independent authority, along the Western Railway it should be vested with Rs. 1101 crores for fixed assets alone. Assuming an average age as 40 years for different assets, depreciation, on a straight line basis, without adjusting for inflation, works out to be Rs. 27 crores. Thus, the present provisions for depreciation i.e., Rs. 21.289 crores (on shared basis) will prove adequate only under a state of zero or very low inflation, unless these are invested in high yielding sinking funds investments.

We are not aware whether the present DRF allocations are invested and maintained under sinking fund with due adjustment for inflation. Had this been so, railways might not have faced difficulties in mobilising resources for expansion of their network.

5.2 Fare Levels and Capital Recovery

Let us now consider the situation in which we were to revalue the existing assets of EMU services assuming them to be procured and installed freshly. This exercise requires some recent estimates of the value of relevant assets in recent period. Expansion of the existing network necessitates expenditure on additional fixed costs. We have used the cost estimates of Mankhurd-Belapur project that were made available to us for revaluing the cost of assets on Western Railway. Total expenditure on assets on the Mankhurd-Belapur 18 km. two way electrified track was 287.11 crores. This includes land, buildings, railways, overhead equipment and rolling stock. The cost of creek bridge construction is not included. Rolling stock consists of 9 EMU rakes accounting for 15% of the total project cost. This allows us to separate the value of the rolling stock as Rs. 4.7852 crores per EMU rake. The remaining cost pertains to other fixed assets. These, when applied to 60 km. double track of Western Railway with 60 EMU rakes, yield a cost estimate of Rs. 287.11 crores for EMU rakes and Rs. 813.4783 crores for non-EMU assets; the total cost, thus, being Rs. 1100.5883 crores. These assets are shared with other non-EMU services i.e., passenger coaching and goods. We also present estimates of costs with 30%, 50% and 100% of capital cost being attributable to EMU. In the last case, (i.e., 100% share), the entire revalued capital of Rs. 1100.5883 crores is imputed to EMU alone. (See Table 5.11)

It may be noted that passenger kms. on the Western Railway have been growing at a compound rate of growth of 6.3787% per annum. Hence, the number of passenger kms. handled by EMU services on WR can be expected to double within the coming twelve and a half to thirteen years. Some investments in additional capacity would, therefore, be unavoidable. Let us assume that this is to be done in three phases of four years each. Since projecting these requirements for longer periods would not be very reliable, we restrict our projections to four years, i.e., from 1992-93 to 1995-96. Additional investments for expansion of capacity are calculated on the basis of average value of capital to physical output ratio of Rs. 0.4866 crores/passenger km (crores). (The value of capital-output ratio may seem very low initially, as the output has been measured in its physical unit. If we take the current revenue per passenger km., i.e., 6.5204 paise, as the value of gross output and consider 40 percent of this to be value added, then the capital to value added ratio will be Rs.18.66). This measure of capital requirement is used to estimate additional investments for handling additional passenger kms. This can be seen from Table 5.12. We have no other method of cross validating this ratio. Using the above mentioned parameters we have projected additional annual investments for four years. We have adjusted for these capital costs assuming a rate of inflation of 10 percent. We then get the present value of the inflation adjusted investments

by discounting them at the rate of 13 percent. Thus, we have inflation adjusted present value of future investment expenditures that would be added to the initial value of the share of capital (i.e., either 30% or 50% or 100% of 1100.5883 crores). Table No. 5.13 shows these workings in detail.

This exercise gives us the initial cost (with three versions attributing 30%, 50% and 100% cost of capital respectively to EMU services) that needs to be recovered. If we assume the average life of the asset created as 25 years in the coming four years, $4/25$ i.e., 16 percent of the estimated capital cost should be recovered in these four years. As the expected revenues forthcoming are spread over four years, these also need to be discounted at a suitable postulated internal rate of return.

Given that we postulate different rates of return (15%, 16% and 17%) each rate will yield a different capital recovery factor thereby giving different sums of capital to be recovered from revenue. This can be seen from table 5.11.

We do not have estimates of future revenue per passenger km. which is the price of the output. We have, however, projections of passenger kms. i.e., the quantum of output to be supplied. Thus, we will solve for average 'revenue' necessary for recovering the capital invested per year for a postulated rate of return. The resultant value is divided by the average of projected passenger kms. to arrive at the capital cost per passenger km. that should be recovered from the fare. To this, we add the working expenses per passenger km., to arrive at the fare which covers both working expenses as well as the requisite capital cost. This can be noted from Table 5.14. Since we are adjusting the recovery of capital for the internal rate of return and age of the asset, working expenses per passenger km., are taken net of depreciation and interest. The costs per passenger km. thus estimated may be compared with average revenue per passenger km. This provides a reasonable estimate of the adequacy or otherwise of present fares. Table 5.14 shows these estimates.

The working expenses including headquarters' share and interest charges but excluding depreciation charges for Western Railway are Rs.113.6166 crores. The interest charges as per the Int. Stat. are reported to be calculated at the rate of 6.5 percent per annum. We have adjusted for these by taking twice the value of current provisions, which corresponds to the rate of interest of 13 percent per annum. If this assumption is not correct, then the working expenses will be lower than our present estimates. We have also not explicitly dealt with the question of debt-equity components of capital since the 'capital-at-charge' is defined as value of assets, and no information is available on its debt or equity mode of financing. The capital to be recovered from the fare

could be financed either entirely through 'equity' or partly with equity and partly with debt. It is possible to incorporate the modifications due to debt-equity composition by multiplying the total quantity of capital to be recovered by a fraction which pertains to 'equity'. Consequently, the total capital to be recovered will be lowered. On the other hand, interest expenditures as per the relevant interest rate, should be added to the total working expenses. If the capital is to be shared between EMU and non-EMU services and equity represents only a part of total capital raised, then, capital attributable to EMU services will be much less. Therefore, the recovery of capital per passenger km. will be smaller than the present estimates. We, however, reiterate that due to lack of clear information our estimates are open to revision.

As per the present provisions of Western Railway, interest expenditures are 5.38% of the working expenses. Thus adjustment for debt-equity mix will possibly lower recovery of capital cost per passenger kilometre, raise the working expenses and generally indicate lower revenue required (i.e., lower level of fare to be charged per passenger km.). The cost of working expenses per passenger km. turns out to be 5.0235 paise. To this is added the fixed cost per passenger km. to obtain the total cost per passenger km. Fixed cost per passenger km. has been calculated for three different internal rates of return (IRR) and specifying different percentages of the capital cost to the attributable to EMU. (Refer to Table 5.14)

The total cost (working expenses per passenger km. plus the capital cost per passenger km. as estimated) per passenger km. is maximum i.e. 8.1736 paise, if the entire capital cost is attributed to EMU services alone with the IRR as 17 percent. Since the revenue per passenger km. is 6.5204 paise for 1991-92, revenue collection falls short by 1.6459 paise or 25.20% of present revenue per passenger km. The short fall in the revenue to be collected per pass. km. is the lowest at 0.2804 paise or 4.29 percent if 30% of capital cost is attributed to EMU at 15 percent of IRR. Thus it is clear from the table that revenue per passenger km. as it stands presently falls short of total costs under all the three conditions that have been considered.

5.3 Summary.

We may now summarise our principal observations:

1) A good part of the working expenses are allocated on the basis of proxy indicators of equipment time and/or capacity. Since there is no genuine opportunity cost that can be imputed to two competing outputs produced by the equipment (and their consequent contribution to surplus), it is not desirable to evaluate equipment capacity and constraint on the basis of physical occupancy and utilization. It would be equally justified or even better if the cost of these capacities are allocated in proportion to the output produced.

Moreover, the indicators such as the 'equated track kilometers' and 'passenger vehicles and wagon kilometers' are by themselves not adequate and satisfactory measures of production activity and utilization. Hence, we prefer a more direct and common measure of output such as gross tonne kilometers to allocate the working expenses arising out of common equipment.

As demonstrated above, adopting such a change in the method of allocating overhead and common cost to different services, will also change the estimates of surplus or deficit on W.R. and C.R.. If GTKM is used as the measure of output to reallocate working expenses, surplus on the W.R. increases from Rs. 23.7187 crores to Rs. 31.44 crores (i.e. by 7.726 crores and the C.R. no longer suffers from a deficit of Rs. 1.8796 crores but has a surplus of Rs. 1.4639 crores.

2) Our examination of data and discussions with concerned officials indicates, a) lack of unambiguous data on relevant assets at the divisional level, b) inadequate provisions for maintaining capital intact and surpluses needed for further expansion. We regret to note that practices followed in computing and imputing "capital at charge" and the basis and rate of inflation adjustment implied in the procurement factor are often unclear and ambiguous. Many senior officials have sounded their scepticism to us in this regard.

Given these limitations, we have preferred to work with parameters derived from Mankhurd-Belapur line. Admittedly, there is considerable scope for improvement and refinements. The estimates presented here are intended to illustrate and indicate the method and possible range of revision in fares. It also presupposes ear-marking of the resulting surpluses for the expansion of EMU alone. Hence, these may not be taken as unqualified and general recommendation of upward fare revisions. However, it does indicate the necessity of changing the accounting and pricing practices on non-EMU services as well. In other words, the tariff policy and cost accounting procedures so far pursued, appear to have inadequately provided for the capital recovery. The problem, thus, is not confined to EMU services alone but pertains to the wider question of pricing of rail services.

**TABLE:5.1(a) ANALYSIS OF EMU WORKING EXPENSES (IN RUPEES) RELATING TO
DIVISION WHERE EMU**

SERVICES RUN (W.E.S.A.) CENTRAL RAILWAY, 1991-92

SR. NO.	ABSTRACT	HEAD OF ACCOUNT	EXPENSES OF DIVISION	FOOT NOTE	APPORTIONMENT FACTOR FOR EMU (%)	SHARE OF EMU
1	A-100	GENERAL MANAGEMENT AND GENERAL MANAGEMENT SERVICES	4673237	17	32.743	1530158
2	A-200	FINANCIAL MANAGEMENT	10711641	17	32.743	3507313
3	A-300	PERSONNEL MANAGEMENT	196518125	17	32.743	6436660
4	A-400	MATERIAL MANAGEMENT	-	17	-	-
5	A-500	WAY & WORKS MANAGEMENT	5748122	5	18.904	1086625
6	A-700	ELECTRICAL MANAGEMENT	3620551	7	80.421	2911683
7	A-800	S & T MANAGEMENT	2640133	15	59.539	1571909
8	A-900	TRAFFIC MANAGEMENT	9830902	16	43.195	4246458
9	GRAND TOTAL		56882711			21290806
1	B-100	ESTABLISHMENT IN OFFICES	15999839	5	18.904	3024610
2	B-200	MAINTENANCE OF PERMANENT WAY	134312346	1	19.391	26044507
3	B-310	MAINTENANCE OF BRIDGE WORK, GIRDER BRIDGES	5161091	2	42.443	2190522
4	B-320	MAINTENANCE OF BRIDGE WORK, OTHER BRIDGES	1435399	2	42.443	609226
5	B-330	MAINTENANCE OF TUNNELS	587245	3	48.280	283522
6	B-340	MAINTENANCE OF RUBs/ROBs & FOOTOVER BRIDGES	4181877	3	48.280	2019010
7	B-410	MAINTENANCE OF BUILDINGS (OTHER THAN STAFF QUARTERS & SERVICES BUILDINGS)	26131934	17	32.743	8556379

TABLE : 5.1(a) CONTUNED....

