INDIA

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REPORT OF THE SUB GROUP OF METROPOLITIN TRANSPORT TEAM

FIFTH FIVE YEAR PLAN

METROPOLITAN RAIL TRANSPORT DEVELOPMENT PROGRAMME

18/27

REPORT OF THE SUB GROUP

METROPOLITAN TRANSPORT TEAM
PLANNING COMMISSION

JULY 1973

REPORT OF THE SUB-GROUP ON RAILWAYS FOR FORMULATION OF THE FIFTH FIVE YEAR PLAN FOR THE METROPOLITAN CITIES

INTRODUCTION :

The Planning Commission vide its Office Memorandum No. MTT/VII/22/72 dated June 9, 1972, set up a Sub-Group for Railways in connection with the formulation of the Fifth Five Year Plan relating to Railways. The terms of reference of the Sub-Group were to make a :

(i) review of the present status of the studies relating to Rapid Transit Projects currently in progress and the Programme for the Fifth Five Year Plan for the Metropolitan Cities of Calcutta, Bombay, Madras and Delhi.

(ii) review of the programme for optimisation of suburban train services in these four metropolitan cities, identify major bottlenecks in the implementation of the programme - particularly the availability of EMU stock etc.

2. The Members of the Sub-Group are:

1) Shri A.V.D'Costa, Leader, Metropolitan Transport Team, Planning Commission.	Chairman
ii) Shri G.N. Bhattacharya, Director, Metropolitan Transport Railway Board.	Member
iii) General Manager, Metropolitan Transport Project, (Railways) Calcutta.	Member
iv) Chief Administrative Officer, Metropolitan Transport Project (Railways) Bombay.	Member
v) Chief Administrative Officer, Metropolitan Transport Project (Railways) Madras.	Member

vi) Chief Administrative Officer — Member
Metropolitan Transport Project
(Railways) Delhi.

vii) Shri S.B. Saharya — Secretary
Secretary
Metropolitan Transport Team
Planning Commission.

3. The Sub-Group held three meetings and worked out its programme for handling the task assigned to it. The Chief Administrative Officers of the four metropolitan cities i.e. Calcutta, Bombay, Madras and Delhi were requested to furnish details regarding the present state of the feasibility studies and other project reports relating to the R.T.S. Projects and the programmes envisaged for the Fifth Five Year Plan, and to collect information from the respective zonal railways, regarding the programmes for optimising of suburban train services and for eliminating major bottlenecks. Particular emphasis was to be laid on the adequacy and timely availability of EMU stock.

RAPID TRANSIT DEVELOPMENT PROGRAMME

With the phenomenal increases in population and land development activities in the metropolitan cities of Calcutta, Bombay, Madras and Delhi, there has been an ever growing demand for transportation, despite the efforts of the authorities concerned from time to time, to provide additional transport capacities. The magnitude of growth in populations in the four cities, can be gauged from the table below:

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TABLE

(in millions)

City	1931	1941	1951	1961	1971	Percentage increase 1931-1971
1. Calcutta	2.54	4.31	5.42	6.30	8.18	222
2. Bombay	1.27	1.69	2.97	4.15	5.97	370
3. Madras	0.71	0.86	1.42	1.73	2.40	238
4. Delhi	0.45	0.69	1.44	2.36	3.44	664

The above figures do not measure fully the magnitude of the transportation problems, for a large number of people from outside the city and in the metropolitan region, also come in and go out daily into and from the Central Business District, on obligatory trips. This is because the economic, administrative and educational activities in these cities, are mostly concentrated at a few places in the old city.

The adhoc measures so far taken to improve the traffic situation in the metropolitan cities, have been compounded by the large growth in the number of commuters. The Metropolitan Transport Team realised the urgent need to devise suitable transportation plans for these cities, to meet immediate as well as long-term transportation requirements of the four metropolitan cities, Calcutta, Bombay, Madras and Delhi. This objective required a comprehensive approach to the problems intrinsic to each city. Since the basic data which could help in identifying the main problems and for preparing a base to evolve a suitable

mass transport structure was not readily available in the case of Bombay, Madras and Delhi, the Team had to initiate comprehensive traffic surveys in each of these cities through special traffic study cells, set up at the MTT's instance, by the State Governments concerned.

