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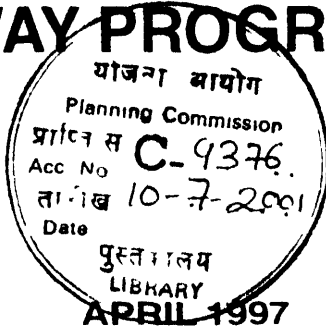
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सत्यमेव जयते

भारत सरकार Government of India
रेल मंत्रालय Ministry of Railways
(रेलवे बोर्ड) (Railway Board)

IX FIVE YEAR PLAN
(1997-2002)
REPORT
OF
THE WORKING GROUP
ON
RAILWAY PROGRAMMES



FOREWORD

It is my privilege to present the IX Plan document for the Indian Railways. This document outlines the achievements of the Indian Railways during the VIII Plan, defines the tasks to be undertaken during the IX Plan and specifies the conditions that must be fulfilled to enable the Railways to achieve the desired goals.

The Railways are the most energy efficient, environment friendly and safe mode of transport and, therefore, are the obvious choice for the role of prime movers to the nation. The nature of Railway investment is large and 'lumpy', it has long gestation lags and relatively low financial rates of return and high social rates of return. For this reason, even in advanced capitalist nations rail investment is state financed and subsidies in freight/passenger rates, if any, are explicit and borne by the state. This is particularly significant in the Indian context where the Railways bear the twin burden of subsidised fares/freight rates and inadequate financial support on capital account. High cost investment funds from the market are singularly inappropriate for most long term Railway investments and therefore, substantial budgetary support is essential if Indian Railways are to effectively meet the transport requirements of a growing economy and the developmental role that has invariably become part of the Railways' repertoire.

The VIII Plan saw a major change in the demand for transport. There was a shortfall between the freight targets and actual performance in the first 3 years of the Plan due largely to the inability of the core sector to offer the projected levels of traffic. Transport output was also affected by a drop in leads on account of reduction in the spatial gap between the centres of production and consumption, changes in the pattern of development of industries and the fact that formerly food grain deficit areas are now becoming self-sufficient. In 1995-96, however, with a spurt in the economy and industrial growth at over 8%, the Railways lifted 390.60 million tonnes of revenue earning traffic, i.e., 25.6 million tonnes more than the previous year, which represents the highest ever incremental loading achieved in a single year. The momentum is expected to be maintained in 1996-97 and the Railways are confident of meeting the target of 410 million tonnes of revenue earning traffic. Compound annual rate of growth of freight transport output in the VIII Plan period in terms of originating revenue earning traffic and ntkm is expected to be 3.94% and 2.48% respectively.

With the economy poised to grow at 6-7% per year in the coming years, the prime task in the IX Plan would be the generation of adequate transport capacity to handle the traffic offered by different core sectors of the economy. In order to satisfactorily meet the requirements of the economy and the aspirations of the people, certain inputs are essential during the course of the IX & X Plans. The size of the IX Plan has been fixed at Rs.65,000 crores as against Rs.27,202 crores in the VIII Plan. The principal objectives of the IX Plan are to:

- A Expand and strengthen the system by
- * augmenting line capacity;
 - * removing terminal capacity constraints;
 - * augmenting holding of rolling stock;
 - * upgrading technology in critical areas;
 - * improving asset productivity;
 - * wiping out arrears in asset renewal and replacement of overaged assets.
- B. Improve the quality of service through training of staff, induction of modern technology and expansion of modern transport practices like integrated inter modal operations.

In framing this document, certain projections were called for from various concerned Ministries. These were found to be very optimistic and have been toned down to present a realistic picture, keeping in mind the expected growth in the economy and the time-trend analysis. The Working Group has benefited from the continuous guidance and involvement of the Planning Commission in completing this exercise.

Investment in the transport sector not only enhance transport capacity but also has a multiplier effect on the economy. While investment in the transport sector as a whole has continuously declined over successive Five Year Plans, the cutback in Railway investment has been particularly severe. This trend has to be reversed to ensure sustained development.

I am very grateful to the members of the Working Group for their contribution to this report.



(C.L.Kaw)

(Chairman, Railway Board & Ex-officio Principal
Secretary to the Government of India)
Chairman, Working Group.

**REPORT
OF
THE WORKING GROUP ON RAILWAY
PROGRAMMES
IX PLAN (1997-2002)**

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LIST OF ABBREVIATIONS

ACF	Air conditioned and First Class
ACC	Air conditioned class
AWS	Auxiliary warning system
BEML	Bharat Earth Movers Limited
BHEL	Bharat Heavy Electrical Limited
btkm	billion tonne kilometre
BG	Broad gauge
B E.	Budget estimate
C&W	Carriage and Wagon
CERN	Committee on Expansion of Railway Network
CFS	Container freight station
CLW	Chittaranjan locomotive works
CNC	Computer Numerical control
CONCOR	Container Corporation of India
CRIS	Centre for Railway Information System
DCW	Diesel Component Works
DE	Diesel-electric
DH	Diesel-hydraulic
DLW	Diesel Locomotive Works
DRF	Depreciation Reserve Fund
EMU	Electric multiple unit
FM	Fouling mark
FRP	Fibre reinforced plastic
GRP	Government Railway Police
GS	Second class (self-generating)
gtkm	gross tonne kilometre
HHP	High horse power
ICD	Inland container depot
ICF	Integral Coach Factory
ICU	Intensive Care unit

IR	Indian Railways
IRCON	Indian Railway Construction Company
IRFC	Indian Railway Finance corporation
km	kilometre
kmph	kilometre per hour
loco	Locomotive
LUD	Lock-up dispensary
MB	Mega-byte
M&P	Machinery and Plant
MGR	Merry-go-round
MG	Metre gauge
MIS	Management Information System
ML	Main Line
MMTC	Minerals and Metals Trading Corporation
MST	Monthly season ticket
mt	million tonnes
M T P	Metropolitan transport project
N G	Narrow gauge
NTPC	National Transport Policy committee
ntkm	net tonne kilometre
OCV	Other coaching vehicle
OHE	Over-head equipment
OIS	Operating information system
PCV	Passenger coaching vehicle
pkm	Passenger kilometre
PLF	Plant load factor
POH	Periodic over-hauling
POL	Petroleum products
PRS	Passenger reservation system
PSU	Public sector undertakings
RCF	Rail Coach Factory
RDSO	Research Design and Standards Organisation

RE	Railway electrification
R.E.	Revised estimate
RITES	Rail India Technical and Economic Service
rkM	route kilometre
ROB	Road over bridge
RPF	Railway Protection Force
RRC	Railway Reforms Committee
RRI	Route relay interlocking
RTEC	Railway Tariff Enquiry Committee
S&T	Signalling and telecommunication
SSI	Solid state interlocking
Telecom	Telecommunication
TEU	Traffic equivalent unit
TOR	Turn-over ratio
UHF	Ultra-high-frequency
UTS	Ultimate tensile strength (in kg per sq cm)
VP/VPU/VPVU	Parcel Vans
WAC	Vestibuled air conditioned
WAP	Wheel and Axle Plant
WMS	Workshop Manufacturing Suspense

**COMPOSITION OF
THE WORKING GROUP ON RAILWAY PROGRAMMES
AND
TERMS OF REFERENCE**

1 0 The Working Group for the formulation of the IX Five Year Plan for Railways

The Working Group for Railways' IX Five Year Plan (1997-2002), under the Chairmanship of Chairman, Railway Board, was constituted vide Planning Commission's Order No T&C/7(26)/95 dated 1 12 1995 With the co-option of a few more members , the composition of the Working Group was as under

1	Shri C L Kaw, Chairman, Railway Board	Chairman
2	Shri V Sivakumaran, Financial Commissioner, Railway Board	Member
3	Shri L K Sinha, Member Mechanical, Railway Board	Member
4	Shri M Ravindra, Member Engineering, Railway Board	Member
5	Shri V K Agarwal, Member Staff, Railway Board	Member
6	Shri S K Khanna Member Electrical Railway Board	Member
7	Shri B N Makhija, Principal Adviser(Tpt), Planning Commission	Member

8.	Shri Shanti Narain Memeber Traffic Railway Board	Member
9.	Adviser (PPD.), Planning Commission.	Member
10.	Shri P. Sengupta, Adviser (Energy), Planning Commission..	Member
11.	Shri A.K. Basu, Adviser (I&M), Planning Commission	Member
12.	Shri Madhao N. Lothe, Dy. Adviser(Transport), Planning Commission,	Member
13	Shri A D. Narain. Director General (Roads), Ministry of Surface Transport.	Member
14	Shri J Hari Narayan, Joint Secretary, Ministry of Coal	Member
15.	Shri K Kipgen, Joint Secretary, Ministry of Steel	Member
16	Shri Ajay Dua, Joint Secretary, Ministry of Power.	Member
17.	Smt. Pratibha Karan, Joint Secretary, Ministry of Industry, Deptt. of Industrial Development.	Member
18.	Joint Secretary, Ministry of Petroleum.	Member

19.	Shri Kundan Sinha, JC (FSD), Deptt. of Fertilizer.	Member
20.	Joint Secretary, Department of Chemicals.	Member
21.	Joint Secretary, Ministry of Surface Transport.	Member
22.	Shri T.S. Vijayaraghawan, Additional Secretary, Ministry of Commerce.	Member
23.	Shri Om Kumar, Joint Secretary (O), Ministry of Defence.	Member
24.	Shri Satish Kumar, Joint Secretary (OF), Deptt. of Defence Production & Supplies.	Member
25.	Dr. N. Sheshagiri, Special Secretary & Director General, N I.C.	Member
26.	Managing Director, Food Corporation of India,	Member,
27.	Shri D.C. Gupta, Joint Secretary (PF-II) Ministry of Finance.	Member
28.	Secretary, Ministry of Science & Technology	Member
29.	Shri V.P.Ojha, General Manager, Rail Coach Factory,	Member

- | | | |
|-----|---|----------|
| 30. | Shri SK Sharma,
Managing Director,
Container Corporation of India. | Member |
| 31. | Shri S.P. Bindra,
Addl. General Manager,
Bharat Heavy Electrical Ltd. | Member |
| 32. | Shri S.Suryanarayanan,
Addl. Member (Planning),
Railway Board | Convenor |

NON OFFICIAL MEMBERS

- | | | |
|-----|--|--------|
| 33. | Shri C.M. Khosla,
Ex. Member Traffic,
Railway Board. | Member |
| 34. | Shri A.N. Wanchoo,
Ex-Chairman/RITES | Member |
| 35. | Shri R.V. Kanodia,
Chairman,
Infrastructure Committee, FICCI | Member |
| 36. | Shri Pratap Narain,
Executive Director,
Fertilizer Association of India. | Member |
| 37. | Shri M.N. Murthy,
Professor,
Institute of Economic Growth. | Member |

2.0 TERMS OF REFERENCE :

- (i) To evaluate the performance of the Railway in the Eighth Plan in respect of:
 - (a) Achievement of traffic targets, both freight and passenger,
 - (b) Expansion of the rail network with reference to the traffic targets;
 - (c) Optimal utilisation of transport capacity already created.
 - (d) Improvement of productivity with particular reference to productivity of wagons, locos, etc.

(x)

- (e) Technological upgradation of the system; and
 - (f) Other physical targets set for the 8th Plan.
- (ii) To project passenger and freight traffic in the 9th Plan, keeping in view the lessons learnt from the experience during the 8th Plan projected rate of growth of the economy and production targets of major bulk commodities in the 9th Plan and other factors.
- (iii) To formulate a comprehensive strategy for handling the projected traffic in a cost effective and efficient manner. While formulating such a strategy, inter-alia, the following may be considered -
- (a) Better utilisation of available assets,
 - (b) Technological upgradation, including development of more efficient locos, wagons, coaching stock and safety equipment,
 - (c) Minimisation/avoidance of equipment failures,
 - (d) Measures to increase the share of rail in total traffic, especially in respect of general merchandise,
 - (e) Development of integrated inter-modal operations, where ever feasible and particularly for handling containers,
 - (f) Need to keep optimal speed differential between passenger and freight trains on crowded corridors
 - (g) Introduction of longer/heavier passenger and freight trains,
 - (h) Need to develop alternative routes to relieve congestion on saturated routes,
 - (i) Need to develop improved communication network, and
 - (j) Computerisation of operational information.
- (iv) To formulate detailed physical plan (including Rolling Stock) for inclusion in the 9th Plan indicating separately -
- (a) Spillover Schemes
 - (b) New Schemes
- The requirement of replacements and additions will also be shown separately.
- (v) To assess the need for stepping up manufacturing capacity of various types of equipment in the country.
- (vi) To assess the requirement of funds for replacement and renewals and new additions to the system.
- (vii) To assess the potential for development of ancillary equipment, etc. in the private sector and requirements of funds for complementary investment for production of equipment in the private sector.

- (viii) To assess the foreign exchange components of the requirements envisaged under item (vi) and (vii) above.
 - (ix) To assess the internal resources of Railways for financing development programmes, and to identify the steps required for augmentation of resources including changes in the tariff policy and structure to bring tariff closer to cost of services provided.
 - (x) To assess the scope for financing railway projects through BOLT (Build, Operate, Lease and Transfer) scheme in the 9th Plan and identify areas/schemes for private financing.
 - (xi) To identify surplus manpower in certain areas considering particularly the possibilities of technological upgradation and modernisation of services and to prepare a detailed programme for effective utilisation of manpower including retraining and development of surplus labour to the extent necessary and based upon technologies and to assess additional manpower requirements during the 9th Plan
 - (xii) To suggest detailed measures for increasing the productivity of the railway system, more particularly the productivity of labour in all important aspects of railway operations.
 - (xiii) To review the existing institutional arrangements for maintenance and planning and recommend detailed improvements needed including establishment of new institutions
- 3 0 The Working Group in their first meeting held on 22.2 1996 reviewed the performance of the Railways during the VIII plan period and felt it necessary to constitute 19 sub-groups to deliberate on specific key-areas. General guidelines for all sub-groups were issued and the objectives for each sub-group were also identified. The Terms of Reference for the sub-groups, and their composition are enclosed as Appendices A, B and C respectively
- 4 0 The working group finalised the report in the meeting on 16 10 96 after considering the draft overview made on the basis of the reports of the various sub-groups.

AN OVERVIEW

1.0 THE CHALLENGE

- 1.1 The formulation of the IX Plan comes at a critical point of time for IR. As the main component of the transport infrastructure, Railways have a crucial role to play in the sustained development of the economy. The change in economic philosophy, rapid acceleration in the pace of the nation's economic growth and the concomitant changes in Govt. policy have confronted Indian Railways with the sternest challenge in their history. The Railways will require to respond to the changed environment by making the necessary competitive adjustments to deal with the pressures of market forces in a liberalised economic environment, not only in order to remain financially viable but to be able to satisfy the growth in demand for rail transport as a result of accelerated growth of a vibrant economy. At the same time, the Railways as a public utility would have to continue to be responsive to their public service obligations.
- 1.2 In formulating the IX Plan, the imperative of striking a proper balance between the Railways' dual role as **a public utility on the one hand and a commercial enterprise to be run on sound business principles on the other**, constitutes the major challenge of investment planning. In a resource-strapped regime and with dwindling Govt. support, the Railways would have to assess objectively the trade off between targeting investment for capacity generation and investing in developmental projects which are unremunerative. Bold initiatives to improve technology and operating practices would also be required to generate adequate transport capacity and improve the utilisation of existing assets.
- 1.3 Considering the stated Govt. policy to create an inter-modal transport mix which provides service at least resource cost to society, the Railways would logically, be the **most suitable and economical mode for long haul freight movement in bulk, long distance intercity passenger traffic and for mass rapid transit suburban systems**. The Railways provide the cheapest, most energy efficient mode of land transportation consuming only one-fourth to one-sixth of energy per tonne compared to any other mode of land transport. It is also more environment friendly than other land modes as also more economical and efficient in land use. In the interest of efficient resource use, the Railways should concentrate on those segments of the market where they enjoy a **comparative advantage**. Conversely, with the unit of movement on the Railways being the train load, **Railways by their inherent nature are unsuitable for carriage of low volume piecemeal goods traffic**. Such traffic is ideally suited for carriage by containers which require the Railways and Road to combine together and provide an integrated transport service. The area of rail-road co-ordination is one which would require special focus during the IX Plan. In this particular area, the Container Corporation of India has made rapid progress as seen from the phenomenal growth in the traffic it has handled in the last few years. **Chartering of trains by freight forwarders** who can aggregate piecemeal traffic into train loads would also enable clearance of long distance piecemeal traffic by rail and would cater to the requirements of break bulk transport over long haul at least cost to the economy.
- 1.4 A critical issue to bear in mind is that creation of most **Railway infrastructure is capital**

intensive and has long gestation, which makes it difficult to match the infrastructure development with transportation demand in an incremental manner in the short term. It is therefore extremely important to initiate action during the IX Plan to develop adequate infrastructure for catering to the anticipated rail transport demand in the X Plan. A number of the projects and investments proposed in the IX Plan have been conceived keeping this critical factor in mind.

- 1.5 An issue that has thrust itself to the forefront of public consciousness and concern is **safety on the Railways**. The need for upgrading the safety infrastructure through induction of technical aids to support the human element, enhancing asset reliability, as also by improving the work culture and ethos cannot be over emphasised. Strengthening the technical and human based safety systems would be a key priority in the IX Plan. It may, however, be not out of place to strike a note of caution here that **no technology has been developed in the world which is completely proof against vandalism or theft**. As the railway criss-crosses throughout the length and breadth of country, **prevailing law and order** in a region has significant impact on the efficiency of railway operations. As the **most visible symbol of Central Government**, railways tend to be the first target of public ire in any civil strife or agitation. The document assumes that the scenario will improve in the IX Plan period.

2.0 VIII PLAN REVIEW

- 2.1 Before analysing the traffic projections for the IX Plan, it would be appropriate to briefly review the performance of the VIII Plan vis-à-vis the targets. Given below are some of the key performance indicators in the VIII Plan. Freight connotes originating revenue earning traffic.

KEY PERFORMANCE INDICATORS OF VIII PLAN

		1992-93	1993-94	1994-95	1995-96 (Prov)	1996-97 (Target)
Freight (Mill. Tonnes)	Target	354.00	370.00	380.00	398.00	410.00
	Actual	350.10	358.70	365.00	390.60	
Tonne Kms. (Billion)	Target	261.30	272.40	273.70	278.80	282.90
	Actual	252.40	252.40	249.60	271.10	
Passengers (Million)	Target	4256.00	4170.00	3908.00	4120.00	4192.00
	Actual	3749.00	3708.00	3915.00	4038.00	
PKMs (Billions)	Target	325.86	326.54	307.60	325.11	341.29
	Actual	300.10	296.25	319.37	334.00	
Plan Size (Rs. Crores)	BE	5700.00	6500.00	6515.00	7500.00	8130.00
	Actual	6162.00	5861.00	5472.00	6335.00	
Net Revenue (Rs. Crores)	BE	2130.00	3448.00	3342.00	3426.16	3503.37
	Actual	1955.43	3102.13	3808.11	3678.16	

(xv)

- 2.2 The shortfall in the utilisation of Plan funds was on account of mainly less utilisation for procurement of rolling stock and drop in inventory levels. Due to difficult situation in the capital markets, planned market borrowing programme had also to be curtailed. The above targets of the Annual Plans were finalised each year in consultation with Planning Commission based on the demand projections from the user industries.
- 2.3 The delayed take off of the economy which did not grow at the projected pace right up to December '94 had its predictable negative impact on the materialisation of freight traffic. The shortfall between the freight targets and the actual performance in the first 3 years of the Plan is largely due to inability of the core sector to offer the projected levels of traffic, resulting in wastage of transport capacity created by the Railways. The transport output was also affected by the drop in leads on account of reduction in the spatial gap between the centres of production and consumption, changes in the pattern of development of industries and the fact that formerly food grain deficit areas are now becoming self-sufficient. In 1995-96, however, with spurt in the economy and industrial growth at over 8%, the Railways lifted 390.60 million tonnes of revenue earning traffic, i.e., 25.6 million tonnes more than the previous year, which represents the highest ever incremental loading achieved in a single year. The momentum is expected to be maintained in 1996-97 and the Railways are confident of meeting the target of 410 million tonnes of revenue earning traffic. Compound annual rate of growth in freight transport output in the VIII Plan period in terms of originating revenue earning traffic and ntkms is expected to be 3.94% and 2.48% respectively.
- 2.4 An annual growth of 5% per annum had been envisaged for passenger traffic in the VIII Plan. However, in the first two years there was a slump in passenger traffic which could be attributed partly to the law and order problems in 1992-93 as also a fare hike. This necessitated a mid-term revision of the original VIII Plan targets to match with the actual growth. For 1995-96 and 1996-97, it was decided that the traffic projections should be on the basis of 2% annual growth on the average traffic offered during 1991-92 and 1992-93. The adverse trend of the first two years has been reversed in 1994-95 and 1995-96. It is reasonable to expect that the passenger traffic projections, for the terminal year of the VIII Plan will materialise.
- 2.5 CONCOR's international traffic handled at the beginning of the VIII Plan period was 96,000 TEUs and is expected to grow to 400,000 TEUs in the terminal year of the VIII Plan registering compound annual growth rate of 33%. CONCOR's domestic container traffic which was 12,000 TEUs in 1991-92 is expected to be about 300,000 TEUs by 1996-97 indicating a compound annual growth rate of 90%.

3.0 EXISTING EFFICIENCY PARAMETERS

- 3.1 During the last 45 years the freight transport output (measured in net tonne kilometres) has increased by about 5.75 times, passenger output (non-suburban passenger kilometres) by about 4.2 times whereas the network has grown by only about 1.17 times in terms of route kilometres and by 1.34 times in terms of track kilometres. Other inputs,

such as, number of passenger coaches, wagons and tractive effort of locomotives, have grown by 2.0 to 2.6 times only. **The significant increase in transport output has been brought about by more intensive utilisation of the available assets, improvement in their productivity and technological upgradation.** Data on intensity of asset utilisation is presented in **Annexure-I**.

- 3.2
- The railway network today which operates on three gauges, the broad gauge, the metre gauge, and the narrow gauge, suffers from inherent imbalance in the traffic flows. The BG, though forming 63.2% of the route carries 95% of the freight and 89% of the passenger output of IR. Among the BG routes, the six corridors connecting the four metropolises of Mumbai, Calcutta, Delhi and Madras and the two diagonals, comprising 25% of the total BG route kilometres (e.g. 15.8% of total network), carry in excess of 56% of the total freight transport output and 47% of passenger traffic, thereby causing serious congestion on the golden quadrilateral connecting the four metropolises.

3.3 Operating Efficiency Parameters

- 3.3.1
- The operating efficiency parameters of the IR in terms of Net tonne kilometre per wagon day on line has steadily improved from 1407 in 1990-91 to 1754 in 1995-96 (See **Annexure-II**). These are comparable with the best in the world excepting the command economies such as China. This would be seen from **Annexure-III**.

3.4 Financial Efficiency Parameters

- 3.4.1
- Indian Railways is perhaps the only railway system in the world having 60:40 traffic mix of passenger and freight traffic in terms of train kilometres (See **Annexure IV**) which is consistently making profit after fully discharging its dividend payment liability to the Central Exchequer, notwithstanding large burden of public service obligations it is required to carry as a Government owned public utility, as would be seen from the data presented below.

YEAR	90-91	91-92	92-93	93-94	94-95	95-96 (RE)	96-97 (BE)
OPERATING RATIO	91.9	89.5	87.4	82.9	82.6	84.6	87.8
NET REV. TO CAPITAL AT CHARGE (%)	6.9	8.7	9.7	13.7	15.3	13.2	11.4
BUDGETARY SUPPORT	1632	1756	2589	974	1145	1150	1269
DIVIDEND PAID	938	1106	1514	1296	1362	1360	1587

- 3.4.2
- It may be observed that there is now a reverse flow of funds from IR to the Central Exchequer.

3.5 Manpower Efficiency Parameters

- 3.5.1 Even though Railways are a labour intensive operation, IR is saddled with certain amount of surplus manpower as a result of past economic policies and technological changes in all spheres of railway working. The total manpower on the IR has reduced from about 17.71 lakh at the end of 31.3.90 to about 16.71 lakh on 31.3.1995, showing a reduction in excess of 1 lakh. In the same period the traffic output in terms of originating revenue earning traffic increased by about 18% and passenger km. by about 14%.

4.0 IX PLAN PROJECTIONS FOR RAIL TRANSPORT

4.1 Freight Traffic Projections

- 4.1.1 The elasticity of freight and passenger transport with respect to GNP has been assessed as 1.5 and 1.9 respectively for the transport sector as a whole. In the case of the railways the elasticity has been historically about 0.9 for freight and 1.0 for passenger. The low elasticity figures are indicative of the falling share of railways in the transport market which has declined from about 89% in 1950-51 to 40% in 1994-95 in the freight sector and from about 68% to 20% in passenger sector. With the economy poised to grow at 6 to 7% per year the freight output would have to grow at more than the historical growth rate of about 3.6% if the railways are not to become a stumbling block in the growth of the economy.
- 4.1.2 Considering the pivotal role of the Railways in promoting economic growth, the prime task in the IX Plan would be the generation of adequate transport capacity to handle the traffic offered from different core sectors of the economy. The **freight traffic projections** in the terminal year of the IX Plan (2001-2002) based on the different calculations of demand projections, the users' forecasts and as estimated by the IX Plan Working Group are given below. The base year has been taken as 1996-97, the terminal year of the VIII Plan

	Tonnage (Millions)	btkms (Billions)	Average Growth Rate	Lead (Km.)
1996-97 (Target)	410	282.9		690
User's Projections	614	427	8.41%	673
Time Trend Analysis	490.5	341	3.65%	695
Elasticity wrt GDP(0.9)	533	360.2	5.39%	695
IX Plan Working Group	525	353	5.00%	673

- 4.1.3 The projection based on the time-trend analysis does not correctly reflect the users' requirement, as it is essentially based on historical data and does not give adequate

weightage to the accelerated future growth. The forecast based on the GDP growth, assumes a GDP growth rate of 6% per annum and a constant elasticity of 0.9. This yields a growth rate of nearly 5.4% per year which is substantially higher than the historical growth rate of 3.65%. The users' projections have been pitched at a level that is unrealistically high when judged against the materialisation of traffic in the past. Moreover, development of railway infrastructure by its very nature has long gestation on account of which it would not be possible for the Railways to create matching infrastructure in the short term even if the projected level of traffic were to materialise. The Working Group has thus moderated the Users' projections on the basis of an analysis of the past performance of users, present status of their expansion programmes as also the estimation of the likely time-frame of new plants going on stream, and **railways capacity to augment its fixed infrastructure and production capacity of its production units engaged in the manufacture of locomotives, coaches, etc.** Even the capacity of the private sector to significantly increase production of wagons is limited. IR will thus be required to achieve an incremental growth of 70 btkms during the IX Plan against the best ever past performance of 57 btkms of incremental traffic in the VII Plan.

The freight projections of the Working Group would mean a 5% compound annual growth rate over the IX Plan period, which appears to be a reasonable and realistic estimate of the future growth albeit substantially higher than the growth rate of 3.6% achieved during the last three decades.

The commodity-wise break up is at **Annexure V**.

4.2 Decline In Market Share

4.2.1 **Perennial constraint of resources** has adversely affected Railways' development resulting in diversion of traffic from rail to road at an overall higher cost to economy, although through successive plans the main theme of the Railways' planning has been creation of enough transport capacity to be just ahead of the demand. National Transport Policy Committee (NTPC) had recommended that Railways should plan to carry 72% of the total land freight by 2000 AD whereas the Railways' share has been declining and at present is less than 40% of the total freight.

4.2.2 With the economy growing at a targeted rate of 6-7% per year, even a growth rate of 5% for the IX Plan would imply a **continuing fall in rail share in the transport market**. If, as recommended by the Planning Commission, the rail share in the overall transport system is to be increased by 5% then the rail freight traffic to be lifted in the terminal year of the IX Plan, calculated on the basis of modest GDP growth rate of 6%, works out to a staggering 427 btkms. It is not practicable to achieve an incremental freight output of 144 btkms (> 50%) in a Five Year Plan period. As mentioned earlier, action has to be

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initiated in the IX Plan to generate adequate capacity to **arrest/reverse the trend of the decline in the market share of the railway in the transport market by the beginning of the X Plan.**

4.3 Passenger Traffic Projections

4 3 1 The passenger traffic projections pose an equally formidable challenge to the Railways especially when one considers that the demand for new services are concentrated on the arterial routes, which are already choked. Elasticity of passenger transport with respect to GDP has been estimated as about 1. Anticipated growth of GDP at 6% per annum would generate demand for passenger transport of 6%. The historical rate of growth of passenger traffic, however, has been 4% per annum. At this rate of growth, the passenger kilometres required to be generated in 2001-02 would be 429 billion. However, according to the estimate of the IX Plan Working Group, the non-suburban passenger traffic projections are as under

	Target 1996-97		Projected 2001-02		Annual Growth rate
	Passengers	PKMs	Passengers	PKMs	
	(Millions)	(Billions)	(Millions)	(Billions)	
Non-Suburban	1590	268.64	1793.25	312.9	3.10%
Suburban	2602	72.65	2988.87	86.5	3.55%

4 3 2 Demographic projections for the year 2001 indicate that the percentage of urban population would increase from 25.72% of the total in 1991 to 33.06% in 2001. This growth would have a large impact on **suburban traffic transport demand**. Forecasts of urban population growth project a doubling of the urban population within the next decade and a fivefold increase over the 1991 figure by the year 2025. As the cost of living in the major urban centres becomes unaffordable for large proportion of the urban population, there may be greater demand for rail transport from the satellite towns and mass rapid transit could possibly be the only system capable of catering to movement of people in such large numbers.

4 3 3 Use of long distance passenger services by the suburban commuters is a source of considerable irritation and inconvenience to the long distance passenger having reserved accommodation and the Railways cannot ignore its responsibility of meeting the suburban transport needs of the large cities. Time has come for creation of **dedicated suburban corridors** in the major metropolises, as also upgradation of the **dispersal systems** so as to reduce concentration of congestion on the roads **in front of the railway stations**. State Government/local authority have to chip in for both initial funding of the cost of suburban infrastructure and for losses incurred in operation of such short distance services so that quality service can be provided to the passengers.

4.4 Container Traffic

- 4.4.1 Rapid growth in the demand for bulk transport had compelled the railways to evolve operating strategies and technology to match the demand. However, this led to the shift of some non-bulk traffic to the road sector. To satisfy the transport demand for non-bulk traffic as also to win back the traffic which had shifted to road, the Container Corporation of India (CONCOR) was started as a public sector unit under the Ministry of Railways. The traffic carried by COCOR has registered very impressive rates of growth.
- 4.4.2 At present the entire container traffic moved on the Railways is handled by the CONCOR which caters to both International and domestic container traffic which is expected to grow considerably during the IX Plan period. As per the decision taken by GOI (Ministry of Commerce), setting up of ICDs/CFSs has been thrown open to the private sector and part of the investment required on this account could be provided by them. The international container traffic is expected to increase from 4 lakh TEU in 1996-97 to 10.5 lakh in 2001-02. During the same period, the domestic traffic is expected to grow from 3.0 lakh TEU to 4 lakh TEU. IX Plan projections for international container traffic are given at Annexure VI.

5.0 BRIEF OUTLINE OF THE IX PLAN

- 5.1 **Objectives:** The objectives of the IX Five Year Plan are as under:
- (i) Generation of adequate rail transport capacity for handling increasing freight and passenger traffic with special emphasis on development of terminals.
 - (ii) Completion of the process of rehabilitation, replacement and renewal of overaged assets.
 - (iii) Modernisation and upgradation of the rail transport system to reduce the costs, improve reliability, safety and quality of service to customers.
 - (iv) Continue with the policy of Unigauge.
 - (v) Introduction of 6000 HP Electric locomotives and 4000 HP Diesel Locomotives employing State-of-Art technology.
 - (vi) Expand and upgrade inter-modal operations including containerisation.
 - (vii) Improvement of Man power productivity, work culture and staff morale.

5.2 Requirement of the Rolling Stock

- 5.2.1 The acquisition of rolling stock depends on the quantum of the traffic to be moved, the mix of traction and the norms of asset utilisation. The three basic and comprehensive norms for measuring utilisation of rolling stock are:

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Wagons: ntkm per wagon day on line.

Locos: lakh ntkm per loco day on line for freight, and lakh gtkm per loco day on line for passenger.

Coaches: Vehicle km per vehicle day on line.

5.2 2 Presented below are the actual figures of utilisation of rolling stock in the VIII Plan:

	Utilisation		Target
	1992-93	1995-96	2001-02
Wagons (ntkm/wagon day on line)	1,457	1,754	1,950
Electric Locos :			
Freight (lakh ntkm/loco day on line)	2.62	2.70	2.70
Passenger (lakh gtkm/loco day on line)	3.39	3.44	3.75
Diesel Locos :			
Freight (lakh ntkm/loco day on line)	2.04	1.94	2.00
Passenger (lakh gtkm/loco day on line)	2.80	2.30	2.30
Coaches (vehicle km/vehicle day on line)	410	426	450

5.2 3 Improvement in the wagon productivity has been essentially the result of weeding out of the older design plain bearing wagons, induction of air brake wagons of improved reliability and efficiency, and almost complete embargo on piecemeal loading. Utilisation of electric locomotives has not shown significant improvement due to the fact that the existing trunk routes are working to saturation and the average running time of the freight trains on the congested routes, where bulk of the incremental growth is to take place, has been rising. In the case of diesel locomotives, the utilisation has been low due to relegation of diesel traction to lower traffic density routes consequent on phasing out of steam traction. There has been a fall in the utilisation of diesel locos in passenger services also due to large scale gauge conversions in the VIII Plan as a result of adoption of the "Project Unigauge". The diesel locos are being increasingly used on less important routes for short distance passenger services.

5.2 4 The requirement of the coaching stock is now worked out as per the actual needs rather than utilisation norms. The figures presented in the table above are only indicative.