8	B-420	STATIONS, GOODS SHEDS	24386753	4	2.412	588208
9	B-430	WORKSHOP & STORES	12305555	5	18.904	2326242
10	B-440	ALL OTHER STRUCTURES	1354285	3	48.280	653849
11	B-510	WATER SUPPLY	21445295	5	18.904	4054019
12	B-520	SANITATION	4515715	5	18.904	853651
13	B-530	SERVICE ROADS & OTHERS (MISCELLANEOUS)	5561379	5	18.904	1051323
14	B-620	STATION MACHINERY OTHER THAN WATER SUPPLY ARRANGEMENT	-	5	-	-
15	B-630	CONSERVANCY OF RIVERS	-	3	-	-
16	B-640	TREES PLANTATION, NURSERIES ETC.	2737626	17	32.743	896381
17	B-650	MISCELLANEOUS EXPENSES	3981273	5	18.904	752620
18	B-711	SPECIAL REPAIRS PERTAINING TO BREACHES - EARTH WORK	3098081	1	19.391	600749
19	B-712	SPECIAL REPAIRS TO BRIDGES	-	2	-	-
20	B-713	SPECIAL REPAIRS PERTAINING TO BREACHES - PERMANENT WAY	-	1	-	-
21	B-714	SPECIAL REPAIRS PERTAINING TO BREACHES - BALLAST	-	1	-	-
22	B-715	SPECIAL REPAIRS (MISCELL- -ANEOUS BREACHES)	-	5	-	-
23	B-721	SPECIAL REPAIRS PERTAINING TO ACCIDENTS - EARTH WORK	-	1	-	-
24	B-722	SPECIAL REPAIRS TO BRIDGES -ACCIDENTS	-	2	-	-
25	B-723	SPECIAL REPAIRS PERTAINING TO ACCIDENTS - PERMANENT WAY	82493	1	19.391	15996

TABLE : 5.1(a) CONTUNED....

26	B-724	SPECIAL REPAIRS PERTAINING TO ACCIDENTS - BALLAST	-	1	-	
27	B-725	SPECIAL REPAIRS-ACCIDENTS	-	5	-	
28	B-730	OTHERS	2856508	5	18.904	539994
29	B-910	CREDIT FOR MATERIAL RELE- -SED FROM REVENUE WORK	-	5	-	
30	GRAND TOTAL		16959746			55060808
1	D-141	OFFICERS WORKSHOP EMU-BB	-	6	DIRECT	-
		WAO-MTN	311305	6	DIRECT	311305
2	D-142	OFFICER OPEN LINE -BB	571427	6	DIRECT	571427
		WAO-MTN	-	6	DIRECT	-
3	D-145	OFFICE ESTABLISHMENT-BB	-	6	DIRECT	-
		WORKSHOP EMU WAO-MTN	1640943	6	DIRECT	1640943
4	D-146	OFFICE ESTABLISHMENT-BB	4090782	6	DIRECT	4090782
		OPEN LINE EMU WAO-MTN	-	6	DIRECT	-
5	D-151	SUPERVISORY STAFF BB	83702	6	DIRECT	3597360
		-WORKSHOP EMU WAO-MTN	3513658	6	DIRECT	3513658
6	D-152	SUPERVISORY STAFF - BB	7651777	6	DIRECT	7651777
		OPEN LINE EMU WAO-MTN	-	6	-	-
7	D-155	OFFICE ESTABLISHMENT-BB	-	6	-	-
		WORKSHOP EMU WAO-MTN	-	6	-	-
8	D-156	OFFICE ESTABLISHMENT-BB	107017	6	DIRECT	107017
		OPEN LINE EMU WAO-MTN	-	6	-	-
9	D-160	CONTINGENT EXPENSES-BB	771076	7	80.421	1742804
		WAO-MTN	197745	7	62.048	122697
10	D-400	EMU COACHES BB	90416323	6	DIRECT	198268934
		WAO-MTN	117310409	6	DIRECT	111969266
11	D-921	DISMANTLINGCHARGES-BB	-	6	-	-
		EMU WAO-MTN	-	6	-	-

TABLE : 5.1(a) CONTUNED....

12	D-922	CREDITS FOR RELEASEDBB	-25349	6	DIRECT	-25349
		MATERIALS WAO-MTN	-	6	-	
13	GRAND TOTAL	BB	103666755	6	DIRECT	99399131
		WAO-MTN	122974060	6	DIRECT	117557869
			<u>226640815</u>			<u>216957000</u>
1	E-110	OFFICERS AND OFFICE ESTAB- -LISHMENTS	43448	15	59.539	25869
2	E-120	SUPERVISORS & THEIR STAFF (S & T)	11915761	15	59.539	7094525
3	E-130	CONTINGENT EXPENSES (S & T)	111496	15	59.539	66384
4	E-140	OFFICERS AND OFFICEES MTN -LISHMENTS (ELECTRICIT BB	1567633	8	42.443	1168807
			1186196	8	42.443	503457
5	E-150	SUPERVISORS & THEIR ST MTN (ELECTRICITY) BB	3612547	8	42.443	5827590
			10117846	8	42.443	4294317
6	E-160	CONTINGENT EXPENSES MTN BB	26949	8	42.443	100868
			210705	8	42.443	89430
7	E-210	PLANT & EQUIPMENT; WAY & WORKS, FURNITURE & OFFICE EQUIPMENT	21073	8	42.443	8944
8	E-221	PLANT & EQUIPMENT;WAY & TRACK EQUIPMENT WORKS	2774075	8	42.443	1177401
9	E-222	OTHER EQUIPMENTS	-	8	42.443	-
10	E-410	OVERHEAD EQUIPMENTS FOR ELECTRIC TRACTION	37494935	8	42.443	15913975
11	E-420	POWER SUPPLY EQUIPMENT FOR TRACTION	11888816	8	42.443	5045970
12	E-444	EMU CAR SHED, PLANT & EQUIPMENT		6	DIRECT	-
13	E-454	WORKSHOP-PLANT & EQUIPMENT EMU PL	-	6	DIRECT	-

TABLE : 5.1(a) CONTUNED....

14	E-460	SPECIAL REPAIRS PERTAINING TO NATURAL CALAMITIES ETC. INCLUDING ACCIDENTS	215000 366207	6 8	• 42.443	212519 155429
		SPECIAL REVIEW WORK				
15	E-470	OTHER PLANT & EQUIPMENT ELECTRIC TRACTION & DISTRIBUTION	1142053	8	42.443	484722
16	E-520	ELECTRICAL BLOCK SIGNALLING	4594869	9	63.387	2912549
17	E-530	ELECTRICAL POWER SIGNALLING	52928381	9	63.387	33549713
18	E-540	OTHER REPAIRS & MAINTENANCE	2200955	9	63.387	1395119
19	E-610	MICROWAVE MULTI CHANNEL RADIO RELAY SYSTEM	10615061	9	63.387	6728569
20	E-620	RAILWAY TELEPHONE EXCHANGE	10957854	9	63.387	6945855
21	E-630	LINE COMMUNICATION SYSTEM	2472205	9	63.387	1567057
22	E-700	RENTAL TO P & T FOR SIGNAL- -LING TELECOM CIRCUITS	-	9	63.387	-
23	E-810	EQUIPMENT OF TRAFFIC & GENERAL DEPT.	5260496	9	63.387	3334471
24	E-830	OTHER REPAIRS & MISCELLANEOUS EXPENSES	289812	9	63.387	183703
25	E-840	STAFF CARS	-	17	32.743	-
26	E-850	OTHER EQUIPMENTS & MICELLA- -NEOUS EXPENSES	199727	17	32.743	65397
27	E-900	(EXCEPT E-920) CREDIT & RECOVERIES	-108848	10	40.310	-43877
28	GRAND TOTAL		160189491			93924041
1	F-400	EMU COACHES	36386608	6	95.447	34729926
2	F-610	TRACTION (OTHER THAN ROLLING STOCK)	13001225	17	32.743	4256991
3	F-640	SUPPLY OF POWER TO WORKSHOP	-	17	32.743	

TABLE : 5.1(a) CONTUNED....

4	F-650	SUPPLY OF POWER TO SERVICE BUILDINGS	66085009	17	32.743	21638214
5	F-700	SIGNAL & TELCOM	5620427	11	47.139	2649413
6	GRAND TOTAL		121093269			63274544
1	G-100	ESTABLISHMENT IN OFFICES	-	16	-	-
2	G-210	TRAFFIC & MOVEMENT INSPECTORS	2002698	9	63.387	1269450
3	G-220	PASSENGER STATION STAFF	54028316	9	63.387	34246926
4	G-250	TRAIN PASSING & CENTRAL OFFICE STAFF	94334435	9	63.387	59795768
5	G-270	TICKETS	1585601	9	63.387	1005065
6	G-290	OTHER EXPENSES INCL.SANITATION	22895192	9	63.387	14512575
7	G-510	GUARDS & ASSTT. GUARDS	51659660	12	DIRECT	18165000
8	G-530	TRAVELLING TICKET CHECKING SQUADS OTHER THAN SPECIAL SQUADS	25697492	12	DIRECT	1134000
9	G-540	SPECIAL TICKET CHECKING SQUADS	5354248	12	DIRECT	2194000
10	G-600	SAFETY	-	9	63.387	-
11	G-785	PAYMENT OF BASIC CHARGES-EMU	-	6	DIRECT	-
12	GRAND TOTAL		257557642			193541187
1	H-332	ENERGY SUPPLIED FOR EMU-BB	217170199	6	DIRECT	
		MTN	73861408	6	DIRECT	291031607
2	H-333	ENERGY SUPPLIED FOR SIGNAL-BB -LING ETC.	3341080	13	60.108	
		MTN	2308169	13	60.108	3395651
3	GRAND TOTAL		296680856			294427258
1	J-100	EDUCATIONAL FACILITIES	3397770	17	32.743	1112532
2	J-200	MEDICAL SERVICES	54580657	17	32.743	17871345
3	J-300	HEALTH & WELFARE SERVICES	19217319	17	32.743	6292327

TABLE : 5.1(a) CONTUNED....