However, in the case of Calcutta, detailed traffic studies had already been made and were readily available though some updating was necessary. The Team in its Interim Report had, therefore, suggested a preliminary engineering feasibility study for providing an electrified suburban railway dispersal line from Dum-Dum to Princep Ghat which could enable daily commuters from the neighbouring townships and colonies north of Howrah and north-east of Sealdah, to reach the central Business area directly and without difficulty. The object of the study was to secure all the data necessary to determine the feasibility of alignment to connect Dum-Dum with Princep Ghat and also to serve the Salt Lake Area with a branch connection, where the State Government has already started action to settle well over a million people. On the basis of the traffic data available, the Team had also come to the conclusion that the proposed railway line will have to be supplemented by a grade separated Rapid Transit Line from the north to the south of Calcutta, as a spine route which could take the form of an underground or elevated Rapid Transit system. The/

alignments selected for analysis, showed that 3,14,000 passengers daily moved in the east-west corridor at Howrah Bridge and about 2,78,000 passengers in the north-south corridor on Nehru Road; peak hour passenger volume of these points being about 31,000 passengers at Howrah Bridge and about 24,000 passengers on the Nehru Road - Chowringhee corridor.

The above traffic analysis strongly emphasised the urgent need for a high capacity rapid transit system along the two corridors. The selection of the type of Rapid Transit System most suitable for these two corridors, called for compatability with the over-all general development plans designed for the region. The system had to embody the most modern transportation concepts and to be adequate for meeting the travel demands for the next 20 to 25 years. It had to be fast, safe and convenient and provided at a cost compatible with the metropolitan region's ability to support it financially against all its financial outgoings.

The Team was convinced that similar grade-separated mass transport systems were also essential in Bombay and possibly for Madras and for Delhi if the traffic studies showed that the intensity of traffic justified it. Priority was, however, required to be given to Calcutta and Bombay where the situation was already critical and in severe arrears. The techno-economic feasibility study for selecting the types of rapid transit system was

taken up from October 1968 for Calcutta and by April 1969 for Bombay.

APPROACH TO FIFTH PLAN

The studies which have been completed so far, have revealed that the total travel in Calcutta City which was 4.6 million trips per day in the survey year 1971 would increase to 6.1 million trips per day by 1983;in Bombay, these would increase from 3.8 million in 1968 to 6.1 million in 1981; in Madras from 1.4 million in 1971 to 5.1 million in 1991 and in Delhi, from 1.7 million in 1969 to 4.8 million trips by 1981. The existing employment would increase from 8 lakhs in 1968 to 28 lakhs in 1981 in Bombay and 9.93 lakhs to 21.81 lakhs in Delhi. The peak hour traffic volume would increase three to four fold, over the existing maximum practical capacity.

In order to meet the long term transportation requirements of the four metropolitan cities, comprehensive traffic and transportation studies were undertaken by the Traffic Cells of the respective State Governments at the instance of the Metropolitan Transport Team. The studies included extensive analysis of the existing conditions of the mass transport facilities. It was found that the demand for transit services has been steadily increasing and the suburban railways both in Calcutta and Bombay, were already running in cruel

overcrowding conditions, during peak travel hours. A nine-coach train during peak hours carried a crush load of over 3300 passengers against a marked sitting and standing capacity of 1800. The Suburban Railway System both in Calcutta and Bombay are now over-saturated and are unable with optimising here and there at small costs to increase the number of trains, particularly during peak travel hours, because there is no line capacity left and due to shortage of additional fit EMU stock. A major optimising programme would be necessary at considerable costs.

In Calcutta, the suburban lines serve about 9.6 lakhs passengers per day and it is anticipated that by 1986, there would be a growth of 65 per cent in suburban passenger traffic. According to the traffic assignments for 1976, it is noticed that maximum capacity loading occured in the north-south alignment near Dalhouse Square. For the southern sections of the north-south alignment, the volume exceeding 7 lakhs passengers daily, with assignments falling below this level only on the section south of Bash Behari Avenue. The northern section of this alignment had a maximum daily load of 5.8 lakh passengers immediately north of B.D. Ganguli Street, 3.70 lakhs in the vicinity of Arvinda Sarani (Grey Street), 1.98 lakh passengers on the extreme northern section. On the east-west corridor,

the maximum volume of 5.21 lakh passengers was assigned to the section extending through Dalhousie Square area, 4.75 lakhs and 5.43 lakhs to sections approaching the Sealdah and Howrah Stations respectively.