5.2 5 The share of the electric and diesel traction for freight and passenger services in 1994-95 is presented in the Table below:

	Electric		Diesel	
	1994-95	2001-02	1994-95	2001-02
Passenger	46.29%	50%	53.71%	50%
Freight	57.37%	67%	42.63%	33%

5.2.6 Keeping in view the target of railway electrification and gauge conversions in the IX Plan, the likely traction split in the terminal year of the IX Plan is also indicated in the Table above.

5.2.7 On the basis of the projected freight transport output of 353 btkms and Rolling Stock utilisation norms discussed in the foregoing paragraphs, the requirement of Rolling Stock in the IX Plan has been estimated as under:

- i) **Wagons:** The total requirement during IX Plan comes to 1.75 lakhs comprising 1 lakh on replacement account and 75,000 on account of incremental traffic. The details of the calculation are indicated in the **Annexure-VII**. Even though the indigenous manufacturing capacity is about 36,000 wagons per annum, the industry has not been able to supply more than about 26,000 wagon in a year in the past. The industry has, therefore, to gear up their production to the rated capacity by removing the bottlenecks in the production lines, wherever existing.
- ii) **Locomotives:** The requirement of locomotives for the IX Plan has been assessed as under:

	Diesel	Electric	Total
Additional locos for freight	210	678	888
Additional locos for passenger	290	172	462
Locos for Replacement	400	200	600
TOTAL LOCO REQUIREMENT	900	1,050	1,950
IN IX PLAN			
Locos being procured	800	950	1,750
Locos to be released by DMUs/MEMUs	100	100	200
TOTAL LOCOS AVAILABLE	900	1,050	1,950

The above loco requirement takes into account the requirement of locos by Konkan Railway. Indigenous manufacturing capacity of diesel (DLW) and electric locomotives (CLW & BHEL) is 150 and 170 per annum respectively. Thus, for meeting

the projected requirement of locomotives, the production capacity would have to be expanded by providing marginal inputs.

- iii) The need based requirement of non EMU coaches is 9000. It is planned to acquire 400 EMUs per annum which is the available manufacturing capacity. Acquisition of 2000 EMUs coaches has been planned in the IX Plan. In addition 750 each of MEMUs/DMUs are proposed to be procured.

5.2 8 Total requirement of funds for the rolling stock in the IX Plan has been assessed Rs. 28,950 crores. The details of the acquisition programme alongwith the cost are indicated in Annexure-VIII.

5.3 Production Units, Workshops and Sheds

5 3 1 To ensure increased availability of rolling stock, the thrust in the IX Plan would have to be on capacity augmentation of maintenance facilities to deal with the increased holding of rolling stock, modernisation of workshops by suitable technological upgradation, system improvement, and creating facilities for the new type of rolling stock like MEMUs, DMUs, Rail-buses. Priority would have to be given to Carriage and Wagon Workshops so that their infrastructure and facilities keep pace with the changes in product mix of rolling stock e.g. percentage of air-brake stock is likely to go up to about 60% by the end of the IX Plan against the existing level of 40%, etc.

5 3 2 The production capacities of production units such as DLW, CLW would have to be increased to 165 and 170 locos respectively. Similarly, the capacity of WAP, signalling workshops, etc. will have to be increased. Adequate facilities may have to be developed for coaching stock for their mid-life rehabilitation.

5.4 Machinery And Plants

5.4 1 While there has been rapid technological upgradation in the design of rolling stock in the last few years, the Machinery and Plant for maintaining the rolling stock has lagged behind, with the bulk of M&P in workshops and production units being over-aged and obsolete. There is immediate need to rectify this imbalance and upgrade the technology by induction of the latest in M&P.

5.4 2 To be able to satisfactorily handle the newer design of rolling stock such as ABB locos, GM locos and LHB coaches, there has to be a radical qualitative improvement in the Machinery and Plant available in the maintenance depots.

5.5 Track

- 5.5 1 The overall arrears in track renewals likely at the end of the VIII Plan would be about 6,300 kms on BG routes. The main objectives of track planning for the IX Plan would be to carry out track renewals of current arising of A,B & C routes and to reduce the arrears on D & E routes, to cater for annual arising of track renewals to the extent of 3250 kms , to make up ballast deficiency fully, to replace metal sleepers on 'A', 'B' and 'C' routes by concrete sleepers, to strengthen the track by extending mechanised track maintenance to cover about 50,000 kms. by the end of IX Plan against 30,000 kms at the end of VIII Plan, to relay track of 1200 kms. annually by mechanised equipment, to weld 4 lakh joints per annum by flash butt welding process and to introduce concrete turnout sleepers at an accelerated pace.

5.6 Bridges

- 5 6 1 During the IX Plan, the corporate objective would be to deal with distressed bridges so that there are no arrears of rehabilitation. It is expected that in the IX Plan about 400 bridges would have to be strengthened/rebuilt yearly not only on account of the backlog but also larger arising of distressed bridges on account of heavier and more intensive traffic. In VIII Plan on an average 300-350 bridges are being rebuilt per annum.

5.7 Gauge Conversion

- 5 7 1 Project Uni-gauge was conceived with the objective of generating transport capacity by opening up alternative routes to ease the congestion on the BG trunk route which are working to saturation and to provide speedy and un-interrupted means of communication between areas which have potential for growth. It would also overcome problems associated with break of gauge transshipment which have hitherto stifled industrial growth in areas served by the MG and NG network. These objectives will continue to guide the IX Plan.
- 5 7 2 By the end of VIII Plan, total MG & NG network left on IR would be about 20,790 Kms. Out of this about 6,200 Kms has been planned to be converted to BG during IX Plan. In the VIII Plan, over 7,000 kms of MG & NG is expected to be converted into BG against the target of 6,000 Kms.

5.8 Doubling

- 5.8 1 The central theme of the IX Plan has necessarily to be creation of transport capacity to match the needs of the economy with all other objectives primarily geared to fulfil this mission. Towards achieving this end, the emphasis will have to be on the creation of

sufficient line capacity through Doubling, construction of the third and fourth lines and Traffic Facility works. The objective of the IX Plan would be to complete the doubling of the quadrilateral trunk routes, to undertake construction of third and /or fourth lines on certain very busy routes and to undertake doubling on other important routes where the existing single line has reached its saturation limit. In all about 2,500 km. of doubling are planned to be commissioned in IX Plan, as against over 1,100 km in the VIII Plan.

5.9 Traffic Facility Works

5 9 1 Adequate terminal capacity is vital in order to ensure against idling of assets and to increase sectional capacity and to improve overall productivity. At present the approaches to all major urban agglomerations are extremely congested with passenger and freight trains competing for available line and berthing capacities. Since the rate of urbanisation is expected to increase during the coming decade, the problems are likely to get accentuated. In the case of freight terminals, the loading and unloading capacities developed by the users have not kept pace with the increase in the payloads of freight trains. The time taken for loading and unloading operations at major industrial complexes continue to be excessive even in the case of terminals equipped with mechanical handling systems. Commodities such as foodgrain, cement and fertilisers are still handled manually leading inevitably to large detentions to rolling stock. One natural consequence of the prevalent systems is that the unit train operation, which requires the train engine to remain attached to the rake, cannot be effectively implemented on IR. Implementation of the unit train concept would bring about a sea change in the utilisation of rolling stock on IR. This has been effectively demonstrated in the case of power stations which are now receiving coal in bottom discharge type hopper wagons.

5 9 2 Creation of adequate terminal capacity is thus an area of vital importance to the railways. The approaches to major yards, important freight and coaching terminals particularly on the high density traffic routes have been identified for improvements in the IX Plan. Facilities would also be created for running of longer passenger trains on identified routes. At the same time, the user industries would also have to take effective steps to modernise loading and unloading systems.

5.10 Railway Electrification

5.10.1 At the beginning of the VIII Plan, 10,809 route-kms of the network was electrified and during VIII Plan the target is to electrify 2,700 route-kms. The objectives in the IX Plan would be to complete the on-going works, to take up electrification of the remaining un-electrified sections of the golden quadrilateral as also to cover certain missing links. A total of 2,300 route km of railway electrification is planned in the IX Plan.

5.11 Other Electrical Works

- 5.11.1 The prime objectives of the IX Five Year Plan would be to strengthen the infrastructure facilities for electrical assets to enable IR to reduce the cost of operation for hauling the increasing passenger and freight traffic. Emphasis will also be laid on strengthening overhead equipment to meet requirements of heavy haul freight trains and longer passenger trains at higher speeds. Conversion of 1500 V DC suburban system in Mumbai area (CR&WR) to 25 KV AC is also planned in the IX Plan as it is no longer possible to increase the frequency of the suburban services on the DC system as it is not capable of taking any additional electric load. Replacement of OHE on age-cum-condition basis, obtaining power supply directly from NTPC, installation of capacitor banks to improve power factor, augmentation/construction of new traction sub-stations to cater for requirement of growing traffic demands, would also be required in IX Plan.

5.12 New Lines

- 5.12.1 The objective in IX Plan would be to construct project oriented lines to serve new industries, complete missing links for developing alternative routes, lines required for strategic reasons, lines for establishment of new growth centres and to develop backward areas. About 1200-1300 km of New Lines is planned for completion in the IX Plan. One additional project of Udhampur-Srinagar-Baramulla has also been taken up as National project at a cost of Rs 2,500 Crores, which is to be funded outside the Railway plan.
- 5.12.2 The throw-forward on new lines at the beginning of the IX Plan is estimated to be a staggering Rs 4410 crores (3610 route kms). In view of the large number of on-going projects and un-likelihood of any substantial increase in the outlay, it is necessary to review and drop certain projects which do not meet the eligibility criteria.

5.13 Computerisation

- 5.13.1 Hitherto, the computerisation on the Indian Railways has been essentially fragmented, with the systems installed being operated on a stand alone basis. A key objective of the IX Plan would be to develop IR's computerisation and information technology in a manner that will establish connectivity with the zonal and divisional computer systems and to extend this facility to other systems like production units, training institutes etc. It is also proposed to expand the PRS network to cover 50 additional stations and satellite locations in major and metropolitan cities. Interactive Voice Response System would be provided at more locations. The system of computerised issue of unreserved tickets which has been started at Mumbai will be extended to other metropolitan cities. The computerisation of the materials and inventory management, financial management will be further extended.

5.14 Signalling and Safety

- 5.14.1 Safety is an inherent feature underlying all works under various plan heads. Even the attempt at modernisation and technological upgradation has kept in mind aspects by

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which safety can be enhanced through better man-machine interaction, easier operating system and reduced need for human interface in maintenance. The outlay for Safety is not only under this Plan Head but, in totality, would come to 28,210.

- 5.14.2 Signalling is an area where modernisation and replacement are urgently needed. In an era of quantum technological advancement resulting in better equipment & providing greater safety through technical aids, e.g. provision of Auxiliary Warning System (AWS) etc., a total of Rs. 1600 crore outlay is proposed in the IX Plan.

5.15 Staff Quarters

- 5.15.1 One of the objectives of the Corporate Plan of the Railways was to raise the housing satisfaction to 42% by the turn of the century. Assuming a net overall decline in staff strength by 2% per annum during the period 1995-2000, the Railways would have on its roll about 14.50 lakh employees by the year 2000 and, therefore, would need 6.08 lakh quarters if 42% housing satisfaction is to be provided. Considering the fact that the Railways already have 6.32 lakh quarters, the Corporate Plan's goal can be achieved without significant addition to the number of new quarters. The main problem, however, would be the replacement of overaged / degraded quarters on condition basis. It is estimated that the rebuilding requirement on replacement account would be at least 6,000 quarters per year during the IX Plan. At current prices Rs 60 crores would be required each year under this Plan-head.

5.16 Staff Amenities

- 5.16.1 This plan head caters to the areas concerning welfare of staff, such as provision of medical and educational facilities, recreation, electrification of quarters and development of colonies.
- 5.16.2 In the IX Plan, there is need to set up 10 new Divisional Hospitals and 6 new Zonal Hospitals, provide adequate infrastructure for computer education in the railway schools and colleges and upgrade an estimated 60,000 single room sub-standard staff quarters and cover deficiencies in the electrification of staff quarters and colonies.

5.17 Other Specified Works

- 5.17.1 Other important works which are critical to the working of the Railways such as security, training facilities, setting up of zones/divisions, improvement of level crossing gates, office buildings, defence/assisted sidings are covered under this plan head. In the IX Plan, 6 new Zones with their complete infrastructure and 10 new Divisions would be set up. Development of suitable sports infrastructure at the Zonal Headquarters as well as at the Divisional level would also be undertaken in a phased manner during the IX Plan.

5.18 Passenger Amenities

- 5.18.1 With increasing public sensitivity to quality of service, customer satisfaction poses a major challenge to the railways. In the IX Plan adequate provision is proposed for

augmentation of amenities for passengers at stations on the lines recommended in the perspective plans prepared by Zonal Railways. The thrust would be on extension of the system of micro processor based self printing machines, electronic display boards indicating the reservation status, provision of washable aprons at large and medium stations, extension of the system of computerised passenger information, provision of wheel chairs and hand trolleys for transport of luggage etc. Other areas of emphasis would be computerisation of claims on the Zonal Railways, setting up of mobile claims offices, simplification and rationalisation of the rules for refund, and vestibuling of long distance and important trains.

5.19 Railway Research And Development

- 5.19.1 Some of the important research projects completed by RDSO during the VIII Plan include the design and manufacture of 2,300 HP and 3,100 HP Diesel locomotives, design of BG rail-bus, development of AC-3 tier coach, etc.
- 5.19.2 In the IX Plan, the emphasis of the research efforts would be to increase the productivity of assets, reduce energy consumption, enhance safety of rail transport, and increase quality consciousness. The important research projects proposed in the IX Plan are introduction of disk brakes on coaches, design of EMU with air suspension, design and development of continuous train control for increasing throughput, developing technology for high speed operation, and reduction of wagon ineffective from 4% to 3%, development of highly fuel-efficient Diesel Engine, etc.

5.20 Public Sector Undertakings

- 5.20.1 For Catering Corporation, Land Management Board, etc., the Railways propose to make an investment of Rs. 50 Crores for PSUs during the IX Plan period.

5.21 Inventories

- 5.21.1 In order to ensure that the functioning of the Railways' Production Units and workshops is not affected on account of paucity of spares and materials, this Plan-head includes investment in the inventories under Stores, workshops and manufacturing suspense and miscellaneous advances. The actual expenditure under inventories in the VIII Plan was (-) Rs. 192 crores i.e. inventories came down by this amount during this period despite increased activities and issues. In the IX Plan it is proposed to provide Rs.300 crores under this Plan-head.

5.22 Metropolitan Transport Projects

- 5.22.1 There has been a great deal of ambivalence on the issue of responsibility for metropolitan rail transport. According to the Government of India Business Allocation Rules as amended in 1986, the subject of planning and co-ordination of urban transport was

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assigned to Ministry of Urban Affairs and Employment, with the Railways having the responsibility of providing technical inputs. The main issue of funding of MTP projects remains nebulous. However, keeping in view the massive transport requirements of the metropolises, the Railways propose to continue investment in projects already on hand and complete all the on-going projects. A few additional projects such as Mumbai Suburban System, would be initiated in the IX Plan.

5.23.1 Plan-head-wise requirement of funds is summarised below. Anticipated provision made in each Plan head in the VIII Plan is also indicated in the table below:

PLAN HEAD	VIII PLAN		IX PLAN	
	Rs. CRORES	%	Rs. CRORES	%
ROLLING STOCK	12858	40.23	28950	44.54
WORKSHOPS & SHEDS	652	2.04	1250	1.92
MACHINERY & PLANT	264	0.83	1000	1.54
TRACK RENEWALS	5257	16.45	13200	20.30
BRIDGE WORKS	381	1.19	1000	1.54
GAUGE CONVERSIONS	4887	15.29	4800	7.38
DOUBLING	1169	3.66	2500	3.85
OTH TRAFFIC FACILITIES	530	1.66	1300	2.00
SIGNALLING & SAFETY	982	3.07	1600	2.46
COMPUTERISATION	220	0.69	450	0.69
ELECTRIFICATION	1512	4.73	1800	2.77
OTH ELEC WORKS	327	1.02	1500	2.31
NEW LINES	1216	3.80	1500	2.31
STAFF QUARTERS	160	0.50	400	0.62
STAFF WELFARE	187	0.59	300	0.46
USERS' AMENITIES	386	1.21	800	1.23
OTH SPECIFIED WORKS	108	0.34	800	1.23
INVENTORIES	(-)375	(-)1.17	300	0.46
MTP	1044	3.27	1250	1.92
RAILWAY RESEARCH	29	0.09	250	0.38
INVESTMENT IN PSUs	166	0.52	50	0.08
TOTAL	31959	100	65000	100

5.23.2 The requirement of funds is almost double of that in the VIII Plan.

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6.0 PUBLIC SERVICE OBLIGATIONS AND AGENDA FOR STRUCTURAL REFORMS:

- 6.1 Total cost of public service obligations borne by IR on account of pricing its various services below cost on considerations of social equity or due to special status enjoyed by the remote areas, operation of uneconomic branch lines, travel concessions offered to certain sections of people on socio-economic considerations, etc. is in excess of Rs. 1500 crores per annum. A special mention needs to be made of the **short distance passenger services**. Apart from the heavy losses suffered by IR in their operation, the situation has now become critical because of **saturation of the existing high density corridors**. It may not be possible to introduce additional long distance passenger and freight services unless restraint is exercised on the growth of such short distance services. Railway should be suitably compensated for the losses incurred on the operation of short distance passenger services.
- 6.2 Railways' role as a **catalyst for development** is well known. Moreover, Railways generate a great deal of employment and IR's delivery of infrastructure and services is highly efficient. Since Government allocates substantial funds in the budget for social welfare schemes, IR should be given explicit **subsidy for services provided below cost in larger social equity** so as to enable IR to mobilise enough resources to create much needed transport capacity to cater to the requirement of rail transport in the core sectors of the economy. It needs to be recognised that rail transport is likely to become a bottleneck in the growth of the economy unless adequate investments are planned in the basic rail infrastructure in the IX Plan.
- 6.3 Investment policies of IR are controlled by Government and are based on considerations other than purely commercial. As the most visible symbol of Central Government, **expansion of the rail network is synonymous with the development of an area in the public eye**. Railways should be advanced dividend free loan in perpetuity for undertaking projects which do not pass the test of financial remunerativeness and are required on considerations of country's cultural and emotional unity, or, for opening up of the backward areas.
- 6.4 Competition from road has adversely affected the market share of the Railways. Main factors responsible for the situation are major expansion of the road network and **absence of a level playing field in respect of true cost of transportation**. Capital cost of road infrastructure is borne by Government. The road sector also enjoys the advantage of subsidised fuel. On the other hand electricity tariff for the Railways has meteorically increased since IR embarked on railway electrification as an item of national priority due to country's heavy dependence on imported oil. A road transporter can price his products what the market will bear, unlike IR who do not have autonomy in deciding their tariff policy. As a result, the market share of the rail transport has come down from as high as 91% in 1951 to 40% in 1995 in the freight sector and from 80% to 20% in terms of passengers carried.

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- 6.5 Indian Railways is a Government owned monopoly enjoying considerable **economies of scale in operations, maintenance of assets and procurement of stores, etc.**, as a result of planning on all-India basis IR have tremendous organisational strength on account of standardisation of their operating procedures, uniformity in the recruitment and promotional policies and a strong professional management at the top. Due to a high degree of vertical integration, IR is able to produce bulk of its rolling stock in-house economically and to the required quality standards. The product mix can be easily changed in the manufacturing plants to suit the market requirements
- 6.6 In most railway systems in the world, **the thrust for reorganisation arose due to railways incurring very heavy losses.** Most of the railway systems which had undergone restructuring, were comparatively much smaller in size and did not have the kind of geographical spread India has, nor did those railway systems have IR's transport mix
- 6.7 It is almost universally accepted that the Railways should be compensated for the public service obligations, especially in the field of passenger and suburban traffic by the appropriate National/Regional/Local authorities at whose request such services are provided Subsidies granted from Government funds to the railways in some of the advanced countries in the world for various public service obligations are indicated in the following table

RAILWAY	YEAR	% OF SUBSIDY/ COMPENSATION TO TOTAL REVENUE
BRITISH RAIL	1993-94	23.1%
SWISS FEDERAL RAILWAYS	1994	40.1%
GERMAN FEDERAL RAILWAYS	1993	68.5%
FRENCH NATIONAL RAILWAYS	1994	47.7%

- 6.8 IR is acutely aware of its responsibility to exercise utmost control on the costs of its operations It would be observed from the graph presented at **Annexure IX** that the rise in freight and fare per tonne kilometre and per passenger kilometre has consistently been lower than the composite weighted index of inputs.
- 6.9 The present size and geographical spread of business operations of IR is, however, such that it is no longer possible to effectively manage the railway system by manual systems of Operational and Management Control. Absence of managerial accounting systems and a meaningful comparison of cost of transport output across various production centres (Divisions/Zones) is coming in way of further improving the utilisation of existing assets. **IR as a natural monopoly, is aware of the need to control the costs of its operations in a transparent and verifiable manner.** With these objectives in view, a beginning will be made in the IX Plan to introduce computer based Operational and Management Control System in the IR.

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- 6.10 Indian Railways, however, do not suffer from any dogmatic inflexibility in the face of change. **Corporatisation of IR or privatisation of IR's core business** merely because of deregulation of economy, however, may not be a step in the right direction as IR by any standards is doing quite well and does not face a fiscal crisis, or, a break down in the service quality which led to restructuring of many of the state owned railways in other countries.

7.0 MOBILISATION OF RESOURCES FOR THE IX PLAN

- 7.1 The requirement of resources for the IX Plan were estimated for the levels of traffic projected by the users and those estimated by the Working Group. The estimates were as follows:

Forecast by	btkms	Resource Requirement (in Rs. Crores)
Users	427	93,000
Working Group	353	65,000

- 7.2 The creation of capacity to move 427 btkms of traffic would call for investment in double/multiple lines on existing corridors, construction of new lines and acquisition of additional rolling stock. It has been estimated that the asset requirement per year would be of the following magnitude:

Asset(s)	Requirement per Year
Doublings /Multiple Lines (Kms)	900
Wagons (Nos. in FWUs)	57853
Locomotives (NOs)	546

- 7.3 Generation of manufacturing capacity to meet the above requirements even if finance were available would present a challenge to the industry and the railways. For example at present, the wagon manufacturing industry produces about 25000-26000 wagons per year. It would have to nearly double its output to meet the requirements. Similarly, the manufacturing capacity for locomotives would require to be increased substantially. Whether this quantum jump would be feasible in the short run has to be carefully considered in consultation with the industry.
- 7.4 Since the resource requirements for moving the traffic projected by the users was much above what could realistically be achieved, the analysis of resource mobilisation was confined to the requirement based on the traffic forecast by the Working Group. The methods of raising the resources required for the IX Plan presents the greatest challenge to the Working Group. Year-wise requirement of funds has been assessed as under:

Year	Rs. in crore
1997-98	11,000
1998-99	12,000
1999-2000	13,000
2000-2001	14,000
2001-2002	15,000
TOTAL	65,000

- 7 5 In order to appreciate magnitude of the task involved in finding resources for the IX Plan, it may be worthwhile to take a look at the source-wise financing of the VIII

Five Year plan, presented below:

(Rs. in crores)

Year	Internal Generation	Market Borrowing*	Budgetary Support	Total
1992-93	2548(41%)	1025(17%)	2589(42%)	6162
1993-94	4030(69%)	856(14%)	975(17%)	5861
1994-95	3582(65%)	745(14%)	1145(21%)	5472
1995-96(Prov)	4209(66%)	985(16%)	1141(18%)	6335
1996-97 (BE)	4111(50%)	2750(34%)	1269(16%)	8130

*incl. BOLT & OYWS

- 7 6 Until now more than 50% of the resources are being generated from the Railways' own earnings and another substantial portion through market borrowings. The recourse to market borrowing by the Railways in view of the reduced budgetary support over the years has severely circumscribed Railways' capacity for mobilising internal resources due to **increased payments of lease rentals to IRFC, etc.** Moreover in sharp contrast to all other major Railway systems which are dependent on direct subsidies from their Governments, Indian Railways have to pay dividend in perpetuity for all the Government money received since 1951. The financial contradiction today is that the **funds received from the Central Exchequer euphemistically termed "budgetary support" is in fact less than what Railways pay the Govt. in the form of dividend.** In 1995-96, the Railways received Rs. 1150 crores as budgetary support and paid back a dividend of Rs. 1360 crores. It may be further noted that Railway Fund Balances (DRF, PF, CF) maintained with Ministry of Finance are in excess of Rs. 3,860 Crore, on which railways receive an interest rate of only 7%. **The concessional element of low rate of interest on the budgetary support is more than offset by the low rate of interest received on the huge railway Fund Balances kept with the Ministry of Finance.**

- 7.7 The financial burden is further exacerbated due to various public service obligations carried by railways as mentioned in para 6. Railways are required to double the investment over the VIII Plan period due to projected higher rate of growth of economy. The task becomes formidable considering that the Ministry of Finance has indicated that the budgetary support is not likely to increase but on the contrary may be reduced. Another critical factor which will adversely impinge on the Railways' capacity to generate resources internally would be the implementation of the **recommendations of the V Pay Commission**, the full impact of which will be felt in the IX Plan.
- 7.8 It is evident that current level of Govt. financial support and the methods hitherto adopted for mobilising funds would leave a huge unfilled gap in resources. An estimate of the financial results in the IX Plan has been made at current prices keeping the appropriations to DRF, Budgetary support, market borrowing at the same level as in 1996-97, with only Pension Fund Appropriation being hiked at 7% every year. The results of the exercise are given at **Annexure X**. The unfilled gap is a staggering Rs.25,178 crores. Even if budgetary support is increased by 10% every year (see **Annexure XI**), the financial results show only a marginally less dismal position.
- 7.9 Quite clearly, the Railways would have to find radical solutions for funding the IX Plan. It may be broadly assumed that IR may be able to generate about 30% of projected Annual Capital Expenditure Programme of about Rs. 13000 cr. (i.e. about Rs. 3900 crore) from internal operations with a modest hike in fare and freight to neutralise the impact of rise in input costs. The outgo on account of anticipated hike in the wage bill and pension payments could be contained by the incremental revenue from the projected increase in the btkms, provided IR is able to strictly **observe the discipline of controlling the size of its work force**.
- 7.10 Economy today is poised for accelerated growth as a result of economic reforms initiated by Government of India. Rail Transport capacity is likely to become a serious bottleneck notwithstanding the fact that the rail mode is the most efficient mode of surface transport. Even for a modest growth of 6% per annum in the traffic output in the IX Plan, **investments required for building up fixed infrastructure and procurement of rolling stock are double of those in the VIII Plan**. It is in the backdrop of resource crunch of unprecedented magnitude faced by the IR due to dwindling budgetary support on the one hand and high cost of market borrowing on the other that the following new sources of funding may have to be tapped for the IX Plan.
- (i) **Public service obligations** borne by the railways in every country of the world are funded by the Government as an **explicit subsidy**. IR should be compensated for the cost of the social burden as subsidy from the General budget to the extent of Rs. 1500-2000 crores per annum.
 - (ii) There is a need for creation of a **Rail Infrastructure Development Fund (RIDF)** for taking up projects in backward areas, removing regional imbalances and promoting national unity. Corpus for the proposed RIDF can be created by utilising half of the dividend paid by IR to the Central Exchequer.

- (iii) The proposal for **commercial exploitation of railway land** in different cities pending with the government needs to be expeditiously cleared. Powers may be delegated to the IR to develop real estate selectively in consultation with the local authorities and the state governments.

7.11 As Rail Infrastructure Development Fund and Commercial exploitation of railway land may start yielding funds only from X Plan onwards, the pattern of funding for the IX Plan will have to be as under:

SOURCE OF FUND	PERCENTAGE OF TOTAL	AMOUNT IN RS. CRORES
INTERNAL GENERATION	30	19,500
SUBSIDY FOR PUBLIC SERVICE OBLIGATIONS	15	9,750
BUDGETARY SUPPORT	30	19,500
DOMESTIC & INTERNATIONAL BORROWING	25	16,250
TOTAL	100	65,000

7.12 IR will have to increasingly resort to borrowing from multi-lateral International Financial Institutions and from overseas markets. In order to safeguard against **the risk of foreign currency fluctuations**, export of rolling stock and tourism will have to be thrust areas in the IX Plan of the railways.

8.0 MAJOR ISSUES FOR THE FUTURE

Indian Railway will have to address the following major issues in the IX Plan in order to remain viable and to live upto public expectations. Railways provide the basic infrastructure to keep the economic wheels of the nation rolling. Time has come to take hard decisions as there are no easy solutions now available. A broad consensus has to be reached keeping in view the comparative advantage enjoyed by rail mode of surface transportation. Some of the major issues confronting the railways are presented below.

8.1 Tariff Structure and Demand Management

8.1.1 Successive railway freight and fare committees have recommended that **price of each of the services offered by the IR should be based on the cost of providing the same**. At the beginning of the era of planned development passenger operations accounted for 59% of the transport output (in terms of train kilometres) and generated 41% of the total earnings. The freight traffic accounted for 41% of the transport but

generated 59% of the earnings. Thus, even at that time the freight traffic was subsidising the passenger traffic. Over the years the extent of subsidy accorded to passenger traffic has increased significantly. In 1994-95, passenger traffic accounted for 60% of the transport output but contributed only 28% to the earnings. Thus the **extent of cross subsidy in the past 45 years has increased**. This would have to be brought back at least to the level existing in 1951 in order to enable railways to provide quality and quantity of services demanded by public and the core sectors of economy.

- 8.1 2 A comparative analysis of passenger and freight tariff for the major railway systems of the world is placed at **Annexure XII**. The analysis has made necessary adjustments to establish purchasing power parity. It would be observed that the **ratio of passenger fares to freight tariff on IR is the second lowest in the world**.
- 8.1 3 Inter-city passenger travel shows considerable seasonality and **a surcharge on travel in the peak holiday season**, at least by the upper class passengers could provide the fiscal signals for moderation of the demand for passenger travel in the peak season. Attempts at curbing the seasonality in the freight traffic could be made through pricing mechanisms which makes it attractive to move traffic during the lean season.

8.2 Investment Strategy

- 8.2 1 While the extent of budgetary support to the railways' Annual Plan has reduced significantly over the years, the cost of borrowing capital from the market has steadily gone up adding to the proportion of revenue required to service debts. At present 10% of the revenue earning of the railways goes towards debt servicing. It is felt that this figure should not be allowed to cross a threshold level of 15% beyond which the railways would be in danger of falling into **a debt trap**. The high cost of borrowing from capital markets has naturally reduced the net surplus available to the railways for investment in capital expansion.
- 8.2 2 Another implication of acquiring an asset from borrowed money is **that IR has to pay 20% excise duty and sales tax** as applicable in that State for acquisition of rolling stock. The effective cost of borrowing from the Capital market thus works out to more than 20%. The cut off rate for evaluating financial remunerativeness of the projects should be increased from the existing level of 14% to say 22%.
- 8.2.3 IR has a large portfolio of **on-going projects many of which are not remunerative** from a financial stand point. As the rate of borrowing capital from market is increasing steadily all unremunerative projects which have not progressed significantly **may be reviewed**.

8.2.4 IR empathises with the public perception that expansion of rail network is synonymous with development of a region. IR, however, has been perennially strapped for resources to live up to the expectations of the people. Since, the cost of market borrowing is very high, implementation of all railways projects having financial remunerativeness of less than 20% , should be done from funds made available by GOI to IR which do not carry any dividend liability. All rail infrastructure required to cater for suburban traffic should similarly be funded by dividend free capital from GOI.

8.2.5 IR should also be allowed use of off-shore funds for meeting domestic investment.

8.3 Short Distance Passenger Services

8.3.1 Introduction of new passenger trains on arterial routes may be restrained in the IX Plan, pending creation of the requisite line capacity. Railways should be provided adequate funding for creation of dedicated suburban corridors around major metropolises. Railways should also be compensated for the losses incurred on operation of such services.

8.4 Charter for Indian Railways

8.4.1 Railways have comparative advantage in long-haul freight movement in block rakes, long distance inter-city passenger traffic and Mass Rapid Transport System for suburban commuters. Imperatives of Rail Road technology are not suited to piecemeal loading involving frequent marshalling which can best be handled by the Container Corporation and the Freight Forwarders. Charter for the Indian Railways should, therefore, be as under:

“IR’s business mission is to provide high quality wholesale transport services for long haul bulk freight, intercity and suburban passenger traffic in the most cost effective manner. IR as a dominant public utility will continue to play a proactive role in the transport sector to ensure optimal allocation of economic resources among various transport sub-sectors.”

8.5 Funding Of Suburban Transport Projects

8.5.1 Rail Component of Urban and suburban transport systems cannot be economically separated. Ire of the people is directed at the railways for their problems of commuting. Presently, commuters forcibly occupy the existing intercity passenger services causing considerable inconvenience to the long distance passengers having reserved accommodations. Rules of business allocation may, therefore, be modified and the rail component of urban transportation may be restored back to IR for greater economic efficiency, provided IR is made available funds separately for MTP projects and

the loss incurred on the suburban operations is made good by providing a specific subsidy.

8.6 Structural Reforms

8.6 1 IR is natural monopoly and enjoys considerable economies of scale in its operations. Time is, therefore, not ripe for **corporatisation of IR.**

8.6 2 **Corporatisation of PUs** also does not afford any particular benefit as the **cost of procurement of rolling stock will go up due to levy of Excise duty and State Sales Tax.**

8.6 3 So far as **separation of railway finance from general budget** is concerned, this issue has been gone into by Polluose committee on Capital Restructuring of IR. The Committee has recommended that status-quo should be maintained

8.7 Railway Convention Committee

8.7 1 The terms of reference of the **Railway Convention Committee** should be enlarged to decide not only the dividend payable by Indian Railways to the Central Exchequer for the borrowed capital but also **to decide the extent of subsidy** that is required to be paid by the Central Government to IR for various public service obligations

8.8 Excise Duty On Procurement Of Rolling Stock

8.8 1 Procurement of rolling stock by IR under 'OYWS' and 'BOLT' should be **exempt from payment of excise duty** as rail infrastructure is highly capital intensive and nowhere in the world railways are able to generate enough resources internally from business operations to plan for incremental transport output. Railway cannot become a vehicle for generation of resources for the General Budget.