4	J-400	CANTEEN & OTHER STAFF AMEN- -ITIES	4221135	17	32.743	1382126
5	J-510	RESIDENTIAL BLDGS.-ALL TYPES	36219031	17	32.743	11859197
6	J.550	WELFARE BLDGS.	5619544	17	32.743	1840007
7	J-560	WATER SUPPLY & SANITATION	10541926	17	32.743	3451743
8	J-570	IMPROVEMENT IN RAILWAY COL- -ONIES	1746245	17	32.743	571773
9	J-600	MISCELLANEOUS EXPENSES	-	17	-	-
10	GRAND TOTAL		135543627			44381050
1	K-100	SECURITY	65339579	17	32.743	21394138
2	K-300	WORKMEN & OTHER COMPENSATION CLAIMS	1567684	17	32.743	513307
3	K-400	CATERING	43043687		AS PER DRMS LETTER	16101613
4	K-500	COST OF TRAINING STAFF	4652175	17	32.743	1523262
5	K-600	OTHER EXPENSES	57413876	17	32.743	18799006
6	K-700	HOSPITALITY & ENTERTAINMENT EXP.	3098	17	32.743	1014
7.	GRAND TOTAL		172020039			58332345
1	L-700	GRATUITIES & SPECIAL CONTR- -IBUTION TO P.F.	2234094	17	32.743	731509
2	L-800	CONTRIBUTION TO P.F.	13661	17	32.743	44583
3	L-920 & 990	CREDIT OR RECOVERIES P.F.	-	17	32.743	-
4	GRAND TOTAL		2370255			776092
1	M-200	APPROPRIATION TO PENSION FUND	324085586	19	32.743	131807851
2		INTEREST	58285753	18	DIRECT	58285753
3		D.R.F.	162724662	18	DIRECT	162724662

NOTE : HEADQUARTERS SHARE GIVEN SEPARATELY IN TABLE 5.5

**TABLE:5.1(b) ANALYSIS OF EMU WORKING EXPENSES (IN RUPEES) RELATING TO
DIVISION WHERE EMU
SERVICES RUN (W.E.S.A.) WESTERN RAILWAY, 1991-92**

SR. NO.	ABSTRACT	HEAD OF ACCOUNT	EXPENSES OF DIVISION	FOOT NOTE	APPORTIONMENT FACTOR FOR EMU (%)	SHARE OF EMU
1	A-100	GENERAL MANAGEMENT AND GENERAL MANAGEMENT SERVICES	3276316	17	43.485	1424706
2	A-200	FINANCIAL MANAGEMENT	8435666	17	43.485	3668249
3	A-300	PERSONNEL MANAGEMENT	16345478	17	43.485	7107831
4	A-400	MATERIAL MANAGEMENT	1803646	17	-	-
5	A-500	WAY & WORKS MANAGEMENT	4969862	5	19.277	958040
6	A-700	ELECTRICAL MANAGEMENT	5580537	7	78.150	4361190
7	A-800	S & T MANAGEMENT	1696176	15	33.271	564335
8	A-900	TRAFFIC MANAGEMENT	2801558	16	42.615	1193884
9	GRAND TOTAL		43105593			19278235
1	B-100	ESTABLISHMENT IN OFFICES	13476893	5	19.277	2597941
2	B-200	MAINTENANCE OF PERMANENT WAY	101860415	1	12.432	12663287
3	B-310	MAINTENANCE OF BRIDGE WORK, GIRDER BRIDGES	3382886	2	27.337	924780
4	B-320	MAINTENANCE OF BRIDGE WORK, OTHER BRIDGES	2302816	2	27.337	629521
5	B-330	MAINTENANCE OF TUNNELS	103158	3	33.959	35031
6	B-340	MAINTENANCE OF RUBs/ROBs & FOOTOVER BRIDGES	38083	3	33.959	12933
7	B-410	MAINTENANCE OF BUILDINGS (OTHER THAN STAFF QUARTERS & SERVICES BUILDINGS)	9461958	17	43.485	4114532
8	B-420	STATIONS, GOODS SHEDS	18462681	4	52.978	9781159
9	B-430	WORKSHOP & STORES	4031997	5	19.277	777248
10	B-440	ALL OTHER STRUCTURES	2913856	3	33.959	989516
11	B-510	WATER SUPPLY	15496056	5	19.277	2987175

TABLE : 5.1(b) CONTUNED....

12	B-520	SANITATION	1018258	5	19.277	196289
13	B-530	SERVICE ROADS & OTHERS (MISCELLANEOUS)	5741696	5	19.277	1106827
14	B-620	STATION MACHINERY OTHER THAN WATER SUPPLY ARRANGEMENTS	-	5	-	-
15	B-630	CONSERVANCY OF RIVERS	-	3	-	-
16	B-640	TREES PLANTATION, NURSERIES, ETC.	2458894	17	43.485	1069250
17	B-650	MISCELLANEOUS EXPENSES	825078	5	19.277	159050
18	B-711	SPECIAL REPAIRS PERTAINING TO BREACHES - EARTH WORK	-	1	-	-
19	B-712	SPECIAL REPAIRS TO BRIDGES	-	2	-	-
20	B-713	SPECIAL REPAIRS PERTAINING TO BREACHES - PERMANENT WAY	-	1	-	-
21	B-714	SPECIAL REPAIRS PERTAINING TO BREACHES - BALLAST	-	1	-	-
22	B-715	SPECIAL REPAIRS (MISCELLAN- -EOUS BREACHES)	-	5	-	-
23	B-721	SPECIAL REPAIRS PERTAINING TO ACCIDENTS - EARTH WORK	2177261	1	12.4320	270677
24	B-722	SPECIAL REPAIRS TO BRIDGES- -ACCIDENTS	-	2	-	-
25	B-723	SPECIAL REPAIRS PERTAINING TO ACCIDENTS - PERMANENT WAY	109766	1	12.432	13646
26	B-724	SPECIAL REPAIRS PERTAINING TO ACCIDENTS - BALLAST	-	1	-	-
27	B-725	SPECIAL REPAIRS-ACCIDENTS	-	5	-	-
28	B-730	OTHERS	8463622	5	19.277	1631532
29	B-910	CREDIT FOR MATERIAL RELEASED FROM REVENUE WORK	-2320445	5	19.277	-447312
30	GRAND TOTAL		190004923			39513072

TABLE : 5.1(b) CONTUNED....

1	D-141	OFFICERS WORKSHOP EMU-BCT	-	6	-	
		PL	167550	6	-	167500
2	D-142	OFFICER OPEN LINE - BCT	377278	6	-	377278
		PL	-	6	-	-
3	D-145	OFFICE ESTABLISHMENT-BCT	-	6	-	-
		WORKSHOP EMU PL	1327229	6	-	1327229
4	D-146	OFFICE ESTABLISHMENT- BCT	556185	6	-	556185
		OPEN LINE EMU PL	-	6	-	-
5	D-151	SUPERVISORY STAFF-WORKSHOPBCT	-	6	-	-
		EMU PL	1655020	6	-	1655020
6	D-152	SUPERVISORY STAFF BCT	8021351	6	-	8021351
		OPEN LINE EMU PL	-	6	-	-
7	D-155	OFFICE ESTABLISHMENT BCT	-	6	-	-
		WORKSHOP EMU PL	-	6	-	-
8	D-156	OFFICE ESTABLISHMENT BCT	108390	6	108390	
		OPEN LINE EMU PL	-	6	-	-
9	D-160	CONTINGENT EXPENSES BCT	222774	7	78.150	224089
		PL	125977	7	39.683	49991
10	D-400	EMU COACHES BCT	65569314	6	15171886	
		PL	86149547	6	86149547	
11	D-921	DISMANTLING CHARGES BCT	-526769	6	526769	
		EMU PL	-	6	-	-
12	D-922	CREDITS FOR RELEASEDBCT	-1860903	6	-1860903	
		MATERIALS PL				
13	GRAND TOTAL		161892893			161768231
1	E.110	OFFICERS AND OFFICE ESTA- -BLISHMENTS	120833	15	33.271	40202
2	E-120	SUPERVISORS & THEIR STAFF (S & T)	12336048	15	33.271	4104327
3	E-130	CONTIGENT EXPENSES (S & T)	259230	15	33.271	86248

TABLE : 5.1(b) CONTUNED....

4	E-140	OFFICERS & OFFICE ESTABL-BCT	-	8	-	-
		-ISHMENT (ELECT.) PL	-	8	-	-
5	E-150	SUPERVISORS & THEIR STAFF BCT	5685239	8	28.511	1952142
		(ELEC.) PL	1161740	8	28.511	331224
6	E-160	CONTINGENT EXPENSES BCT	179949	8	28.511	51305
		PL	-	8	-	-
7	E-210	PLANT & EQUIPMENT;WAY & BCT	6163	8	28.511	1757
		WORKERS, FURNITURE & PL	-	8	-	-
		OFFICE EQUIPMENT				
8	E-221	PLANT & EQUIPMENT;WAY &	79589	8	28.511	22692
		TRACK EQUIPMENT WORKS.				
9	E-222	OTHER EQUIPMENTS	29024	8	28.511	8275
10	E-410	OVERHEAD EQUIPMENTS FOR	20243631	8	28.511	5771662
		ELECTRICITY TRACTION				
11	E-420	POWER SUPPLY EQUIPMENT FOR	16793085	8	28.511	4787876
		TRACTION				
12	E-444	EMU CAR SHED, PLANT &	-	6	-	-
		EQUIPMENT				
13	E-454	WORKSHOP-PLANT & EQUIPMENT	3864913	6	-	3864913
		EMU PL				
14	E-460	SPECIAL REPAIRS PERTAINING				
		TO NATURAL CALAMITIES ETC.				
		INCLUDED ACCIDENTS SPECIAL	-	8	-	-
		REVIEW WORK				
15	E-470	OTHER PLANT & EQUIPMENT				
		ELECT. TRACTION & BCT	2887716	8	28.511	823317
		DISTRIBUTION				
16	E-520	ELECTRICAL BLOCK SIGNALLING BCT	884011	9	54.888	485216
17	E-530	ELECTRICAL POWER SIGNALLING BCT	26230308	9	54.888	14397291
18	E-540	OTHER REPAIRS & MAINTENANCE BCT	3818731	9	54.888	2096025
19	E-610	MICROWAVE MULTICHANNEL BCT	4644605	9	54.888	2549331
		RADIO RELAY SYSTEM				

TABLE : 5.1(b) CONTUNED....