In Bombay, the commuter survey of rail passengers (196 indicated the total movements of the incoming passengers during 6.00 a.m. to 2.00 p.m. at both stations (V.T. and Churchgate) were 3,01,498 while during 2.00 p.m. to 10.00 p.m. they were 3,08,044. The total number of suburban passengers carried by the suburban railways (Central and Western) has grown to about 22.6 lakhs daily. The demand for mass transit facility has been rapidly increasing, whereas the services provided by the suburban railways, are already inadequate as is evident from the intense increasing overcrowding in trains. According to the projections of the traffic cell "the total transit trips are likely to increase from 38.11 lakhs in 1968 to 60.22 lakhs by 1981". The stage has already been reached when there is no alternative left but to suggest grade separated rapid transit facilities which may be underground and/or elevated.

In Madras, about 14 lakhs trips are being made by commuters of which 45 per cent are being handled by buses, 15 per cent by suburban trains. The total loading and over crowding in suburban trains is to the extent of 440 percen in certain sections. Inspite of increase in the number of trains, it has not been possible to cope with growing tra demands of the commuters. The situation is likely to reach critical stage by 1981, when number of person trips is ex Rep to be more than 40 lakhs. On the basis of Travel Corridor

the year 1991, eight travel corridors have been identified where concentration of passenger trips varies from 0.16 million to 1.50 million per day. The heaviest concentration of passenger trips is reported on the north-south (eastern) corridor. In order to meet the growing travel demand on this section, the existing facilities would have to be supplemented by a high capacity intra-urban rapid transit system. Projected figures of travel for 1981 are currently under study to ascertain whether the north-south (eastern) corridor would require the grade separated facility by 1981.

In Delhi, there are no suburban trains and commutation between Delhi and adjoining areas is done by short distance shuttle trains, operating over five radial directions, within a maximum range of 90 Kms. The passenger trips on the public transport system have increased from 5.05 lakhs in 1961-62 to 11.5 lakhs person trips by 1971. The railways cater for only 4 percent and the buses for 40 per cent of the total intra-urban trips in the Delhi urban area. It is felt that Railways with their higher carrying capacity, should play a more important role in the city's public mass transport system for a balanced and orderly growth of the city.

On the basis of the comprehensive traffic and transportation studies for Calcutta, Bombay, Madras and Delhi, rapid transit corridors have been identified in these cities and have been taken up by the railways for techno-economic

feasibility studies, for selecting the type of rapid transit system - underground/elevated/surface whichever is most suitable for the cities along these corridors. In the case of Calcutta, the techno-economic feasibility study has been completed.

In the case of Calcutta, the Project Report for the under-ground railway from Dum Dum to Tollyganj was examined by the Metropolitan Transport Team. The Government of India has since sanctioned the underground railway project for Calcutta costing Rs.140 crores.

The Fifth Plan Development Programme has been based on:

i) Proper physical planning of the metropolis and its surrounding region and rational attempts to harness demand for transportation through sensible control over land-use and by increasing the modal split percentage for public mass transportation facilities.

ii) Optimisation and augmentation of the suburban rail facilities for a better modal split for travel by rail and improved workshop and terminal facilities for road public mass transportation facilities so as to increase the modal split percentage by public mass transportation by road.

iii) Priority for the core areas.

iv) Integration of the existing travel lines with the new lines leading to the developing areas by convenient inter-change points.

v) Integration of rapid transit lines with the roads, the suburban railways and the Road Transport Development Programmes.

vi) The provision of new facilities along the centre the gravity of the new major developments to be served, so that travel lines are so dispersed as to be within convenient walking distances from work-places for the largest number of the urban population.

I. REVIEW OF M.R.T.S. PROJECTS

The design and construction of the Dum-Dum Tollyganj grade-separated line has already been taken up during the financial year 1972-73, with a provision of Rs.2.97 crores. It is anticipated that Rs.12 crores will be spent on a continuation of work on this project, during the IVth Five Year Plan ending 1973-74. Out of a total estimated cost of Rs.140 crores required for the completion of the project, it is anticipated that this provision will be utilised by the end of the Vth Five Year Plan, as the completion date indicated by the railways is seven years from 1971. Provision in the Vth Five Year Plan of the balance of Rs.125 crores would therefore have to be made.