8.9 Real Estate Development

8.9 1 The Railways possess some of the most valuable real estate in the country. Proposals for development of real estate which have been sent to the Govt. in the past have not been approved so far. This power requires to be delegated to IR which could develop real estates selectively in consultation with the local municipal authorities. Even if a small beginning could be made in the IX Plan, this method could provide substantial revenue for IR in the 10th Plan. Possibility of resource mobilisation from this source in the 9th Plan is limited due to long gestation period of real estate development projects.

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8.10 Terminal Detentions

- 8.10.1 One of the main areas of detention to rolling stock continues to be the loading and unloading points at the power houses, collieries and other industrial plants. An integrated programme for modernising loading and unloading systems would have to be organised to reap the full advantages of induction of unit train operation and further improving utilisation of the rolling stock.

8.11 Reduction of Staff Strength

- 8.11.1 Nearly 45% of the ordinary working expenses of IR is on wages. There is little scope to reduce the size of the labour force employed by IR due to social and political imperatives. However, for any financially viable organisation a 45% outgo on wages is an unviable scenario. Although IR has reduced its workforce during the last 5 years, the rate of reduction is very slow. There is a paramount need to continue to exercise utmost vigil in the matter of addition of bodies on railways' payroll as continued viability of railways depends on controlling the wage bill.

8.12 Rolling Stock To Form Part of Industrial Project

- 8.12.1 Requirement of rolling stock should form part of the cost of industrial projects at the time of project appraisal and PIB approval. At present this is not permitted for the thermal power projects.

Annexure I

INDICES OF GROWTH OF TRAFFIC OUTPUT AND INPUTS (1950-51 = 100)

YEAR	OUTPUT INDICES			INPUT INDICES			
	FREIGHT	PASSENGER	WAGON	PASSENGER	ROUTE	RUNNING	TRACTIVE
	TRAFFIC	TRAFFIC-NON SUB	CAPACITY	COACHES	KMS	KMS	EFFORT
	(NTKMS)	(BPKMS)					OF LOCOS
1951	100	100	100	100	100	100	100
1961	199	110	152	154	105	107	144
1971	289	159	+	188	112	121	178
1981	359	279	269	210	114	128	201
1991	550	394	278	219	116	133	192
1994	583	384	273	233	117	134	188
1995	575	419	260	229	117	134	196

INTENSITY OF ASSETS UTILISATION

		Passenger Km/		Track	Passenger
Year		seating capacity		Net tonne km/	km/route
		Total		route km	km
		All Gauges		BG	BG
1950-51		100		100	100
1960-61		77.74		184	115
1970-71		100.62		241	163
1980-81		157.74		289	291
1990-91		203.33		420	402
1991-92		211.1		442	428
1992-93		193.89		430	399
1993-94		187.22		421	385
1994-95		207.47		404	404

**OPERATING EFFICIENCY PARAMETERS
TREND OF IMPROVEMENT
INTERNATIONAL COMPARISON**

YEAR	NTKM per wagon per day (BG) <i>INDIA</i>	NTKM s OF CERTAIN OTHER RAILWAY SYSTEMS (For the year 1993)	
		Country	NTKM per wagon per day
1990-91	1407	French National Railways	804
1991-92	1439	German Federal Railways	613
1992-93	1457	Italian State Railways	503
1993-94	1506	Japanese National Railway	2468
1994-95	1590		
1995-96	1754		

OPERATING EFFICIENCY PARAMETERS**INTERNATIONAL COMPARISON**

COUNTRY	YEAR	TU PER	NTKMPER	DIESEL LOCO	OPERATING RATIO	
		LINE KM	WAGON	AVAIL. %	w. norm	w/o norm
		('000)	('000)			
India	1993-94	8,784	808	90	90	90
China	1993	28,629	3,056	82	59	59
Indonesia	1993	2,512	315	70	90	97
Republic of Korea	1993	14,708	898	88	97	97
Italy	1993	4,223	221	79	132	231
Japan	1993	13,583	922	89	80	81
Spain	1993	1,933	283	86	114	273
Sweden	1993	2,375	839	NA	94	174
Great Britain	1993	2,669	497	74	99	124
West Germany	1993	3,766	229	88	120	188
Australia ANR		NA	NA	81	NA	NA

NOTE :

- * TU/Line KM - Traffic Units (NTKM + PKM) / Route Km
- * Operating Ratio - Expenses (incl. depreciation) divided by revenue.
- * w.norm - With normalisation. Includes subsidies in revenue Account
- * w/o norm - Without normalisation

TRANSPORT CHARACTER OF IR

YEAR	FREIGHT OPERATIONS			PASSENGER OPERATIONS		
	TRAIN	% SHARE	% SHARE	TRAIN	% SHARE	% SHARE
	KMS	IN TOTAL	IN	KMS	IN TOTAL	IN
	(Millions)		EARNINGS	(Millions)		EARINGS
1950-51	112	41	59	163	59	41
1960-61	161	44	68	204	56	32
1970-71	202	45	67	248	55	33
1980-81	199	40	65	294	60	35
1990-91	245	40		363	60	
1994-95	241	40	72	395	60	28

Note Extent of cross subsidisation of passenger services by the freight traffic in the last 45 years has shown an upward trend.

Annexure V

COMMODITY-WISE TRAFFIC PROJECTIONS FOR IX PLAN IN 2001-02

Commodity	Tonnage	NTKMs	Lead
	(Millions)	(Billions)	(Kms)
Coal	240	146.4	610
Raw material to Steel Plants	61	22.0	360
Finished Steel	18	18.5	1025
Iron Ore for Exports	13	7.5	580
Cement	53	31.8	600
Foodgrains	32	43.2	1350
Fertilisers	30	27.0	900
POL	38	20.9	550
Other goods	40	36.0	900
TOTAL	525	353	673

PROJECTIONS OF CONTAINER TRAFFIC
DURING IX PLAN (IN TEUs)

YEAR	INTERNAL	VARIATION OVER
	(IN TEUS)	PREVIOUS YEAR
1997-98	500	25%
1998-99	600	20%
1999-2000	720	20%
2000-01	870	21%
2001-02	1050	21%

Annexure VII

REQUIREMENT OF BG WAGONS DURING IX PLAN

(All wagon figures are in 4-wheeler units)

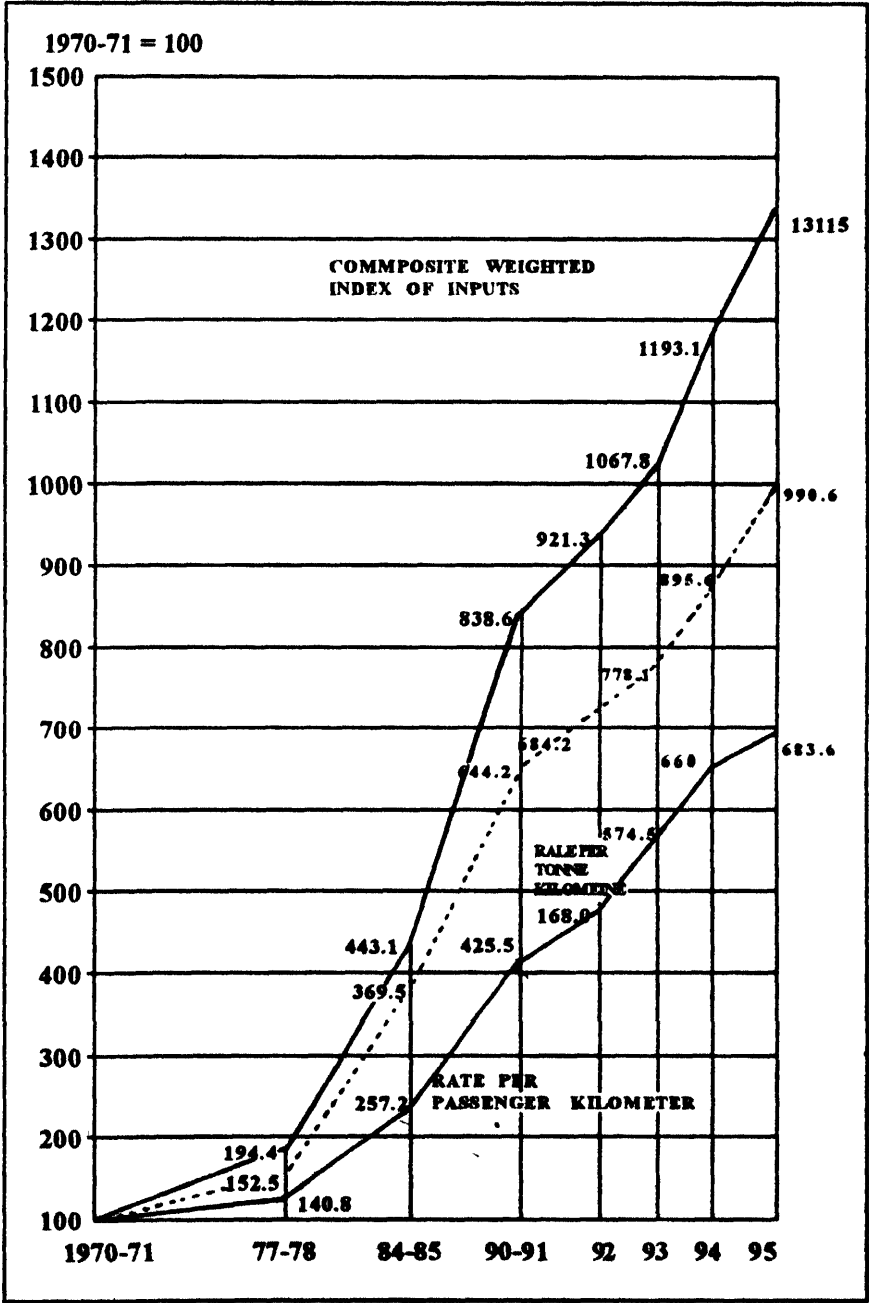
1.	Revenue freight traffic in 2001-02	(btkm)	353.0
2.	Non-Revenue Traffic	(btkm)	3 0
3.	MG & NG Share	(btkm)	3.0
4.	Total BG Traffic	(btkm)	353.0
5.	Wagon Productivity for 2001-02 : ntkm/w/d		1,950
6.	% of wagon holding available on line		91%
7.	Wagon requirement for above traffic		545,012
8.	Expected wagon holding on 31.3.97		470,000
9.	Wagons required on additional account		75,012
10	Wagons required on replacement account (@20000 per annum as estimated from available age profile)		100,000
11.	Total Wagons required		175,012
		Say =	175,000

Annexure VIII

COST OF ACQUISITION OF ROLLING STOCK IN IX PLAN

	UNIT COST (RS. CRORES)	NO.	TOTAL COST (RS. CRORES)
LOCOMOTIVES			
ELECTRIC - CLW	3.90	650	2,535
- ABB (CLW)	12.00	200	2,400
- BHEL	6.40	100	640
DIESEL - DLW	2.80	680	1,904
- GM LOCOS	7.50	20	150
- GM (DLW)	10.00	100	1,000
TOTAL LOCOS		1,750	8,629
COACHES			
COACHES	0.60	8,776	5,266
- LHB	5.82	24	140
- LHB (RCF)	2.00	200	400
DMU	1.07	750	803
MEMU	0.76	750	570
TOTAL COACHES		10,500	7,178
EMUs			
MOTOR COACHES	1.50	667	1,001
TRAILER COACHES	0.45	1,333	600
TOTAL EMUs		2,000	1,600
WAGONS (IN FWUs)	0.0525	175,000	9,188
MISCELLANEOUS			
REBUILDING OF LOCOS	1.00	360	360
TRACK MACHINES			500
CRANE MANUFACTURE	5.00	32	160
CAPITAL SPARES, C & W REHAB., RAIL CARS, ETC			1,335
TOTAL			2,355
GRAND TOTAL			28,950

UNIT RECOVERY VS UNIT OF
INPUT COST



Financial Results with appropriations to DRF (Rs. 2000 Crores) being maintained as at the end of Terminal year of VIII Plan and Budgetary Support assumed at Rs. 1831 Cr. every year of the IX Plan period - Scenario 1 (With Bonds)

Terminal
Year of VIII
Plan

Annexure X

		IX PLAN					
		1996-97 RE	1997-98	1998-99	1999-2000	2000-01	2001-02
1	Capital-at-charge	23536	25197	26878	28559	30240	31921
	Capital Fund	7356	8380	9030	9717	10277	10904
	Passenger Through put projected (Billion PKMs)	347	351	363	374	387	399
	Goods through put projected (Billion NTKMs)	281	293	307	322	337	353
2	Earnings						
	a Passengers	6640	7106	7333	7555	7817	8060
	b. Other Coaching	550	592	616	641	667	694
	c Goods	16650	19322	20201	21188	22175	23227
	d Sundry Other earnings	480	500	520	541	563	586
	e Total (a+b+c+d)	24320	27520	28670	29925	31222	32567
	f Suspense	130	335	-25	-25	-25	-25
	g GROSS TRAFFIC RECEIPTS (e+f)	24450	27855	28645	29900	31197	32542
3	ORDINARY WORKING EXPENSES	14671	19070	19393	19727	20256	20626
4	Lease Charges to IRFC	1479	1865	2491	3117	3743	4369
5	Appropriation to Pension Fund %%	2700	2200	2354	2519	2695	2884
6	Total Working Expenses (3+4+5)	18850	23135	24238	25363	26694	27879
7.	Net Traffic Receipts (2g-6)	5600	4720	4407	4537	4503	4663
8.	Net Misc. Receipts	316	329	356	396	436	476
9	NET REVENUE (7+8)	5916	5049	4763	4933	4939	5139
10	Dividend Payment to General Revenues	1515	1630	1763	1896	2029	2162
11	Excess/Shortfall (9-10)	4401	3419	3000	3037	2910	2977
	Proposed Plan	8300	8300	14175	14175	14175	14175
12.	Appropriation to Depreciation Reserve Fund	2115	2000	2000	2000	2000	2000
13	Appropriation to other Rly. Funds	2286	1419	1000	1037	910	977
	Unfilled resource gap to be filled by the following	3899	5881	11175	11138	11265	11198
	Budgetary Support **	1439	1831	1831	1831	1831	1831
	IRFC Bonds	1930	2150	2150	2150	2150	2150
	BOLT/OYW Scheme	530	900	900	900	900	900
	Balance Unfilled Gap	0	0	6294	6257	6384	6317
	Unconventional methods						
	Commercial Exploitation of Land						
	Balance unfilled gap to be covered by fare & freight hike						
14.	OPERATING RATIO	86.3%	91.3%	91.5%	91.4%	91.9%	91.7%
15.	% Ratio of Net Revenue to Capital + Cap. Fund	12.2%	9.1%	7.7%	7.7%	7.3%	7.3%
16.	% Ratio of surplus/shortfall to Capital + Cap. Fund	14.2%	10.2%	8.4%	7.9%	7.2%	7.0%

** Budgetary support for each year in IX Plan has been assumed at Rs. 1831 cr.

%% Pension Fund appropriation has been hiked @ 7% every year.

Appropriation to DF assumed on Rs. 350 cr, every year

@@ Rs. 45 cr. are kept for OLWR and NMR have been inflated by that amount.

Financial Results with appropriations to DRF (Rs. 2000 Crores) being maintained as at the end of Terminal year of VIII Plan with increasing Budgetary Support @ 10% every year of the IX Plan - Scenario 3 (With Bonds)

Terminal Year of VIII Plan		Annexure XI IX PLAN				
	1996-97 RE	1997-98	1998-99	1999-2000	2000-01	2001-02
1. Capital-at-charge	23536	25197	26878	28559	30240	31921
Capital Fund	7356	8380	9030	9717	10277	10904
Passenger Through put projected (Billion PKms)	347	351	363	374	387	399
Goods through put projected (Billion NTKMs)	281	293	307	322	337	353
2. Earnings						
a Passengers	6640	7106	7333	7555	7817	8060
b Other Coaching	550	592	616	1641	667	694
c Goods	16650	19322	20201	21188	22175	23227
d Sundry Other earnings	480	500	520	541	563	586
e Total (a+b+c+d)	24320	27520	28670	29925	31222	32567
f. Suspense	130	335	-25	-25	-25	-25
g GROSS TRAFFIC RECEIPTS (e+f)	24450	27855	28645	29900	31197	32542
3. ORDINARY WORKING EXPENSES	14671	19070	19393	19727	20256	20626
4. Lease Charges to IRFC (with Bonds)	1677	2241	2805	3369	3933	4497
5. Appropriation to Pension Fund	2700	2200	2354	2519	2695	2884
6. Total Working Expenses (3+4+5)	19048	23511	24552	25615	26884	28007
7. Net Traffic Receipts (2g-6)	5402	4344	4093	4285	4313	4335
8. Net Miscellaneous Receipts	316	329	358	402	446	491
9 NET REVENUE (7+8)	5718	4673	4451	4687	4759	5026
10 Dividend Payment to General Revenues	1515	1630	1769	1915	2063	2213
11. Excess/Shortfall (9-10)	4203	3043	2682	2772	2696	2813
Proposed Plan		8300	14175	14175	14175	14175
12. Appropriation to Depreciation Reserve Fund	2115	2000	2000	2000	2000	2000
13. Appropriation to other Rly. Funds	2088	1419	1000	1037	910	977
Unfilled resource gap to be filled by the followings		5257	11493	11403	11479	11362
Budgetary Support	1439	1831	2014	2216	2437	2681
IRFC Bonds	1930	2150	2150	2150	2150	2150
BOLT/OYW Scheme	530	900	900	900	900	900
Balance Unfilled gap		376	6429	6137	5992	5631
Unconventional methods						
Commercial Exploitation of Land						
Balance unfilled gap to be covered by fare & freight hike						
14. OPERATING RATIO	86.3%	92.7%	92.6%	92.3%	92.5%	92.1%
15. % Ratio of Net Revenue to Capital + Cap. Fund	12.2%	8.0%	6.8%	7.0%	6.8%	7.1%
16. % Ratio of surplus/shortfall to Capital + Cap. Fund	14.2%	9.1%	7.5%	7.2%	6.7%	6.6%

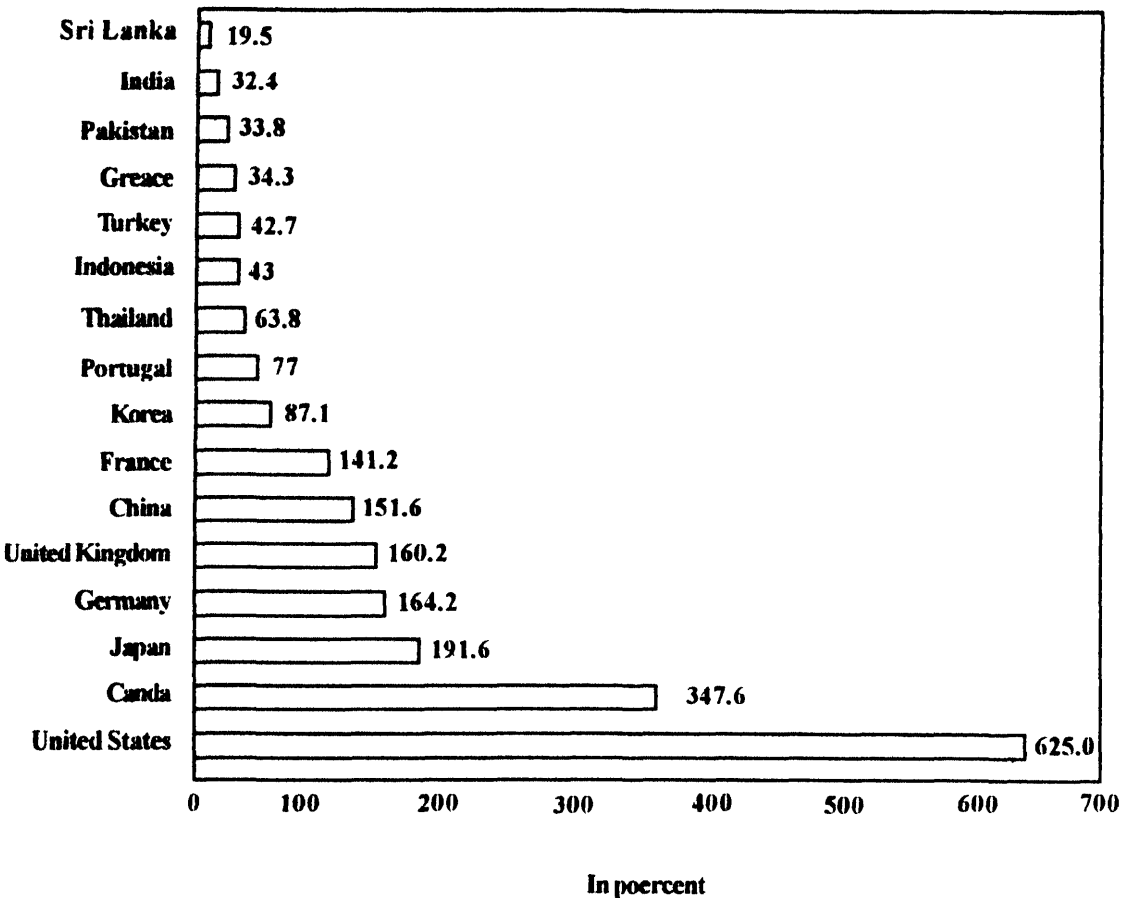
**Budgetary support for each year in IX Plan has been assumed to have increased by 10% over the previous year.

%% Pension Fund appropriation has been hiked @ 7% every year

Appropriation to DF assumed as Rs. 350 cr, every year

@@ Rs. 4.5 cr. are kept for OLWR and MNR have been inflated by that amount

International Passenger Fare to Freight Rate Ratios
(Ratios \$ per passanger-kilometer to \$ per ton-kilometer)



(Indonesia-1987, Thailand-1990
Canada-1990)

CHAPTER - I

FREIGHT BUSINESS

TRENDS IN FREIGHT TRAFFIC

- 1.1 Originating freight traffic includes both revenue earning and non-revenue freight traffic. The position of freight traffic carried by Railways during the period 1950-51 to 1991-92, that is, before the commencement of VIII Five Year Plan is given below:-

Year	Originating tonnes (Million tonne)			Net tonne kilometres (billion)		
	Revenue	Non-revenue	Total	Revenue	Non-revenue	Total
1950-51	73.2	19.8	93.0	37.6	6.5	44.1
1960-61	119.8	36.4	156.2	72.3	15.4	87.7
1970-71	167.9	28.6	196.5	110.7	16.6	127.3
1980-81	195.9	24.1	220.0	147.6	10.9	158.5
1985-86	258.5	27.9	286.4	196.6	9.3	205.9
1986-87	277.7	29.6	307.3	214.1	9.0	223.1
1987-88	290.2	28.3	318.5	222.5	8.7	231.2
1988-89	302.0	27.5	329.5	222.4	7.7	230.1
1989-90	310.0	24.3	334.3	229.6	7.3	236.9
1990-91	318.4	23.0	341.4	235.8	6.9	242.7
1991-92	338.0	21.9	359.9	247.3	6.7	254.0

- 1.2 During the period 1950-51 to 1991-92, the originating freight traffic on Indian Railways had grown up by 387 per cent in terms of tonnage and by 576 per cent in terms of transport output measured in terms of tonne kilometres. The growth in revenue earning freight traffic is much higher being 462 per cent in terms of tonnage and 658 per cent in terms of transport output.

GROWTH OF FREIGHT TRAFFIC IN VIII PLAN

- 2.1 The VIII Plan envisaged the demand of rail transport in the terminal year (1996-97) at 418.5 million tonnes of revenue earning freight traffic and a transport output of 323.3 billion tonne kilometres based on an overall lead of 773 kilometres.
- 2.2 However, the growth of freight traffic in first three years of Plan (1992-93 to 1994-95) was not encouraging as evident from the following table. Though the tonnage lifted had increased, the

transport output declined after remaining constant for the first two years. However, in the fourth year of the Plan (1995-96), there was a significant increase in both tonnage lifted and in transport output. In fact, the incremental loading in revenue earning freight traffic in 1995-96 over the previous year was the highest ever achieved.

Revenue earning freight traffic growth in VIII Plan

	Originating tonnes (million tonne)	Net Tonne Kms. (billion)	Lead (km)
1992-93	350.1	252.4	696
1993-94	358.7	252.4	681
1994-95	365.0	249.6	663
1995-96	390.6	271.1	694
1996-97 (Target)	410.0	282.9	690

- 2.3 Due to very severe drop in lead of revenue earning freight traffic, the achievement in transport output has been much below the projected level. As against a projected lead of 773 Kms by the end of the Plan, the actual lead of revenue earning freight traffic was only 694 Kms in 1995-96. The drop in lead has been significant in coal, iron and steel, cement, fertilisers and other goods as indicated in the following table:

Commodities	Projected lead in the Terminal year of VIII Plan (km)	Actual lead in 1995-96 (km)
Coal	691	608
Raw materials for Steel Plants	350	367
Iron & Steel	1200	1036
Iron ore for export	600	585
Cement	660	595
Foodgrains	1400	1365
Fertilisers	1000	920
POL	620	658
General Goods	1000	896
Total Revenue Traffic	773	694

- 2.4 The materialisation of traffic in iron & steel, iron ore for export, cement, foodgrains and POL has not been in line with the projections made. However, loading of coal, raw-material for steel plants, fertilisers and other goods has been more than the expectations. The following Table indicates commodity-wise projected traffic in the terminal year of the VIII Plan and the actual achievement in 1995-96 and the anticipated loading in 1996-97 -

Commodity	Projected loading in terminal year of VIII Plan	Actual loading in 1995-96	Anticipated loading in 1996-97
Coal	183.7	184.3	194.0
Raw material for Steel Plants	40.5	38.6	40.0
Iron ore for export	16.2	10.2	11.0
Iron & Steel	15.5	12.1	13.5
Cement	37.5	31.8	35.0
Foodgrains	40	25.8	27.0
Fertilisers	22	23.2	23.5
POL	33	28.9	36.0
Other goods	30.0	35.6	36.0
Total	418.5	390.6	410.0

- 2.5 Loading of Iron ore for export has been less due to decline in export of iron ore. Similarly, loading of foodgrains could not pick up in the initial years of the Plan due to comfortable stocks available in the consuming areas. Demands in the other sectors, by and large, have been met except in the case of cement where the shortage of wagons was felt in 1995-96 and the entire demand could not be met satisfactorily.

PROJECTIONS OF FREIGHT TRAFFIC FOR THE IX PLAN

- 3.1 Demand for a transport sector like the Railways is derived demand relating to growth in different economic sectors. Discussions have been held with different economic Ministries and other organisations for assessing commodity-wise demand for railway transport for the IX Plan.
- 3.2 Some of the Ministries have not yet firmed up the transport demand. In the absence of firm figures of demand, following methodology has been used for estimating the transport output in the terminal year of the IX Plan:-
- (a) Time trend analysis.
 - (b) Regression analysis co-relating growth in Railways sector and the GDP, and
 - (c) Linear aggregation of demand projected by the user Ministries and other coordinating agencies like Cement Manufacturers Association, etc.

TIME TREND ANALYSIS

- 3.3 Projection of total revenue earning freight traffic on the basis of trend growth for the period from 1965-66 to 1995-96 has been carried out taking time as independent variable. The following equation has been used-

$$\ln(\text{NTKMs}) = A + B(t).$$

In the above equation the transport output measured in net tonne kilometers (NTKMs) has been regressed taking time as the independent variable. The lead of traffic has been assumed to be

uniform for the entire period of IX Plan as no major change in the traffic pattern is envisaged.

Following results are obtained on the basis of Time Trend Analysis -

Year	Revenue NTKMs (billions)	Revenue Tonnage (million tonnes)	Lead (kms)
1996-97	285	410 0	695
2001-02	341	490 5	695
2006-07	408	587 0	695

CO-RELATION BETWEEN GDP AND RAIL SECTOR GDP

3 4 Taking time series data for about 30 years , the elasticity of rail transport with respect to GDP has been estimated as 0.9 . The observed value of the elasticity may be an under-estimate as it may not reflect accurately the unsatisfied demand for rail transport . However , assuming that the response of rail transport remains unchanged during the IX Plan period due to extreme saturation of rail capacity , projections were made assuming a GDP growth rate of 6% . The results are as follows

With Elasticity wrt GDP (0.9) · Tonnage is estimated as 533 in 2001-02 and the transport output as 360.2 btkm .

COMMODITYWISE PROJECTIONS

3 5 1 **Coal :** It is very difficult to make a precise assessment of coal transport demand in view of very large gap between demand and availability of coal in the coming years. While the total availability of coal is likely to be 349 million tonnes, the demand projected by various sectors is 420 million tonnes leaving behind a gap of 71 million tonnes . Some of the gap is likely to be supplemented by imports though large scale import of coal may not be feasible in view of the limited handling capacity at the ports

The share of rail transport of coal is about 60 per cent of the coal produced . However, about 90 per cent of imported coal moves by rail . On the basis of demand of the coal, the share of rail transport is likely to be 292 million tonnes . As already mentioned, this appears to be excessive as large scale import of coal does not appear to be feasible, at least, in the IX Plan period

The demand of coal traffic has also been estimated on the basis of time trend analysis using the data of coal traffic available from 1965-66 to 1995-96 with the help of following regression equation -

$$\ln (\text{NTKMs}) = A + B (t)$$

On the basis of the time trend analysis the estimates of coal traffic to be transported by rail is given below. The lead of the coal traffic has been assumed as 610 kms as no major change in the lead is envisaged during the IX Plan Period .-

Year	NTKMs (billion)	Tonnage (million tonne)	Lead (km)
1996-97	113.7	186	610
2001-02	148.5	243	610
2006-07	194.0	318	610

On the basis of tentative movement plan indicated by Ministry of Coal, the rail loading of CIL is likely to go up from 143.46 million tonnes in 1996-97 to 161.58 million tonnes in 2001-02, i.e., an incremental loading of over 18 million tonnes. In terms of daily loading a demand of 21000 wagons per day has been projected in the year 2001-02 as against 18418 wagons per day in 1996-97. This, however, gives an incremental loading of about 22 million tonnes. Additional demand of imported coal by the SAIL has been estimated as 2 million tonnes. Taking into account existing facilities available in the ports for handling the imported coal, not more than 20 million tonnes of additional imports is expected to materialize per year up to the end of the IX Plan.

In these circumstances, it appears that the demand for incremental loading of coal in the IX Plan will be 42-45 million tonnes. The target for loading of coal in 1996-97 is 194 million tonnes. This means that in 2001-02 the demand of coal transport by rail will be, at the best, 243 million tonnes- the figure obtained by time trend analysis.

3.5.2 Traffic to and from steel plants: Ministry of Steel has furnished requirement of rail transport for carrying raw-material to, and finished steel from, the steel plants as under -

Raw material to steel plants (other than coal)

	Total requirement (million tonne)	Rail Share (million tonne)
(i) Integrated Steel Plants (ISP)		
SAIL	39.0	39.0
VSP	8.3	8.3
TISCO	8.3	8.3
total		55.6
(ii) New Steel Plants (under commissioning)	13.4	12.0
(iii) Sponge Iron Plants	5.8	5.0

(iv)	Pig Iron Plants		
	Iron Ore	7.5	
	Fluxes	2.0	
	total	9.5	
2.4	Total (i) to (iv)		75.0
(v)	Plants under consideration		
	(not yet sanctioned)	12.6	11.0
	Finished Steel		Million tonne
(a)	Integrated Steel Plants	25.8	
(b)	New Steel Plants	4.0	
(c)	Sponge Iron	0.5	
(d)	Pig Iron	1.0	
	Total (a) to (d)	31.3	
(e)	Plants under consideration	2.5	

In the VIII Plan the actual materialisation of steel traffic, which was primarily to and from ISPs, has been approximately 10 per cent less than the estimates. As far as new steel plants and sponge iron plants are concerned, there has been severe delays in commissioning of these plants. Unitwise analysis of progress of commissioning of the plants indicates that there are significant delays in construction of unloading infrastructure and railway sidings at many locations. Some of the plants nearer to the ore source have indicated preference for road movement. It appears that not more than 70 per cent of projected requirement of raw materials is likely to materialize in respect of new plants. No provision needs to be made for the plants not yet sanctioned, in view of the long gestation periods involved. However, taking into account the increasing demand of steel in the country, it is assumed that rail traffic projects for raw materials to steel plants will be 73 million tonnes at 85 per cent materialisation of total demand as projected by Ministry of Steel. This demand includes requirement projected for the plants which has not yet been sanctioned. This assessment has been agreed to by Ministry of Steel.

As regards finished steel it may be noted that rail transport requirement estimated as 25.8 million tonnes from ISPs is more than double of the existing level of 12 million tonnes, which is on the high side, as expansion has been planned only in Bhilai and Bokaro. Taking into account of three million tonnes of additional traffic from ISPs, total finished steel traffic is estimated as 18.5 million tonnes. It may also be noted that most of new plants will manufacture HR Coils for which the preferred mode of movement is road.

3.5.3 Iron-ore for export : MMTC has projected a requirement of rail transport of 17.5 million tonnes of Iron-ore for export by the year 2001-02. This is on the assumption that Banspani-Daitari rail line will become operational by the end of 1997.

- 3 5 4 **Fertilisers** : Ministry of Chemicals and Fertilisers has made following projections of rail transport requirement for 2001-02 for transport of chemical fertilisers

Scenario 1 : Without price correction in urea

Year	Projected rail loading (million tonne)
1996-97	25 9
2001-02	39 1

Scenario 2 : With price correction in urea

Year	Projected rail loading (million tonne)
1996-97	25 1
2001-02	32 8

With heavy rise in subsidy it is most likely that price of urea will increase and the second scenario should be adopted for projection of rail transport requirement. However, the estimate for 1996-97 is excessive in view of steep fall in offer of fertiliser traffic on account of comfortable stocks held in consumption areas. The loading of fertilisers is not likely to exceed 24 million tonnes in 1996-97.

While estimating the rail transport requirement the rail share has been taken as 75 per cent. However, the existing rail coefficient of 72 per cent and the lead of fertiliser traffic may not change in view of the fact that new capacities are largely created in the form of expansion of the existing plants. In fact, both the rail share and the lead may decline in view of less materialisation of imported materials and creation of additional production capacity in consumption areas. It is expected that by the end of IX Plan the country will achieve self-sufficiency in urea. Taking into account above factors the rail transport requirement for fertilisers is estimated as 31 million tonnes in 2001-02.