20	E-620	RAILWAY TELEPHONE EXCHANGE BCT	4968746	9	54.888	2727245
21	E-630	LINE COMMUNICATION SYSTEM BCT	6789848	9	54.888	3726812
22	E-700	RENTAL TO P & T FOR SIGNAL- BCT	1207062	9	54.888	662532
		-LING& TELECOM CIRCUITS				
23	E-810	EQUIPMENT OF TRAFFIC & BCT	7148712	9	54.888	3923785
		GENERAL DEPT.				
24	E-830	OTHER REPAIRS & MISCELLA- BCT	-91521	9	54.888	-50234
		-NEOUS				
25	E-840	STAFF CARS BCT	-	17	-	-
		PL	60157	17	43.485	-26159
26	E-850	OTHER EQUIPMENTS & MICELLA-BCT	77212	17	43.485	127814
		-NEOUS EXPENSES PL	216713	17	43.485	94238
27	E-900	(EXCEPT E-920) CREDIT & BCT	-1138300	10	28.952	-329561
		RECOVERIES PL	-	10	-	-
28	GRAND TOTAL		118463444	51857140		
1	F-400	EMU COACHES	28340266	6	28340266	
2	F-610	TRACTION (OTHER THAN ROLLING STOCK)	540763	17	43.485	235151
3	F-640	SUPPLY OF POWER TO WORKSHOP	-	17	-	
4	F-650	SUPPLY OF POWER TO SERVICE BUILDINGS	23416338	17	43.485	10182595
5	F-700	SIGNAL & TELCOM	4193159	11	32.305	1354600
6	GRAND TOTAL		56490526			39884384
1	G-100	ESTABLISHMENT IN OFFICES	11133204	16	42.615	4744415
2	G-210	TRAFFIC & MOVEMENT INSPECTORS	1151033	9	54.888	631779
3	G.220	PASSENGER STATION STAFF	64528438	9	54.888	35418369
4	G-250	TRAIN PASSING & CENTRAL OFFICE STAFF	61965916	9	54.888	34011852
5	G-270	TICKETS	3072468	9	54.888	1686416
6	G-290	OTHER EXPENSES IND.SANITATION	35290703	9	54.888	19370361

TABLE : 5.1(b) CONTUNED....

7	G-510	GUARDS & ASSTT. GUARDS	36542503	12	61.446	22453906
8	G-530	TRAVELLING TICKET CHECKING	24037195	12	61.446	14769895
		SQUADS OTHER THAN SPECIAL				
		SQUADS				
9	G-540	SPECIAL TICKET CHECKING SQUADS -		12	-	24371
10	G-600	SAFTY	44401	9	54.888	24371
11	G-785	PAYMENT OF PAYMENT OF BASIC	-	6	-	-
		CHARGES-EMU				
12	GRAND TOTAL		237765861			133139592
1	H-332	ENERGY SUPPLIED FOR EMU	230846272	6	DIRECT	230846272
2	H-333	ENERGY SUPPLIED FOR	4155000	13	55.231	2294848
		SIGNALLING ETC.				
3	GRAND TOTAL		235001272			233141120
1	J-100	EDUCATIONAL FACILITIES	2320982	17	43.485	1009279
2	J-200	MEDICAL SERVICES	38370879	17	43.485	16685576
3	J-300	HEALTH & WELFARE SERVICES	10408320	17	43.485	4526058
4	J-400	CANTEEN & OTHER STAFF	1016611	17	43.485	442073
		AMENITIES				
5	J-510	RESIDENTIAL Bldgs.-ALL TYPES	20548007	17	43.485	8935301
6	J-550	WELFARE Bldgs.	3231718	17	43.485	1405313
7	J-560	WATER SUPPLY & SANITATION	5453718	17	43.485	2371549
8	J-570	IMPROVEMENT IN RAILWAY	2171480	17	43.485	944268
		COLONIES				
9	J-600	MISCELLANEOUS EXPENSES	-	17	43.485	-
10	GRAND TOTAL		83571215			36319417
1	K-100	SECURITY	33490110	17	43.485	14563174
2	K-300	WORKMEN & OTHER	1016845	17	43.485	442175
		COMPENSATION CLAIMS				
3	K-400	CATERING	43893801	14	30.461	13370490
4	K-500	COST OF TRAINING STAFF	6414117	17	43.485	2789179

TABLE : 5.1(b) CONTUNED....

5	K-600	OTHER EXPENSES	3431442	17	43.485	1492163
6	K-700	HOSPITALITY & ENTERTAINMENT EXP.	-	17	-	-
7		GRAND TOTAL	88246315			32657181
1	L-700	GRATUITIES & SPECIAL CONTR- -IBUTION TO P.F.	2254784	17	43.485	980493
2	L-800	CONTRIBUTION TO P.F.	75099	17	43.485	32687
3	L-920&990	CREDIT OR RECOVERIES P.F.	-	17	-	
4		GRAND TOTAL	2329883			1013150
1	M-200	APPROPRIATION TO PENSION FUND	252858215	19	38.265	11415958
2		INTEREST.	68959376	18	-	68959376
3		D.R.F	21286133	18	-	21286133

NOTE : HEADQUARTERS SHARE GIVEN SEPARATELY IN TABLE 5.5

**TABLE:5.2 DISTRIBUTION OF VARIOUS ABSTRACT HEADS ALONG WITH THEIR SHARE IN EMU EXPENSES
ON CENTRAL AND WESTERN RAILWAY ACCORDING TO FOOTNOTE**

FOOTNOTE	APPORTIONMENT FACTOR		ABSTRACT HEADS	SHARE OF EMU	
	FOR EMU (%)			CENTRAL	WESTERN
	CENTRAL	WESTERN			
1	19.391	12.432	B-200	26044507	12663287
			B-711	600749	-
			B-713	-	-
			B-714	-	-
			B-721	-	270677
			B-723	15996	13646
			B-724	-	-
2	42.443	27.337	B-310	2190522	924780
			B-320	609226	629521
			B-712	-	-
			B-722	-	-
3	48.281	33.959	B-330	283522	35031
			B-340	2019010	12933
			B-440	653849	989516
			B-630	-	-
4	2.412	52.978	B-420	588208	9781159
5	18.904	19.277	A-500	1086625	958040
			B-100	3024610	2597941
			B-430	2326242	777248
			B-510	4054019	2987175
			B-520	853651	192689
			B-530	1051323	1106827
			B-620	-	-
			B-650	752620	159050
			B-715	-	-
			B-725	-	-
B-730	539994	1631532			

TABLE : 5.2 CONTUNED....

			B-910	-	-447312
6	DIRECT		D-141	311305	167550
			D-142	571427	377278
			D-145	1640943	3127229
			D-146	4090782	556185
			D-151	3597360	1655020
			D-152	7651777	8021351
			D-155	-	-
			D-156	107017	108390
			D-400	198268934	15171886
			D-921	-	526769
			D-922	-25349	-1860903
			E-444	-	-
			E-454	215000	3864913
			F-400	34729926	28340266
			H-332	291031607	23084627
			G-785	-	-
7	80.421	78.151	A-700	2911683	4361190
			D-160	742804	224089
8	42.443	28.511	E-140	1168807	-
			E-150	5827590	1952142
			E-160	100868	51305
			E-210	8944	1757
			E-221	1177401	22692
			E-222	-	8275
			E-410	15913975	5771662
			E-420	5045970	4787876
			E-460	155429	-
			E-470	484722	823317
9	63.387	54.888	E-520	2912549	485216
			E-530	33549713	14397291
			E-540	1395119	2096025

TABLE : 5.2 CONTUNED....

			E-610	6728569	2549331
			E-620	6945855	2727245
			E-630	1567057	3726812
			E-700	-	662532
			E-810	3334471	3923785
			E-830	183703	-50234
			G-210	1269450	631779
			G-220	34246926	35418368
			G-250	59795768	34011852
			G-270	1005065	1686416
			G-290	14512575	19370361
			G-600	-	24371
10	40.311	28.952	E-900	-43877	-329561
11	47.139	32.305	F-700	2649413	1354600
12	-	61.446	G-510	18165000	22453906
			G-530	1134000	14769895
			G-540	2194000	24371
13	60.108	55.231	H-333	3395651	2294848
14	3.742	30.461	K-400	16101613	13370490
15	59.539	33.271	A-800	1571909	564335
			E-110	25869	40202
			E-120	7094525	4104327
			E-130	66384	86248
16	43.195	42.615	A-900	4246458	1193884
			G-100	-	4744415
17	32.743	43.485	A-100	1530158	1424706
			A-200	3507313	3668249
			A-300	6436660	7107831
			A-400	-	-
			B-410	8556379	4114532
			B-640	896381	1069250
			E-840	-	-26159

TABLE : 5.2 CONTUNED....

			E-850	65397	127814
			F-610	4256991	235151
			F-640	-	-
			F-650	21638214	10182595
			J-100	1112532	1009279
			J-200	17871345	16685576
			J-300	6292327	4526058
			J-400	1382126	442073
			J-510	11859197	8935301
			J-550	1840007	1405313
			J-560	3451743	2371549
			J-570	571773	944268
			J-600	-	-
			K-100	21394138	14563174
			K-300	513307	442175
			K-500	1523262	2789179
			K-600	18799006	1492163
			K-700	1014	-
			L-700	731509	980493
			L-800	44583	32687
			L-920	-	-
			L-990	-	-
18			DRF	162724662	212861330
			INTEREST	58285753	68959376
19	32.743	43.485	M-200	106115343	10995539

**TABLE: 5.3(a) APPORTIONMENT OF EMU EXPENSES ACCORDING TO DIFFERENT
ALLOCATION MODES
UNDER EACH FOOTNOTE FOR C.R.**

FOOT NOTE	GTKM	ETKM	TKM	EMU HRS.	VKM	DIRECT	OTHERS.
1	-	26661252	-	-	-	-	-
2	2799748	-	-	-	-	-	-
3	-	-	-	2956381	-	-	-
4	-	-	-	588208	-	-	-
5	1161190	11057768	-	1470126	-	-	-
6	-	-	-	-	-	542190729	-
7	-	-	-	-	-	3654487	-
8	29883706	-	-	-	-	-	-
9	-	-	167446823	-	-	-	-
10	-13964	-	-29813	-	-	-100	-
11	-	-	-	-	2649413	-	-
12	-	-	-	-	-	-	31699000
13	3395651	-	-	-	-	-	-
14	-	-	-	-	-	16101613	-
15	-	-	8758687	-	-	-	-
16	-	-	4246458	-	-	-	-
17	5848633	5925976	28123846	787928	416254	88192613	4980139
18A	37412223	-	32594975	-	-	92717464	-
18B	25138074	-	8321313	-	-	24826366	-
19	4622066	4683188	22225752	622685	328958	69696982	3935712
TOTAL	110247327	48328184	271688041	6425328	3394625	837380154	40614851

TOTAL EXPENSES OF CENTRAL RAILWAY (EMU)=1318078510

HEADQUARTER SHARE =49809327

TOTAL(INCL. HQ SHARE)=1367887837

18A : REFERS TO DRF

18B : REFERS TO INTEREST CHARGES

TABLE: 5.3(b) APPORTIONMENT OF EMU EXPENSES ACCORDING TO DIFFERENT ALLOCATION MODES UNDER EACH FOOTNOTE FOR W.R.