The Metropolitan Transport Project(Railways) Calcutta had suggested a techno-economic feasibility study for the east-west corridor. This is in full progress and is scheduled for completion early. The provision of Rs.18 lakhs was considered necessary for these studies during 72-73. This east-west line alignment will have to face certain major difficulties in its implementation such as a deep tunnel under the bed of Hooghly and an alignment beset with great difficulties east of the Hooghly end of the tunnel against the fact that the total length of the alignment will be only a few kilometers and therefore of use only for a small part of Calcutta. A token provision of Rs.1 crore in the Vth Five Year Plan has been asked for taking up construction of this east-west corridor. The Soviet

Team of Consultants had indicated a network of 5 RTS lines for Calcutta but this has been done without a future land-use plan for the regional areas through which these alignments are proposed. This includes 2 lines i.e. north-south and east-west lines. The C.M.P.O. is undertaking further studies regarding transport and traffic studies and evolving a future tentative network of RTS lines based on future land use. Accordingly, there may be need to continue techno-economic feasibility studies of such corridors in the Fifth Five Year Plan. It would be desirable therefore, to keep a token provision of Rs. one crore in the Fifth Five Year Plan for such surveys and studies.

A total provision in the Vth Five Year Plan should therefore be Rs.127 crores comprising of Rs.125 crores for the design and construction of the Dum-Dum-Tollyganj line, Rs. one crore as a token provision for the east-west line construction and Rs.1 crore for the techno-economic studies.

BOMBAY

Techno-economic feasibility studies for the mass rapid transit system in Bombay are in progress.

While the M.T.Team have made certain proposals for the provision of rapid transit/mass transportation facilities alongside certain corridors and has indicated the priority of implementation of these projects, the U.K. Consultants brought in by the railways, have made certain suggestions which are at variance with those made by the M.T.Team. The M.T.Team after discussion with the railways in regard to these

differences of opinion, have reached a consensus of opinion that the integrated rapid transit system as recommended by the Team in its Report on "Rapid Transit Corridors for Bombay", should be adhered to. The Team have recommended vide record note of the meeting of the M.T.Team held on the 1st February, 1973 at Delhi, that for Bombay priority should be accorded to the implementation of the rapid transit network as given below:

Priority-I	Eastern Corridor -	From Raoli Junction to Horniman Circle.
	Central Corridor -	From Horniman Circle to Byculla.
	Western Corridor -	From Byculla to Mahalaxmi.
	Southern loop -	From Horniman Circle to Churchgate Station, including connection to Car Shed at Back Bay Reclamation.
Priority-II	Central Corridor -	From Byculla to Kurla
	Western Corridor -	i) From Churchgate to Byculla; and ii) From Mahalaxmi to Bandra interchange.
	Northern cross connector from Bandra interchange to Kurla interchange together with the connections to Car Shed in Bandra-Kurla Reclamation area.	

The Team has however, stressed that the construction work on the section to Horniman Circle from Raoli Junction and the Back Bay Car Shed to Mahalaxmi should be the lengths taken up immediately as of first priority. As the construction priorities of these two sections have also been urged by the U.K. Consultants, it is considered that with the

constraints of funds during the Vth Five Year Plan, these lengths should be taken up for implementation on priority basis.

The IVth Plan has a token provision of Rs.1 crore for taking up the construction of R.T.S. in addition to Rs.3.4 crores for its feasibility studies and Project Report. This amount may be retained either for detailed design and commencement of the construction of M.R.T.S. or for its detailed design only during the last year of the Fourth Plan. An amount of Rs.100 crores for continuing the construction of the R.T.S. may be required in the Fifth Plan.

Rs.7 crores have been kept in the Fourth Plan for taking up construction of the Third Terminal Line. The final location survey has already been completed and it would be advisable to keep a token provision of Rs.1 crore for construction of the line in the last year of the Fourth Plan. A total of Rs.80 crores may be required in the Vth Plan for its construction to completion.

Throw-over provision for techno-economic feasibility studies from the Fourth Plan should be made in the Vth Plan.

Summarising the position, the following amounts may be needed for construction in the Vth Plan for Bombay.

	Rs. in crores
i) Rapid Transit System	100.00
ii) Third Terminal Line	80.00
iii) Techno Economic Feasibility Studies (throw over)	0.10
Grand Total:	Rs.180.10 crores