- 3 5 5 **Food-grains** : Firm estimates of the requirement of rail transport for carrying foodgrains is not available from the Ministry of Food. However, FCI has advised that for estimating the growth in the foodgrains traffic it would be safe to assume a growth rate of 4 per cent per annum. FCI has estimated movement requirement of foodgrains traffic at 26.5 million tonnes in 2001-02 as against 20.3 million tonnes in 1995-96 and 21.0 million tonnes in 1996-97. Assuming that incremental loading of foodgrains other than FCI account also increases at the same growth rate, the total foodgrains traffic in 2001-02 will be 33 million tonnes including 26.5 million tonnes of originating traffic of FCI.

The lead of foodgrains traffic is not likely to change as traffic flows for foodgrains will continue to be from surplus Northern region to eastern, north-eastern and southern states.

3 5 6 **Cement** : In 1995-96 the production of cement was 69 55 million tonnes including 64 45 million tonnes from large plants. It is estimated that the production of cement in the year 2001-02 will be 113 million tonnes including 105 million tonnes from large plants and 8 million tonnes of cement from mini cement plants which is transported by road to nearby areas. The growth in the consumption of cement in the country is estimated at 8 per cent per annum and is likely to be 109 million tonnes in 2001-02. Demand and supply of cement in the country is, therefore, matching with each other.

The availability of wagons for movement of cement is considered as a constraint in the steady growth of cement industry. According to Report of the Task Force on Cement Industry for the IX Plan prepared by Ministry of Industry, (Department of Industrial Policy & Promotion-May, 1996) the industry has been experiencing shortage of wagons for despatching cement to various consuming centres. Shortage in the rail capacity for transportation of cement to the consuming centres and the ports cannot be economically met by the road sector.

Yearwise projection of requirement of rail transport for movement of cement for the IX plan as indicated in the Task Force Report is given below -

Year	Estimated consumption demand (million tonnes)	Estimated cement production from large size plants (million tonnes)	Demand for rail transport (million tonnes)	Wagons per day
Terminal year				
VIII Plan				
1996-97	73	70	42	4795
IX Plan				
1997-98	79	77	46	5250
1998-99	86	83	50	5705
1999-00	93	90	54	6165
2000-01	101	98	59	6735
2001-02	109	105	63	7190

On the macro level the share of rail transport of cement has been assumed as 60 per cent. However, the rail movement should be 85 per cent from the cement plants in cluster and with one million tonne and above capacity plants.

Rail share of movement of cement from 1985-86 to 1994-95 is given as under -

Year	% share	Year	% share
1985-86	52.90	1990-91	56.00
1986-87	51.00	1991-92	55.10
1987-88	51.80	1992-93	53.40
1988-89	56.20	1993-94	52.50
1989-90	57.40	1994-95	50.30

In the years 1992-93 and 1993-94 there was no shortage of wagons for loading of cement, but the rail share did not go up, rather it declined from the level assumed in previous years. Experience also shows that in the slack season between April and September the demand for rail transport of cement declines making the wagons surplus to the requirements. In the VIII Plan the projection for rail borne traffic was assumed as 42.75 million tonnes in 1996-97. However, the anticipated loading may not be more than 36 million tonnes.

On the basis of the time trend analysis based on rail movement of cement for the 31 year period from 1965-66 to 1995-96, the estimated demand for the year 2001-02 is given as under -

Year	NTKMs (billion)	Tonnage (million tonne)	Lead (km)
1996-97	22.7	38.0	600
2001-02	29.7	49.5	600
2006-07	38.8	65.0	600

Granting that there is enough scope to increase the movement of cement by rail, it will be appropriate to assume a higher demand than obtained by time trend analysis. Demand of loading of cement, therefore, is assumed as 63 million tonnes at 60 per cent of rail share of cement produced from large plants in 2001-02 as suggested by Department of Industry and CMA.

3.5.7 POL : The consumption of petroleum products in 1995-96 is estimated at 70 million tonnes. According to draft projections demand of petroleum products in 2001-02 will be 113 million tonnes.

The share of rail traffic which used to be 49 per cent in 1980-81 has declined to about 41 per cent in 1995-96.

The factors which will affect rail movement are -

- (i) Commissioning of two product pipelines, namely, Bombay-Manmad and Visakhapatnam-Vijaywada resulting in drop in rail share as well as in lead of traffic.

- (ii) Commissioning of Karnal refinery which will result in large scale change in the movement pattern and decrease in the lead as the need for feeding northern region from western ports/refineries will get reduced considerably. Similarly, commissioning of Bina refinery will also reduce the need for serving Central India from the refinery at Bombay

On the basis of time trend analysis, the estimated demand is as under

Year	NTKMs (billion)	Tonnage (million tonne)	Lead (km)
1996-97	21.0	32.0	650
2001-02	27.0	45.0	600
2006-07	34.8	60.5	575

It appears that railways share in POL traffic will be at the level of 40 per cent of total POL traffic. With this the estimate of rail demand for POL traffic appears to be, at best, 45 million tonnes. OCC has agreed with this assessment. The lead of the rail movement, however, will be more than 500 kms as stated above.

- 3.5.8 **General Goods :** In General Goods segment, container traffic is poised to register a significant growth. CONCOR has estimated that total container traffic, both domestic and international will be 12.7 million tonnes. Yearwise break-up of the estimated traffic is given as following

Estimated container traffic			
(million tonne)			
Year	International	Domestic	Total
1996-97	3.11	3.70	6.81
1997-98	3.88	4.55	8.43
1998-99	4.66	4.55	9.21
1999-00	5.59	4.55	10.14
2000-01	6.76	4.55	11.31
2001-02	8.16	4.55	12.71

The lead of container traffic is likely to be the same and no major change is expected.

The increase in other general goods traffic is assumed to be about 3 per cent in view of

- (i) decrease in piecemeal traffic in view of declining four-wheeler wagons
- (ii) conversion of metre gauge to broad gauge resulting in decrease of general goods traffic

Thus the general goods traffic is expected to be 4.7 million tonnes in 2001-02 with no change in the lead of traffic.

- 3.6. Summarising, on the basis of users' projections the demand of rail transport for 2001-02, commodity-wise, will be as under:-

Commodity	Revenue NTKMs (billion)	Revenue Tonnage (million)	Lead (km.)
1. Coal	148.2	243.0	610
2. Raw material to steel plants	26.3	73.0	360
3. Finished steel	19.0	18.5	1025
4. Iron-ore for export	10.2	17.5	580
5. cement	37.8	63.0	600
6. Foodgrains	44.6	33.0	1350
7. Fertilisers	28.5	31.0	920
8. POL	22.5	45.0	500
9. Other goods	42.3	47.0	900
Total	379.4	571.0	664

PROJECTIONS FOR REVENUE EARNING FREIGHT TRAFFIC

- 3.7 1 On the basis of different methods, the projections of traffic demand for revenue earning freight traffic in 2001-02 is as under .

	Net Tonne Kms (billion)	Tonnage (million tonne)	Lead (kms.)
Time trend analysis	341.0	490.5	695
GDP-rail traffic correlation	360.2	518.0	695
Users' projections	379.4	571.0	664

- 3 7 2 Railways are the most efficient mode of transport for long and medium distances. In the past, Railways have been criticized for not lifting the traffic in full which was perceived as a constraint in the development of the economy.
- 3 7 3 The projections based on Time trend analysis can not be adopted as such analysis do not provide corrections for the expected absence of the constraints under which the Railways were functioning in the past hampering the growth in economy. Similarly the projections based on correlation in GDP and rail traffic assumes that the share of rail traffic in GDP will continue to decline as in the past. The need is to reverse this trend and increase the share of rail traffic in the total transport system in the country. World bank has suggested that for one per cent growth in GDP the transport sector should grow at the rate of 1.5 per cent. Taking into account the rapid growth in other modes of transportation like MGR system for coal movement, pipelines for petroleum products, it has been assumed that the growth rate in Railway sector should be at par with the rate of growth of the economy.

3 7 4 However, the availability of wagons and locomotives in the short term will pose problems in achieving the desired transport output at the growth rate of six per cent. The manufacturing capacity of wagons in the country is limited and not more than 150000 wagons can be manufactured in the IX Plan. Similarly there is constraint on addition of more locomotives in the system. Keeping in view the availability of wagons, locomotive and other resources the expected materilisation revenue earning freight traffic is estimated as under:-

Revenue earning freight traffic	525 million tonnes
Lead of traffic	673 kilometres
ransport output (NTKMs)	353 billions.

3 7 5 Yearwise and commoditywise projections are given in the annexure The growth rate will be 5 per cent per annum.

OPERATIONAL STRATEGY

- 4 1 The task of lifting additional freight traffic and meeting the requirement of different user sectors is quite challenging and requires both short-term and long-term strategies directed towards increased productivity of assets
- 4 2 In the short-term, action should be taken for -
 - (a) Maximization of investments in rolling stock - wagons and locomotives
 - (b) Investments in line capacity works on identified and saturated routes
 - (c) Improvement in terminal operations
 - (d) Deployment of two or more locomotives to improve trailing load ratio for better speed of goods trains
 - (e) Adoption of engine on-load system at loading and unloading terminals to eliminate the waiting period for the locomotives
 - (f) Encouraging private participation in acquiring wagons under 'Own Your Wagon Scheme'
- 4 3 The users have to play a very important role in improvement of handling of wagons at terminals thereby resulting in reduction of detention to wagons
- 4 4 In the long-term, following strategies should be adopted in a close coordination with the users'-
 - (i) Improved handling system by :-
 - (a) Pelletisation and special type of covered stock with sliding doors.
 - (b) Direct wagon to truck delivery systems, and
 - (c) Containerisation.

- (ii) Improved wagon designs :-
 - (a) Rail-roaders.
 - (b) High speed freight stock (100 Kmph.)
 - (c) Bottom discharge wagons for coal in new plants so as to reduce the detention at unloading terminals.
 - (d) Deployment of dedicated wagons for bulk transport as also for cement in selected corridors.
 - (e) Design of special type of wagon for transporting HR coils
- (iii) Deployment of high horsepower locomotives to carry heavier trailing load at higher speeds.
- (iv) Construction and operation of dedicated heavy-haul freight routes.
- (v) Maximization of beneficiated coal movements.
- (vi) Construction of additional lines - doubling of the existing routes/ providing third line on heavily saturated routes.
- (vii) Development of unloading terminals with adequate capacity to unload trains in less than five hours.
- (viii) Electrification of missing links between major electrified trunk routes so as to avoid bottlenecks on account of change of traction
- (ix) Setting up nodal goods sheds for bulking/consolidation of smalls traffic.
- (x) development of Inland Container Depots and Container Freight Stations.
- (xi) Providing fast and guaranteed container services to and from major ports to meet the growing needs of export and import traffic.
- (xii) Closure of goods sheds where volume of traffic has declined significantly, and closing down of redundant marshalling yards.

MAJOR STREAMS OF TRAFFIC

- 5.1 The bulk of freight traffic at present is concentrated on the quadrilateral routes formed by the four metropolitan cities and the diagonals. The incremental traffic in the IX plan is also expected on the same over-worked routes as the future origin-destination patterns is not likely to deviate significantly from the observed trends. However, certain additional routes will need to be strengthened in view of some new industries coming up in virgin areas.
- 5.2 The major streams of traffic flows have been identified based on substantial growth of traffic in major commodities.

COAL :

- 5.3.1 Ministry of Coal have projected growth in production of coal company-wise for Coal India Limited as under :-

Coalfield		Production (In Million Tonnes)			
		1996-97		2001-02	
		Production by Rail	Off take	Production by Rail	Off take
ECL		31.00	16.59	38.00	18.79
BCCL		29.30	24.04	35.50	22.72
CCL		35.20	27.69	41.30	28.35
NCL		37.00	7.71	49.00	7.19
WCL		29.50	17.99	30.70	18.21
SECL	CIC	20.30	15.65	25.15	18.63
	Korba	32.70	17.26	40.75	20.53
	Total	53.00	32.91	65.80	38.16
MCL	Ib valley	12.55	11.82	15.00	12.28
	Talcher	23.45	15.24	28.00	15.76
	Total	36.00	27.06	43.00	28.04
NEC		1.00	0.95	1.00	1.12
TOTAL	CIL	252.0	143.46	303.00	161.58

5.3.2 It is apparent from the above that major increase in the production is in Korba, Ib Valley and Talcher coalfields. For evacuation of coal from these coal-fields, the following sections need to be strengthened -

- (i) Korba - Champa section
- (ii) Jharsuguda - Bilaspur - Nagpur - Bhusaval - Jalgaon - Surat.
- (iii) Bilaspur - Anuppur - Katni - Bhopal - Ratlam - Ahmedabad.
- (iv) Jharsuguda - Titlagarh - Visakhapatnam
- (v) Talcher - Cuttack - Paradip
- (vi) Talcher - Visakhapatnam

5.3.3 Ministry of Coal has informed that the future growth in the coal production will be primarily concentrated in the following coalfields -

- (i) Ib Valley
- (ii) Talcher.
- (iii) North Karanpura, and
- (iv) Rajmahal Coalfields

5.3.4 The coal from Talcher shall be used by thermal power plants in the South and also by those located on the East Coast. For evacuation of coal from Talcher, following works shall be required

- (i) Doubling of track between Talcher and Paradip Port including construction of a major bridge across Mahanadi.
- (ii) Early completion of Talcher - Sambalpur line and increasing capacity on Sambalpur - Titlagarh - Vijayanagaram section and on Talcher - Waltair - Vijayawada section.

5.3.5 For evacuation of coal from Korba, the following work shall be required .-

- (I) Doubling of track between Champa - Gewra and construction of fly-over at Champa
- (II) Third line between Bilaspur and Bhilai.
- (III) Providing a new line connecting Korba and Pendra Road or any other suitable point on Anup pur - Shahdol section and increasing the line capacity of Pendra Raod - Katni - Bhopal - Ratlam - Ahmedabad route.

5.3 6 For evacuation of coal from North Karanpura, the provision of third line between Mughalsarai and Sonenagar is to be completed early. The A and B routes of Northern Railway are also to be upgraded. A dedicated freight route between Ghaziabad and Mughalsarai should be examined.

STEEL

5 4 1 A number of new steel plants are coming up on South Central Railway based on Iron Ore from Hospet area. For moving coal and Iron ore to these steel plants following sections will have to be strengthened:-

- (i) Madras - Renigunta - Hospet.
- (ii) Hospet - Hubli - Goa.
- (iii) Hospet - Guntakal - Wadi - Daund - Pune - Kalyan.

5.4 2 A large number of high capacity steel plants are planned on Daitari - Banspani new line which is to be completed on priority.

CEMENT

5.5 1 Cement plants will come up in the same clusters, namely, on South Central, South Eastern, Central and Northern Railways. Expansion of many existing cement plants are also planned.

5.5.2 The following sections will need to be strengthened :-

- (i) Katni - Naini - Kanpur - Lucknow.
- (ii) Wadi - Pune - Bombay.
- (iii) Kazipet - Warda - Itarsi.
- (iv) Kazipet - Wadi.
- (v) Ajmer - Jaipur - Rewari - Delhi.

FERTILISERS

5.6 The additional fertiliser production will be primarily from expansion of existing plants. Capacity addition in respect of Urea has been planned in such a manner that the need for import is eliminated by the end of the IX Plan. This implies that the requirement of fertilisers of the deficit

Southern states will be met from the surplus production capacity of plants located in Western India. For transportation of fertilisers, the following sections will require strengthening :-

- (i) Baroda - Surat - Jalgaon - Bhusaval - Badnera - Ballarshah.
- (ii) Jalgaon - Manmad - Daund.
- (iii) Bombay - Pune - Daund - Wadi - Guntakal - Renigunta - Jolarpet - Palghat.

INTERMODAL AND CONTAINER TRAFFIC

CONTAINER CORPORATION OF INDIA (CONCOR)

- 6.1 Freight business of CONCOR can be classified in two categories - International (export/import) and Domestic. During the IXth Plan period these two segments are likely to grow vastly differently.

INTERNATIONAL TRAFFIC

- 6.2.1 International traffic handled by CONCOR at the beginning of VIII Plan period was 1,23,000 TEUs and is expected to grow to 4,00,000 TEUs in the terminal year of the VIII Plan i.e. 1996-97. The annual rate of growth of traffic, therefore, would be 26-27 per cent compound per annum.
- 6.2.2 CONCOR's International traffic growth is a derivative of the rate of growth of container traffic at the ports. The growth of traffic at the ports during the previous two years has been about 25 % per annum. In the current year, however, the growth of traffic has been only 11 % over the last year (April - December period). Capacity expansion at ports is highly capital intensive and takes a long time to complete. Therefore, growth of international container traffic at ports is projected to increase at the rate of 12 - 15 % per annum.
- 6.2.3 The level of inland penetration of existing container traffic is currently only about 18 % whereas it is generally believed that 60 % of the port traffic has origin/destination in the hinterland locations more than 400 Kms from the ports and, therefore, can be moved by rail.
- 6.2.4 CONCOR's traffic growth should, therefore, be significantly higher than the rate of ports traffic growth provided other factors like availability of terminals, section capacity, quick and assured transit, etc. are also made available.
- 6.2.5 Setting up ICDs and running of container trains has been thrown open to private participation, CONCOR's share in the growth will, therefore, not be 100 %. Keeping all these factors in view it is projected that international container traffic will grow at the rate of 20 - 22 % per annum during the IX Plan as mentioned hereunder -

	Year	Internal (in 000 TEUs)	Variation over prev year
VIII Plan	1992-93	123	28 %
	1993-94	188	53 %
	1994-95	275	46 %
Estimated	1995-96	350	27 %
	1996-97	400	14 %
Projections			
IX Plan	1997-98	500	25 %
	1998-99	600	20 %
	1999-2000	720	20 %
	2000-2001	870	21 %
	2001-2002	1050	21 %

6 2 6 Jawaharlal Nehru Port in Bombay has projected that it will handle one Million TEUs by the end of this century. This port is the most modern container port in the country and has adequate draught for mainline container ships. Therefore, CONCOR's traffic from this port is likely to grow the maximum.

6 2 7 Madras Port is another port which is trying to attract more container traffic to itself by adding more container handling capacity by shifting handling of bulk cargo to Ennore Port and to the outer Harbour. Madras Port also has sufficient draught to handle main-line vessels. Therefore, CONCOR's traffic growth from Madras Port will also be substantial.

CORRIDORS OF GROWTH

6 3 1 35 - 40 % of Indian's exports and imports have origin/destination in Northern India and the level of Containerisation of this traffic, today, is also around 40 %. Therefore, growth on Delhi-Nava Sheva and Delhi-Madras corridors will be the maximum. With the conversion of Delhi-Ahmedabad route from M G to B G, an alternative route for Bombay would be available upto Ahmedabad but beyond Ahmedabad section capacity will remain a constraint. Also the problems of delay in the suburban areas of Bombay will need attention and the Vasai-Diva-Nava Sheva single line section may need capacity augmentation.

6 3 2 CONCOR has started rail-bridging of international containers from Nava Sheva to Madras. These containers were earlier moving via Colombo transshipment through feeder vessels to Madras. Shipping lines are keen to reduce the number of Ports of Call per voyage to save costs provided they can off-load and pick up containers from India at Nava Sheva (West bound) and Madras (East bound). For this, containers have to be rail-bridged between Madras and Nava Sheva at competitive costs and transits. Bottlenecks like the single line section Daund-Wadi and Diva-Nava Sheva will need to be removed.

6 3 4 Capacity for reception and despatch of trains at Madras Beach Railway Station may also need augmentation.

6 3 5 Another corridor that CONCOR sees growing during the IX Plan period is the North India - Kandla Port.

DOMESTIC TRAFFIC

6 4 1 CONCOR's Domestic traffic - like Indian Railways is of two types viz. 'CC' commodities which are transported in train loads from point-to-point and 'W' commodities which move in piece-meal wagon load or even Less than Wagon Load.

6 4 2 'CC' Traffic is the main domestic traffic that CONCOR is carrying today by utilising the unloadable BOX wagons of Indian Railways converted into container flat wagons Principal commodities being carried are : Cement and Pig Iron

6 4 3 'W' commodities are being moved by CONCOR primarily on the Delhi-Madras corridor. This traffic segment is highly transit sensitive and does not move in bulk. This segment demands quick and assured transit of piece-meal consignments as the road transit time from Delhi to Bangalore is 5 days whereas by rail it is higher. In the absence of quick and assured rail transit, this segment of traffic will grow slowly.

6 4 4 Keeping in view the above, the projections of Domestic container traffic would be as under. -

	Year (in 000 TEUs)	Dom prev year	Variation over
	1992-93	33	175 %
	1993-94	49	48 %
	1994-95	127	159 %
Estimated	1995-96	245	93 %
	1996-97	325	33 %
IX plan			
Projections	1997-98	400	23 %
	1998-99	400	Nil
	1999-2000	400	Nil
	2000-2001	400	Nil
	2001-2002	400	Nil

AVERAGE LEAD OF TRAFFIC

INTERNATIONAL :

- 6.5 With increase in Containerisation, more and more containers will move by rail between the deep hinterland and the ports, Therefore, even with some shorter lead ports increasing their container handling in Gujarat (Kandla and some new minor ports) and the East coast (Calcutta Container Terminal has been rail linked only now and Paradip Port is developing a container terminal), the average lead of international container traffic will continue to remain 1400 - 1450 Kms

DOMESTIC

- 6.6 Since domestic traffic in 'CC' category is primarily Cement and will remain so during the Plan period, its lead will also remain around the present level of about 700 to 750 Kms.

ADOPTION OF DIFFERENT TYPES OF WAGONS

- 7.1 The following types of wagons may be considered for transportation of major commodities:

- | | |
|------------------------------------|---|
| (i) Coal | - Bottom-discharge hopper wagons for new projects. |
| | - Improved design of BOX-N |
| | - Wagons with 22t axle load in selected corridors |
| (ii) Cement | - Special purpose dedicated wagons in specified corridors where empty running is inevitable. |
| | - BCN wagon having width of 3500 mm with sliding doors |
| (iii) P.O.L. | - Bogie tank wagon (BTPN). |
| (iv) Fertilizer & food-grains | - Common type of wagons for bulk transportation of fertilizer and foodgrains to suit changes in packing conditions including pelletisation. |
| (v) Iron ore | - BOXN wagons |
| | Gondola type wagon, and |
| | - Bottom discharge wagon on dedicated routes. |
| (vi) raw materials to steel plants | BOXN wagons. Bottom discharge wagons on dedicated routes. |
| (vii) Containerised traffic | - Special optimally designed flat wagons for both domestic and international traffic. |

CHAPTER II

PASSENGER BUSINESS

AN OVERVIEW

Passenger business on IR is influenced by diverse factors like demographic distribution of population, economic conditions, urbanisation, tariff policy, quality of service, socio-political climate etc. An important factor that seriously affects passenger services is the extensive gauge conversion works on the various Zonal Railways necessitating suspension of train services. On many Railways the traffic which got diverted to road is yet to get back to the Railway mode, and might perhaps do so once the system stabilises.

- 1.1 With the liberalisation of economy and privatisation in the form of BOLT schemes being undertaken in a very big way in the road transport sector, passenger traffic on the IR is bound to get extensively affected in future. Therefore, the relevance of the traditional methods of assessing passenger growth through regression analysis or straight-line method would have to be given serious consideration in the present context. However, in a balanced transport system, the ideal mix would be short-distance to be catered to by road and long-distance travel by the Railways.
- 1.2 Details of the growth of passenger traffic (in terms of PKMs) during the 15 year period from 1980-81 to 1994-95 in the non-suburban sector are given in **Annexure-A**. It may be observed that the annual growth rate was 2.94% during this period.
- 1.3 Passenger traffic in terms of passenger originating in the non-suburban sector from the 1st to the 8th Five Year Plan is given in **Annexure 'B'**. During the 2nd and 3rd Plan periods the growth was around 3%. Fourth Five Year Plan recorded a very nominal 0.77% followed by negative growth rates of -2.64% and -0.08% respectively during the 6th and 7th Plans. The growth during the 8th Five Year Plan upto 1994-95 points to a marginal increase of 0.61% over that of the 7th Plan. The non-suburban passenger kilometres during the same period registered a growth of 3.20% from the year 1950-51 to 1994-95.
- 1.4 The distance slab-wise distribution of non-suburban traffic is furnished in the **Annexure 'C'**.

2 8TH PLAN REVIEW

Projections for growth of passenger traffic during the 8th Plan provided for a growth rate of 3% per annum. There has been a substantial drop in the anticipated traffic for various reasons like gauge conversion works, bandhs and other socio-political factors, as already mentioned. The traffic projections and actual materialisation are summarised below -

ORIGINATING PASSENGER TRAFFIC (in millions)

TABLE-I

Year	Projected	Actuals
1992-93	1741	1467
1993-94	1603	1406
1994-95	1485	1485
1995-96 (Prov)	1509	N.A.

3. PROJECTIONS FOR 9TH PLAN

For arriving at a realistic estimate, an exercise has been undertaken to analyse the trends class-wise, since different segments of traffic have different characteristics and hence differing growth potentials giving due consideration to the absence of any correlation between the long, medium and the short term trends. The class-wise break-up and the actual growth rate per annum of PKMs is given in **Annexure 'D'**. The percentage of overall growth during the 10 year period from 1980-81 to 1989-90 and during the last 5 years upto 1994-95 was as under:-

TABLE-II

Class	1980-81 to 1989-90 (%age)	1989-90 to 1994-95 (%age)
I A.C.	3.85	6.84
2 A.C.	-	16.63
I Class	0.73	-2.81
AC Chair Car	3.35	28.65
II Mail/Exp.	4.81	2.63
II Ordinary	1.35	-8.71

3.1 FIRST A.C.

There has been a positive growth rate in this class. During the 15 years from 1980-81 to 1994-95, the growth has been 3.85% and in the last six years 6.84%. The Zone-wise pattern indicates that this particular class is patronised mainly in the distance slab of 401-750 Kms. The travel by this class is preferred for overnight journeys and that too for distances of upto 700 kms. Keeping in view the total growth during the last 15 years, a growth rate of 5% is projected for this class during the 9th Plan period.

3.2 FIRST CLASS

With the policy decision to gradually phase out this class of travel, the service by this class is likely to be totally abolished, may be by the end of the 9th Plan period. This class

of travel is now being replaced by 2-tier/3-tier A.C.service. It is therefore, felt that any projection of growth of traffic by this class of traffic would not be relevant.

3.3 AC SLEEPER (2-TIER)

This class of travel has registered an impressive and phenomenal growth over a period of time. From the details given, it is evident that there has been a growth of more than 16% since 1988-89 when the service was introduced on the Railways. This class of travel is very popular for long distance as well as for short distance travel. The annual rate of growth during the 9th Plan is projected at 10%.

3.4 AC SLEEPER (3-TIER)

This is a new class of travel which has been introduced during 1994-95. This service is available only in select trains like Rajdhani and certain Superfast trains. It is proving to be popular class of travel and the annual rate of growth for the 9th Plan can be projected at 10%.

3.5 AC CHAIR CAR

This is a class of travel which is preferred by the public for inter-city and short-distance leads. The annual growth rate in terms of PKMs for this class has been 12% for the last 15 years. This class is popular specifically in the distance range of 750-1000 kms. and 1200-1500 kms., mainly because till recently this class of travel was available by Rajdhani and Shatabdi Expresses. Now these coaches have been replaced by AC 3-tier in Rajdhani Expresses. However, they continue to be popular in inter-city trains and also by Shatabdi Express trains. This class of travel is bound to be popular in future also and the projected annual growth for the 9th Plan period could be placed at 5%.

3.6 IIInd AND SLEEPER CLASS (MAIL/EXPRESS)

- This is the most important component of passenger traffic which constitutes 59.9% of non-suburban passengers carried on the IR. The Sleeper Class (Mail/Express) has also been included in this category for the purpose of projection of traffic for the 9th Five Year Plan, since the latter was introduced only w.e.f. 1.4.1993, and to work out a growth rate for II Class Sleeper with this limited data for only two years would not be scientific or accurate. This traffic is also quite sensitive to fare revision. However, with the segregation of Sleeper Class from the general Mail/Express class, sensitivity to fare revision may not be as much as it was hitherto. There have been indications of drop in traffic in this class with increase in fares and vice versa. But, there have also been years when there was increase in fares for this class of travel without any drop in the number of passengers. Thus, a definite co-relationship cannot be drawn between fare revision and the potential for growth in this class of travel. The annual percentage of growth by this particular class between 1980-81 and 1992-93 (till the introduction of Sleeper Class) has been 4.22%. With tremendous growth in urban agglomeration and spurt in the economic activity, there

is bound to be a marked increase in this category of passenger traffic. With a growth of 4.22% in the last 15 years, a projection of 4% during the 9th Five Year Plan would be a reasonable anticipation.

3 7 **IInd CLASS ORDINARY**

This class of travel is generally patronised over short-distances as these passengers normally travel in unreserved coaches by ordinary slow-moving passenger trains. Majority of the passengers patronise this particular class travel upto 60 kms though a substantial number also travel to a distance of about 175 kms. The passenger traffic in the distance zone of 1-150 kms. mainly comprises of short-distance daily passengers. But a large number of season ticket holders also form a substantial percentage travelling in this distance zone. With the extension of the suburban areas of major metropolitan cities and dispersal of residential accommodation beyond the municipal limits of major cities, the number of passengers under this category has been growing. With the rapid growth in urbanisation, movement to and from such places is expected to increase. A growth rate of 3% is anticipated during the 9th Plan period in this class.

3 8 Summarising, the undermentioned growth rates have been projected class-wise to assess the passenger traffic potential during the 9th Plan -

Class	Percentage
First A C	5
AC Sleeper	
2-tier	10
3-tier	10
First Class	-1
AC Chair Car	5
II Class Mail/Exp. (Including SL Class)	3
II Class Ordinary	3

The projections for passenger traffic class-wise for 9th Plan given in Annexure 'E'. The over all growth rate is projected at 3.20%.

4. **STRATEGIES FOR 9TH PLAN**

To deal with the requirements of the growth and changing pattern of the non-suburban passenger traffic, undermentioned strategies need to be considered during the 9th Plan period :-

- (a) **Progressive augmentation of the composition of Mail/Express trains to 24/26 coaches on the traditional high density corridors, as was envisaged in the 8th Plan strategy.** This process has to be completed during the 9th Plan period. With

the procurement of high speed engines with increased haulage capacity strategy should be evolved to have augmented compositions of trains combined with higher speeds. The load and composition of long distance Mail/Exp. trains depending upon the requirements for different corridors and demands could be as under:-

- 17 Coach train - SLRs-2, ACCW-1, ACCN-1, GSCN-10, GS-2, CB-
- 21 Coach train - SLRs-2, FACCW-1, ACCW-1, ACCN-1, GSCN-13, GS-2, CL-1.
- 26 Coach train - SLR-2, FACCW-1, ACCW-2, ACCN-2, GS-2, CL-1, GSCN-16.

As envisaged in the 8th Plan strategy, the augmented composition will be brought into use in tandem with the induction of more powerful locomotives and development of terminals and other ground infrastructural services for such long consists. The following major routes should be identified for running of 26 coach trains keeping in view the demand and the projected traffic, both on the basis of end-to-end demand and inter-city demand on the routes :-

New Delhi-Nagpur-Madras
 New Delhi-Mughalsarai-Howrah
 (via Grand Chord)
 New Delhi-Bombay Central
 New Delhi-Bombay V.T.
 Howrah-Madras
 Howrah-Bombay
 New Delhi-Jammu Tawi/Amritsar
 New Delhi-Gorakhpur-Barauni.

- (b) **Introduction of short and medium-distance inter-city services.** As was visualised during the 8th Plan strategy formulation, there will be increased demand for dealing with inter-city and inter-urban traffic due to intensive growth of industrial nodes, urbanisation and increased tempo of economic activity consequent on economic liberalisation. Infrastructural facilities / services at en-route stations on the corridors identified in the previous paragraph will be required. In addition to the stations mentioned above, the following additional locations also need to be developed:-
 Nasik, Pune, Jaipur, Kanpur, Allahabad,
 Jammu Tawi and Amritsar.
- (c) **Total elimination of sectional coaches wherever such residuary services are in operation.**
- (d) **Introduction of more modern design of coaches lighter in weight, longer in length, ergonomic in design and with better passenger amenities.**

- (e) **Complete rethinking and redefining of strategy for improvement of slow moving passenger trains.** Slow moving passenger trains have in fact become a drag on the railway operation. As the average speed of these trains is lower on account of maximum speed being restricted to 75/90 kmph and stoppages at all the stations at average inter-section distance at 8 km., the movement of the high speed Mail/Express passenger trains and high speed goods trains gets adversely affected by the slow moving passenger trains stopping at all the stations

MEMU/DMU/Push & Pull services should be introduced in such areas where the rake needs to be turned back on the platform in quick time and the trains have to make frequent up and down movements.

In the remaining areas, where suburban-like services are required to be introduced, the Railways can consider introduction of loco-hauled trains with AB coaches (without toilets).