FOOT NOTE	GTKM	ETKM	TKM	EMU HRS.	VKM	DIRECT	ENG. HRS.	OTHERS.
1	-	12947610	-	-	-	-	-	-
2	1554301	-	-	-	-	-	-	-
3	-	-	-	1037480	-	-	-	-
4	-	-	-	9781159	-	-	-	-
5	611590	5094658	-	4256942	-	-	-	-
6	-	-	-	-	-	425649189	-	-
7	-	-	-	-	-	4585279	-	-
8	13419026	-	-	-	-	-	-	-
9	-	-	121661151	-	-	-	-	-
10	-84993	-	-220089	-	-	-24479	-	-
11	-	-	-	-	1354600	-	-	-
12	-	-	-	-	-	-	-	37248172
13	2294848	-	-	-	-	-	-	-
14	-	-	-	-	-	13370490	-	-
15	-	-	4795112	-	-	-	-	-
16	-	-	5938299	-	-	-	-	-
17	2358982	2391798	17521944	1998521	179554	58803960	-	1320816
18A	34014709	-	24449826	-	-	129076547	25320248	-
18B	19552178	-	6466852	-	-	35156385	7783961	-
19	3066876	3109539	22780009	2598246	233435	76450117	-	1717173
TOTAL	76787517	23543605	203393104	19672348	1767589	743067480	33104209	40286161

TOTAL EXPENSES OF WESTERN RAILWAY (EMU)=1141622013

HEADQUARTER SHARE =138445740

TOTAL(INCL. HQ SHARE)=1280067713

18A : REFERS TO DIF

18B : REFERS TO INTEREST CHARGES

TABLE:5.4(a) APPORTIONMENT OF EMU WORKING EXPENSES ACCORDING TO VARIOUS BASES OF

ALLOCATION

MODE	SHARE IN COST		SHARE IN COST		SHARE OF EMU SERVICES	
	(CURRENT PRACTICE)		INCLUDING		(UNDER GIVEN	
	EXCLUDING HQ-SHARE *		HQ-SHARE *		ALLOCATION HEADS) #	
	CENTRAL	WESTERN	CENTRAL	WESTERN	CENTRAL	WESTERN
	RAILWAY	RAILWAY	RAILWAY	RAILWAY	RAILWAY	RAILWAY
1 GTKM	8.3642 %	6.7262 %	8.0597 %	5.9987 %	42.443 %	28.511 %
2 ETKM	3.6666 %	2.0623 %	3.5331 %	1.8392 %	19.391 %	12.432 %
3 TRAIN KM	20.6124 %	17.8162 %	19.8619 %	15.8892 %	63.387 %	54.888 %
4 EMU HOURS	0.4875 %	1.7232 %	0.4697 %	1.5368 %	48.280 %	33.959 %
5 VKM	0.2575 %	0.1548 %	0.2482 %	0.1381 %	47.139 %	32.305 %
6 DIRECT	63.5304 %	65.0886 %	61.2170 %	58.0491 %		
7 ENGINE	NOT	2.8998 %	NOT	2.5861 %		35.629 %
HOURS	REPORTED		REPORTED			
8 OTHERS	3.0814 %	3.5289 %	2.9692 %	3.1472 %		

* This shows the proportion of cost in the total costs which are allocated by GTKM, ETKM etc.

The last column indicates share of EMU services in the relevant allocator i.e. GTKM, ETKM etc.

TABLE:5.4(b) ALLOTMENT OF DRF & INTEREST CHARGES ACCORDING TO VARIOUS

BASES OF ALLOCATION

MODE	SHARE IN COST		SHARE IN COST		SHARE OF EMU SERVICES	
	DRF		INTEREST CHARGES		(UNDER GIVEN ALLOCATION	
	CENTRAL	WESTERN	CENTRAL	WESTERN	CENTRAL	WESTERN
	RAILWAY	RAILWAY	RAILWAY	RAILWAY	RAILWAY	RAILWAY
1 GTKM	22.9911 %	15.9797 %	43.129 %	28.3532 %	4.278 %	5.999 %
2 TRAIN KM	20.0308 %	11.4846 %	14.2768 %	9.3778 %	13.590 %	18.758 %
3 ENGINE HOURS	-	11.8952 %	-	11.2877 %	-	35.629 %
4 DIRECT	56.9781 %	60.6388 %	42.5942	50.9813 %	-	-

TABLE:5.5 HEADQUARTERS SHARE IN WORKING EXPENSES

ABSTRACT	SHARE (%)		WORKING EXPENSES	
	C.R.	W.R.	C.R.	W.R.
A	51.383	36.439	10939856	7024796
B	-1.344	-0.199	-740019	-78631
D	-1.415	-0.189	-3069942	-305742
E	-1.154	1.954	-1083885	1013288
F	-1.516	-0.209	-959242	-81222
G	11.798	68.188	16815548	90765977
H	-1.318	1.493	-3880551	3480797
J	3.783	1.329	1678934	482685
K	-2.249	99.465	-1311894	32482465
L	-0.440	7.470	-3415	75682
M	29.613	3.261	31423937	3585645
TOTAL			49809327	138445740

TABLE:5.6 ALLOTMENT OF EXPENSES ACCORDING TO GTKM

CENTRAL RAILWAY

TOTAL EXPENSES ON EMU SERVICES = 1318078510

HEADQUARTER SHARE = 49809327

SHARE OF EXPENDITURE OF EMU SERVICES IN GTKM = 110099526

SHARE OF EMU IN TOTAL GTKM 42.443 %

MODE	EXPENSES	EMU SHARE IN TOTAL %	REALLOCATION OF THE RELEVANT EXP. ACC. TO GTKM *
1 ETKM	48328184	19.391	105780677
2 TR.KM	271688041	63.387	181918304
3 EMU Hrs.	6425328	48.280	5648513
4 VKM	3394625	47.193	3052954
5 DIRECT	837380154		837380154
6 ENG.Hrs.	-	-	
7 GTKM	110247327	42.443	110247327
TOTAL(EMU) INCLUDING HQ.SHARE	1277463659		1244027929
	1327272986		1293837256

WESTERN RAILWAY

TOTAL EXPENSES ON EMU SERVICES = 1141595854

HEADQUARTER SHARE = 138445740

SHARE OF EXPENDITURE OF EMU SERVICES IN GTKM = 76787517

SHARE OF EMU IN TOTAL GTKM 28.511 %

MODE	EXPENSES	EMU SHARE IN TOTAL %	REALLOCATION OF THE RELEVANT EXP. ACC. TO GTKM *
1 ETKM	23543605	12.432	53993864
2 TR.KM	203393104	54.888	105650430
3 EMU Hrs.	19672348	33.959	16516338
4 VKM	1767589	32.305	1559998
5 DIRECT	743067480	-	743067480
6 ENG.Hrs.	33104209	35.629	26490614
7 GTKM	76787517	28.511	76787517
TOTAL(EMU) INCLUDING HQ.SHARE	1101335852		1024066241
	1239781592		1162511982

* ALL THESE ARE INPUTED ON THE BASIS OF THE GTKM ONLY.

TABLE: 5.7 BOOK VALUE & AGE OF ASSETS EXCLUSIVELY IDENTIFIED FOR EMU & SHARED WITH EMU., 1991-92

I EXCLUSIVELY IDENTIFIED.				CENTRAL		WESTERN	
ABSTRACT	ITEM HEAD		AGE	FOOT NOTE	DRF	BV	DRF BV
D-2133	EMU	25	8	92717464	2317936600	129076547	3226913675
II SHARED				CENTRAL		WESTERN	
ABSTRACT	ITEM HEAD		AGE	FOOT NOTE	DRF	BV	DRF BV
B-1132	Structural Engg. works - Tunnels						
B-1140	Structural Engg. works Permanent way						
B-1150	Structural Engg. works -Bridges						
B-1160	Structural Engg. works -Stations & buildings	55	1	34196928	1880831040	31330929	1723201095
E-1173	Electric, Telegraph & Train control equip. -incl. all signalling and interlocking machinery.	25	10	30589660	764741500	21616965	540424125
E-1174	Plant & equip.- civil Engg.	55	1	256294	14096170	434077	23874235
E-1177	Plant & equip.- S & T department	25	10	1318186	32954650	2551457	63786425
E-1178	Plant & equip.- misc.& . Office Equip.	10/20	13	368667	3686670	456222	9124440
E-1179	Plant & equip.- Motor vehicles & boats required for gen. purposes.	10	13	323981	3239810	121659	1216590
J-1165	Residential Bldgs.	55	1	2721597	167506625	2233142	122822810
J-1166	Bldgs. & other works for staff welfare.	55	1	231885	12753675	11506	632830
E-1171	Overhead powerlines & traction equip.	30	5	-	-	23823666	714709980
E-1172	Underground cables.	30	5	-	-	1205160	36154800

TABLE: 5.8 INTEREST CHARGES EXCLUSIVELY IDENTIFIED FOR EMU & SHARED WITH EMU, 1991-92

I EXCLUSIVELY IDENTIFIED.