MADRAS

There is no providion for construction of any facility during the Fourth Plan. The Techno-economic feasibility studies are still in hand. Certain classified data on points required to be investigated, has been recently put through the computer and the first information given by the Traffic Cell is that the traffic volumes by 1981, would justify a grade separated facility along the north-south (eastern) corridor, even by that year as the trips likely to be generated, would be as high as 8.5 lakhs per day, with 40,800 trips during the peak hour in the peak direction of travel. The travel demands for 1981 are based on the developmental policy already decided by the Cabinet of the State Government for its development plans for 1971-1991, and that the urban developments by 1981 which would be of first priority along the North South (eastern) corridor, justified the need for an RTS facility along that north-south(eastern) corridor. The detailed report is still awaited, from the Tamil Nadu State Traffic Cell. At a recent meeting, the State Traffic Cell was asked to go into further details whether an RTS from north to south for its full length, as an underground facility, was fully justified or whether utilisation of the existing broad gauge lines from the Madras Central Station to the north, after optimisation and electrification and/or if necessary by laying of extra parallel tracks, could meet the 1981 travel demands for the portion north of Madras Central.

For the southern portion from Madras Central to Tiruvanmiyur, the acceptance of justification for an RTS facility, would have to await the report of the computer study recently made. The State Traffic Cell representative was also asked to ensure that traffic loads which were allocated to movements along this RTS corridor if provided, should be worked out with proper allocation to the roads also, as it was expressed by the railway representative, that the central part of the alignment would have to take many overlapping movements from the other corridors, involving heavy interchange facilities. A study of the intensity and requirements for the pattern of movements from east-west to north-south would also have to be made for 1981, with and without the proposed circular corridor. Further details as required by the railway member of the M.T.Team., have also to be furnished by the State Traffic Cell to provide the required information. This is delaying the decision in regard to whether an RTS is or is not required for Madras, and unless these points are resolved, it is not possible to confirm the need for otherwise of a grade separated rapid transit facility to serve the north-south(eastern) corridor. However, as these points are already under active study by the State Traffic Cell and should be possible to resolve within 1973-74, it is desirable that an ad-hoc provision of Rs.50 crores be set aside for the Fifth Five Year Plan for a Mass/Rapid Transit Facility for Madras.

Throw-over provision for techno-economic feasibility studies from the Fourth Plan should also be made in the Vth Plan for an amount of Rs.10 lakhs.

DELHI

In regard to Delhi, the T.C.P.O. Delhi is still on the job of traffic assignments for the different links of a tentative network, as suggested by the M.T.Team. The M.T.Team considered it necessary to give further consideration to certain points like the revised modal split suggested by it. Also it was for consideration whether the R.T.S. alignment as recommended by the C.R.R.I. should be improved, and the repercussions of a major interchange point at Connaught Place as suggested by the M.T.Team vis-a-vis an interchange point near the Central Secretariat as suggested by the C.R.R.I. It was also felt that a sensitivity analysis was required to determine the critical percentage of induced traffic that would have to be absorbed by the RTS facilities. The T.C.P.O. was asked to go fully into these points and a sub-committee was appointed, to go into the T.C.P.O's findings and a report from that Sub-Committee is expected shortly. It is nevertheless considered that with the unusual fast rate of growth in the capital and the existing availability of transport facilities, the RTS would be required to cater to its travel demands. Anticipating this, it is recommended that an amount of Rs.100 crores be provided for this in the Vth Plan.

The throw-over provision for techno-economic feasibility studies from Fourth Plan should also be made in the Vth Plan for Rs.10 lakhs.

OTHER CITIES

The Planning Commission is in touch with the State Governments for setting up Traffic Cells for the cities of Bangalore, Hyderabad - Secunderabad, Poona, Kanpur and Ahmedabad. Assuming that the Traffic Cells will be in position during the last year of the Fourth Plan period, the traffic studies and preparation of comprehensive traffic and transportation plan may take 3 to 4 years. Assuming that 4 cities, out of 5 may need enhanced public mass transportation facilities in future, their techno-economic feasibility studies may be taken up in the Vth Plan for which a total amount of Rs.50 lakhs may be provided on an ad-hoc basis.

Token provision for undertaking construction and/or providing transportation facilities for one or two cities may also have to be kept in the Vth Plan and an ad-hoc amount of Rs.50 lakhs should be provided.