ANNEXURE — A

Non — Suburban — Passenger Traffic

Years	Passenger Kilometers
1980-81	167472
1981-82	176822
1982-83	181142
1983-84	180808
1984-85	182318
1985-86	195176
1986-87	208057
1987-88	217632
1988-89	211819
1989-90	226045
1990-91	236066
1991-92	251174
1992-93	239655
1993-94	233200
1994-95	251376
Growth of traffic per year (%)	2.94

ANNEXURE-B

Growth of Non-Sub Passenger Traffic (1st to 8th Five Year Plan Periods)

Plan Period	No. Of Pass (Mill)	% age Growth Per Annum	No of Pkms (Mill)	% age Growth Per Annum
1st Five Year Plan				
From 1950-51	872		59966	
To 1955-56	776	-2 31	54235	-1 99
2nd Five Year Plan				
From 1955-56	776		54235	
To 1960-61	914	3 33	65895	3 97
3rd Five Year Plan				
From 1960-61	914		65895	
To 1965-66	1064	3 09	79130	3 73
Annual Plans				
1966-67	1110		83666	
1967-68	1151		88095	
1968-69	1129		87425	
4th Five Year Plan				
From 1969-70	1180		91214	
To 1973-74	1217	0 77	107627	4 22
5th Plan period				
From 1974-75	1056		99097	
To 1977-78	1576	14 28	137201	11 45
Annual Plans				
1978-79	1606		149506	
1979-80	1602		159927	
6th Five Year Plan				
From 1980-81	1613		167472	
To 1984-85	1459	-2 64	182318	2 15
7th Five Year Plan				
From 1985-86	1549		195176	
To 1989-90	1544	-0 08	226045	3 74
Annual Plans				
1990-91	1599		236066	
1991-92	1637		251174	
8th Five Year Plan				
From 1992-93	1467		239655	
Up To 1994-95	1485	0 61	251376	2 42

ANNEXURE-C

Distance Slab Wise No. Of PKMs for All Classes (Non-Sub)

(Mill)						
Distance Zone	1992-93	% age to total	1993-94	% age to total	1994-95	% age to total
1 — 50	15505 68	6 47	13362 36	5 73	12040 91	4 79
51 — 150	27823 95	11 61	31272 12	13 41	27852 46	11 08
151 — 300	33383 94	13 93	30712 44	13 17	30793 56	12 25
301 — 500	44096 52	18 4	39364 16	16 88	42080 34	16 74
501 — 750	33695 49	14 06	28030 64	12 02	36248 42	14 42
751 — 1200	33000 49	13 77	31691 88	13 59	36600 35	14 56
1201 — 1600	21904 47	9 14	28520 36	12 23	31070 07	12 36
1601 — 2000	18309 64	7 64	16393 96	7 03	17948 25	7 14
2001 And Above	11934 82	4 98	13852 08	5 94	16741 64	6 66
Total	239655 00	100 00	233200 00	100 00	251376 00	100 00

ANNEXURE-D
Indian Railways - Passenger Traffic
Passenger Kilometres - Classwise (Non-Suburban) 1972-73 To 1994-95

A. C. I. Class		A. C. II Sleeper		First Class		A. C. Chair Car		Sleeper Class		II Class M/E		II Class Ord.		Total (all Classes)			
Years.....		PKMs		%age variation over previous year		PKMs		%age variation over previous year		PKMs		%age variation over previous year		PKMs		%age variation over previous year	
1	2	3	4	5	6	7	8	9	M/Exp	Ord	11	12	13	14	15	16	17
1972-73	168				2439		382				45804		56353		105146		1972-73
1973-74	198	17 86			2672	9 55	468	22 51			49642	8 38	53657	-4 78	106637	1 42	1973-74
1974-75	143	-27 48			2660	-0 45	387	-17 31			46154	-7 03	49753	-7 28	99097	-7 07	1974-75
1975-76	120	-16 08			2893	8 76	408	5 43			54140	17 30	58338	17 26	115899	16 96	1975-76
1976-77	147	22 50			3021	4 42	460	12 75			57731	6 63	65395	12 10	126754	9 37	1976-77
1977-78	160	8 84			3235	7 08	583	26 74			65500	13 46	67724	3 56	137202	8 24	1977-78
1978-79	174	8 75			3617	11 81	655	12 35			74405	13 60	70655	4 33	149506	8 97	1978-79
1979-80	187	7 47			3942	8 99	630	-3 82			81113	9 02	74055	4 81	159927	6 97	1979-80
1980-81	205	9 63			4298	9 03	636	0 95			86712	6 90	75621	2 11	167472	4 72	1980-81
1981-82	238	16 10			4534	5 49	742	16 67			94515	9 00	76793	1 55	176822	5 58	1981-82
1982-83	231	-2 94			4663	2 85	684	-7 82			97746	3 42	77818	1 33	181142	2 44	1982-83
1983-84	250	8 23			4510	-3 28	700	2 34			102160	4 52	73188	-5 95	180808	-0 18	1983-84
1984-85	264	5 60			4723	4 72	929	32 71			103818	1 62	72584	-0 83	182318	0 84	1984-85
1985-86	296	12 12			5597	18 51	1051	13 13			109277	5 26	78955	8 78	195176	7 05	1985-86
1986-87	240	-18 92			5706	1 95	750	-28 64			117956	7 94	83405	5 64	208057	6 60	1986-87
1987-88	221	-7 92			6305	10 50	711	-5 20			123059	4 33	87606	5 04	217902	4 73	1987-88
1988-89	235	6 33	1977		4910	-22 13	747	5 06			121604	-1 18	82346	-6 00	211819	-2 79	1988-89
1989-90	288	22 55	2627	32 88	4591	-6 50	856	14 59			132341	8 83	85342	3 64	226045	6 72	1989-90
1990-91	288	0 00	2860	8 87	4658	1 46	906	5 84			138054	4 32	89300	4 64	236066	4 43	1990-91
1991-92	311	7 99	3175	11 01	4772	2 45	998	10 15			148336	7 45	93582	4 80	251174	6 40	1991-92
1992-93	410	31 83	3382	6 52	4555	-4 55	1404	40 68			142444	-3 97	87460	-6 54	239655	-4 59	1992-93
1993-94	411	0 24	3729	10 26	4203	-7 73	1804	28 49	48882	1314	88356	-37 97	84501	-3 38	233200	-2 69	1993-94
1994-95	401	-2 43	5669	52 02	3980	-5 31	3017	67 24	64718	1851	85990	-2 68	85750	1 48	251376	7 79	1994-95

Average annual growth rate percentage															
from 1972-73															
(in 22 years)		4 03		35 09		9 85		-11 16		2 90		1 93		4 04	
From 1990-91		8 63												1 58	

ANNEXURE-E

Traffic Projections For IX Five Year Plan (No. Of PKMs) (In Millions) (Non-Suburban)

	Year	AC Ist	AC II sleeper	Ist class	AC 3T	AC Chair Car	II M/E	II Class ordy.	Total class	%age incr.
I	Year 1997—98	464 21	7545 44	3351 74	609 22	3492 55	16482 70	95723 98	275869 85	3 16
II	Year 1998—99	487 42	8299 98	3318 23	639 68	3667 18	169623 18	98595 70	284631 37	3 18
III	Year 1999—2000	511 79	9129 98	3285 04	671 67	3850 54	174711 88	101553 57	293714 47	3 19
IV	Year 2000—2001	537 38	10042 98	3252 19	705 25	4043 07	179953 23	104600 18	303134 28	3 21
V	Year 2001—2002	564 25	11047 28	3219 67	740 51	4245 22	185351 83	107738 18	312906 94	3 22
Total		2565 04	46065 66	1646 87	3366 34	19298 57	874322 82	508211 60	1470256 91	3 20

CHAPTER III

COMMUTER TRAFFIC

3.1 SUBURBAN AND SUBURBAN-LIKE TRAFFIC

3.1.1 Over the years rapid and unabated urbanisation has resulted in a large number of urban conglomerations in the country. Apart from the 4 metropolitan cities, such conglomerations have developed in and around cities like Secunderabad, Ahmedabad, Bangalore, Agra, Bhopal, Visakhapatnam, Patna, Lucknow, etc. A significant portion of the work force resides in the suburbs of these megalopolises and has to commute daily to the business areas. At present, a large number of locomotive hauled shuttle services are being operated to cater to the needs of these commuters. These have their limitations however, and would require replacement by a suburban type rapid transit system for meeting the demands.

3.1.2 Projects sanctioned and in progress

A large number of projects are already under implementation and are on the anvil in so far as the major metropolitan cities are concerned. These projects will have to be completed with sufficient funds being made available for the purpose during the IX Plan period

3.2 GROWTH OF COMMUTER AND COMMUTER-LIKE TRAFFIC

3.2.1 The growth in intra-urban/suburban passenger traffic has not been to the expected level mainly because of lack of capacity to meet the demand. In Mumbai, for example, the suburban trains carry more than super dense crush loads due to capacity constraints. It has become wellnigh impossible to increase the frequency of trains. Similarly, in Delhi, there is limited track capacity and other infrastructural facilities like maintenance etc to augment the services for meeting the ever growing demand

3.2.2 The annual growth rate of suburban passenger kilometres was 4.5%, 7.6%, 7.8%, 6.1%, 13.2%, 1.9%, 4.8% and 6.1% respectively (Annexure-A) during the first Five Year Plan to the VIII Five Year Plan upto 1994-95 periods. However, the growth rate from 1990-91 to 1994-95 was 3.36% per annum. The annual growth rate of suburban passengers was 3.9%, 6.4%, 8.4%, 5.5%, 12%, -1.5%, 2.9% and 3.2% respectively during the same period with a growth rate from 1990-91 to 1994-95 of 1.85% per annum. The drop in growth rate from 1990-91 onward is mainly due to law and order problems in some parts of the country during 1992-93 and extensive gauge conversion works undertaken during 1992-93 and 1993-94.

3.2.3 In view of the trends in the immediate past i.e. 1990-91 to 1994-95, a growth rate of 3% per annum for suburban passenger kms and 3% per annum for suburban number of passengers may be adopted for IX Plan. The projected figures are given in Annexure-B

3.3 STRATEGIES FOR DEALING WITH COMMUTER & COMMUTER-LIKE TRAFFIC:

3.3.1 As already mentioned, a large number of important cities including state capitals need urgent augmentation of suburban-like service. The demand for these areas will be met by introducing DMUs/MEMUs and rail buses.

3.3.2 While on this, it is felt that expansion of the suburban-like network should take into account the capacity available for expansion and extension on ground rather than on the availability of EMUs. Experience has shown that even with the availability of rolling stock it has not been possible to expand/increase services because of capacity constraints. The Mumbai suburban system is one classic example of this kind.

3.4 SCHEMES FOR EXPANSION/IMPROVEMENT OF SUBURBAN SERVICES IN METROPOLITAN CITIES.

3.4.1 The strategies for dealing with the growth of commuter and commuter-like traffic are specific to a definite area. While in the metropolitan cities the strategies would have to take into account the infrastructural facilities available, in other areas, it would depend upon the availability of funds and the urgency of the need for the facility.

3.4.1 The broad strategies required to be followed during the IX Plan could be as under

- (i) Deployment of additional 12 car rakes in Mumbai suburban system.
- (ii) Complete the plan of augmentation of 8 coach AC EMU rakes to 9 coach consists on Eastern and South Eastern Railways, started in the VIII Plan
- (iii) Complete the augmentation plan to 10 coach consists of all 9 coach rakes on MG system of Southern Railway, envisaged in VIII Plan itself.
- (iv) Suitably augmenting the section and terminal capacities of the suburban corridors of Calcutta, Mumbai and Chennai so as to reduce the headway and increase the capacity during peak hours.
- (v) Plan and strengthen the infrastructure to deal with longer consists of EMU trains

GROWTH OF SUBURBAN PASSENGER TRAFFIC ANNEXURE : A

(1st to 8th Five Year Plan Periods)

Plan Period	No of Pass (Million)	% age Growth Per Annum	No of PKMs (Million)	% age Growth Per Annum
1st Five Year Plan				
From 1950-51	412		6551	
To 1955-56	499	3.91	8165	4.50
2nd Five Year Plan				
From 1955-56	499		8165	
To 1960-61	680	6.39	11770	7.59
3rd Five Year Plan				
From 1960-61	680		11770	
To 1965-66	1018	8.40	17164	7.84
Annual Plans				
1966-67	1081		18469	
1967-68	1106		19068	
1968-69	1084		19515	
4th Five Year Plan				
From 1969-70	1159		22168	
To 1973-74	1437	5.52	28037	6.05
5th Plan Period				
From 1974-75	1373		27157	
To 1977-78	1928	11.98	39433	13.24
Annual Plans				
1978-79	2113		43439	
1979-80	1903		38730	
6th Five Year Plan				
From 1980-81	2000		41086	
To 1984-85	1884	-1.48	44264	1.88
7th Five Year Plan				
From 1985-86	1884		45438	
To 1989-90	2110	2.87	54803	4.80
Annual Plans				
1990-91	2259		59578	
1991-92	2412		63390	
8th Five Year Plan				
From 1992-93	2282		60448	
UP To 1994-95	2430	3.19	67989	6.05
AV. % age Growth				
Per Year Since 1951	4.21		5.59	

ANNEXURE : B

Suburban No of Passengers		(In Million)					Projection for IX Plan (@3% per annum)				
Railway	1990- 1991	1991- 1992	1992- 1993	1993- 1994	1994- 1995	% age growth per year	1997- 1998	1998- 1999	1999- 2000	2000- 2001	2001- 2002
Central	776.15	833.46	776.74	788.19	860.91	2.62	940.74	968.96	998.03	1027.97	1058.81
Eastern	410.84	428.99	387.35	393.34	410.31	-0.03	448.36	461.81	475.66	489.93	504.63
Northern	1.48	1.64	1.92	2.02	1.95	7.14	2.13	2.19	2.26	2.33	2.4
North Eastern											
North Frontier											
Southern	165.09	175.85	176.19	178.86	191.71	3.81	209.48	215.76	222.23	228.9	235.77
South Central											
South Eastern	57.59	58.17	53.11	55.22	57.18	-0.18	62.49	64.36	66.29	68.28	70.33
Western	847.4	913.37	886.77	884.46	908.18	1.75	992.39	1022.16	1052.82	1084.4	1116.93
Total	2258.55	2411.48	2282.08	2302.09	2430.24	1.85	2655.59	2735.24	2817.29	2901.81	2988.87

Suburban No of Passengers Kilometres		(In Million)					Projection for IX Plan (@3.5% per annum)				
Railway	1990- 1991	1991- 1992	1992- 1993	1993- 1994	1994- 1995	% age growth per year	1997- 1998	1998- 1999	1999- 2000	2000- 2001	2001- 2002
Central	18971	20445	19826	20513	23952	6.00	26556.01	27485.47	28447.46	29443.12	30473.63
Eastern	13892	14912	14359	14753	15488	2.76	17171.82	17772.83	18394.88	19038.7	19705.05
Northern	40	38	22	22	22	-13.88	24.39	25.24	26.12	27.03	27.98
North Eastern											
North Frontier											
Southern	3393	3575	3469	3612	3898	3.53	4321.79	4473.05	4629.61	4791.65	4959.36
South Central											
South Eastern	1792	1804	1383	1642	1582	-3.07	1753.99	1815.38	1878.92	1944.68	2012.74
Western	21790	22616	21389	22503	23047	1.76	25552.63	26446.97	27372.61	28330.65	29322.22
Total	59578	63390	60448	63045	67989	3.36	75380.63	78018.94	80749.6	83575.83	86500.98

CHAPTER - IV

NORMS FOR ASSET UTILISATION

4.0 The Ninth Plan Period will witness intensified pressure on the railway system, both for freight traffic and passenger journeys, as a result of the accelerated growth of the economy that is forecast. At the same time, shortage of financial resources for new investments is bound to continue. The task of meeting the demand, providing customer satisfaction at the enhanced levels that will be expected, has therefore to be accomplished through efficient use of such physical resources as exist and as can be added to the system within the limitations of scarce finances. Crucial to the success of this endeavour is the productive utilisation of the assets, the wagons, coaches and locomotives.

4.1 1 Although many different indices would express performance efficiency, the three basic norms for measuring asset utilisation are

1. Wagons - ntkm per wagon per day on line.
- Locos - lakh ntkm per loco day on line for freight and lakh gtkm per loco per day on line for passenger services.
3. Coaches - Vehicle kms per vehicle day on line.

4.1 2 Further, only Broad Gauge rolling stock has been considered since the Meter Gauge system is shrinking through conversion and no investment in MG rolling stock would be needed in the Ninth Plan

4.2 ROLLING STOCK UTILISATION:

4.2 1 Wagons :

The most comprehensive indicator of wagon productivity is the ntkm per wagon per day on line. This index of BG wagon utilisation moved rather slowly during the years 1986-93, from 1420 ntkm per wagon per day to 1457. In the next two years, it rose by 9.1% to 1590 and the figure for 1995-96 is 1754, representing an increase of 10.3%. The recent improvement is mainly due to accelerated condemnation of plain bearing four wheeler wagons mixed with better monitoring systems and improved operation practices. Condemnation of plain 4 wheeler wagons will reduce as their population would come down substantially at the beginning of IX Plan. In the coming years, new acquisition of wagons will be BOXN type, bringing in improvement in the payload per train. They will be equipped with air-brakes for better operating speeds. Other factors that would make for higher productivity of wagons are the induction of 3100 hp and later 4000 hp diesel locomotives (the higher hp locomotives are being imported, with technology transfer for series production) increased production of electric locomotives of 5000 hp and later of 6000 hp, the projected improvement in the availability of rolling stock and the reliability

of these and other assets like track and signalling through the ongoing technological upgradation measures. Together, these developments may be expected to result in an annual improvement of about 2% in the wagon utilisation index, taking it to about 1950 ntkm per wagon per day by the terminal year of the Ninth Five Year Plan. As the growth of traffic, both passenger and goods, is likely to be on routes that are already congested, it is considered prudent to assume no more than this modest improvement in wagon productivity.

	Year	Utilisation in ntkm per wagon day on line	% age increase over the previ- ous year
Corporate Plan Target	1999-2000	2000	
VIII Plan Target	1994-95	1750	
Actuals	1991-92	1439	
	1992-93	1457	1.3%
	1993-94	1506	3.4%
	1994-95	1590	5.6%
	1995-96	1754	10.3%
IX Plan Proposed Target	2001-02	1950	

4.2.2 Electric Locomotives:

Utilisation of electric locomotives on freight traffic improved marginally from 2.6 lakh ntkm per loco per day on line in 1991-92 to 2.7 (provisional) in 1995-96, missing by a wide margin the target of 3.25 set by the Eighth Plan Working Group for the year 1994-95. This expectation did not materialise mainly because the growth of traffic has been in the dense corridors where line capacity constraints have tended to inhibit operational productivity. It is proposed that the Ninth Plan target should be placed at 2.7 lakh ntkm per loco per day on line for the same reason.

Electric locomotives utilisation in the passenger sector registered a much better improvement during the five year period 1991-96, the provisional figure for the last year having risen from 3.25 lakh gtkm per loco per day on line to 3.44, which is slightly higher than the Corporate Plan target of 3.39. There is reason to anticipate further rise of this index. The figure for the final year of the Ninth Plan is proposed to be placed at 3.75 gtkm per loco per day on line.

4.2.3 Diesel Locomotives

The outlook for utilisation of diesel freight locomotives is not very encouraging, seeing that it has come down from 2.17 lakh ntkm per loco per day on line in 1991-92 to 1.94 (provisional) in 1995-96. Indeed the anticipation for the Eighth Plan

Period was itself not very optimistic since diesel traction was being relegated to less intensive routes consequent upon the progress of electrification of the busy routes; the target for 1994-95 was placed at 2.20. Apparently, the worst is over. Higher horse power locomotives will now progressively enter into the holding and higher capacity trains are proposed to be powered by them. Moreover, alternative routes opened up by gauge conversion will restore, to some degree, the operation of superior services under diesel traction. Keeping in view these factors, the utilisation is expected to improve to 2.0 lakh ntkm per loco per day on line in the final year of the Ninth Plan.

A declining trend of utilisation has also been witnessed in passenger operations with diesel locomotives, the figure having come down from 2.87 lakh gtkm per loco per day on line in 1991-92 to a provisional level of 2.30 in 1995-96. It is expected that this downtrend would be arrested and so, it is proposed to place the target of utilisation in the final year of the Ninth Plan at the 1995-96 level of 2.3 lakh gtkm per loco per day.

- 4.2 4 Relevant figures relating to locomotive utilisation are given in the table below, for freight in ntkm per loco day on line and for passenger in gtkm per loco day on line.

(Figures in lakhs)

		Electric Loco		Diesel Loco	
		Freight	Passenger	Freight	Passenger
Corporate Plan Target	1999-2000	3.80	3.39	2.00	2.65
VIII Plan Working Group Target	1994-95	3.25	2.92	2.20	2.50
Actuals	1991-92	2.60	3.25	2.17	2.87
	1992-93	2.62	3.39	2.04	2.80
	1993-94	2.63	3.43	1.98	2.56
	1994-95	2.55	3.38	1.96	2.34
(Prov.)	1995-96	2.70	3.44	1.94	2.30
IX Plan Proposed Target	2001-02	2.70	3.75	2.00	2.30

4.2.5 COACHING STOCK

The actuals of BG coaching stock utilisation in terms of vehicle kilometres per vehicle day on line are shown in the following table indicating the targets

		Utilisation	% age increase over last year
Corporate Plan Target	1999-2000	500	
VIII Plan Working Group Target	1994-95	450	
Actuals	1991-92	406	
	1992-93	410	1 %
	1993-94	414	1%
	1994-95	426	2.9%
	1995-96(Prov)	426	-
IX Plan Proposed Target	2001-02	450	

It will be seen that the annual growth rate in this index is not very impressive and the Corporate Plan target of 500 vehicle km per vehicle day on line appears quite distant. Keeping in view the trend, it is proposed that the target for the final year of the Ninth Plan may be kept at 450, the level anticipated by the VIII Plan Working Group.

4.3 ROLLING STOCK AVAILABILITY FOR USE

4.3.1 WAGONS

The Eighth Plan Working Group target in this respect was 96.2% and was achieved in the year 1994-95. This may be retained unchanged for the Ninth Plan also.

4.3.2 COACHES:

In the case of coaches the availability in the year 1994-95 was 91.21%, exceeding the Eighth Plan Working Group target 91%. This may be slightly revised to 92% for the terminal year of the Ninth Plan.

4.3.3 LOCOMOTIVES:

4.3.4 Availability of both electric and diesel locomotives has improved during the five year period 1991-96. The provisional figures for electric and diesel locomotives are 88% and 84.4% respectively. This trend of improvement is expected to be maintained and the Ninth Plan targets are proposed to be placed at the levels anticipated in the Corporate Plan, that is 90% and 85% respectively for electric and diesel locomotives. There may be a review for enhancement later after observing the

performance in this regard from the imported locomotives even before their series production is commenced in the IR workshops. The relevant figures are tabulated below:

		Electric percentage	Diesel percentage
Corporate Plan Target	1999-2000	90.0	85.0
VIII Plan Working Group Target	1994-95	86.2	83.5
Actuals	1991-92	87.2	82.3
	1992-93	87.5	81.6
	1993-94	87.0	83.3
	1994-95	87.8	84.4
	1995-96 (Prov)	88.0	84.4
IX Plan Proposed Target	2001-02	90.0	85.0

4.4 RELIABILITY OF ASSETS:

- 4.4.1 The parameters of utilisation of rolling stock depend, on the one hand, upon the volume of traffic and on the other, upon the reliability of the rolling stock as well as the fixed assets. While operational strategies must be so devised as to cope with the traffic volumes, the success of this effort would be considerably affected by the incidence of engine failure, hot-box detachments, spring breakages, rail fracture and other track failures, failures of signalling and telecommunication equipment etc. Although certain targets for improvement in these areas were envisaged keeping in view the technological improvements expected to be made in the Eighth Plan, there is still a long way to go in controlling the adverse impact of the various types of failures. It is desirable that targets in these areas are fixed annually and measures for achieving improvement are implemented effectively.

4.5 FORECAST OF REQUIREMENTS OF ROLLING STOCK

- 4.5.1 It has been the practice to work out the requirement of the different kinds of rolling stock based upon the projected volume of traffic and the utilisation indices aimed at. The experience of the Eighth Plan shows that the norms fixed for both electric and diesel locomotives productivity, in relation to freight traffic, and for diesel locomotives for passenger traffic as well, could not be achieved on account of the interplay of various factors. In the case of wagon utilisation, also the original Eighth Plan period did not witness the projected improvement. While norm-based estimates undoubtedly deserve to be taken seriously, being derived from reasonable anticipation of higher productivity, they tend to fail, with disagreeable consequences for the traffic capacity, when the expected productivity does not materialise. It may, therefore, be desirable to make an alternative set of calculations in which the requirement of wagons is computed on the basis of forecast

of origin-destination flows of freight traffic, counting local and through traffic separately, the requirement of locomotives is arrived at from the power plans of the individual Railways and that of passenger coaching vehicles is worked out from the rake links (as is being done even now). Any significant difference between the two sets of computations should be analysed and moderated before investment decisions are arrived at. It would be necessary to bear in mind in this context that in the case of locomotives, both electric and diesel, the proportion of higher horsepower locomotives is set to increase. The utilisation of main Line Electric Multiple Units and Diesel Multiple Units would also influence the requirement of locomotives.

4.6 STRATEGIES FOR THE FUTURE:

- 4.6.1 From the Seventh Plan period onwards particularly, Indian Railways have made a firm commitment towards rapid technological upgradation in all areas of their working. Recent examples of progress in this direction are the high horsepower locomotives of diesel and electric traction, and state-of-the-art coaches with high speed potential being imported with transfer of technology. Improvements in the design of wagons have been taking place over time, but this is an area where more decisive measures to produce wagons of high speed potential are required to be undertaken. But, as seen from earlier discussions, it is clear that the limitations on productivity are imposed by the density of traffic itself, compounded by the failure of the various assets. These are the issues that have to be addressed in the short run. Besides operational measures to achieve greater fluidity of movement, better terminal efficiency and line capacity augmentation in the dense corridors have to be urgently achieved. Investment has to be directed accordingly and should follow clearly laid down priorities from a holistic standpoint. Maximum advantage has to be taken of alternative routes opened by up gauge conversion. Increase in the speed of good trains should be an essential objective. This would call for progressive time-tabling of goods trains and efforts to identify, as far as feasible, separate time corridors for goods and passenger traffic. Besides, overpowering of trains with appropriate planning for locomotives would be necessary. And it bears repetition that for any of these strategies to succeed, failures of the various assets must be drastically brought down, through qualitative improvement of the maintenance effort.
- 4.6.2 Financial investment may at best succeed in building up capacity for dealing with the anticipated levels of freight and passenger traffic. Actually the goal of the Plan has to be restated as providing the best customer service and satisfaction at those levels of traffic. There should be a clearly articulated corporate philosophy of customer service, reaching out to people at all levels of the organisation, to animate their thought and action and maximise their commitment to public service. Efficiency in all its desired forms will, hopefully, follow therefrom.

CHAPTER V

WORKSHOPS, SHEDS, PRODUCTION UNITS AND MACHINERY AND PLANT

5.1 VIII PLAN REVIEW

5.1 1 The main emphasis in the VIII plan was to complete ongoing modernisation projects covering six workshops namely Parel, Kanchrapara, Bhusaval, Kharagpur, Golden rock and Ajmer. The modernisation project has helped in reduction of shop down time, improvement in quality and productivity and capacity augmentation. A coach repair workshop at Bhopal for mid life rehabilitation of coaches and a coil spring manufacturing facility at Gwalior also became operational. During the VIII Plan, the production capacity of Chittaranjan Locomotive Works was raised from 100 to 150 electric locomotives and Diesel Locomotive Works (DLW) from 135 to 145 Diesel locomotives.

5.1 2 In pursuance of unigauge policy, the four MG workshops at Ajmer, Hubli, Jodhpur and Dibrugarh workshops are being converted to BG workshop so as to cater to the increased POH arising of BG rolling stock. Substantial inputs have also been made for replacing of out dated plant and machinery.

5.2 APPROACH TO THE IX PLAN

5.2 1 In the Ninth five year plan, the accent will be on ensuring that the maximum stock is available for traffic, by keeping maintenance holding to the very minimum. This will require continuous modernisation of workshops by suitable technological upgradation, system improvements, replacement of over-aged machines with sophisticated and high productivity machines, optimisation of facilities so as to improve maintenance infrastructure and capabilities of workshop for higher availability and reliability of rolling stock. While doing so priority would be given to Carriage and wagon workshops so that their infrastructure and facilities keep pace with changes in product mix of rolling stock. The percentage of air brake wagon stock will increase substantially as also the holding of air braked and AC coaches, DMUs, rail buses and MEMUs. The requirement of IX Plan period has been worked out under following heads.

- (i) Workshops including Engineering & Signal Workshops, sheds for locos, coaches and wagons and production units
- (ii) Machinery & Plant (including Stores)

5.3 THRUST AREAS FOR IX PLAN

The thrust in the IX plan would be as under:

5.3.1 Capacity augmentation:

Numerical capacities in workshops will have to be developed to deal with the increased holding of rolling stock and simultaneously there will be need to create facilities for new type of rolling stock like DMUs, Rail buses, MEMUs.

5.3.2 Up-gradation of facilities:

Keeping in view the changes in mix and design of rolling stock both manufacturing and repair technology will be suitably upgraded

However, while doing so emphasis would be given to integrate the upgradation with system improvements based on Industrial Engg. aspects such as work-station layout, Machinery and Plant layout and material facilities so as to optimise and improve the quality of work, cycle-time and productivity.

5.3.3 Quality Improvement

Workshops and Production Units will acquire ISO-9000/IS-14002 certificate during initial phases and Total Quality Management (TQM) for the future.

5.3.4 Management Information System (MIS)

Improvement in Management Information system by providing latest computer system having provision of "On Line" processing with a view to integrate it with repair and maintenance activities of workshops.

5.3.5 Replacement of Machinery And Plant

During the 8th plan only a portion of overdue M&P was replaced. This process would have to be completed in the 9th Plan. In addition to this induction of sophisticated machines will be essential in order to absorb the GM Loco, ABB Loco and LHB coaches technologies. Mechanised painting facilities will also be provided in selected coach and wagons POH shops.

5.3.6 Costing System

Adoption of revamped and updated cost accounting system for repairs of rolling stock undertaken in the workshops so that cost of products and services are established more accurately and provide meaningful feedback for corrective action.

5 4 WORKSHOPS:

The broad strategy to meet the challenges in the IX Plan are as under -

5 4 1 Augmentation Of Capacity:

Increase in holding of various types of rolling stock i.e Diesel Locos, Electric loco, Coaches wagons, EMU/MEMU, DMUs and rail buses will not only require commensurate addition to existing POH facilities but also creation of new facilities for the newer generation of stock such as MEMUs, rail buses, etc

However while creating additional facilities, induction of new design of rolling stock such as ABB electric locos, GM diesel locos and LHB coaches which have a higher periodicity of POH would be kept in mind, so that POH facilities do not become redundant at the end of X five year plan period, by which time the holding of the new design of locos and coaches is likely to be sizeable

5 4 2 Creation Of Facilities To Suit Change In Rolling Stock Mix

Keeping in view the induction of rolling stock with major changes in design, maintenance facilities will have to be upgraded for complete overhaul and remanufacture of vital sub-assemblies/components such as high tensile couplers and draft gears, cartridge roller bearings, casnub bogies and air brakes to ensure against any major attention between consecutive POHs. Unit exchange spare systems in workshop would need to be strengthened for following modular replacement concept to reduce ineffective time

In addition, modern and mechanised paint shop facilities in major coach/wagon repair shops having out-turn capacity of 2000 FWUs's per annum are required to be created during POH to reduce effect of corrosion and increased availability of rolling stock. It will also help to improve staff productivity

5 4 3 System Improvement

System improvement including the industrial engineering aspects e.g workstations layouts, machinery and plant layouts, work process effectiveness, availability of proper tools, fixtures, material handling system based on studies to be conducted by specialised agencies/institutions such as National Productivity Council, NITIE, industrial engineering departments of IITs, reputed consultants for optimisation and improvement in quality of POH, repair cycle time and productivity are considered essential for upgrading the quality of the workshops

5.4.4 Integrated Systems Of Overhaul

Adoption of an integrated system of coach and wagon overhaul repairs, particularly for those workshops which are slated for modernisation or conversion from MG to BG is proposed. Such a system reduces the infructuous movement of rolling stock, requirement of infra-structural facilities and manpower and thereby ensures improvement in repair cycle time and higher availability of rolling stock.

5.4.5 Facilities For Rehabilitation Of Rolling Stock

Consolidation and development of adequate and specialised workshop facilities to cater to the arisings of mid life rehabilitation of rolling stock particularly for coaches and wagons to reduce the overall maintenance cost and to increase reliability as well and availability, is proposed. Another coach rehabilitation workshop, in addition to the Bhopal workshop will be required to cater to the arisings of BG coach rehabilitation workload.

5.4.6 Computerisation And Communication System

It is essential that the computerisation coverage is extended to all major workshops (31) with provision of "On Line" processing in order to improve the major areas of workshop working such as production planning and control, material planning and procurement, rolling stock maintenance management, machinery and plant maintenance and management information system for getting optimum productivity in workshops

Similarly internal and external communication is to be improved through provision of FAX, E-Mail, mobile internal communication through wireless system

5.4.7 Diagnostic System

Introduction of microprocessor based equipment for measuring, recording and analysis of wheel set parameters like profile, dimensions, acoustics analysis and other measuring systems for bearings, microprocessor based ultrasonic testing and recording machines, spring and shock absorber testing machines to improve the effectiveness and reliability of test and provide easier analysis for correctives action is proposed.

5.4.8 Quality Improvement

The emphasis will be on improving quality during manufacturing and repair operations through periodical quality audits. In order to institutionalise the Quality Policy, major workshops will acquire ISO-9000/IS-14002 certificates during initial phases and total quality management philosophy for the future,

5.4.9 Energy Consumption

The system of a regular energy audit is contemplated to identify the areas for improvement to optimise energy consumption and to reduce expenditure. For petroleum products, a study would be carried out in all workshops, in association with PCRA and oil companies to provide improved storage and handling facilities, overhead pipelines, better insulation, recuperator and recording measuring instruments for reducing consumption.

There will be increased use of solar water heaters, energy saving devices like capacitor for welding transformers, energy efficient lighting system.

5.4.10 Costing System

Adoption of a revamped and updated cost accounting system in the workshops so that cost of products and servicing are established more accurately, is proposed.

5.4.11 Material Supply

The system of assessing the requirement of maintenance spares and raw materials for workshops on zero base, estimating the provision of matching funds to cover the requirements of spares is to be adopted. In addition, a list of mandatory "MUST CHANGE" spares during POH activities for workshop would also be implemented.

5.4.12 Environmental Act - Compliance

The existing infrastructural facilities in workshops will have to be revamped/augmented and in some cases creation of new facilities will be necessary so that smoke emission, effluent, and sewage discharge standards conform to new environmental act. Some of the foundries located in workshops in metropolitan cities like Bombay, Madras and Calcutta may need to be relocated. Adequate provision will also be made for this purpose.

5.4.13 Estimated Cost For Workshops(excluding M&P)

The estimated outlay required for the workshops would be about Rs. 225 crores during the IX Plan period.