ABSTRACT	ITEM HEAD	AGE	FOOT NOTE	SHARE OF EMU	
				CENTRAL	WESTERN
D-2133	EMU	25	8	24826366	35156385

II SHARED

ABSTRACT	ITEM HEAD	AGE	FOOTNOTE	SHARE OF EMU	
				CENTRAL	WESTERN
B-1132	Structural Engg. works -Tunnels				
B-1140	Structural Engg. works Permanent way				
B-1150	Structural Engg. works -Bridges				
B-1160	Structural Engg. works Stations & buildings	55	1	23313627	18004340
E-1173	Electricity, Telegraph & Train control equip. incl. all signalling and interlocking machinery.	25	10	7918687	5683417
E-1174	Plant & equip.- civil Engg.	55	1	155559	259627
E-1177	Plant & equip.- S & T department	25	10	339598	690332
E-1178	Plant & equip.- misc.& Office Equip.	10/20	13	32233	98391
E-1179	Plant & equip.- Motor vehicles & boats required for gen. purposes.	10	13	34566	14340
J-1165	Residential Bldgs.	55	1	1534266	1272825
J-1166	Bldgs. & other works for staff welfare.	55	1	130851	3511
E-1171	Overhead powerlines & traction equip.	30	5	-	7578868
E-1172	Underground cables.	30	5	-	197340

TABLE: 5.9 DRF & INTEREST CHARGES ALLOTMENT TO EMU ACCORDING TO FOOTNOTES

FOOT NOTE	APPORTIONMENT RATIO		MODE OF ALLOCATION	ABSTRACT	DRF EXPENSES		INTEREST CHARGES	
	C.R.	W.R.			C.R.	W.R.	C.R.	W.R.
1	4.278	5.999	GTKM	B	34196928	31330929	23313627	18004340
				E-1174	256294	434077	155559	259627
				J-1165	2721597	2233142	1534266	1272825
				J-1166	231885	11506	130851	3511
8	-	-	DIRECT	D-2133	92717464	129076547	24826366	35156385
10	13.59	18.758	TR.KM.	E-1173	30589660	21616965	7918687	5683417
				E-1177	1318186	2551457	339598	690332
13	3.916	17.444	MIXED	E-1178	368667	456222	32233	98391
				E-1179	323981	121659	34566	14340
5	-	35.629	ENG.HRS.	E-1171	-	23823666	-	7578868
				E-1172	-	1205160	-	197340
TOTAL					162724662	212861330	58285753	68957376

TABLE: 5.10 DRF & INTEREST CHARGES ALLOTMENTS TO EMU ACCORDING TO UNDER VARIOUS MODES

MODES	DRF EXPENSES		INTEREST CHARGES	
	CENTRAL	WESTERN	CENTRAL	WESTERN
1. GTKM	37412223 (22.99)	34014709 (15.98)	25138074 (43.13)	19552178 (28.35)
2. TR.KM.	32594975 (20.03)	24449826 (11.49)	8321313 (14.28)	6466852 (9.38)
3. ENG.HRS	-	25320248 (11.89)	-	7783961 (11.29)
4. DIRECT	92717464 (56.98)	129076547 (60.64)	24826366 (42.59)	35156385 (50.98)
TOTAL	162724662 (100.00)	212861330 (100.00)	58285753 (100.00)	68959376 (100.00)

FIGURES IN BRACKETS INDICATE RESPECTIVE SHARE IN COST IN PERCENTAGE ACCORDING TO THE CURRENT PRACTICE.

TABLE : 5.11 ESTIMATES OF FIXED CAPITAL OF EMU SERVICES (WR)

		SHARE OF EMU IN INITIAL CAPITAL		
		100 %	50 %	30 %
I.	INITIAL CAPITAL OF EMU	1100.5883	693.8491	531.1535
	INCREMENTAL CAPITAL EXPENDITURES OF EMU	288.2204	288.2204	288.2204
TOTAL (Rs. Crores)		1388.8087	982.0695	819.3739
	REVENUE (in Rs. Crores)	77.8322508	55.037587	45.9197259
	NECESSARY TO RECOVER	79.4120969	56.1547449	46.8518087
	CAPITAL COST AT IRRs.	81.0026816	57.2794964	47.7902270
	AVERAGE PASSENGER KMS.	25692101400		
II.	CAPITAL COST PER PASSENGER KM (in Rs.)	0.030294	0.021422	0.017873
	WITH IRR AS	0.030909	0.021857	0.018236
		0.031528	0.022295	0.018601
	* 20 % CAPITAL COST PER PASS.KM TO BE RECOVERED FROM THE FARES (in Rs.)	0.0061	0.0043	0.0036
		0.0062	0.0044	0.00365
		0.0063	0.0045	0.0037

NOTE: * THE REST OF THE CAPITAL COST i.e. 80 %, IS EXPECTED TO BE GENERATED BY SELLING OF AIR SPACE, ETC.

**TABLE:5.12 DETERMINATION OF CAPITAL-OUTPUT RATIO
AND PROJECTIONS OF PKMS**

YEAR	PASS.KM (In Crores)	INCREMENTAL PKM (In Crores)
1991-92 (t=0)	2261.6802	-
1992-93 (t=1)	2405.9457	144.2655
1993-94 (t=2)	2559.4134	153.4677
1994-95 (t=3)	2722.6704	163.2570
1995-96 (t=4)	2896.3401	173.6697

THE ANNUAL COMPOUND GROWTH RATE OF PASSENGER KMS USED FOR PROJECTIONS IS 6.3787 % .
THE CAPITAL OUTPUT RATIO IS THEN OBTAINED BY DIVIDING THE ESTIMATED CAPITAL COST FROM THE
MANKHURD-BELAPUR PROJECT DATA i.e. Rs.1100.5883 Crores BY TOTAL PASSENGER KM (In Crores) IN
1991-92 OF WESTERN RAILWAY.
HENCE (CAPITAL / OUTPUT RATIO) = (1100.5883/2261.6802) = 0.4866 Rs / PKM

TABLE:5.13 ESTIMATION OF PRESENT VALUE OF INCREMENTAL CAPITAL

YEAR	INCREMENTAL PASS.KM (Crores) (1+i) ^t	INFLATION FACTOR 'i'=10 % (1+i) ^t	PRESENT VALUE DISCOUNT FACTOR 'r'=13 %	PRESENT VALUE OF INCREMENTAL CAPITAL (In Crores)
1991-92 (t=0)	-	1.000	1.000	
1992-93 (t=1)	144.2655	1.100	0.885	68.34270069
1993-94 (t=2)	153.4677	1.210	0.783	70.75511032
1994-95 (t=3)	163.2570	1.331	0.693	73.27853823
1995-96 (t=4)	173.6706	1.464	0.613	75.84405623
				288.2204055

- 1 EXISTING CAPITAL = Rs 1100.3883 Crores
- 2 PRESENT VALUE OF INCREMENTAL CAPITAL = Rs 288.2204055 Crores
- 3 TOTAL CAPITAL - (1) + (2) = Rs 1388.608706 Crores
- 4 CAPITAL RECOVERY FOR THE PROJECTED PERIOD = (4/25) X TOTAL CAPITAL
= 0.16 X 1388.608706
= Rs 222.177393 Crores
- 5 RECOVERY THROUGH FARES = $\sum_{t=1}^4 \frac{P}{(1+k)^t}$

WHERE 'p' IS THE TOTAL PASSENGER REVENUE PER YEAR AND HAS BEEN EVALUATED AT THREE VALUES
OF K i.e. K = 15%, 16% AND 17% AS THE INTERNAL RATE OF RETURN WHOSE VALUE HAS BEEN EQUATED
TO THE DIVIDEND FACTOR.

**TABLE:5.14 ESTIMATES OF TOTAL COST PKM UNDER DIFFERENT ALTERNATIVES
OF IRRS AND CAPITAL SHARE ATTRIBUTED TO EMU**

1	WORKING EXPENSES WITH HQ SHARE EXCLUDING DEPRECIATION AND INTEREST	=	Rs.998247047		
2	INTEREST CHARGES AT 6.5 %	=	Rs.68959376		
3	INTEREST CHARGES AT 13 %	=	Rs.137918752		
4	WORKING EXPENSES INCLUDING HQ. SHARE AND INTEREST CHARGE AT 13 % BUT EXCLUDING DEPRECIATION=(1)+(3)	=	Rs.1136165799		
5	TOTAL PASSENGER REVENUE ON W.R.	=	Rs.1476969000		
6	TOTAL PASSENGER KMS ON WESTERN RAILWAY	=	Rs.22616802000		
7	PER PASSENGER KM COST OF WORKING EXPENSES GIVEN IN (4)	=	5.0235 Paise		
8	PER PASSENGER KM REVENUE	=	6.5304 Paise		
9	ADDITIONAL CAPITAL COST TO BE RECOVERED (in paise) UNDER				
	a) RATE PER PASS.KM WHEN 100 % OF THE CAPITAL COST IS TO BE ATTRIBUTABLE TO EMU	IRR = 15 %	IRR = 16 %	IRR = 17 %	
		3.0294	3.0909	3.1528	
	b) RATE PER PASS.KM WHEN 50 % OF THE CAPITAL COST IS TO BE ATTRIBUTABLE TO EMU	2.1422	2.1857	2.2295	
	c) RATE PER PASS.KM WHEN 30 % OF THE CAPITAL COST IS TO BE ATTRIBUTABLE TO EMU	1.7873	1.8236	1.8601	
	TOTAL COST TO BE RECOVERED, PER PKM (in paise)				
	a) 100 % CAPITAL ATTRIBUTABLE TO EMU	8.0549	8.1144	8.1763	
		+(1.5245)	+(1.5840)	+(1.6459)	
		*(23.34 %)	*(24.26 %)	*(25.20 %)	
	b) 50 % CAPITAL ATTRIBUTABLE TO EMU	7.1657	7.2092	7.2530	
		+(0.6353)	+(0.6788)	+(0.7226)	
		*(9.73 %)	*(10.39 %)	*(11.07 %)	
	c) 30 % CAPITAL ATTRIBUTABLE TO EMU	6.8108	6.8471	6.8836	
		+(0.2804)	+(0.3167)	+(0.3532)	
		*(4.29 %)	*(4.85 %)	*(5.41 %)	

NOTE : 1. + FIGURES IN BRACKET INDICATE ADDITIONAL REVENUE REQUIRED PER PKM (in paise) TO JUST COVER COSTS.

* PERCENTAGE SHORTFALL IN FARES TO COVER COSTS AS PER THE PER PKM REVENUE FOR 1991-92.

CHAPTER 6
FINANCIAL AND ORGANISATIONAL OPTIONS FOR THE FUTURE

CHAPTER 6

FINANCIAL AND ORGANISATIONAL OPTIONS FOR THE FUTURE

6.1 Current Investment Options & Problems

For a reasonable solution of the suburban transport problem (in its various dimensions) it is necessary to have an effective programme with the following objectives :

- a) make best use of existing facilities,
- b) add to capacity of the network in a selective manner, and
- c) emphasise improvement of the mass transport system while at the same time discouraging individualised modes.