Summarised position for the Vth Plan is as under:

PROGRAMME FOR THE FIFTH PLAN

(Rupees in crores)

	Total for Vth Plan.
1. CALCUTTA	
Design and construction of RTS from Dum-Dum to Tollyganj	125.00
Token provision for east-west corridor(Construction)	1.00
Techno-economic feasibility studies	1.00
	127.00

-/-

(Rupees in crores)

		Total for Vth Plan
II. BOMBAY		
Mass Rapid Transit System Eastern corridor.		100.00
Techno-economic feasibility studies		80.00
		0.10
		180.10
III. MADRAS.		
Electrification of Madras - Gummidipundi Section. Replacement of existing steam suburban trains Madras-Trivellore Section. Provision of MRTS	Token provision.	50.00
Madras-Beach Tambaram Section		
Techno-economic feasibility studies		0.10
		50.10
IV. DELHI		
Provision of surface lines Provision of part of underground system Provision of Third Terminal	Token provision	100.00
Techno-economic feasibility studies.		0.10
		100.10
V. OTHER CITIES		
Techno-economic feasibility studies		0.50
MRTS Construction (Token provision)		0.50
		1.00
Grand Total:		458.30

N.B. Rs.20 crores now left in the Fourth Plan for MRTS Projects will be utilised.

II. PROGRAMME FOR OPTIMISATION OF SUBURBAN TRAIN SERVICES

In regard to the augmentation of the existing suburban rail facilities, the railways are considering the possibility of optimising their existing assets. This optimisation includes electrification of suburban sections, replacement of steam suburban services by EMU services, introduction of additional trains, augmentation of rake composition from 8 to 9 cars, provision of route relay interlocking at key points, installation of automatic signalling, construction of additional passenger platforms etc. which would enable operating to be increased to the maximum practical capacities.

CALCUTTA

For expanding and optimisation of the existing suburban services, serving the Calcutta Metropolitan Area, provision will have to be made under the following heads.

a) S.E. Railway: EMU stock is already running on the Howrah Kharagpur section on which suburban services as such, are not being operated. Suburban traffic is however forecast on the basis of increases in population and developments in the commuter catchment area. The terminal capacity at Howrah has reached its saturation limit and the S.E. Railway is exploring the possibility of alternative terminals near Shalimar or Ramrajatolla to get over the problems at Howrah and also to co-ordinate operation with traffic on the second bridge over the Hooghly.

In order to cater to the traffic requirements of the Haldia Port complex, the Panskura-Howrah Section is also being electrified. EMU services from Howrah to Haldia will also be introduced after the completion of electrification.

b) Eastern Railway: Studies are in progress regarding optimisation of services, adequacy of terminal and Sectional capacities, requirements of EMU sheds and other repair facilities for absorbing additional traffic during Vth Five Year Plan Period. The Eastern Railway is also examining the possibility of shifting the suburban terminal close to Howrah Station.

The optimisation studies both on S.E. and Eastern Railways, are in progress and a final view can be taken only after considering these reports. Pending this, an ad-hoc provision for the procurement of 154 coaches for Eastern Railway and 52 coaches for S.E. Railway has been made in Fifth Plan proposals. Introduction of EMU service on any other new sections, except on the Haldia Branch has not been taken into account.

For the Calcutta Railways the requirement has been given as 154 coaches for the Eastern Railway and 52 coaches for the South Eastern Railway, and at one motor coach in a unit of three coaches, this would be split up into 70 motor coaches and 136 trailer coaches. At the rate of Rs.9 lakhs per motor coach, the cost would be Rs.630 lakhs for the 70 motor coaches and Rs.408 lakhs for 136 trailer coaches making a total requirement of funds of Rs.1088 lakhs for the Calcutta Railways for procurement of EMU rolling stock, during the Fifth Five Year Plan, which includes the provision for EMU stock for the Haldia Branch line also.

BOMBAY

As far as the Western Railway is concerned, the section extends from Churchgate to Virar, 50.83 Kms. The completion of quadrupling during the IVth Five Year Plan between Grant Road and Churchgate, enabling a four minute service would meet the demands for traffic with 9-car trains. This could be taken as adequate to meet traffic during the Vth Five Year Plan. As it is only after 1981-82 that the traffic is expected to out-grow facilities, quadrupling between Grant Road and Churchgate should suffice. Further optimisation to enable a 3-minute service to be run on each corridor, will be required beyond the Vth Five Year Plan. With the availability of the Raoli Junction - Fort Market rail facility the future growth of traffic that would continue to generate in the commuter catchment of the Western Railway suburban system, would still be possible to

move for the foreseeable future with a 3-minute service, as the total future suburban traffic to and from Churchgate, will be jointly shared by the Raoli Junction-Fort Market Line, and the available lines between Churchgate and Borivili.