5.5 CIVIL ENGINEERING WORKSHOPS

- 5.5.1 All the engineering workshops are equipped for fabrication of riveted girders. Welding is resorted to in a very limited way only for the fabrication of non-dynamically loaded structures like sheds, foot-over bridges, platform shelters etc. In view of the advantages of welded fabrication, engineering workshops have made a beginning in fabrication of dynamically loaded bridge girders using welding techniques. This change, which started in the 8th Plan Period, is proposed to be given a further fill up during the IX Plan. The present stage of fabricating partially welded plate

girders is proposed to be taken to its logical end of fabricating fully welded plate and open web-girders.

5.5.2 Bridges workshops also undertake manufacture of points and crossings to meet requirements of special points and crossings and part requirement of standard points and crossings of Indian Railways.

5.5.3 The Track Machine workshops at Allahabad, Jhansi and in the other Zonal Railways require a number of essential facilities and machines. These are hydraulic test benches, electronic test benches, gantries with small EOT crane, dynamic balancing machines, heavy lifting jacks (20 tonnes capacity), portable welding generator sets (heavy duty).

5.5.4 The total requirements of funds for engineering workshops during the IX plan would thus be about Rs. 20 crores.

5.6 SIGNALLING WORKSHOPS

5.6.1 Major signalling workshops are at Podanur, Southern Railway; Gorakhpur, NE Railway and Byculla Central Railway. In addition small workshops are provided in each zonal railway.

5.6.2 In addition to meeting the requirements of respective railways for overhauling, repairs and reconditioning of signalling equipments, the following important items are manufactured in the workshops for the consumption of Indian Railways:

- (i) Relays of different types and relay racks.**
- (ii) Electric Point Machines.**
- (iii) Colour Light Signalling Units etc.**
- (iv) Tokenless Block Instrument**
- (v) SGE type Block Instrument**
- (vi) Neals Ball Token Block Instrument.**
- (vii) Axle Counters.**
- (viii) Control and indication panels**
- (ix) Invertors.**

5.6.3 There would be increasing use of electronic and electric signalling equipments in Railways to cope up with the demands of the Railways for replacement and execution of new works. Solid State Interlocking would be used increasingly in the railways. The requirement of signalling material as above would only increase. The total investment needs have been categorised under the following important items:

- (i) Replacement
- (ii) Modernisation
- (iii) Training of staff
- (iv) Capacity augmentation
- (v) Adoption of quality, standards ISO-9000.

5.6.4 The total requirement of funds during the IX Plan period has been estimated at Rs 30 crores.

5.7 MAINTENANCE SHEDS AND DEPOTS:

In order to cater to the increased holding of diesel locos, electric locos, EMUs, MEMUs, DMUs, coaches and wagons, the maintenance requirements in openline will be met by augmentation of capacity of existing sheds/depots and also creation of new sheds/depots particularly for new design of locomotives, coaches etc. The estimated outlay required for this purpose would be Rs 740 Crores during IX Plan period.

5.8 PRODUCTION UNITS:

5.8.1 Augmentation of Capacity in Production Units

ICF and RCF supplemented by BEMIL, would be able to meet the projected requirement of coaches during the 9th Plan with their existing capacities. However marginal expansion of both DLW and CLW would be required to meet the projected requirement of locos for IX Plan period. The capacity of WAP would need to be augmented from 82,000 wheels per annum (expected to be attained during 1996-97) and 48,000 axles to 1,05,000 wheels and 55,000 axles per annum. Wheel-set assembling capacity will also be required to be augmented from the existing level of 34,000 wheel-sets per annum to 40,000 wheels per annum.

5.8.2 Updation of Manufacturing Technology

The need to update manufacturing technology in our production units is already long overdue. With transfer of technology agreement for manufacturing electric and diesel locomotives and modern high speed coaches, sizeable investments would have to be made for CLW, DLW, ICF and RCF.

5.8.3 Replacement of M&P

During the 8th Plan only a portion of the overdue M&P was planned for replacement. This process would have to be completed in the 9th Plan. Some additional M&P may also be required.

- 5 8 4 Design and Development Facilities**
Design and Development Wings have been set up for almost all the Production Units. They would need to be strengthened by inputs of CAD/CAM infrastructure, test and measuring equipments etc.
- 5 8 5 Material Handling Facility**
There is an urgent need to modernise all material handling facilities in various Production Units to make the system cost effective. Systems like Automated storage/retrieval system which is existing only in RCF at the moment should be procured for all the production units
- 5 8 6 Quality Improvement**
With globalisation, our Production Units, in order to be internationally competitive, would have to grow beyond ISO Certification stage to the concept of Total Quality Management. The only expenditure required would be towards training of the personnel in various techniques of TQM
- 5 8 7 Management Information System**
The MIS introduced in RCF on an experimental basis has been a great success. However, with the rapidly changing scenario in this field, the system available in RCF has become dated and needs to be replaced with a modern system. Such a system should be in place for all the production units. On account of fast improving technology in this field, it is proposed to go in for a leasing system rather than for acquisition of the system
- 5 8 8 Social Welfare**
It has become more important than ever before that in order to retain the best talent within the organisation, suitable measures are taken for ensuring improved living standards. Various social welfare schemes like housing, education, health care, colony care etc. are important means to motivate the employees.
- 5 8.9 Total Investment Required for Production Units
(excluding M&P)**

	<u>(Rs. in crores)</u>
CLW	37
DLW	45
ICF	25
RCF	15
DCW	10
WAP	18
M&IS	100
Total	<u>250</u>

5.9 MACHINERY AND PLANT

5.9 1 Far reaching changes are taking place in the design of Rolling Stock being utilised by Railways by way of technological upgradation which has brought higher carrying capacities, higher horse power locos, higher speeds. The bulk of M&P in workshops and Production Units are to be replaced being overaged and of old design in order to acquire the capability of satisfactorily manufacturing and maintaining the newer breed of Rolling Stock. The drive to meet the quantitative requirements will have to be continued. Simultaneously, there is an urgent need to introduce technological development for qualitative improvement and cost effectiveness of the Machinery and Plant. Locomotive Sheds, Depots and Production Units will have to continue to update the manufacturing technology in areas where new materials are likely to be used. Since more and more highly sophisticated machines are to be acquired for assimilation of Modern technology and methods, replacement of obsolete M&P by latest, highly sophisticated more productive M&P is of critical importance. In order to absorb the GM locos, ABB locos and LHB coach technologies, an additional investment will be needed in IX Five Year Plan.

5.9.2 There are approximately 30,000 M&P items installed on Railways and Production Units, taking all Departments together.

5.9 3 As on 31.3.1996, the throw-forward liability on Machinery and Plants is 200 crores

5.9 4 Estimated Costs For M&P:

The total outlay required for the Machinery & Plant would be about Rs 960 Crores during the IX Plan period.

The Machinery and Plant in all Departments including Production Units will continue to require attention for replacement as only a portion was replaced during VIII Plan. This process will be mainly completed in the IX Plan

5.10 STORES:

5.10.1 In the wake of challenges caused by dwindling budgetary support to railway finances, special drive was launched for improving the performance and to effect savings on all possible areas. Inventory management has been one of the main thrust areas to achieve this corporate objective. Investment on inventory has been kept minimal without affecting production, operation and maintenance requirements. A turnover ratio of 34 percent in 1990-91 has been reduced to 19 percent in 1994-95, with a target of 17 percent to be achieved in 1995-96.

5.10.2 For efficient discharge of material management function, mechanised material handling in

depots is considered very important and inescapable. Also the effectiveness of computerisation of material management functions in the Stores Depots and purchase offices has been established beyond doubt all over. However, in most of the Stores Depots, the major portion of material handling is still done manually. Currently only 18 Stores Depots out of a total of 217 have been provided with computers.

- 5 10 3 The cumulative saving achieved through improved material management during last three years is of the order of Rs. 891 crores. This amount of internal resource generation has not only provided funds to other needy plan heads at this crucial juncture of acute resource crunch but also reduced the dividend liability under the plan head 'inventory'.
- 5 10 4 The need of the hour is that these savings should not only be sustained in the coming years, but also be further improved. However, this goal can be achieved only by introducing computers in day today working along with better material handling systems.
- 5 10 5 The total funds requirement for Stores during IX Plan period has been estimated to be Rs 40 Crores.

5.11 IX PLAN OUTLAY:

The estimated outlay required to be made in the IX Plan will be as indicated below

- | | | |
|-----|--|---------------------|
| (a) | Workshops, Production Units include Sheds and depots | Rs.1250 Crs. |
| (b) | Machinery & Plant | Rs.1000 Crs. |

CHAPTER VI

COMPUTERISATION AND TELECOMMUNICATION

6.1.0 INTRODUCTION

6.1.1 A major concern of the Indian Railways (IR) in the coming years will be the speed at which the information generated or otherwise gathered can be communicated within the organisation. The management of data as well as its transmission will be a critical factor in determining the organisation's operational as well as economic efficiency. To a large extent this can be accomplished through installation of efficient computer systems suited to the IR needs, and their integration leading to improved management information systems which should be conducive to achieving the highest levels of efficiency the IR is capable of.

6.1.2 Consistent with the Railways' Corporate Plan related to the use of computers, the following objectives were laid down for the VIII Plan:

- The FOIS project to be completed by 1996-97.
- The computerised PRS system to be expanded to cover all locations handling 1000 or more reservation transactions per day, on a progressive basis from 1991 onwards. The total number of stations covered would be 56, covering about 80% of total reservations work-load on the Indian Railways.
- The computerised passenger reservation systems to be inter-linked through a communication network, for which software would be developed.
- Stand-alone systems set up in divisions, production units, workshops, maintenance depots, store depots, etc., to be expanded to cover the entire Indian Railways.
- The ticketing system to be computerised.
- Comprehensive Track Management system to cover entire IR.
- PC-based systems to be provided to cover wide areas of management in the Railway Board, Zonal offices, divisional offices and field units.

MIS systems to be designed and networked to cover most of the activities on the Indian Railways.

Computer-aided design, manufacturing and education applications to be expanded. - Use of computers for research and design to be intensified. These should also be used extensively in transportation planning design and model-

ling

The feasibility of terminals operated by agencies in public/private sectors at some important stations to extend the PRS facilities to remote locations at such stations would be explored.

6.2 ACHIEVEMENTS DURING VIIIITH PLAN

It needs to be noted here that so far computerisation on the Indian Railways has, for the most part, proceeded in a segmented manner. The systems installed operate mainly on a stand alone basis and inter-system integration does not really exist. The explanation for this lies primarily in historical factors. The need for co-ordinated approach for the attainment of the requisite and achievable compatibility/integration has now arisen and has to be met to derive the benefits of higher productivity, improved service, and economy on an enlarging scale.

6.2.1. Computerised Passenger Reservation System (PRS)

- 6 2.1.1 At the beginning of the VIII Plan it was aimed to extend the PRS cover to all stations with reservation workload of 1000 or more transactions per day (80%) by 1997. The total cost estimated for additional stations was of the order of Rs.13.00 crores. It was proposed to replace the main frame computer at New Delhi at a cost of Rs 10 00 crores.
- 6 2 1.2 Keeping in view the benefits of the computerised reservation system as also the widespread appreciation with which the public viewed it, in 1994-95 a major expansion programme was planned and executed and this more than doubled the total number of PRS locations from 102 to on 31 3.94 to 240 on 31 3 95 These included 183 stations and 57 satellite locations By 31.3.96 the total number went up further to 271 with the addition of three more stations, 3 non rail-head state capitals and 25 satellite locations. With the addition of these locations about 92% of the reservation workload on the IR (totalling about 6 lakh reservation related transactions per day) is now computerised and all stations having a workload of 300 and above reservation related transactions per day have been covered Certain other important factors such as the town being a state capital, nationally/ internationally renowned place of pilgrimage or tourist interest, major industrial area, etc., have also been kept in view. Another significant fact is that the cost of the new works in 1994-95 and 1995-96 has been kept at a much lower level than in the past.
- 6.2.1.3 A major breakthrough during the last over one and half years has been the provision of PRS facilities at the non-railhead state capitals of Srinagar, Port Blair, Shillong and Panjim where no railway staff or railway infrastructure exists Three

of these locations involve considerable logistical problems for the intending passengers and provision of the PRS facilities has been hailed as an unprecedented and exceedingly customer-friendly gesture on the part of the IR. Agreements have been drawn up with the Governments of Meghalaya and Andaman & Nicobar for the operation of reservation terminals by the staff of those State Governments at Port Blair and Shillong, for the sharing of cost and responsibility for operation. In Srinagar the Department of Posts is operating the facilities and at Panjim the existing CBO has been computerised for PRS facilities.

- 6.2.1.4 The provision of computerised reservation facilities at 164 additional locations in 1994-95 and 1995-96 signifies record expansion of PRS facilities in 11 years since the inception of the PRS in 1985. It is pertinent that only 102 locations (including stations and satellite locations) had been computerised till 31.3.94.
- 6.2.1.5 Keeping in view the substantial increase in workload as well as the age of the computer main frames in use, these were upgraded/replaced at all the five centres i.e. New Delhi, Bombay, Calcutta, Madras and Secunderabad. This included not only replacement of the CPU but also upgradation of software and replacement of old and excessively energy consuming peripherals with the latest energy efficient equipment. The old MEDHA computer system in use at Secunderabad was completely replaced with new VAX 4000 series of machines and Secunderabad was brought onto the VAX platform in consonance with the other four centres. The new software, CONCERT, developed by CRIS has been implemented at Secunderabad.
- 6.2.1.6 **PRS Networking Project**
With a view to providing the facility of return and onward reservations from stations on other PRS systems, for which demand has been raised in many quarters, the Centre for Railway Information Systems (CRIS) has developed a new software called CONCERT. The CRIS is presently customising and testing the CONCERT software for the Delhi PRS centre and would first implement networking between New Delhi and Secunderabad. The extension of the system to the other three locations will depend on its successful operation between New Delhi and Secunderabad.
- 6.2.1.7 **Expenditure on PRS & Related Facilities**
An amount of Rs.144.75 crores approximately had been spent by way of total project costs for the provision of PRS facilities till 1992-93. This includes the cost of infrastructure, equipment, project establishment as well as the initial rental of the DoT channel. The outlay was Rs.16.00 crores for 1993-94, Rs.38.50 crores for 1994-95 and about Rs.29.00 crores for 1995-96.

6.2.2 Interactive Voice Response System (IVRS)

Computerised Interactive Voice Response System (IVRS) has been installed at Delhi, Mumbai CST, Vijayawada, Madras and Bangalore for reservation related telephonic enquiries. This system reduces manual interface thereby sparing staff for undertaking reservation work. This system has given considerable satisfaction to the intending passengers. Work is in progress for installation of IVRS at Nagpur, Pune, Jammu Tawi, Allahabad, Varanasi and Lucknow. It is proposed to provide this at 6 more locations in 1996-97 with a progressive increase yearly outlay at an approximate cost of Rs. 90 lakhs per year.

6.2.3 Computerisation of Season Tickets

Software has been developed and commissioned on the PRS mainframe computer at Mumbai in 1995-96 for the first time on the IR for issue of computerised season tickets. Now these tickets can be issued from any station of Central and Western Railways to any other station of these Railways in the Mumbai suburban area. Terminals installed at 9 locations are now dealing with of over 60% of the volume of season tickets on the Central Railway.

6.2.4 Freight Operations Information System (FOIS)

6.2.4.1 Keeping in view the growing volumes of freight traffic, the need to improve the management of such traffic through modernisation of management information systems and the expected benefits in terms of productivity and economy, it was decided by the Government to opt for computerised Freight Operations Information System (FOIS) for the IR. Accordingly, the FOIS Project was developed. The project was approved by the Planning Commission in November '89 at a cost of Rs.1098 crores with the stipulation that it should be implemented, to begin with, on the Northern Railway. The detailed estimate of the Northern Railway was sanctioned in December '92 at a cost of Rs.267.2 crores.

6.2.4.2 The broad objectives of FOIS are to develop an integrated operations information system to meet the freight operations related information needs of the IR; improve monitoring and control of railway operations and allied commercial, mechanical, traction and accounting functionalities; and optimise utilisation of railway assets, particularly wagons and motive power fleets, increasing thereby the productivity and profitability of railway operations. Improvement in the utilisation of dynamic assets is the central theme of FOIS. In the detailed project documents, it has been envisaged that the implementation of the system would result in the saving of 15% wagons and 5% locomotives in use in freight services through improved utilisation apart from conferring other related benefits.

- 6.2.4.3 The system is based on two-tier architecture and has a total of 18 sub-systems/modules of the central on-line, central off-line, zonal on-line and zonal off-line systems.

These modules are enumerated as under:-

- (i) ***Central On-line System (COLS)***
 - (a) Wagon movement control
 - (b) Train movement control
 - (c) Locomotive Movement Control
 - (d) Empty Wagon Distribution
 - (e) Scheduling and routing of wagons
 - (f) Container movement control
 - (g) Customer service
- (ii) ***Zonal On-line System (ZOLS)***
 - (a) Yard management
 - (b) Terminal management
 - (c) Wagon repair management
 - (d) Loco repair management
 - (e) Crew management
 - (f) Fuel management
- (iii) ***Central Off-line System (COFLS)***
 - (a) Performance reports
 - (b) Financial reports
 - (c) Statistical reports
- (iv) ***Zonal Off-line System (ZOFLS)***
 - (a) Freight revenue accountal system
 - (b) Safety management system

Of these 18 modules six, which are at different stages of development, have been offered to the Northern Railway by the CRIS which is executing the system. As regards the telecom segment out of the 72 locations, 47 have already been provided with telecom links, work is in progress at 13 locations and at remaining 12 locations work will be taken in hand later on.

- 6 2.4.4 The pre-implementation field trials of the core software (TRACS) of the FOIS by CRIS were started in Delhi Area with the association of the Northern Railway in Aug. '94. During the period which has elapsed since the field trials were started, the CRIS has been endeavouring to remove bugs, overcome problems and carry out enhancements to make the system functional. However, the Northern Railway

which is the user has not found the system offered to be acceptable in view of its limited utility. A substantial amount of work would need to be done to ensure that the system serves as an effective aid to managing day-to-day freight operations.

6.2.5 Long Range Decision Support System (LRDSS)

6.2.5.1 The LRDSS Project was set up in August, 1994 by the Ministry of Railways to enable long range planning taking into account the growth of traffic, market preferences, availability of resources and technology, and the operating policies.

6.2.5.2 Phase I of the project was aimed at completing the traffic forecast by commodity between origin destination pairs for the year 2000, and identification of bottle-neck sections has now been completed. The Board has already sanctioned Phase II of the LRDSS. This phase envisages full development of the LRDSS including completion of the market analysis survey and the road Origin Destination Survey and using these results to obtain sensitivity of the system wide revenues and costs to various market parameters. This phase would also involve setting up various alternative scenarios and studying the impact of these in terms of costs and benefits

6.2.5.3 The hardware platform for the development phase of the LRDSS is a set of 486 DXs alongwith a Pentium. As the work progresses the hardware and software would be upgraded .

6.2.6 Zonal Railways Computerisation

6.2.6.1 Computers were introduced on the Indian Railways with the installation of IBM 1401 systems in the late '60s. During the VIIth Plan period these systems were replaced by fourth generation computer systems (ECILs TDC 332 and ICIM 6060) at an expenditure of Rs 14.5 crores.

6.2.6.2 During the current (terminal) year of the VIII Plan period all the old computer systems have been replaced with new hardware of the HCL/HP 9000 series at the EDP Centres at the nine Zonal HQs of the Indian Railways. The existing software will be converted and ported onto the new hardware platforms. Thereafter it is proposed to develop new software and standardise it for the Indian Railways. This will be at a total cost of about Rs.9.00 crores.

6.2.7 Divisional Computerisation

6.2.7.1 By the end of the VIII Plan period it is proposed to replace all computer equipment

which has outlived its codal and economic life on 18 Divisions of the Indian Railways. It is also proposed to install and commission new hardware as well as software in 23 additional Divisions by 31.3.97. This will be at a total cost of Rs. 13.00 crores.

6.2.8 Production Units (PUs) Computerisation

6.2.8.1 In most of the PUs (viz. Integral Coach Factory Perambur, Diesel Locomotive Works Varanasi, Carriage and Loco Workshop Chittaranjan and Rail Coach Factory Kapurthala) computers have largely been confined to following usage :

- (a) Pay-roll and incentives
- (b) Material management
- (c) Production planning and control
- (d) Production monitoring
- (e) Stores management
- (f) Purchase management
- (g) Personnel management
- (h) E-Mail
- (i) Design office management
- (j) Jigs and fixtures
- (k) Quality control
- (l) ISO-9000 documentation
- (m) Computer aided design (CAD)

6.2.8.2 Almost all the PUs have obsolete systems the replacement of which is in an advanced stage of progress and is expected to be completed during 1996-97.

6.2.9 Computerisation in Electrical Loco Sheds and Other Installations

6.2.9.1 At present there are 21 electric loco sheds on the Indian Railways. PCs/mini computers with different hardware architectures have been provided in most of the sheds, the software is yet to be standardised and some of the hardware has become obsolete. No PC/computer has so far been provided in Overhead Equipment /PSI depots and train lighting/air-conditioning depots.

6.2.10 Computerisation in Mechanical Workshops

6.2.10.1 Computerisation in Mechanical Workshops was initiated in the mid-eighties and the following 14 workshops have been covered:-

Central Railway

Jhansi, Bhusawal & Parel

Eastern Railway	Jamalpur, Liluah & Kanchrapara
Northern Railway	Charbagh & Jagadhari
Southern Railway	Golden Rock
South Central Railway	Lallaguda
South Eastern Railway	Kharagpur & Raipur
Western Railway	Kota & Ajmer

6.2.10.2 The following major application areas have been catered for computerisation in these workshops:-

- (a) Production planning and control
- (b) Machinery and plant maintenance
- (c) Rolling stock maintenance
- (d) Material management
- (e) Personnel management information
- (f) Financial management information
- (g) Workshop pay roll including incentive payment.

6.2.10.3 The system has, however, various limitations. It is not an on-line system and there is no provision of networking. Moreover, the machine capacity is also a limiting factor in extending the areas of application. Replacement of these systems has been planned during the terminal year of 1996-97 and may spill over to IX Plan.

6.2.11 Computerisation of Track Management System

6.2.11.1 For the purpose of track maintenance computers have been deployed in two areas, namely track monitoring and track management system.

6.2.11.2 Track monitoring is being carried out with the help of track recording cars, which are fitted with computers. Each Zonal Railway headquarters has also got computers for the purpose of track monitoring and track modernisation. The salient features of the track of the Railways have been brought out on the computer at the Zonal Railway Headquarters. The RDSO sends computerised outputs of track recording cars to the Zonal Railways every month. Also, track monitoring carried out by the divisional offices with the help of Oscillation Output of the Oscillation Machines (OMs) is also processed in the computers in the Zonal Railway Headquarters.

6.2.11.3 For the track management system, 27 Divisions were identified to be taken up in the first phase. Till now, the computer based Track Management System, has been implemented on one sub-division of the Zonal Railway and one complete

division i.e. Allahabad on Northern Railway. In the Track Management System, need based maintenance is carried out with the help of job cards, which are produced through the computers installed at AENs' offices on the concerned sub-divisions

6.2.11.4 Track Management System has been developed for implementation using relational data base for data storage and organisation. Data communication is through the available telephone links and modems.

6.2.11.5 The decision support system caters for track structure and its performance with reference to traffic carried,

- On line status reports of material inputs.
- On line status reports of equipment.
- On line status reports of inputs

6.2.11.6 A complete data base of the track structure and its condition is a prerequisite. This database as designed gets updated through inspection and monitoring reports for the condition of assets while the work and project reporting updates the inventory. Standard formats have been evolved for capturing and preparing the database.

6.2.12 Computerisation in Stores Department

6.2.12.1 Indian Railways have a large stores organisation to cater to planning, procurement, inspection, stocking and distribution of stores required by the Railways for their maintenance and production activities. Material worth about Rs.6600 crores is purchased annually for various maintenance and production activities

6.2.12.2 Computerisation of inventory management on the IR started in the mid sixties on the 1402 IBM computer provided in 9 Zonal Railways and PUs. Later, in early eighties, these computers were replaced by 3rd generation computers. These systems however did not cover purchase office management.

6.2.12.3 Apart from the inventory accounting applications running on main frame computer of the Zonal Railways, railway introduced mini computer in 1986-87 in 18 major depots as a first phase, to computerise ledger receipt and certain other functions of the Stores Depot operations. These computer systems were procured from M/s HCL, WIPRO, DCM, DSI, NELCO and installed in 18 depots.

6.2.12.4 With the existing computerisation of depots there has been substantial savings in

the capital funds invested in inventories as inventory Turn Over Ratio (TOR) has dropped from 33% in 1985-86 to the current level of around 19% in 1994-95. In one year i.e. 1993-94 alone there was a saving of Rs.233 crores under the plan head "Inventory" and this saving further went up to Rs.508 crores with a TOR of 19% in 1994-95. If this TOR is maintained at this level in the ensuing year, it will mean a perennial saving in capital funds invested in Inventories. However, to sustain this level of performance vigorous efforts will be needed for which computerisation will play very crucial role.

6.2.13 Computerisation of Manpower Planning

6.2.13.1 Software has been developed and is being used for monitoring the staff strength of all the Railways, department-wise; keeping the history details of officers who have been trained abroad; keeping a track of the various court cases; and for developing training modules for different categories of staff of all departments.

6.2.13.2 Manpower Planning Information System was introduced in all the Zonal Railways as an outcome of Manpower Planning Report of M/s RITES. The system will immensely help the railways in planning their manpower requirements and monitoring changes in staff profile. The software provided by Lower Parel W/shop, Central Railway to all the Zonal Railways relate to entering of the details of the staff regarding their service particulars, career profile and other relevant facts in PCs.

6.2.14 Computerisation in Research & Design Standardisation Organisation (RDSO)

6.2.14.1 RDSO is handling a large volume of data, analysing it and using it in design models for development of new designs, modification of existing components for improving reliability and improving safety of the assets of the Railways.

6.2.14.2 At present, RDSO has one Main Frame (SGI) which was commissioned in 1993. This main frame has already become obsolete as more powerful computers with better software are now available which help in fast and optimal designing.

6.2.15 Computerisation in Claims Offices

A pilot project was started at Gorakhpur. Thereafter the claims office at New Delhi was computerised with a system developed by the CRIS for processing of claims cases. Work is on hand at Calcutta and it is proposed to extend this to Mumbai (Central Railway) by 31.3.97.

6.2.16 Coaching Cabinet Application

The Zonal Railways have made an attempt at computerising coaching operations with special emphasis on time-tabling and coaching stock management. The initial software for this was developed by the CRIS.

6.2.17 Computerisation in Railway Hospitals

Selected facets of hospital management have been computerised in three railway hospitals.

6.2.18 Office Automation

6.2.18.1 On the IR the purpose of office automation has been the adoption of certain tools for enhancing productivity and reducing manual labour through technology. Computers are playing a major role in office automation and towards achieving the goal of a paper-less office (in the areas where it is feasible) by storing data, quick retrieval of desired data and sharing and handling of the information. This results in eliminating computational errors and provides timely statements, speedier response as well as improvement in the quality of book keeping, accuracy, monitoring and decision making.

6.2.18.2 GMs have been empowered to approve purchase of personal computers costing upto Rs. 1.5 lakhs. This has resulted in availability of PCs in sufficient number over the Railways. They are extensively used for word processing. However, there is a need for increasing their utilisation by introducing additional applications and providing exposure and training to more officers and staff. With the spread of PCs and the wide variety of user- friendly software now available, the use of PCs will gradually become more extensive thereby enabling maximised realisation of their potential.

6.3 STRATEGY FOR THE IXTH PLAN

6.3.1 Going by the benefits of computerisation in the form of cost reduction (e.g. inventory management), improved and upgraded service to the rail users (e.g. Passenger Reservation System) increased productivity (e.g. workshop), reduced drudgery, monotony and more congenial conditions of work etc., the Indian Railways attach considerable importance to the need for the expansion of computerisation.

6.3.1.2 During the IX Plan, it is proposed that the IR's computerisation and information technology is so designed and developed that not only is connectivity established with the Zonal and Divisional Computer Systems but is also extended to the other systems like PUs, PRS, FOIS, Training Institutes, RDSO, LRDSS, etc., in a need

based manner. This important need for ensuring compatibility or integration as may be required, of not only intra-system computers but also among different computer systems would be an important goal to be pursued. Besides, a focal point would be set up on each Zonal Railway for scrutinising proposals for the purchase of PCs or installation of LANs etc. from the points of view of justification and utilisation and that of co-ordinated approach. As time passes there will be a need for the Railways to increasingly adopt and proliferate the use of such technologies in a planned, co-ordinated and, where feasible, integrated manner keeping cost-effectiveness as well as quality of performance in view. The extremes of information overload, low utilisation and low levels of cost effectiveness will have to be scrupulously avoided.

6.3.2 Passenger Reservation System (PRS)

6.3.2.1 Further expansion of PRS facilities will depend on the consolidation of the proliferation done so far, and provision of proper and satisfactory maintenance arrangements to cover all the PRS locations which is a crucial requirement.

6.3.2.2 In 1996-97 and the subsequent years of the IX Plan, it is proposed to provide these facilities at locations where the existing facilities needs to be expanded or strengthened to cater to the increasing workload, set up some satellite locations in the major and metropolitan towns in order to decongest the main reservation offices, and provide PRS facilities at about 50 additional stations depending upon justification. It is also proposed to provide PRS facilities at all the non rail-head state capitals. Abstract cost has been estimated to be about Rs.26 crore.

6.3.3 Interactive Voice Response System

6.3.3.1 This system has given considerable satisfaction to the intending passengers and it is proposed to progressively provide this at an increasing number of locations over the Indian Railways. Abstract cost has been estimated to be about Rs.3 crore.

6.3.4 Computerised issue of Unreserved Tickets

6.3.4.1 Keeping in view the success of the work of issuing computerised season tickets in the Mumbai suburban area, the feasibility of expanding this facility at the other metropolitan towns will be explored. Further, the issue of unreserved tickets using the mainframe approach will also be examined. Abstract cost has been estimated to be about Rs.2 crore.

6.3.5 FOIS Project

- 6.3.5.1 In view of the problems encountered in making available the system which is acceptable to the user, and the fact that several sub-systems/modules are yet to be developed and integrated with the other sub-systems/modules of the FOIS, it would evidently take considerable time for the FOIS as a whole to sub-serve the purpose for which it was conceived. The attainment of this objective would be a major aim of the IR during the IX Plan period. While time over-run has already taken place in the execution of this project on the Northern Railway, it would be the endeavour to complete the project on the Northern Railway within the sanctioned amount (i.e. Rs.267.2 crores) and depending on the successful functioning of the scheme on that Railway, extend its implementation to the other Zonal Railways in a phased manner. Considering that it would take 2 to 2 1/2 years to implement the project on the Northern Railway (balance cost being about Rs. 107 crores) its extensions to two more Railways (i.e. Eastern & South Eastern Railways) to a large extent would cost on abstract basis about Rs.200 crores. The total expenditure during the IX Plan period could thus be expected to be about Rs. 300 crore.

6.3.6 Long Range Decision Support System (LRDSS)

- 6.3.6.1 The LRDSS Project design envisages 6 modules, each designed for specific areas like market analysis, demand forecasting, cost benefit analysis, and once completed, will enable the Railways to look at the expected traffic demand between a set of origin destination pairs and the potential bottlenecks on its facilities like specific sections, yards, terminals, etc. which are likely to appear with the forecast traffic. The LRDSS model would also provide alternative solutions - including low cost options - and be able to prioritise these, based on such criteria as cost benefit ratio, resource requirement etc.
- 6.3.6.2 LRDSS will also be used by the Zonal Railways for evaluating various alternative options like re-routing of traffic, etc. In the next five years, the LRDSS model would be set up in various Zonal Railways.
- 6.3.6.3 The LRDSS would also be dovetailed with the FOIS and the Zonal EDP Centres, through a computer to computer connectivity for updating the traffic database and origin destination flows in future.
- 6.3.6.4 The LRDSS can be used to disseminate the knowledge gained in this simulation model to the Zonal and even Divisional level, so that field units are better equipped to evaluate alternative strategies at the field level. This would involve setting up a 486 DX on each of the units and training staff for this purpose.

6 3 6.5 For setting up the LRDSS at the Traffic Planning Cells at the Zonal Railway level and upgradation of the existing hardware at the Railway Board as also establishing connectivity with the FOIS and Zonal Railways the total hardware and software development cost for these additions would approximate Rs.2 crore.

6.3 7 Zonal Railways Computerisation

6 3.7.1 All the systems proposed to be developed/re- developed will be integrated not only between the different application areas but to the extent feasible and warranted with the Divisional, Workshop and similar other computer systems provided or to be provided on a Zonal Railway. Suitable interfaces will also exist with IR's FOIS, LRDSS and computerised Passenger Reservation System. This integration will generally be aimed at - providing consistency and integrity of the databases, avoiding duplication of data entry from the same data source and providing a wider area for information analysis and correlation.

6 3 7 2 With a view to providing timely and accurate data input and assist the staff in efficiently and effectively carrying out their jobs, it is proposed to introduce new and comprehensive on-line systems in the following areas -

- (i) Materials and Inventory Management covering purchase, receipts and issues, depot accountal, purchase suspense, scrap disposal, vendor empanelment and evaluation, materials budgeting and forecasting, with a link to stores accountal and bill passing in the Financial Management System, etc**
- (ii) Financial Management System comprising of Budget preparation and monitoring, expenditure accountal including bill passing and cheque preparation, stores accountal, cash office accountal, etc**
- (iii) Integrated Payroll System comprising Provident Fund (Credits, recoveries, advances & ledger), Advances (with issue of sanctions on the system and automatic recoveries), leave (with sanctions on the system), electric and water billing, attendance, drawl of arrears and settlement dues, etc**
- (iv) Personnel Management System covering maintenance of service sheet, personal file, bio-data, training, transfer & promotions, scale check, recruitment, duty assignment and overtime working, etc**

The cost of this is expected to be about Rs 9 crore.