Moreover, integration of planning and investment in transport facilities with the desired land use and area development is also essential to achieve a desirable pattern in the location of activities. These objectives form the basis of the transport policy currently being pursued and promoted by the B.M.R.D.A. Accordingly, this state govt. agency has prepared a set of proposals for suburban transport in the Region under the Bombay Urban Transport Project II (BUTP II) which integrates transport needs and regional development objectives.

"Faced with a problem of such gigantic proportions, after considerable studies and debate, the two-pronged strategy that has been decided and being implemented is as follows:

- a) To meet backlog of demand through all available methods i.e. of optimisation, management, containment and on increasing supply;
- b) To change the pattern of the growth through major regional restructuring from the existing overwhelming mono-centric to the desired poly-nucleated structure" (B.M.R.D.A.,1991d, p-32).

We now examine this policy and then proceed to spell out our framework of financial and organisational options required to meet emerging needs.

Under the aegis of the B.M.R.D.A., a Working Group of officers drawn from the concerned organisations prepared a Report (B.M.R.D.A.,1989) on improvement of the suburban railway system in the Region. This Group identified 22 suburban railway projects costing about Rs. 1600 crores (at 1989 prices). In 1990, the Status Paper prepared by the Ministry of Railways also identified a set of projects which were considered absolutely essential for the system. Of these, most of them related to suburban passenger services. A little later, the B.M.R.D.A. and the Ministry of Railways jointly identified a package of priority works from these projects to be taken up for improving the system. These projects, on-going as well as new ones, are listed in the Table 6.1. While the

Ministry of Railways is financing on-going works, it has expressed its inability to finance new projects. The cost of these projects excluding road works worked out to be Rs.1304.86 crores (1989-90 prices). These five projects, it may be noted, mainly consist of optimisation works and those related to parts of the sixth corridor project. This set of five projects has been further grouped into a) Maximum Programme which includes all the projects and b) Core Programme which excludes the last two. The total cost of the Core Programme works out to be Rs.814.86 crores.

On account of the Railways inability (or reluctance) to taken up new works, the B.M.R.D.A. examined the feasibility of a package of measures required for mobilisation of resources by alternative means which were identified as consisting of :

- a) sharing of capital cost by Railways, State Govt. and local authorities,
- b) cesses, surcharges and levies in various forms.
- c) floating of bonds.
- d) commercial exploitation of air space at railway stations and other railway areas.

On the question of sharing of capital cost, it is to be noted that such an experiment has already been attempted in the case of the Mankhurd-Belapur railway line for which the State Govt. is committed (through CIDCO) to contribute to two thirds of the capital cost. The revised cost of the project has been worked out to be Rs. 287.11 crores, the proportionate share of the Govt. of Maharashtra being Rs.284 crores including interest, guarantee fee, stamp duty, etc. Nearly half of this amount (Rs.150 crores) has already been raised (outside the state plan quota) through Govt. Guaranteed bonds.

In regard to levies and surcharges, the pay roll tax, transport development levy, terminal tax, surcharge on season tickets and property development levy have been identified as possible sources. An exercise undertaken by the B.M.R.D.A. revealed that a substantial sum of money could be raised through such sources (see Table 6.2). Even from the legal point of view, it was found that with suitable changes in Acts either in the State legislature or in the Parliament, it appears feasible to raise money from these sources (refer to Table 6.5 of B.M.R.D.A.,1991c for legal opinion).

The time profile of investment in the Maximum and Core Programmes as envisaged by the B.M.R.D.A. are given in Tables 6.3 & 6.4 respectively. On the assumption that the State Govt. bears 50% of the capital cost of projects, the required financial outlays in terms of shares of the State Govt. and the Ministry of Railways are given in Table 6.5. Other scenarios based on finances raised from alternative sources / borrowing do not seem viable since the amounts that can be raised fall far short of requirements. Thus, there arises an imperative need for active financial participation of the State Govt. in railway projects especially priority ones. This is a widely emerging

view. The Working Group on Railway Programmes (1989) strongly supported this view-point-" World over urban transport systems are generally run by the local authorities who also provide a major share of the capital investment needed for developing these systems as well as for their operating expenses. The main line railways are not normally involved in funding or meeting the capital or operating costs of the urban transport system. This is particularly relevant in the case of Indian Railways who have tremendous pressures on their resources for meeting the needs of inter and intra regional demands for freight and passenger transport - a demand which cannot be met by any other transport mode in the country.

The urban transport projects are an essential component of urban planning process. The urban transport schemes would, therefore, have to be included in the development plans of the cities concerned and funds for such schemes would have to be mobilised by the concerned local authorities and the State Governments. Furthermore, problems associated with the construction of these systems, viz., land acquisition, rehabilitation of affected persons, large scale diversion of utilities, diversion of road traffic, law and order etc., are issues which can be best tackled by the local authorities/State Governments.

It is true that urban transport schemes being highly capital intensive the State Governments/local authorities by themselves may not be able to finance them. It is also true that the necessary technical expertise for implementing and operating rail based urban transportation schemes is not available with them. The consortium approach for funding of urban transportation scheme thus appears to be the only workable solution. Urban transportation scheme should, therefore, be funded jointly by local authorities, State Governments and the Central Government, the major share being of the State Government/local authority. At the Central Government level in October 1986, the Ministry of Urban Development has been designated as the nodal Ministry for general planning and coordinating the development of urban transport through the amendment to the Government of India (allocation of finances) Rules, 1961. Processing and sanction of urban transportation schemes as well as arranging for Central assistance for such schemes is to be done by that Ministry. The Ministry of Railways would continue to provide the necessary technical assistance in the implementation/operation of rail based schemes, if called upon to do provided necessary funds are placed at their disposal" (B.M.R.D.A.,1991d,pp91-2).

It is obvious that the issue involves something more than merely financial participation. Given the existing structure of the transport system which comprises numerous corporate bodies (each having different corporate objectives and ideas about the limits of their responsibilities, problems and their solutions), there is considerable potential for conflict of interests or priorities and consequent

mis-allocation of investments. The Railways respond by attempting to increase supply on the north-south corridors because of existing demand patterns. On its part, B.E.S.T. attempts to add to its bus fleet. Consequently, the management of determinants and patterns of demand continue to remain relatively neglected. It is in this context that there has arisen a need for a comprehensive and autonomous administrative setup which can deal with the entire range of objectives and requirements, and make adequate and appropriate investments (B.M.R.D.A., 1989). Such an organisation, perhaps called the Unified Metropolitan Transport Authority, should essentially be expected to operate largely at the policy making level, leaving day-to-day operations to the concerned organisations. The National Transport Policy (Planning Commission, 1980), in fact, had recommended setting up of a single authority as a part of the regional development authority such as B.M.R.D.A. Besides being able to ensure coordination between all modes of transport, coordinated development of land use and transportation, such an authority can be more effective in its response to local needs by providing a typical 'local' response. Such a provision entails production of 'externalities' in the form of benefits to others besides the direct users of the system which when tapped as a resource for investment, could go a long way in establishing the financial viability of the system, which, under the present policy of rate making is under severe strain. We take up these issues in detail in the next section.

6.2. Emerging Issues in the Context of the Suburban Rail System

Historically, suburban railway services have been supplied by the regional divisions of the Indian Railways. Demand for suburban services differs from the demand for freight and other passenger services. Though suburban EMU services share certain common characteristics vis-a-vis other non-EMU services (e.g. capital intensity, economics of size and scale) they are primarily governed by specific local conditions of demand and supply. The benefits are produced and achieved locally. Given such a distinct 'localised' character and huge size of operations in the Region, it would be worthwhile to consider these services as being a distinct type of specialised services. Moreover, the availability of such a service generates positive external economies to employers and productive units located in the Region. Thus, the demand has not only a marked local character, but its provision results in direct as well as indirect benefits. Since some benefit that accrues to employing units and property owners in the Region is indirect, there is need for some method of charging for such benefits other than the fare charged from direct users. A tax/levy is the only method of recovering some part of the indirect benefits. We may identify at least the following four categories of indirect beneficiaries: (1) Employers of the travelling worker population, (2) Property owners in

the CBD or similar overcrowded zones, (3) Users and occupants of land/buildings in the Region, and (4) Local authorities like Municipal Boards, Corporation, etc.

Given (a) the conflict in determining investment priorities of the railways, (b) the question of localised nature of benefits & services, and (c) the issue of recovering a part of the cost from indirect beneficiaries, the following questions are relevant :

- 1] What is the rationality and tenability of running the suburban railway system as a sub-entity within a given division of the Indian Railways? Can these divisions be accorded greater autonomy or even independent status?
- 2] Should fares of EMU services be at all related to operational cost data and single passenger journey ticket as is presently done?
- 3] In what manner can indirect beneficiaries be made to pay for accrued benefits?
- 4] If such recovery costs of indirect benefits requires the use of taxes, what arrangements should be made regarding the railways or local transport authority vis-a-vis the local & state governments?
- 5] Is it desirable to have a separate organisation to supply and coordinate the multimodal system? Would the Railways be retained as a major partner/shareholder or should they gradually withdraw from suburban transport operations? What explicit arrangements are to be made to share common capital costs and working expenses?

6.3 The Case for a Suburban Transit Authority.

Given the complex and multifaceted nature of the problem our views about alternative institutional arrangements may be summarised as follows:

- 1] Given the distinct local nature of demand, supply and indirect benefits of EMU services and their future requirements, it will be desirable to provide for greater autonomy by way of a distinct administrative set-up for suburban railway transport. To begin with, the Railways should develop a division level balance sheet where EMU operations related assets and liabilities should be separated from others .
- 2] It would be even more desirable to set up a distinct mass transit authority for the B.M.R. and transfer some of the existing assets to its fold.

The new authority to be formed should have a distinct corporate entity under the Company Act. Its major promoters and shareholders should be a) Govt. of Maharashtra, b) local authorities like the B.M.C., Thane Municipal Corporation ,etc. and c) Indian Railways. The Railways should initially provide i) technical expertise and training to the staff of the company in the initial period,

ii) jointly execute railway constructions (excluding other civil constructions such as buildings, roads etc.)

Such a company should have explicit arrangements with the railways on sharing of common capital cost and working expenses. This authority should enter into a contractual arrangement with the Bombay divisions of Central & Western Railways to share the existing facilities. Gradually, a good part of non-EMU operations should be relocated with distinct tracks and terminals and with a progressive reduction in the share components of assets and costs.

A company thus formed can raise capital from financial institutions and partly from the public. It may be given land owned by Railways, local bodies and a State Govt. on a lease basis for developing and exploiting the airspace or FSI. The proceeds of this commercial utilization including lease of built-up area or sale of built-up area will yield to some revenue and capital receipts respectively.