The introduction of 12-car trains of the Bombay suburban section previously recommended by the M.T.Team, and as a result of the additional light thrown on these proposals by the traffic studies, now not considered advisable nor necessary. This is so both on account of the very high expenditure involved and because of the serious congestions that will be created on the road system outside the terminals, it is not possible to increase such road facilities outside the railway stations to ensure quick, safe and convenient dispersal. Further, the rapid transit system through the north-south alignments would draw away considerable volumes of increased traffic that would otherwise be generated on the existing suburban railways, and to that extent, provide relief both on the existing Western Railway suburban system as well as on the road net-work outside the suburban terminal stations and the suburban stations in the C.B.D.

As regards requirements of EMU rolling stock, these will be as follows:

WESTERN RAILWAY: The up-to-date position in regard to optimisation of the suburban services for Bombay, is that such studies on the Western Railway have been completed. In the Vth Plan proposals, a total of 289 coaches, on additional account, including throw-forwards from IVth Plan, to enable the introduction of a 4-minute service on each corridor consequent upon quadrupling of Churchgate-Grant Road section, has been included.

CENTRAL RAILWAY: Optimisation studies on Central Railway are still in progress and a final view about the feasibility of introduction of additional trains can be taken only on receipt of the study report. A total provision of 284 EMU coaches has been tentatively made in the Vth Plan proposals which includes the likely throw-forward from the Fourth Plan.

The total EMU rolling stock programme for the Bombay railways will therefore be, including the throw-forward from the Fourth Plan, 289 coaches for the Western Railway and 284 coaches for the Central Railway i.e. 573 coaches in all. In the ratio of one motor coach for a unit of three coaches, this gives a requirement of 190 motor coaches and at Rs.9 lakhs per motor coach, the requirements of funds for the motor coaches would be Rs.1710 lakhs. The balance of 383 coaches would be trailers and at Rs.3 lakhs per coach, they would cost Rs.1149 lakhs, making the total of requirement of funds for the Bombay railways Rs.2859 lakhs.

MADRAS:

For the Southern Railway the optimisation of the suburban train services for the Madras Metropolitan Area during the Vth Five Year Plan would have to cover the following four groups. Madras-Gummidipundi Section, Madras-Tiruvallore Section, Madras Beach-Tambaram Section and Madras Central-Madras Beach Section.

i) Madras Gummidipundi Section: 9 trains with 8-coach rakes, steam-hauled, serve currently for moving regional commutative traffic between Madras and regional points of the region. The electrification of this section is expected to be completed by 1976 which will make it possible to replace steam-working by electric traction. Twenty two 4-coach units of EMU stock (i.e. 30 motor coaches and 58 trailers) are being provided as a part of this electrification project, at a cost of Rs.444 lakhs. As the availability of this coaching stock would enable handling the level of traffic envisaged by the end of the Vth Five Year Plan period, no further provision need be made in the Vth Five Year Plan, unless the project implementation is in arrears. In the case of such arrears, there may be alwayy spill-over into the VIth Five Year Plan.

ii) Madras-Triwellore Section: 28 steam worked trains move regional commutative traffic between Madras and points of the region. The Project Report for electrification of this section is already in the hands of the Railway Board. This Project Report envisages provision of 20 numbers of 4-coach EMU units, (i.e. 30 motor coaches and

50 trailers) at a cost of Rs.420 lakhs. The completion of the electrification with the availability of the above electric multiple stock, should cater to all demands of the traffic on the section, during the Vth Five Year Plan. Adequacy of line capacity between Villivakkam-Trivellore is however likely to be faced. In that connection, the laying of extra tracks between these two stations will need consideration. The Report in regard to this is expected to be ready for submission to the Railway Board, shortly.. It is expected that with the electrification of this section and with the provision of this extra line capacity, nothing further is required in the Vth Five Year Plan.

(i) Madras Beach-Tambaram Section: Currently 257 trains are run both ways per day, with an available fleet of 43 EMUs. To meet the extra traffic anticipated, it is proposed to run 264 trains per day by an augmenting of the fleet to an authorised 49 EMUs. The supply of this extra coaching stock is expected to be made against the 1970-71 and 1972-73 Rolling Stock programme by the ICF, at a cost of Rs.81 lakhs. The present headways for suburban operation during peak hours, range from 6 to 7 minutes. Besides a reduction of this headway to enable more intensive operation, the proposals are also to augment accommodation per train by converting some of the double units trains into three units trains, by 1976-77. The Southern Railway estimates that 122 million passengers are expected to be carried. For this increased traffic extra requirements of the Southern Railway for Rolling Stock

would be 22 additional Motor Coaches and 44 trailers costing Rs.198 lakhs for the Motor Coaches and Rs.110 lakhs for the trailers making a total of Rs.308 lakhs.

iv) Madras Central-Madras Beach: It is a short section of 7 Kms. with 5 stations. There is currently a quadruple line section from Madras Central to Bassein Bridge and a double line section from Bassein Bridge to Rayapuram. From Rayapuram to Madras Beach there is a single line. Provision for optimisation of this section will have to be made in the Railway Budget.