6.3.8 Divisional Computerisation

- 6.3.8.1 In the IX Plan period computerisation will be extended to cover the balance 20 Divisions on the IR (Rs. 7.0 crores) thereby covering all the Divisions. Initially, the software already running on 18 Divisions will be ported after necessary conversion onto the new hardware platform. Thereafter, in the IX Plan period Systems Development Groups will be set up to prepare and port new software which will be standardised for the Indian Railways to the extent it is considered essential. At the same time, flexibility will exist for developing and running applications to meet the specific needs of individual divisions to the extent warranted. Abstract cost Rs. 10 crore.

6.3.9 Production Units Computerisation

- 6.3.9.1 With the manufacture of modern locomotives and coaches in some PUs it would be essential that the existing systems are replaced by modern and more efficient systems. Funds to the tune of Rs. 1 crore each were sanctioned for some of the PUs like DLW, CLW, ICF, etc. in the Pink Book 1995-96. The expenditure involved in the replacement of the existing systems by new ones would obviously be more and hence much more funds would be needed.
- 6.3.9.2 During the first phase, the effort will be to supply and install appropriate computer hardware and system software and ancillary equipment in Zonal Railways and Production Units replacing the whole system and porting and implementing the existing applications. In the subsequent phase, it is planned to re-develop all the existing applications in on-line environment depending upon the application requirements. This will be followed by the development of software for new application areas. Necessary integration will be aimed at while developing/redeveloping the systems.
- 6.3.9.3 With a view to providing timely and accurate data input and assist the staff in efficiently and effectively carrying out their jobs, it is proposed to introduce new and comprehensive on-line systems in following areas.-
- (i) Production planning and control including master production scheduling, forecasting, material requirement planning, capacity planning, generation of job cards, maintenance of bill of material and routing details, progress monitoring alternative process routing and costing.
 - (ii) Materials and inventory management.
 - (iii) Financial Management System.
 - (iv) Integrated Payroll System.
 - (v) Personnel Management System.

The coverage of item (ii) to (iv) above will be similar to that of the Zonal System. Abstract cost is expected to be about Rs.4 crore.

6.3.10 Computerisation in Mechanical Workshops

6.3.10.1 It is planned to extend the computerisation coverage to all major workshops (31) with provision of on-line processing and networking so as to improve the major areas of workshop activities such as production planning and control, material planning and procurement, rolling stock maintenance management, machine and plant maintenance and management information system for getting optimum productivity in workshops.

6.3.10.2 The use of computers is expected to cover all important activities by developing standard software packages to facilitate networking of maintenance sheds, depots and workshops with a view to deriving maximum benefits of the advancements in information technology. Computers can be used with considerable benefits in the following areas:

- (a) In field units and headquarters for rolling stock and motive power management.
- (b) In repair workshops, maintenance sheds and depots to support maintenance decisions.
- (c) In workshops to assist in production control.
- (d) In all units for management information tasks.

Abstract cost is expected to be about Rs.9.25 crore.

6.3.11 Computerisation in Signalling and Telecommunication (S&T)

6.3.11.1 Major modernisation schemes are being introduced in both signalling and telecommunication (S&T). To enable effective communication at various levels of administration and to ensure quick and efficient exchange of information and to keep pace with fast changing technology, the following computerisation schemes are envisaged in the IX Plan period :-

6.3.11.2 S&T workshops computerisation (production planning, inventory control, costing, accounting, personnel management, information system, CAD/CAM) - 10 no. @ Rs.10 lakh = Rs.1 crore.

6.3.11.3 Computerisation of S&T HQ office (project planning & monitoring, database on equipment, specification, annual procurement, signalling infrastructure on Railways,

telecom links, manpower on Railways, CAD, reliability analysis, inventory management for critical items) - 9 no @ Rs. 10 lakh = Rs 0.90 crores. This would be linked to the Zonal EDP Centre for undertaking the above work . At the HQ office attempts will be made to ensure integration on the Zonal System to the extent feasible.

6.3.11.4 Computerisation of divisional set-up, reliability analysis, CAD) - 20 no. @ Rs. 5 lakh = Rs. 1 crores.

6.3.11.5 Computerisation in training institutes - IRISSET (imparting training on computers with multi-media interactive tutorials, CAD & CAM training, network management training, data communication) 1 no. - @ Rs. 60 lakh. All the above systems would be linked on Wide Area Network (WAN) to have easy accessibility of data and MIS and also linked to other important locations like RDSO, Railway Board, IRISSET, CORE, etc. This plan will be integrated in the plans for Zonal and Divisional computerisation for integrated expansion.

6.3.12 Computerisation in Electric Loco Sheds and Other Installations

The requirement of computers during IX Plan and the proposed outlay is given below:

6.3.12.1	<u>Electric Loco Sheds</u>	Outlay (Rs. in crore)
(i)	By the end of IX Plan 30 electric loco sheds would be functioning. Computers at the rate of Rs. 8 lakh (cost of hardware, software & hand held terminals)/ shed are necessary	2.40
(ii)	By the end of IX Plan there will be 8 workshops carrying out POH of electric locos and 2 shops doing the rewinding work of traction motors. Computers at the rate of Rs. 10 lakh (cost of hardware, software & hand held terminals) per shop are required.	1.00
(iii)	Provision of computers at Zonal Railway Headquarters) with the facilities of CAD/ CAM (total 9 Zonal Headquarters) @ Rs. 10 lakh per Zonal Headquarters.	0.90

6.3.12.2	<u>Traction Distribution</u> During the IX Plan computers will be required at 50 major OHE/PSI depots at a cost of Rs.5.00 lakh (cost of hardware and software) for each depot.	2.50
6.3.12.3	<u>Train lighting and air-conditioning</u> By the end of the IX Plan computers are to be provided in 35 major train lighting/ AC depots at a cost of Rs.4.00 lakh (cost of hardware and software)/depot.	1.40
6.3.12.4	<u>EMU Car Sheds/Workshops</u> During the IX Five Year Plan computers would be provided at 16 EMU car sheds/ workshops at a cost of Rs. 10 lakh (cost of hardware, software including CAD/CAM and hand held terminals) each.	1.60
Overall requirement of funds for the computerisation		9.80

6.3.13 Computerisation of Track and Bridging Management System

- 6.3.13.1 In the IX Plan it has been envisaged to extend the Track Management System (TMS) to 27 identified Divisions. TMS helps in preparing perspective plans for renewals, requirement of material and fund allocation well in advance upto a decade.
- 6.3.13.2 It is proposed to set up a computerised Bridge Management System. All basic data of bridges, inspection results, history of maintenance, repairs, investment made etc. shall be computerised. It will help in more rational and objective planning of bridge rehabilitation/maintenance/rebuilding programme as also monitoring of condition of bridges.
- 6.3.13.3 Software has been developed by RDSO and is being validated. It is proposed to use for this purpose the network to be developed for Track Management System. The exact needs would have to be worked out. It may not lead to reduction of manpower but could give benefit of more rational and economical use of available resources. All

sub-divisions and divisions of IR would have to be covered in the long run just as in case of TMS. The cost of the above is expected to be about Rs. 15 cr.

6.3.14 Computerisation of Stores Department

6.3.14.1 In the IX Plan it is proposed to computerise 27 major stores depots (Rs. 4.86 crores). It is also proposed to computerise 8 purchase offices at a cost of 3.60 crores. A synergy will be brought about between stores depots computerisation and purchase office computerisation.

6.3.14.2 This plan will be integrated in the overall plan for integrated expansion of computerisation on the IR, keeping in view the systems at the Zonal EDP Centres and PUs.

6.3.15 Computerisation of Manpower Planning

6.3.15. During the IX Plan, it is proposed to procure appropriate hardware and develop software for continued data updating, processing the desired statements for comparing the staff productivity on different railways and various measures required for training, re-deployment, etc. Abstract cost Rs. 5 cr.

6.3.15.2 Availability of good software and capable trained personnel are essential for obtaining full benefits out of investments made in computerisation. There is an urgent need to provide training at all levels in field units, headquarters offices and Railway Board to make sufficient number of trained and competent personnel available who are capable of handling software both packaged and special purpose so that full advantage of computer facilities provided can be achieved.

6.3.16 Computerisation in RDSO

6.3.16.1 During IX Plan the following steps are proposed for upgrading information technology :

- (i) Replacement of main frame in the beginning of the IX Five Year Plan with AO size colour plotting facilities and acquisition of latest software systems.
- (ii) Lap-tops will be used to provide independent computing facilities to the field officers while conducting field trials, to capture field data. Education Research Net connections through main frame shall also be provided.

(iii) Telecommunication will be strengthened to provide necessary support.

6.3.16.2 Zonal Railway Headquarters, Research wing of Production Units, Training Institutes of IR and major maintenance depots shall also be networked. Abstract cost is expected to be about Rs. 1 cr.

6.3.17 Computerisation for Commercial Applications.

6.3.17.1 The matter of computerisation of parcel handling is under active consideration. It is also proposed to computerise handling of claims cases at additional Zonal and Divisional HQ deriving maximum benefit from the new Systems under installation as well as development of new software making use of the vast professional expertise now available. Abstract cost is expected to be about Rs. 10 cr.

6.3.18 Electronic Mail

6.3.18.1 Communication through computers is economical and faster. Computerisation of units need to take into account developing technologies in this field so that the Railways can obtain similar benefits like many private companies do.

6.3.18.2 Electronic Mail facility for linking important junctions, yards, inter-change points, divisional headquarters, zonal headquarters, production units, workshops, depots, RDSO, CORE, zonal training institutes, technical training institutes, Railway Board, etc. at a cost of about Rs.2 crores is proposed to be provided in the IX Plan period.

6.3.19 Office Automation

During the IX plan, stress will be on the enhancement of the utilisation of PCs and Local Area Networks (LAN) by developing of suitable applications, adding services like E-Mail, providing common servers for common/corporate databases and corporate wide networks to cater to all applications and MIS.

Abstract cost is expected to be about Rs.3 crore.

6.3.20 Requirement of Funds in the IX Plan

Summary of total expenditure for the facilities proposed is as under:

	Computerisation	(Rs. in Crores)
1.	PRS	61.00
2.	FOIS	295.00
3.	LRDSS	2.00
4.	Zonal Computer Centres	9.00
5.	Production Units	4.00
6.	Divisional EDP Centres	10.00
7.	Signalling and Telecommunication	3.50
8.	Electrical	9.80
9.	Mechanical	9.25
10.	Civil Engineering	15.00
11.	Stores	4.86
12.	Training and Manpower Planning	5.00
13.	Interactive Voice Response System	3.00
14.	Computerisation of Unreserved Ticketing	2.00
15.	Other Commercial Applications	10.00
16.	RDSO	1.00
17.	Electronic Mail	2.00
18.	Office Automation	3.00
Total		Rs. 449.41 crore

6.4.0 TELECOMMUNICATIONS IN THE IX PLAN

6.4.1 Optical Fibre Communication System (OFC)

Optic Fibre Communication System is state-of-the-art technology for long-haul as well as short-haul communication requirements. The system not only offers very large communication capacity but is also immune to noise and interferences etc. With the economic liberalisation policy of the Government of India, the OFC systems have become cost effective and, therefore, it is proposed to go in for this system to meet the control communication requirements as well as long distance administrative circuit requirements of the Railways along the entire broad gauge of Indian Railways. Total broad gauge route kms is about 40,000 kms out of which the work of provision of OFC is already completed/sanctions for 2,000 kms. The cost for provision of OFC system is about RS.7.5 lakh per km. The entire cost to cover remaining portion of broad gauge route would be Rs.2,850 crores.

6.4.2 Digital Microwave Links

The existing analog MW links which were commissioned during the 1970s have outlived their useful life and are required to be replaced by state-of-the art digital MW

links. The MW links are essentially required for providing back-up to control communication as well as to provide long distance administrative circuits. Since it is proposed to have the OFC system both for control communication and long-distance communication, the digital MW links will be needed as a back-up to the OFC system. It has been observed that if a cable gets cut, it takes about 24 hours for identification and rectification and, therefore, a reliable back-up through digital microwave links is essential. Already, about 5,000 route kms of digital MW links have been commissioned/sanctioned. To have a complete back-up, OFC links along the broad gauge routes, about 35,000 route kms. of MW links have to be provided. The average cost of provision of digital MW system would be of the order of Rs.4.5 lakh per km. and thus total expenditure would be Rs.1750 crores.

6 4 3 Very Small Aperture Terminals (VSAT)

It is also proposed to induct VSAT technology in Indian Railways to cover the need of data/voice communication at remote locations which are not covered through conventional OFC/MW links. VSATs shall also be useful for establishing quick communication in case of accidents, natural calamities, etc. It is proposed too install one HUB with a capacity of about 1,500 VSAT terminals to cater to this requirement. The cost of HUB and VSAT terminals would be around Rs.100 crores.

6 4 4 Global Positioning Systems (GPS)

A lot of developments have taken place in the global positioning System technology. These systems are now capable of locating vehicles with the accuracy of a few metres. This could be very useful, particularly in locating of locomotives/containers etc. in conjunction with VSATs and mobile train radios. The cost of GPS System to cover all locomotives would be around Rs.100 crores.

6.4.5 Mobile Radio Train Communication System

In order to improve safety, it is proposed to provide Mobile Train Radio Communication System on all important busy sections. To cover quadrilateral and diagonals during the IX Plan, an expenditure of about Rs.600 crores would be required @Rs.5 lakh per km. for 12,000 route kms.

6.4.6 Digital Electronic Exchanges

To meet the communication requirements at important locations, the old and worn-out analog strowger telephone exchanges are proposed to be replaced by state-of-the-art Digital Electronic Exchanges. About 40,000 telephone lines shall become due for replacement during the IX Plan and considering the additional capacity requirement of about 50 per cent, 60,000 telephone lines shall be required to be replaced by digital lines during the IX Plan. The cost of such replacement @ 10,000 per line including cost of line plant would be about Rs.60 crores.

6.4.7 Universal Emergency Communication System

The provision of communication between driver, guard and the nearest Station Master is considered extremely essential and therefore works have been sanctioned on out of turn basis on 7 zonal Railways at a cost of Rs.62 crores during 1995-96. It is now proposed to cover the remaining 50,000 route kms. The total expenditure at a cost of Rs.60,000 per km. would be around Rs.300 crores.

6.4.8 Mobile Communication System

The Mechanical and Electrical Directorates have projected the requirement of mobile links in loco sheds carriages and wagon depots, EMU car sheds and wagon examination points in the yard etc. A total of 192 locations have been identified for the purpose. It is proposed to provide mobile radio communication links in about 200 important electric/diesel loco sheds, EMU sheds, carriage and wagon depots and other important yards etc. during the IX Plan period . The cost of such mobile links would be about Rs.50 lakh at each location and, therefore, total expenditure would be Rs.100 crores.

6.4.9 Passenger Amenities

Passenger amenities like micro processor based public address system, Electronic Train Indication Boards, Auto Answering Machines for train enquiries, etc are proposed to provided at 500 stations in the IX Plan period. The total cost Rs.10 lakhs per station would be around Rs. 50 crores.

6.4.10 Other Telecom Equipment

Besides the above, other telecommunications equipments such as walkie-talkie sets, fax machines, telephone instruments, control phones, telecom cables, Inmarsat terminals, intercoms etc. shall also be required by the Railways. The total cost may be taken as Rs.50 crores in the IX Plan towards these requirements.

CHAPTER VII

OTHER TRAFFIC FACILITY WORKS, GAUGE CONVERSION, DOUBLING AND NEW LINES

7.1 OTHER TRAFFIC FACILITY WORKS

7.1.1 INTRODUCTION

Traffic facility works comprise (i) doublings, (ii) other traffic facility works for freight and passenger traffic and transshipment points, (iii) terminal development works for freight and passenger traffic and (iv) gauge conversions.

Adequate line and terminal capacities will require to be generated to deal effectively with the traffic potential as it grows, to ensure that the system continues to provide the required infrastructural support for a rapidly-growing economy. With the intensive utilisation of track and other fixed structures, need for traffic blocks for their maintenance and renewal by machines increases in proportion. Traffic blocks of 4 hour duration at a stretch are essentially required for this purpose. Additional line capacity has to be generated for granting such traffic blocks and at the same time for carrying the increasing level of traffic. In other words, the planning of traffic line capacity in such sections should provide for 4 hour maintenance block in one or more instalments.

7.2 VIII PLAN REVIEW

In the VIII Plan, Rs.4,500 crores were initially provided for all traffic facility works under items (i) to (iv) above. In the mid-term review, the outlay on Gauge conversion was increased from Rs.3600 crores planned originally to Rs.4,745 crores with the approval of the Planning Commission. The year-wise details are as under:

	Gauge Conversion		Doubling		Other traffic facility works
	Outlay (Rs. in crore)	Length commissioned (Kms.)	Outlay (Rs. in crore)	Length commissioned (Kms.)	Outlay (Rs. in Crore)
92-93	689	1351.00	213	201.76	112
93-94	931	1619.00	232	295.00	121
94-95	1150	1805.00	206	142.00	72
95-96	1117	758.00	218	200.00	85
96-97 (Proposed)	1000	1655 target	300	302.00	140

7.3 GAUGE CONVERSION

7.3.1 Criteria adopted for conversion of MG to BG are broadly the following :-

- (i) To develop alternative routes and links, to generate addl. carrying capacity.
- (ii) Lines required for urgent strategic/operational considerations.
- (iii) When transshipment at change of gauge points becomes uneconomical or a bottleneck in coping with the anticipated growth of traffic.
- (iv) When there is need to provide speedy and uninterrupted means of communication between areas which have potential for growth.

7.3.2 Gauge conversion programme aims at generation of substantial transport capacity in the country by opening up alternative routes to ease the congestion on the present Broad Gauge trunk routes which are working to saturation. Gauge conversion of most of the routes will have a large impact on the economic growth of the country and provide operational advantage to the Railways

7.3.3 It has been decided to keep the cost low by providing the barest minimum facilities for functional arrangements, platforms, station buildings, etc. in the initial stage. In order to economize on time and money, no need had been felt to conduct detailed engineering surveys except on sections where large scale re-alignment and diversion of traffic would be necessary owing to long heavy gradients or pre-ponderance of sharp curves.

7.3.4 The conversions will result in better utilisation of BG rolling stock by improving turn-round due to elimination of transshipment time losses and availability of alternative, and in some cases, even shorter routes. BG rolling stock will be suitably augmented by using the funds earlier earmarked for procurement of MG rolling stock.

7.3.5 ON-GOING PROJECTS AT THE END OF THE VIII PLAN

Particulars of the gauge conversion projects which are in progress at the commencement of the IX Plan are given at Annexure 7/1. The throw-forward of these projects which will spill over into the IX Plan would be around Rs.6510 crores. Of this Rs. 4800 crore are proposed to be provided in the IX Plan and the balance in X Plan.

7.3.6 PROPOSED NEW STARTS IN THE IX PLAN

The details of the sections completed year-wise during the first 4 years of the VIII five year plan and those planned for the 5th year is placed at Annexure 7/2. Based on operational priorities and strategic requirements, the routes listed in Annexure 7/3

have been identified for being taken up as new works in the 9th five year plan with priorities as indicated against each. As regards the projects to be taken up on Strategic considerations, Planning Commission should provide budgetary support and dividend exemption.

7.3.7 OUTLAY REQUIRED IN THE IX PLAN

The total outlay planned for gauge conversion in the IX Plan would be Rs. 4800 crores. The amount of budgetary support required for projects started prior to 1.4.92 and those required on strategic considerations as well as all NF Railway projects has been worked out in **Annexure 7/4**. It totals upto Rs. 1070 cr in the IX Plan period.

7.4 DOUBLING

7.4.1 OBJECTIVES

- (i) To progress and complete the doubling of the quadrilateral and diagonal trunk routes in the IX Plan.
- (ii) To undertake the construction of third and/or fourth lines on certain very busy routes in order to develop additional line capacities to handle the anticipated traffic on those routes in the IX Plan.
- (iii) To undertake doubling on other important routes where the existing single line has reached its saturation limit and further increase in traffic on such routes is anticipated in the IX Plan

Some of the doubling proposals as well as proposals for third and/or fourth lines may be on a new alignment which for all practical proposes would be a new line. The advantages to be gained in taking up the 2nd, 3rd and 4th lines on a new alignment would be development of alternative routes to existing busy and congested routes, economic development of new areas, flexibility in operations during floods, accidents and agitations.

7.4.2 WORKS-IN-PROGRESS AND NEW WORKS

In the first 4 years of the VIII Plan 838 kms of doublings were completed and another 302 kms have been targeted in the last year of the plan making a total of 1140 kms. The spill over into the IX Plan will be Rs. 1575 crores.

- 7.4.3** The outlay proposed for doublings in the IX Plan will be Rs. 2500 crores - Rs. 1500 crores for on-going works excluding frozen projects and Rs. 1000 crores for new

starts. In all about 2000 km of doublings are proposed to be commissioned in the IX Plan. Full doubling of the quadrilateral and diagonal trunk routes will be accomplished in IX Plan

Priority will also be given to sections having 100% capacity utilisation, considering the commodity-wise traffic growth projections.

7.5 OTHER TRAFFIC FACILITY WORKS INCLUDING TERMINAL DEVELOPMENT WORKS

7.5 1 OBJECTIVES

- (i) To augment the section capacity on important routes to meet the needs of the traffic which is anticipated to materialize on those routes in the IX Plan
- (ii) To improve signalling and block working to enable handling of increased throughput on certain sections
- (iii) To create facilities for running of longer passenger trains
- (iv) To provide bye-passes and fly-overs at identified bottleneck points to enable attainment of higher average speeds of freight trains.
- (v) To develop integrated freight terminals for speeding up wagon dealing at nodal points
- (vi) To develop new coaching terminals to handle the anticipated increase in passenger traffic and passenger trains
- (vii) To identify existing / likely bottlenecks/constraints (approaches to major yards, by pass lines, single line bridges) in particular on the quadrilateral, diagonals and other densely worked routes, suggest works to ease them and estimate requirement of funds in the IX Plan. The needs of passenger traffic will be explicitly taken into account.

7.5 2 WORKS-IN-PROGRESS

There are a large number of other traffic facility works including terminal development works of varying magnitude in progress. The balance requirement of funds for completion of on-going projects after 1996-97 will be Rs 466 crs

7.5.3 NEW STARTS IN IX PLAN

7.5.3.1 The important traffic facility works which have been identified are listed below:

1. WORKS REQUIRED TO EASE EXISTING/LIKELY BOTTLE-NECKS/ CONSTRAINS ON APPROACHES OF MAJOR YARDS ON THE QUADRILATERAL AND DENSELY WORKED ROUTES

- (i) grade separation at the following locations by provision of fly-over -
 - (a) Khurja - For movement towards Hapur
 - (b) Mathura - For movement towards Alwar
 - (c) Virar - For movement towards Diva
 - (d) Rampura Cabin - For movement from Patel Nagar to Naya Azadpur
 - (e) Sirhind - For movement to Nangal dam side
- (ii) Remodeling of major junction stations such as Bhusawal, Itarsi, Nagpur, etc
- (iii) Provision of bye-pass at Merta Road, Delhi Cantt, Muzaffarpur, Bhatni, Sagauli

2. MODIFICATION/AUGMENTATION OF FREIGHT TERMINALS

Development of freight terminal at Sankrail, Dankuni, Korakkapet, Tughlakabad, Jamuna Bridge In addition, block rake handling facility has to be provided at the stations given in the **Annexure 7/5**

3. MODIFICATION/AUGMENTATION OF FACILITIES AT PASSENGER TERMINALS

Development of the following coaching terminals

Delhi, New Delhi, Delhi Sarai Rohella, Lucknow, Gorakhpur, Howrah, Sealdah, Patna, Shalimar, Madras, Bombay VT, Kurla, Manglore, Trivendrum, Bangalore
A detailed list is given in the **Annexure-7/6**

4. IDENTIFICATION OF ROUTES/SECTIONS FOR RUNNING LONGER TRAINS

New Delhi-Madras, New Delhi-Calcutta, New Delhi-Bombay, New Delhi-Gorakhpur-Barauni, New Delhi-Lucknow and Moradabad have been identified for running of 24/26 coach length long passenger trains A list of stations requiring extension of platforms is enclosed as **Annexure-7/7**

5. DEVELOPMENT OF NODAL TERMINALS

Nodal terminals are proposed to be developed every 150 kms To begin with, 5 nodal terminals will be developed on each railway. Each nodal terminal will have warehouse and matching handling facilities It is proposed to hand over these terminals to private operators and CONCOR

7.5 4 FUNDS REQUIREMENT IN THE IXTH PLAN

The outlay proposed for other traffic facility works excluding terminal development works in IX Plan will be Rs. 1300 crores.

7.5.7 OUTLOOK FOR IX PLAN

At the end of the IX plan, it is projected that about 12,500 kms of the lines requiring to be converted to BG as per the criteria adopted, would be converted, the remaining lines identified for conversion totaling about 2000 kms. would be taken up in the X Plan. The residual MG lines will be those having light traffic, serving as feeder lines or as local self sufficient networks with suitable facilities at transshipment points. Thereafter, a few Gauge conversion projects which become necessary due to developments in the region served by them and/or operational or strategic considerations, would be considered on merits and inter-se priority with other traffic facility/doubling works.

7.6 NEW LINES

7.6.1 INTRODUCTION

Indian Railways had about 53,500 rkm of rail network at the time of independence. Since then, only about 900 km have been added to the network.

During the last forty years, while the traffic has grown by about 300%, the growth in railway network has been only 16.7%. As about 85% of the existing network was built before independence, its configuration was largely shaped by the strategic and commercial interests of a colonial power. The system had thus certain inherent weaknesses, like absence of inter-connection in Central India. There has been a need to reshape the network to rectify its inherent deficiencies.

7.6.2 NEW LINES - OBJECTIVES

Railways are now following a systems approach to build new lines to enhance the aggregate capacity of the network. This has led to laying down of following objectives for the construction of new lines:

- project-oriented lines to serve new industries or tapping mineral and other resources;
- missing links or complete alternative routes to relieve congestion on existing saturated routes;
- lines required for strategic reasons; and
- lines for establishment of new growth centers or giving access to remote areas.

These objectives are in line with the recommendations made by National Transport Policy Committee and Railway Reforms Committee. It has also been decided to extend the rail transport infrastructure in the NF Region and also to the backward and tribal areas. The new lines being taken up on these considerations have also been included in the plan.

7.6.3 VIII PLAN REVIEW

An outlay of Rs.2900 crores was proposed for new line construction. However since the entire expenditure on new lines is borne out of budgetary support, and adequate resources could not be provided under budgetary support, the plan outlay for new line had to be kept at Rs.950 crore At the beginning of the IX Plan, Railways will have a huge throw-forward of Rs.4410 crore for completing the new line works in progress which total upto 2769 kms. excluding the Udhampur-Srinagar-Baramula line which is to be funded outside the Railways plan.

The Government have decided to accord priority to the development of the rail network in the backward areas as well as in the North East Region. Several New Line Projects have been added to the shelf in 1996-97 and these lines are also required to be progressed and completed in a time bound manner as per the New Initiatives for the NE Region. Earlier an outlay of Rs.1500 crore was projected for new line projects in the IX plan. However, in view of this decision of the Government, this amount will be very inadequate and we will require additional budgetary support, may be project specific for the NE Region projects. The Kumarghat - Agartala new line is to be completed in the IX Plan needing additional project specific budgetary report of Rs 500 crore for this line in the IX Plan. In addition to these, an outlay of Rs.1500 crores will have to be provided for progressing the other lines in the IX Plan.

7.6.4 NEW STARTS IN THE IX PLAN

- 7.6.4.1 New Starts will be of two types, lines recommended by CERN(Committee of Railway Network) for expansion and the lines required on strategic, and operational considerations.
- 7 6.4.2 CERN Committee has already identified the requirement of new lines till the end of the IX plan. These lines cover a total of 2902 kms. The present position in respect of each is as under:

	Section	kms	Position
1	Roha-Mangalore	836	Work will be completed in 1997 Alignment modifies to 760 kms.
2	Devas-Maksi-Indore -Dahod-Godhra	316	Work in progress.
3	Koderma-Manikpur	520	In lieu of this, construction of 3rd line has been taken up. Work on First Phase between Mughalsarai and Sonnagar is in progress.

4	Ballarshah-Bibinagar	290	Survey is in progress.
5	Nadikudi-Venkatgiri	346	-do-
6	Bhildi-Viramgam	145	This work has been sanctioned as a part of Kandla-Bhatinda Gauge conversion project. However, the work is temporarily frozen in view of development of alternative route via Mehsana-Marwar-Jodhpur
7	Jaipur-Phulera parallel BG	55	This work is no longer required due to Gauge conversion of Jaipur Phulera.
8	Rewari-Alwar parallel BG	74	This work is no longer required due to Gauge conversion of Rewari-Alwar
9	Bhimsen-Kanpur	20	In lieu, 3rd line is planned between Panki and Kanpur.
10	Kasganj-Aligarh-Palwal-Rohtak	300	This work between Kasganj and Aligarh would not be necessary in view of the Gauge conversion of Kanpur-Kasganj-Mathura which is planned in the 9th plan period. For Palwal-Rohtak, this is part of the NCR line for which survey is in progress
Total		2902	

7.6.4.3 As regards other lines for which requirement may arise on strategic / operational considerations, during the plan, the projects would be considered for inclusion in the annual plan after conducting due survey, examination of the survey report by the Technical and Economic Dtes. of the Ministry, appraisal by the Planning Commission and approval by the Expanded Board and CCEA as required under the extant procedures, within the outlays approved by the Planning Commission in the Annual Plans, by readjustment of funds and interpolating the priority amongst ongoing projects, on the urgency of the operational strategic requirement.

7 6 5 COST TO BE BORNE BY OTHER AGENCIES

The cost of the project Jogighopa-Guwahati with rail-cum-road bridge across river Brahmaputra is being shared by Railways, Ministry of Surface Transport and the North East Council under the Ministry of Home Affairs. The Bogibheel bridge proposed to be taken up on the river Brahmaputra near Dibrugarh in Assam is also to be taken up on a cost sharing basis. Dallirajahara-Jagdalpur new line also involves cost sharing with Ministry of Steel and M P Govt. The requirement of funds projected above in the 9th plan caters only to the Railway share for such projects.

In the case of Udhampur-Srinagar-Baramulla line, funds are to be provided outside the Railways plan and the requirements of funds for this project have not been included in the above projection of IX Plan funds for new lines.

GAUGE CONVERSION PROJECTS SPILL OVER TO IX PLAN

(Figures in crores)

Work Description	Cost	Outlay Spill 97-98	over to IX Plan
AN DHRA PRADESH			
Guntur-Guntakal and Guntakal -Gooty-Kalluru	452	35	58
Katpadi-Pakala-Tirupati (184 kms)	72	15	51
Mudkhed-Adilabad (162 kms)	110	36	79
Naupada-Gunupur	47	01	46
Secunderabad-Dronachallam & Secunderabad-Bolaram (331 kms)	283	53	5
Solapur(Hotgi)-Gadag (300 kms)	208	31	99
Mudkhed-Secunderabad	235	01	234
Secunderabad-Mudkhed and Janakampet-Bodhan	283	01	283
ASSAM AND N.E. STATES			
New Jalpaiguri-Siliguri-New Bongaigaon	380	20	360
Lumding-Silchar (198 km)	648	34	608
BIHAR			
Hajipur-Bachwara (71.45 km)	54	40	3
Mansi-Saharsa	210	8	194
Narkatiaganj-Valmikinagar	35	25	2
Jaynagar-Darbhanga-Narkatiaganj	233	01	232
Samastipur-Khagaria	70	.01	69
Ranchi-Lohardaga with extension to Tori	147	10	136
GUJARAT			
Surendranagar-Bhavnagar, Dhola-Dhasa- Mahuva with extension to Pipavav(385 kms)	372	01	372
Wankaner-Maliya Miyana (97 kms)	79	.01	79
Gandhidham-Bhuj (58 kms)	42	2	27
Bhildi-Viramgam	155	2	153
Rajkot-Veraval (185 kms)	152	13	81
KARNATAKA			
Arsikere-Hassan-Mangalore	185	24	97
Mysore-Chamarajanagar with extention to Mettupalayam	175	.01	174

KERALA

Quilon-Tirunelveli-Trichendur and Tenkasi-Virdhmnagar	280	.01	279
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MADHYA PRADESH

Jabalpur-Gondia including Balaghat-Katangi	356	1	354
Neemuch-Ratlam (135 km)	116	1	113

MAHARASHTRA

Miraj-Latur (59 kms)	310	20	266
Gondia-Chandafort (242 kms)	215	55	23

ORISSA

Rupsa-Bangriposi (89 kms)	57	3	54
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RAJASTHAN

Viramgam-Jodhpur-BG rail route, Bhildi-Samdari-Luni	185	.001	184
Luni-Marwar(72 kms)	45	30	11
Luni-Jodhpur (28 kms)	32	15	13
Luni-Barmer-Munabad	240	36	203
Sriganganagar-Sarupsar Canal Loop(Phase-I)	47	01	46
Ajmer-Udaipur-Chittaurgarh(300 km)	262	5	256
Phulera-Marwar-Ahmedabad (572 km)	540	28	69

TAMILNADU

Yeshwantpur-Salem (197 kms)	184	17	15
Madras Beach-Tiruchchirappalli	300	138	19
Dindigul-Trichy(93 kms)	80	17.5	52
Tiruchchirappalli-Nagore-Karaikal (200 kms)	139	15.5	30
Villupuram-Pondicherry	30	.01	29

UTTAR PRADESH

Kashipur-Lalkuan	44	3	40
Mathura-Achnera	20	.001	19
Khadda-Gorakhpur	77	4.6	64
Kanpur-Kasganj-Mathura & Kasganj-Bareilly	39	.01	394

TOTAL**Rs. 6510 crores**

**GAUGE CONVERSION WORKS
NEW STARTS PLANNED IN THE IX PLAN PERIOD**

	Kms	Amount required in IX Plan		Priority
Northern Railway				
1	Suratgarh-Hanumangarh canal loop	205	120	I
2	Luni-Munabao on Defence Account.	297	200	II
3	Hissar-Ratangarh-Bikaner (Required on Defence account)	310	210	II
4	Rewari-Sadulpur -do-	141	90	II
NE Railway				
5	Mathura-Kasganj-Kanpur	354	300	I
6	Kasganj-Bareilly-Lalkuan	191	175	I
7	Gonda-Gorakhpur loop	221	180	I
8	Anandnagar-Nautanva	41	30	I
9	Bhojipura-Mailani-Lucknow	211	160	III
10	Pilibhit-Tanakpur	63	40	III
N F Railway				
11	Rangia-Baliapara-Bhalukpong	169	120	III
12	Tezpur-Rangapara North	27	20	III
Southern Railway				
13	Thanjavur-Villupuram via main line	289	200	I
14	Arrakonam-Chengalpattu	63	50	I
15	Villupuram-Pondicherry	38	25	I
16	Quilon-Tirunelveli	183	150	III
SC Railway				
17	Khandwa-Purna	249	200	I
18	Mudkhed-Bolarum	235	180	I
Western Railway				
19	Rewari-Ringus-Phulera-Jaipur	260	200	I
20	Ajmer-Chhitaurgarh-Udaipur	300	260	III
21	Badisadari-Mavali-Marwar (Defence account)	234	180	II
	Total	4081	3090	

Of the Rs. 3090 crore, about Rs.2000 crore are proposed to be spent in the IX Plan and the remaining in the X Plan period.