On the question of recovery of cost from indirect beneficiaries, our viewpoint is as follows :

Availability of EMU services causes benefit to all those residential and employment zones along the tracks. Each of them is under one or the other municipal authority. Under the present Bombay Shop Act of the Govt. of Maharashtra, any shop, restaurant or commercial enterprise is required to register under the relevant local authority. This Act also regulates conditions of employment, work hours in 'shops', thus registered. Thus, all varieties of commercial employments are covered under the Shop-Act and are subject to the jurisdiction of the concerned local authorities. All the local authorities as, share holders and owners of the mass transit authority, can collect at least some tax to tap indirect benefits accruing to these units and earmark the same as annual contributions to the transit authority.

In year 1990, there were 294000 shops establishments under the Shop Act in the Greater Bombay area. This number could be expected to have grown to 3 lakhs. On an average, each establishment employs four persons. The minimum average passenger fare as per the existing fare schedule is Rs. 33 for a second class monthly season ticket. This means a little more than a rupee per day or Rs.400 per year. If every establishment is charged a lumsome of Rs.400 on annual basis, it can provide a revenue of Rs.12 crores in a year. Needless to say, the existing machinery should be used for collection purposes. If this arrangement is found to be weak, inadequate or amenable to local political pressures, the sales tax department of Govt. of Maharashtra should share the additional responsibility of collecting these taxes. These collections alone can generate a revenue necessary to purchase three EMU rakes every year at 1991-92 prices.

As far as the costing and fare determination procedures are concerned, we believe that the

relevant costs can be easily and less ambiguously estimated. Once we choose a targeted rate of return (say 17%), it should be feasible to ascertain the fare that covers long term replacement costs. Thus, there is no need to refer to all India passenger km. cost which at present governs the basic single journey fare. We, at the same time, emphasise that the transit authority should like the Indian Railways today, be exempted from corporate taxation. If not this provides an in-built incentive for the State Govt. to levy a suitable fare which reduces the 'taxable surplus or income'. Revenue, thus mopped up, gets transferred to the State Govt. instead of the Central Govt. Moreover, there is no guarantee that the authority would be assured of regular finances from the State Govt. especially when they are needed urgently. This has been the experience of a good number of public sector road transport corporations. It is necessary, therefore, to seek a binding commitment from the State Govt. in this regard.

TABLE : 6.1 ON-GOING AND NEW SUBURBAN RAILWAY PROJECTS IN B.M.R.

SR. NO.	NAME OF THE WORK
On Going works :	
1.	Mankhurd-Belapur rail line (18 kms.) including a flyover at Raoli junction with reversal facilities at Wadala.
2.	Additional pair of lines between Bandra and Andheri (7.2 kms.)
3.	Optimisation on Central Railway (fast corridor) to reduce head-way from 5 minutes to 4 minutes.
4.	Road over bridges at Mahim, Goregaon, Santacruz, Borivali, Goregaon-Mulund, Ambarnath and Mulund.
New works (tentative) :	
1.	Optimisation on Western Railway to reduce head-way from 4 minutes to 3. minutes.
2.	Optimisation on Central Railway to reduce head-way from 4 minutes to 3 minutes.
3.	Elimination of the remaining level crossing on Western Railway.
4.	Elimination of the remaining level crossing on Centern Railway.

5. Borivali-Virar quadrupling of tracks
(27 kms.)
6. Provision of additional tracks between
Andheri and Goregaon (5 kms.)
7. Provision of a part of the sixth
corridor between Carnac Bunder
(Ballard Estate) and Ravli junction.
8. Station Area Traffic Improvement Schemes
at suburban stations to augment commuter
dispersal facilities.

SOURCE: B.M.R.D.A. DOCUMENTS, 1991.

**TABLE: 6.2 ESTIMATES OF RESOURCES FROM ALTERNATIVE
SOURCES OF FINANCING.**

SR. NO.	SOURCE	YEAR			
		1992-93	1993-94	1994-95	1995-96
1	Contribution from employers (pay roll tax)	65	65	65	65
2	Transport development levy	4	4	4	4
3	Development cost in the form of terminal charges.	7	7	7	7
4	Surcharge on season tickets	20	20	20	20
5	Property development levy	8	8	8	8
		104	104	104	104
6	Commercial exploitation of railway land (total about Rs.600 crores).	135 (Mahim and Vidya- vihar)	192 (Dadar and Khar)	232 (Kurla and Thakurli)	47 (Other stations)

SOURCE: B.M.R.D.A. DOCUMENTS, 1991.

**TABLE: 6.3 TENTATIVE INVESTMENT PROGRAMME FOR SUBURBAN RAILWAY
PROJECTS IN BMR (MAXIMUM PROGRAMME)**

		(Rs. IN CRORES)					
SR. NO.	ITEM	YEAR					TOTAL
		1992-93	1993-94	1994-95	1995-96	1996-97	
1	Optimisation on Western Railway to reduce headway from 4 minutes to 3 minutes.	0.66	1.41	2.23	145.01	152.03	301.34
2	Optimisation on Central Railway to reduce headway from 4 minutes to 3 minutes.	2.43	5.15	8.18	114.93	115.70	246.39
3	Borivali-Virar quadrupling of tracks.	50.71	76.76	67.81	71.87	NIL	267.15
4	Provision of additional tracks between Andheri and Goregaon.	8.84	26.75	56.54	59.21	NIL	153.34
5	Provision of a part of the sixth corridor between Carnac Bunder (Ballard Estate) and Ravli junction.	12.88	46.59	91.61	92.58	92.99	336.64
TOTAL		75.52	158.66	226.36	483.61	360.72	1304.86

SOURCE: B.M.R.D.A. DOCUMENTS, 1991.

**TABLE: 6.4 TENTATIVE INVESTMENT PROGRAMME FOR SUBURBAN RAILWAY
PROJECTS IN BMR (CORE PROGRAMME)**

(Rs. IN CRORES)

SR. NO.	ITEM	YEAR					TOTAL
		1992-93	1993-94	1994-95	1995-96	1996-97	
1	Optimisation on Western Railway to reduce headway from 4 minutes to 3 minutes.	0.66	1.41	2.23	145.01	152.03	301.34
2	Optimisation on Central Railway to reduce headway from 4 minutes to 3 minutes.	2.43	5.15	8.18	114.93	115.70	246.39
3	Borivali-Virar quadrupling of tracks.	50.71	76.76	67.81	71.87	NIL	267.15
TOTAL		53.80	83.32	78.22	331.81	267.73	814.88

SOURCE: B.M.R.D.A. DOCUMENTS,1991.

TABLE: 6.5 FINANCIAL OUTLAYS REQUIRED FOR SUBURBAN

RAILWAY PROJECTS IN BMR.

(ALTERNATIVE-1)

(Rs. IN CRORES)

YEAR	PROPOSED CAPITAL INVESTMENTS					
	STATE GOVT.'S		RAILWAY'S SHARE		TOTAL	
	SHARE (50%)		(50%)			
	MAX.	CORE	MAX.	CORE	MAX.	CORE
	PROG.	PROG.	PROG.	PROG.	PROG.	PROG.
1992-93	37.76	26.91	37.76	26.91	75.52	53.81
1993-94	79.33	41.66	79.33	41.66	158.66	83.32
1994-95	113.18	39.11	113.18	39.11	226.36	78.22
1995-96	141.81	165.91	141.81	165.91	483.61	331.81
1996-97	180.36	133.87	180.36	133.87	360.72	267.73
	652.43	407.44	652.43	407.44	1304.86	814.88

SOURCE: B.M.R.D.A.DOCUMENTS,1991.

MAX PROG. : MAXIMUM PROGRAMME

CORE PROG. : CORE PROGRAMME

CHAPTER 7
SUMMARY AND CONCLUDING REMARKS

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SUMMARY AND CONCLUDING REMARKS

The transport problem in the Bombay Metropolitan Region is undoubtedly formidable and complex. In this study, we have examined the principal characteristics and determinants of demand for and supply of suburban railway services. Given the nature of the problem, it is obvious that it calls for a two-pronged strategy to tackle both demand and supply. From the supply view point, the emphasis has to be on the provision of better and increased services between areas in the suburbs and beyond rather than in terms of provision of additional north-south corridors linking the island city with the northern areas. With the development of the New Bombay Region and the expected rapid growth of the Bandra-Kurla complex and residential and other economic activity centres along the Western Railway corridor, the provision of the East-West corridor seems meaningful. This can be expected to provide relief to existing sections between Dadar and Kurla, Kurla and Wadala Road and Bandra and Andheri. Critical sections south of Bandra on W.R. and south of Kurla on C.R. would also get relief. Moreover, connections between stations beyond the suburbs on the two systems would be further strengthened.

On the demand side, the congestion surcharge on an area basis appears to be an emerging necessity. Though we have observed that the responsiveness to fare increases is fairly low, we expect some reallocation of trips which would, consequently, reduce the pressure on the system. This surcharge, we feel, needs to be given a fair trial. Besides attempting to 'control' demand, a good deal of revenue can also be expected to be generated. But it must be emphasised that such a revenue must be earmarked for the development of the suburban railway system.

We have shown that the present practice of allocating common and over head expenditure is neither entirely consistent nor based on reliable proxy variables (which are supposed to be measures of activity, process and/or utilisation of equipment). A more direct output based allocation is equally or more desirable. Such a change in the basis of allocation would radically revise present figures of alleged surplus and deficits on Western and Central Railways. On the basis on GTKM allocation criterion, both the EMU services would appear to generate surplus and non-EMU services would be incurring losses. Hence, the present practice is extremely sensitive to the overhead allocation criteria and deserves critical review.

We have demonstrated, with the limited data, a method of estimating capital cost and the appropriate fare levels which would recover capital invested with adequate rate of return over a period of time. We suspect that present provisions for maintaining capital intact and surplus for

further expansion are too inadequate. The present accounting practices at the zonal level involve several ambiguities and unclear principles in making provisions, maintaining and presenting the data on assets and liabilities.

We have generally favoured the establishment of an independent urban mass transit authority (UMTA) with the involvement of the state government, local government bodies and Railways. We strongly favour the formation of such an authority as an independent company. In addition, we believe that state governments and local governments together can undertake efforts to mobilise additional funds from taxation, the revenue from which should be exclusively earmarked for UMTA. The tax should be levied on all Shop Act establishments. Such a tax will have the minimum basic levy equivalent to the minimum monthly season ticket. This tax could be further differentiated by the size of employment. It could be collected by Shop Act administration of the local governments and the net proceeds be paid to UMTA. The levy may be collected on an annual basis or as a lumpsum amount for the future dues at the time of registration under Shop Act with a suitable discount.

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