These additions will make provision only for movements of regional commuter traffic along the arterials rail facilities radiating from the city. These arterials will not make provision for the enormous traffic generated and to be moved in the city and in the large fast developing zones between these radials. From these sections between the road and rail radials, enormous volumes of traffic will in future gravitate towards Madras and which cannot be served only by the radial railway tracks. Major provision for moving of these enormous volumes of intra-city traffic particularly oriented through the CBD, therefore requires to be made by modes other than the railways along, the existing radial routes.

The requirements of funds for Madras would therefore, be a total of 168 B.G. EMU coaches with a break-up of say 60 motor coaches and 108 trailers coaches at Rs.9 lakhs per B.G. motor coach the cost would be Rs.540 lakhs and for the 108 trailer coaches Rs.324 lakhs making the total requirements for EMU rolling stock for Madras-Gummidipundi Section and

Madras Trivellore Section is Rs.864 lakhs. In addition, 22 MG motor coaches at Rs.9 lakhs per motor coach, and 44 MG trailers at Rs.2.50 lakhs per trailer would cost Rs.308 lakhs. Thus the total requirement for Madras will work out Rs.11.72 crores.

DELHI

There are no suburban services as such in Delhi and their optimisation does not therefore arise. But electrified suburban services must soon be introduced in the Delhi Region. Commutation between Delhi and points in the regional area, is done by short distance shuttle trains of which there are 54 in numbers both ways, on the Broad Gauge, operating over the five radial directions, within a maximum range of 90 Kms. daily. Commutation also takes place by many riding in the 34 long distance trains which run both ways and which in the Delhi Regional Area are given halts at such stations as traffic justified for the convenience of local traffic generated between points in the Delhi Region. The running of short distance shuttle trains is interfering seriously with the running of the through trains and it will be necessary to meet the increasing demand of traffic into and out of Delhi by providing extra facilities to move such increased traffic.

However, the actual position is that no decision has as yet been taken about the electrification or introduction of EMU services. However at the rate of Rs.9 lakhs per motor coach and Rs.3 lakhs for trailers, 10 units of

4 coaches each would mean a total of 40 coaches and as one motor coach for a unit of 3 coaches would mean 14 motor coaches approximately including a spare motor coach, the cost of which would be Rs.126 lakhs and 26 trailers at a cost of Rs.78 lakhs.

Summarised position of the requirement of EMU rakes for the Fifth Five Year Plan is as follows:

	Coaches	Total funds required	
1. CALCUTTA			
a) Eastern Railway	154		
b) South Eastern Railway	52		
	206		
=70-Motor coaches		6.80)	10.38
136 Trailer Coaches		4.08)	
II. BOMBAY			
a)Western Railway	289		
Central Railway	284		
=190 motor coaches		17.10	
283 trailerscoaches		11.49	28.59
			38.97

	Coaches	Total funds required.	
		C.F	38.97
III. MADRAS			
a) Madras-Gummudipundi Section	88		
b) Madras-Trivellore Section	80		
	168		
=60 Motor coaches		5.40	
108 trailers		3.24	8.64
c) Madras Beach Tambaram Section.			
= 22 motor coaches (MG)		1.98	
44 trailers (MG)		1.10	3.08
	Total Madras:		11.72
IV. DELHI			
New Delhi-Delhi Ghaziabad	40		
=14 motor coaches		1.26	
26 Trailer coaches		0.78	2.04
	GRAND TOTAL:		52.73

N.B. Cost has been worked out at the rate of Rs.9 lakhs per B.G. and M.G. motor coaches and Rs.3 lakhs for B.G. Trailers and Rs.2.50 lakhs for M.G. Trailers.

Thus the total requirements both for MRTS Projects and for requirements of EMU rakes for the Vth Plan is:

Provision for MRTS	458.30
Requirement for EMU coaches ..	52.73
	511.03

Or Say Rs.511 crores

Sd/- A.V.D'Costa
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Metropolitan Transport Team
Planning Commission
New Delhi.