Annexure - 7/4

**Gauge conversion Works sanctioned prior to 1.4.92 and projects
in the NF Railway, to be funded out of Budgetary support:**

		Kms	Cost Rs. in crs.	Amount required in 9th plan	Remarks
	Northern Railway				
1	Samdari-Bhildi	225	180	0	Frozen. Pre 92 project
2	Luni-Munabao	297	200	200	Defence account.
3	Hissar-Bikaner- Ratangarh	310	210	210	-do-
	N E Railway				
4	Kashipur-Lalkuan	60	45	45	pre 92 project.
	NF Railway				
5	Simalguri-Moranhat	54	35	35	NF Rly. project
6	Mariyani-Furkating loop	89	60	60	-do-
7	Lumding-Silchar	209	500	200	-do-
8	Rangia-Bhalukpong	169	120	120	-do-
9	Tezpur-Rangapara north	27	20	20	-do-
	Western Railway				
10	Bhildi-Mehsana	80	60	0	Frozen. Pre 92 project
11	Barisadri-Mavli-Marwar	234	180	180	Defence account
	Funds required in the IX plan :	1754	1610	1070	

GOODS SHEDS AND FREIGHT TERMINALS

1. KORAKKUPET
2. WHITEFIELD
3. TIRUPPUR
4. VALAPATNAM
5. NAGERCOIL
6. ALWAYE
7. OLLUR
8. TIRUR
9. KUTTIPURAM
10. ANGADIPURAM
11. BARASAT
12. HABRA
13. DHANBAD
14. MALDA
15. COSSIMBAZAR MALANPUR (GWALIOR AREA)
16. SATNA
17. MALKAPUR
18. BURHANPUR
19. HARPALPUR
20. PARASIA
21. CHANDRAPUR
22. IRADATGANJ
23. DHULE
24. KOPARGAON
25. PIPARIYA
26. LONI
27. SANKHRAIL
28. DANKUNI
29. TUGHLAKABAD
30. NANGLOI
31. GURGAON
32. CHEOKI
33. JALLANDHAR
34. CHAKKIBANK
35. JAMMU TAWI
36. BARETA
37. MAUR
38. MORADABAD
39. GAJRAULA
40. SHAKURBASTI
41. HOLAMBI KALAN
42. KUSHMI
43. DEORIA SADAR

COACHING TERMINALS

1. MADRAS CENTRAL
2. MADRAS EGMORE
3. BANGALORE CANTT
4. TRIVENDRUM CENTRAL
5. NAGARCOIL
6. KANYA KUMARI
7. MANGALORE
8. BOMBAY VT
9. PUNE
10. SOLAPUR
11. AGRA
12. NAGPUR
13. KURLA
14. TIRUPATI
15. KACHEGUDA
16. GUWAHATY
17. BHUBANESWAR
18. VISAKHAPATNAM
19. HOWRAH
20. SEALDAH
21. SHALIMAR
22. NEW DELHI
23. DELHI SARAI ROHILLA
24. AMRITSAR
25. HAZARAT NIZAMMUDDIN
26. ANAND VIHAR
27. LUDHIANA
28. GOVINDPURI

24/26-BOGIE PLATFORM

1.	MADRAS CENTRAL	45.	MIRZAPUR
2.	KATPADI	46.	HAPUR
3.	SALEM	47.	GAJRAULI
4.	COIMBTORE	48.	MORADABAD
5.	BANGALORE CANTT	49.	BAREILLY
6.	BANGALORE CITY	50.	HARDOI
7.	HOWRAH	51.	LUCKNOW
8.	BARDHMAN		
9.	DURGAPUR		
10.	ASANSOL		
11.	DHANBAD		
12.	GOMOH		
13.	HAZARIBAG ROAD		
14.	KODERMA		
15.	GAYA		
16.	DELHI-ON-SONE		
17.	SASARAM		
18.	BHABUA ROAD		
19.	MUGHALSARAI		
20.	IGATPURI		
21.	MANMAD		
22.	DAUND		
23.	BHUSAWAL		
24.	BHOPAL		
25.	KHANDWA		
26.	KATNI		
27.	JABALPUR		
28.	SECUNDERABD		
29.	HYDERABAD		
30.	WARANGAL		
31.	DORNAKAL		
32.	MAHBUBABAD		
33.	KHAMMAN		
34.	TENALI		
35.	CHIRALA		
36.	ONGOLE		
37.	NELLOR		
38.	GUDUR		
39.	KHARAGPUR		
40.	KHURJA		
41.	HATHRAS		
42.	SHIKOHABAD		
43.	FIROZABAD		
44.	FATEHPUR		

CHAPTER VIII

TRACK PLAN

8.0 INTRODUCTION

- 8.1.1 Track utilisation has witnessed a phenomenal increase during the last 40 years. Not only has there been quantitative increase but also a qualitative change in the type of loading on the track, speed of the trains etc. Introduction of longer and heavier freight trains with increased trailing loads causes more damage to the track even if the axle load, speed and quantum of traffic remains the same, due to the increased fatigue effect. Similarly, progressive increase in the number and size of diesel and electric locos results in higher braking and tractive forces which induce much higher track stresses.
- 8.1.2 However, with accelerated track renewals, rail fractures which had shown an increasing trend in 1984-85 started to decline during the VII Plan itself and at the beginning of the VIII Plan (1992-93) there were 3710 rail fractures, annually, which has been brought down in 1995-96 to 2531 rail fractures, a reduction of 32% when compared to 1992-93.
- 8.1.3 The beginning of the VII Plan (1985-86) saw a new thrust on clearing the accumulated arrears of track renewals which was made possible by substantial increase in the provision of funds for this purpose. As a result, the arrears of track renewals were brought down from 19,500 km at the beginning of the VII Plan to 12,000 km at the end of the VII Plan. The tempo was continued in the 2 inter-plan years 1990-91 and 1991-92 and the arrears of overdue renewals came down to 9600 km at the beginning of VIII Plan.
- 8.1.4 During the VIII Plan, however, uni-gauge policy was adopted and a length of 6000 kms of MG/NG routes was planned for conversion to BG in the VIII Plan. With this planned conversion it was no longer necessary to undertake renewals on these MG/NG routes. Traffic on the progressively truncated residual MG system was proposed to be maintained in safe running condition mostly with casual renewals only if inescapable. Rails released from primary renewals were proposed to be used for secondary renewals on MG/NG sections as well as sidings and yard lines.
- 8.1.5 The planning of track renewal now being followed is based on the concept of route-wise planning. Complete track renewals on a stretch cover not only the mid-section track but also the track on bridges and upgradation of running loops as

well as turnouts. This would ensure systematic clearance of the arrears of the renewals from the sections. In VIII Plan, it was contemplated to wipe out the arrears on A, B and C routes and accordingly funds of Rs. 7840 crore (net) were proposed for track renewal works. However, in view of financial constraints, limited funds could be made available as follows:

	Rs. in crore (net)
1992-93	1062
1993-94	970
1994-95	1024
1995-96	1150
1996-97(budgeted)	1050
TOTAL	5256

- 8.1.6 With the funds made available in the VIII Plan falling short of the requirements, it is expected that overall track renewal arrears yet to be sanctioned are likely to be 6300 km on all BG routes by the end of VIII Plan. The track renewals carried out in the VIII Plan also include the renewals necessitated at certain locations on condition basis as well as to cater for the running of Rajdhani/Shatabdi Express trains.
- 8.1.7 The accelerated track renewals during VII and VIII Plans have certainly helped the Railways in carrying higher traffic. The serious disruption to traffic on account of spate of rail/weld fractures and accidents on track account due to accumulation of overdue track renewals has been largely controlled. With the change in traffic pattern, type of rolling stock, heavier axle loads, increase in speed of goods trains, increase in number of Shatabdi/Rajdhani, the Railways cannot afford to accumulate arrears of track renewals on A, B & C routes as it would very adversely impact safety and operational efficiency. Therefore, it is essential that annual arising on A, B & C routes are now fully taken care of every year. Further, metal sleepers on these A, B & C routes are all more than 17-22 years and it is imperative to replace all the metal sleepers on A, B & C routes in the IX Plan itself.
- 8.1.8 With the increasing length of concrete sleeper track, the replacement of elastic fittings on a programmed basis has also become very important to ensure safety. Considering life of the fittings as 8 to 10 years it may be necessary to replace fittings to the extent of at least 10,000 kms during the IX Plan. Similarly, ballast recoupment on concrete sleeper track will also have to be done to the extent of 10,000 kms to ensure that concrete sleepers do not get damaged because of caked up ballast cushion. The requirement of ballast hoppers is also likely to increase substantially to cater to the enhanced requirement of ballast.

- 8.1.9 The track modernisation programme consists of provision of better and stronger track structure and adoption of improved methods of monitoring, maintenance and relaying of track with a view to minimise maintenance and operational costs, improving reliability of track and at the same time making rail travel safer and more comfortable even at the high speeds contemplated in the future. Use of rails of ultimate tensile strength of 90 kg/sq.mm (90 UTS) has been specified on routes which are identified for operation of BOXN rakes.
- 8.1.10 Indian Railways are progressively welding the rails thereby minimising the fish plated joints. All primary track renewals are being done with welded rails. On trunk routes and other important routes, the rails are welded into continuous length of one km or more; on the other routes short welded rail panels - welding of rail to form a single welded rail panel of 39 metres - have been adopted. This has reduced the maintenance requirements apart from other salutary affects such as less energy consumption, less wear and tear to both the rails and the rolling stock and more comfortable and safer travel.
- 8.1.11 The main objectives of track planning for the IX Plan period will be as follows:
- To carry out the current arising of track renewals on A, B & C routes and to reduce the arrears on D and E routes.
 - To cater for annual arising of primary track renewals on BG 3250 track km
 - To eliminate all 90R turnouts on running lines on A, B & C routes.
 - To strengthen the weak formations through vigorous rehabilitation programmes.
 - To replace all metal sleepers on A, B & C routes.
 - To plan for annual production of 74 lakh BG pre-stressed concrete sleepers and to provide concrete sleepers in a length of about 37,000 km by end of IX Plan.
 - To introduce mechanised track maintenance on BG routes aggregating to about 50,000 km.
 - To cater for relaying of track of about 1200 km per annum by mechanised equipment.
 - To plan for welding of 4 lakh joints per annum by flash butt welding process to cater for welding of 2200 kms of primary renewals besides construction projects requirement.
 - To introduce concrete turnout sleepers at an accelerated pace.

8.2 ARISING OF TRACK RENEWALS ON A, B & C ROUTES

The arising of track renewal on GMT consideration is as detailed below, however, in addition to this, there will be certain stretches where renewal will be needed on condition basis as well as for upgrading the track for increase in speed, etc.

1.	Total track on A+C	=	15,772 kms
2.	Average life of rails on A & C route	=	say 15 years
3.	Current Annual arising on account of rail renewal		
	<u>15772</u>	=	1052 kms
	15		
4.	Total track on B route	=	13,465 kms
5.	Average life of rails on B route	=	20 years
6.	Current annual arising on account of rail renewal on B route		
	<u>13465</u>	=	673 kms
	20		
7.	Total arising during IX Plan on account of rail renewal		(1052+673)5
		=	8625 kms
8.	Metal sleepers requiring renewal	=	8000 kms
9.	Current arising in terms of CTR Units	=	<u>8625+8000</u>
			2
		=	8313 kms

8.2.1 D & E Routes

1.	Total track on D+E route	=	31,401 kms
2.	Average life of track on D&E routes	=	say 25 years
3.	Current annual arising	=	<u>31,401</u>
	20		
		=	1570 kms
4.	Current arising during IX Plan in terms of CTR units	=	5 X 1570 kms
		=	7850 kms

8.2.2 Existing overdue renewals as on 1.4.97 on BG routes (CTR Units) = 6300 kms

8.2.3 ARISING OF TRACK RENEWAL ON MG/NG @ 250 kms per year (secondary)

$$= 5 \times 250$$

$$= 1250 \text{ kms}$$

8.2.4 TOTAL MID-SECTION TRACK DUE TO RENEWAL DURING TILL THE END OF IX PLAN IN TERMS OF CTR UNITS = 8313 + 7850 + 6300+1250 = 23713 kms

- 8.2.5 TOTAL MID-SECTION TRACK RENEWAL PROPOSED DURING IX PLAN IN TERMS OF CTR UNITS (MG+NG) = 18000(BG)+1250 = 19250 kms.
- 8.2.6 TOTAL MID-SECTION TRACK RENEWAL TO BE CARRIED OVER TO X PLAN (belonging to D&E routes) = 23713-19250 = 4463 kms
- 8.2.7 STRENGTHENING OF TRANSPORTATION SIDINGS AND YARD LINES (Secondary)(10% of 12.2.5) 10% of 19250 kms = 1925 kms
- 8.2.8 RENEWAL OF FITTINGS ON CONCRETE SLEEPER TRACK = 10,000 kms
- 8.2.9 THROUGH BALLAST RECOUPMENT ON CONCRETE SLEEPER TRACK = 5,000 kms
- 8.2.10 PROCUREMENT OF HOPPERS = 1,500 Nos.

8.2.11 **Renewal Of Points & Crossings**

During the IX Plan period renewal of points and crossings will be required as per the details given below:

	Total No. India Railway	Annual Replacement required
BG 1 in 8-1/2	50,601	5,060
BG 1 in 12	22,974	2,300
MG 1 in 8-1/2	16,030	1,600
MG 1 in 12	7,797	800
TOTAL		9,760

It is proposed to eliminate all 90R turnouts on running lines on A, B & C routes during IX Plan.

Out of the 9760 turnouts proposed to be renewed in IX Plan 5000 nos. modern turn-outs consisting of thick web switches and cast manganese steel crossings on high speed and heavy density routes during IX Plan will be installed.

8.2.12 **Casual Renewals Of Rails And Sleepers**

It becomes imperative to resort to carry heavy casual renewals of rails and sleepers to maintain track at following locations:

- (i) Sections prone to heavy corrosion or excessive wear on curves.
- (ii) Steep gradient sections.
- (iii) Yielding formations.
- (iv) Truncated MG lines.

Requirement of track in terms of CTR units will be around 400 kms per annum and therefore, will work out to 2000 CTR units during the IX Plan.

8.3 FORMATION REHABILITATION

Formation treatment will be given due priority so as to increase the service life of track and thereby minimise the requirement of track renewals in future. Rehabilitation of formation on important routes will require Rs. 100 crores.

8.4 REQUIREMENT OF RAILS/INDIGENOUS AVAILABILITY OF RAILS IN THE IX PLAN

8 4 1 The requirement of rails during IX Plan period would be as follows:

Item of work	Physical Target (Km)	Reqt. of rails (T-12) during the IX Plan period (in lakh tonnes)
Track renewals(Primary BG) (Item 12.2.5-12.2.3)	18000	21.60
New Lines	1200	1.22
Doublings	2500	3.00
Gauge Conversion	6200	5.47
Other traffic facility works	250	0.22
Points & Xings fabrication and casual renewal	3000	2.65
TOTAL		34.16

8.4 2 The entire requirement of rails will be of 90 UTS. The requirement to the extent of nearly 22.00 lac tonnes will be met indigenously by BSP.

8.4.3 As regards the balance requirement, efforts will be made to procure rails indigenously from private sector, supplies from which can, however, be expected at around 2.50 lac tonnes only. To bridge the gap of nearly 10 lac tonnes, Indian Railways will have to depend on import.

8.4.4 The requirement of crane rails for Points & Crossings fabrication is also expected to be met from BSP. However, in case of any deficiency or failure, this will have to be imported for modern high speed turnouts.

8.4.5 Thrust area during the IX Plan will be to ensure better quality standards for rails mostly supplied by BSP. Measures like commissioning of B1-planner machine to improve end straightening, on-line Ultrasonic testing of rails during production, vacuum degassing to control hydrogen content to ensure 100% continuous casting system, and facilities to reduce residual stresses, are being undertaken by BSP to improve the quality of rails leading to their longevity and better reliability.

8.5 REQUIREMENTS AND AVAILABILITY OF LINE SLEEPERS

8.5.1 The requirement of sleepers works out as under:

Item of works	Physical target (Kms)	Requirement (in lakhs)
Track renewals (Primary BG)	18000	275
New Lines	1200	18
Doublings	2500	40
Gauge Conversion	6200	98
Other Traffic Facility Works	250	4
TOTAL		435

The total annual requirement works out as 87 lacs. (Nos.)

Whereas concrete sleepers will be used on high density routes and high speed corridors, metal sleepers viz. Steel trough and cast iron ones will find their use on the remaining routes/sections.

8.5.2 There are 70 concrete sleeper factories in the country now and all of these factories are in private sector except one which is in Public Sector and one departmental unit. The rated production capacity of these factories is sufficient to meet the total requirement of concrete sleepers.

Requirement of steel trough sleepers will be met from Durgapur Steel Plant whereas cast iron sleepers will be procured from trade.

8.5.3 Fan Shaped Turnout Sleepers

In line with the extant policy of the Govt. of India in conserving forest wealth as also to maintain the ecological balance, a conscious decision was taken by the Ministry of Railways to gradually phase out the use of wooden sleepers and wooden specials for turn outs. In this direction, the intake of wooden line sleepers has already been brought to zero in 1992. All out efforts are also being made to reduce the intake of wooden specials for which steps have been taken to make use of pre-stressed concrete sleepers for turn outs. Presently, we are producing 1400 sets per year. It is planned to achieve a production level of 3000 sets per year which will enable complete switch over from wooden specials. Orders for fan shaped turnout sleepers have been placed on 26 factories and 21 factories have already started production whereas others are under development.

8 5 4 Improved Version Of Elastic Fastening

Elastic fastening at present being used on IR is of the design developed in 1960. A number of problems such as low initial toe load and its further loss during service, slippage of rubber pads, jamming of the clips in the insert holes etc. are being faced with these fastenings. To overcome these problems and to strengthen the track for heavy traffic loads, higher speeds which Indian Railway have to carry by the turn of the century, it is planned to introduce improved type of fastenings. Fastenings of various designs will be tried under varying field conditions to arrive at a most desired solution under Indian conditions.

It will also be necessary to improve the design of existing grooved rubber pads as their behaviour is not satisfactory and this will need further improvement due to heavier axle load and higher speed of trains.

8 5 5 Wooden sleepers

In line with the extant policy of the Govt. of India to phase out the use of wooden sleepers, requirement of wooden line sleepers has been brought to zero by 1992. The requirement of wooden specials for turnouts is also being reduced gradually as pre-stressed concrete sleepers for turnouts have been developed and their production has been stepped up.

For bridge timbers no suitable substitute for wood has been found so far. Trials are in progress with steel sleepers, built up steel sections and composites. Efforts have to continue in the IX Plan to find a viable alternative to wood in this area. Meanwhile wooden sleeper have to be used as bridge timbers. The consumption has reduced over the years as bridge girders upto 20 feet span are being replaced by concrete decks.

The average annual consumption of wooden specials for turnouts and bridge timbers during the VIII Plan is 0.43 lakh cm and is expected to be brought down to 0.30 lakh cm by the end of IX Plan period.

8.6 REQUIREMENT OF FUNDS FOR TRACK RENEWALS

The total requirement of funds for track renewals including points and crossings, casual renewals, ballast, fitting renewals etc. during the IX Plan will be as under

S. No.	Item	Gross Amount (Rs. in crores)
1.	Track renewals(19250 kms)	10,828
2.	Strengthening of loops(secondary)	300
3.	Renewal of fittings on concrete sleeper track	300
4.	Through recoupmnt of ballast on concrete sleeper track	350
5.	Procurement of hoppers	200
6.	Renewal of points and crossings	600
7.	Casual renewals	522
8.	Formation rehabilitation	100
Total		13,200

8.7 MACHINES FOR MAINTENANCE AND RENEWAL OF TRACK

Consequent upon the strengthening of track structure, use of concrete sleepers, 60 kg long welded rails and deeper ballast cushion, etc., the conventional manual methods of track maintenance and relaying are no longer appropriate, on heavy density routes. The increased frequency of trains leaves little time for manual maintenance of track and constitutes a safety hazard. Apart from the technical necessity, mechanisation of track works will improve the quality of track geometry, productivity of manpower and will also improve the safety of trains.

- 8.7.1 Heavy duty machines will be used for continuous maintenance/renewal works on long stretches. Small machines with mobile mechanised gangs will be required to do the job of track maintenance and renewal between two heavy machine cycles. The maintenance organisation for modern track structure would thus operate at three levels
- (i) *heavy duty machines under centralised control of zonal head quarters;*
 - (ii) *small machines to be operated by mechanised gangs working for spot attentions, and*
 - (iii) *small stationery gangs for patrolling of track and other jobs not requiring machines.*

8.7.2 Track Machines

The outlay required for procurement of track machines during the IX Plan will be Rs 500 crore and will be included under the plan head 'Rolling Stock'. Traffic blocks have to be necessarily made available for the efficient and economic utilisation of heavy track machines especially on the important routes provided with modern track structure. 4 hours block is essentially required for this purpose. Time tabling of blocks and specific provision of loco powers for engineering track works will be necessary. System have been designed to effectively use shorter blocks and provide more blocks in a day including at nights to maximise the utilisation of these machines. Also, methods would be evolved for minimal speed restrictions, if not completely eliminate them, after maintenance work is completed.

During the IX Plan, about 12,500 kms are to be renewed with PRC sleepers and another 8000 kms new lines/doublings/gauge converted. In this way in the IX Plan, there would be an increase of about 20,500 kms PRC sleepers which will have to be maintained by machines

8.7.3 Machines required on replacement account and New Machines

Old tamping machines which were procured in the 1970's are due for condemnation in the IX Plan. At present, 31 such Tampers are in use which would be phased out during this plan. We would be requiring additional machines in lieu of these 31 machines. Also, the track laying equipment i.e. PQRS Portals which were procured in the 1970's are due for condemnation. Here also, new Portals would be required on replacement account.

8.7.4 Reorganisation for Mechanised Track Maintenance

Reduction in the existing man power available in track maintenance gangs is being continuously effected with the increased mechanisation of track maintenance, relaying and other track activities. This process of reduction in gang strength will continue as more and more stretches are brought under mechanised maintenance by heavy and light duty track machines and by reducing the frequency of maintenance attention after scientific studies and monitoring of track geometry by objective methods.

On modern double line sections of IR on BG, with predominantly the following track structure:

Rails	-	60/52 kg LWR/CWR
Sleepers	-	Monoblock PRC
Sleeper Density	-	1540/km
Ballast cushion	-	250 mm

It is planned to go in for a three tier system of track maintenance during the IX Plan. It is envisaged that Rs. 75 lakhs will have to be spent as initial cost of equipment for each unit. Total requirement will be to the tune of Rs. 150 crore. This requirement will be included in the plan head 'Machinery and Plant'

8.7 5 Formation rehabilitation machine

With heavier axle load and higher speeds the length of formation requiring strengthening is increasing. Formation rehabilitation is required in such cases to permit safe movement of traffic without any speed restrictions. This job is highly labour intensive. Other World Railways are already using mechanised methods for formation rehabilitation purpose. One such machine is proposed to be procured for Indian Railways during the IX Plan.

8.7 6 Workshop Machinery

The track machines workshops at Allahabad, Jhansi and in the other Zonal Railways lack a number of facilities which are very essential. These facilities include Hyd. Test benches, Gantries with small EOT Cranes, Dynamic balancing machines, Heavy lifting jacks, Electronic Test benches, Portable Welding generating sets, etc. For these small machines a lump sum provision is being made in the plan. Also, track machines workshops are lacking the transportation arrangements which are essentially required for transportation of tamping banks, engines and other heavy machine parts to the sites where the machines are working. These transportation arrangements are necessary for the purpose of unit exchange system of maintenance whereby we can keep the down time of machines to the minimum possible. Each Zonal railway would be requiring 4 to 5 small lorries with a capacity of about 4 to 5 tonnes.

8.7 8 Requirement for Modernisation (Welding) Machines

8.7.8.1 Two Nos. Flash Butt Welding Plants

Flash Butt Welding Plant of Central Railway at Kalyan was installed in the mid '60's. It has, therefore, completed 30 years of life. This machine has not been replaced so far and is giving frequent troubles now and will need replacement. Apart from this, 4 welding machines of ESAB, Sweden make, were installed, one each on SCR, WR, CR and SR. During the IX Plan period, these machines will be completing their 15 years of service and as per the norms may need replacement. Therefore, the provision of replacement of at least one of these machines is being made in the IX Plan period. Hence, provision of two Flash Butt Welding Plants at a cost of about Rs. 12 crores is required to be made in the IX Plan period. For unforeseen heavy repairs Rs. 2 crores is proposed to be made available to ensure that break down are minimised.

8.7.9 Procurement of one SPURT Car (Approx. cost Rs. 15 crores)

RDSO has a self-propelled Ultrasonic Rail Testing (SPURT) car presently which was procured in the mid '80's. This car can ultrasonically test the rails at a speed of 40 kmph only. Due to its slow speed the same does not get blocks for its running on the important routes due to pressure of traffic as a result its utilisation is getting effected. Technologically it has become obsolete and its on board computer has also not been working for sometime now. In the meantime, the SPURT car technology has progressed on the world railways and Spurt cars are available which can do the testing at about 70 kmph and the results can be analysed in the board latest generation computers. Since the manual USFD testing is becoming more and more difficult to do due to increased traffic on important routes as also its reliability is low, it is necessary that a latest generation Spurt Car is procured by Indian Railways for ultrasonic testing of rails as the same has very important bearing on the safety of traffic. (approx. cost of car will be Rs. 15 crores).

8.7.10 Track Management System

It is proposed to introduce computerised Track Management System on the complete golden quadrilateral and the Diagonals joining the four major metropolises. A provision of approximately Rs. 1.5 crores is proposed to be made for this purpose under plan head 'Computerisation'.

**SUMMARY OF OUTLAY REQUIRED IN RESPECT OF VARIOUS PLAN
HEADS FOR TRACK WORK**

Item	Amount in crores (Base year 1996-97)
A. TRACK	
(i) Track renewals	10828
(ii) Strengthening of loops	300
(iii) Renewal of fittings on concrete sleeper track	300
(iv) Replacement of overaged ballast on concrete sleeper track.	350
(v) Procurement of hoppers	200
(vi) Renewal of points & Xings	300
(vii) Casual renewals	522
(viii) Formation rehabilitation	100
TOTAL	13200
B. ROLLING STOCK	
Track Machines	500
C. WORKSHOP & SHED	
(i) Workshops for POH of machines	2
(ii) New Flash Butt Welding Plants	14
(iii) New Gas Pressure Welding Plants(nine)	5.5
TOTAL	21.5

CHAPTER IX

BRIDGE WORKS

9 0 Introduction

9 1 The following types of works are covered under the Plan Head 'Bridges'.

- (a) Rehabilitation/rebuilding/strengthening of bridges,
- (b) Road Over/under bridges in replacement of existing level crossings

9 2 There are nearly 1.15 lakh bridges on Indian Railway system. Out of these, 9,453 are classified as major bridges, each having linear waterway of 18.3 mtrs. (60 ft.) or more or having a clear span of 12.2 mtrs (40 linear feet) or more in any one span and the rest are minor bridges. The cost of rebuilding/regirdering/rehabilitating the existing track bridges is chargeable to DRF.

9 3 Railways generally undertake replacement of existing busy level crossings having traffic density of one lakh or more TVUs (Train Vehicles Units, a figure obtained by multiplying the number of trains by the number of Road Vehicle Units passing over the level crossing in 24 hours) by Road over/under bridges on cost sharing basis. The Railways share 50% of the total cost of the bridge proper and its approaches of a specified width of the bridge as per the laid down rules for apportionment of cost. Some of the costs such as cost of acquisition of land are borne entirely by the State Government/Road Authority. The Railway's share of such works is chargeable to DF 4.

9 4 Rehabilitation of Bridges

In Railway codes, a life of 60 years has been envisaged for the steel work and 100 years for masonry work of the bridges. As most of the railway bridges were built 80 to 100 years ago and some have been showing signs of distress on account of ageing and fatigue, they need special attention and care, including rehabilitation where warranted, so as to ensure safety of rail traffic. The actual life of bridge, however, depends upon various factors like type of construction, standard of construction, the loads and number of trains passing, the site conditions, etc. Prime consideration in re-building/rehabilitation of a bridge, therefore, has been the actual physical condition of the bridge. The Railways have a system of inspecting the bridges annually at the level of officers and a continuous record of these inspection is maintained in bridge registers to ensure safety and take remedial actions well in advance before there could be danger to safety.

9 5 A system has been evolved on the Railways of identifying the bridges requiring either rebuilding or rehabilitation. Such bridges are termed as 'distressed bridges'. This term does not mean that they are unsafe but that they need attention. The list of distressed bridges is updated every year, adding fresh accrual and deleting those bridges where necessary rehabilitation works have been carried out. The identification of distressed bridges is a continuous process. During the IX Plan,

it proposed to deal with the distressed bridges concurrently so that there is no backlog at any time for rehabilitation of distressed bridges. Due to paucity of funds, as against a projected requirement of Rs. 711 crore, an allocation of only Rs. 400 crore was made during the VIII Plan period, planned bridge rehabilitation/rebuilding works had to be curtailed. This is expected to give rise to a larger arisings of distressed bridges in the IX Plan as the bridges are being subjected to more severe usage on account of heavier and intense traffic. It is expected that during the IX Plan period, about 200 bridges would have to be tackled every year on account of development of distress. A sum of Rs. 160 crores approximately would be needed to deal with these distressed bridges during the IX Plan period.

- 9.6 On the Railways, there are a large number of steel bridges, constructed up to 1905 using steel manufactured before 1895. Because of lack of control on the maximum percentage of sulphur and phosphorus content i.e. permissible in the finished steel and quality control in the manufacturing process, steel-manufactured bridges up to 1895 is termed 'early steel'. It has also been considered that bridges constructed on the Railways up to the year 1905 would have used this 'early steel'. These bridges are termed as 'early steel girder bridges'. Due to the presence of excess sulphur and phosphorus, the fatigue life of the steel gets reduced and the girders are liable to sudden brittle fracture. There are at present about 2,000 bridges having 'early steel' girders. The residual fatigue life of such girders cannot be predicted with certainty. These girders have already served the Railway for nearly 100 years. However, on account of paucity of funds, the Railway have decided to replace them only on age-cum-condition basis

9.7 Strengthening of bridges to cater for heavy mineral standards of loading

Over the years, Indian Railways have seen substantial growth in both freight and passenger traffic. The quantum jump in traffic is proposed to be tackled by permitting a further increase in the axle loads of rolling stock or running of longer trains or a combination of both with the use of heavier and more powerful locomotives. New modified loading standards have been evolved and adopted for future construction of bridges to take care of future long-term needs. The modified BG loading standard (MBG-1987) provides for 25t axle load locomotive in coupled operation, with maximum tractive effort of 100t, hauling a trailing load of 8.25 t/m. For certain specified routes, 'Heavy Mineral Loading' is proposed to be adopted. This will provide for 30t axle load and 12 t/m trailing load. The growth of loads over the years is indicated in Annexure I. Strengthening of the existing bridges, which were constructed to much lighter loading standards in vogue in the early years, is being undertaken on a programmed basis so that they can safely carry heavier and faster trains of the future. Investigations have accordingly been undertaken to identify those bridges where the superstructure or sub-structure needs strengthening or rebuilding to suit modified BG loading standard or heavier Mineral Loading as the case may be. Rehabilitation of the bridges is to be undertaken on priority on a programmed basis on the diagonal and quadrilateral routes of the Indian Railways system and also those routes where BOX 'N' wagons operate.

9 8 **Total Bridge Rehabilitation Plan**

The Railway Reforms Committee had recommended a critical study to assess the magnitude of the problem of re-building of the large number of old bridges on Indian Railways and had suggested that a special group to be set up for the same. Accordingly, a sub-committee comprising Chief Bridge Engineers of Northern and South Eastern Railways, Director Standards (B&S), RDSO and Commissioner of Railway Safety, Northern Circle was constituted. The committee was also directed to examine the problems of old and distressed bridges on Indian Railways and make recommendations regarding their rehabilitation.

The Committee, in its report, submitted in April 1988, had observed that about 50% of broad gauge bridges and 40% of metre gauge bridges are more than 80 years old and apart from rehabilitation of the bridge sub-structure in general, the following types of bridge works would be required to be executed in significant number in the near future.

(i) **Early Steel/Wrought Iron Girders**

Considering the results of investigations conducted by RDSO on the test samples of early steel girders, it is expected that nearly all early steel-wrought iron open web girders would need to be replaced in the next 10-15 years. This will involve about 60,000 tonnes of steel. Early steel plate girders would also be required to be replaced on age-cum-condition basis.

(ii) **Corrugated Steel Pipes/arches**

A number of steel pipe and arch bridges are having heavy corrosion. About 200 of such bridges would need replacement in the next 10 years.

(iii) **Cast Iron Screw Pile Bridges**

The screw pile foundation bridges have also served for about 80 years to 100 years. In view of uncertainty of condition of the screw piles, these require to be planned for rebuilding on condition basis. On the basis of information furnished by the Railways, about 200 spans would need replacement in the next 10 years.

(iv) **Laterite Stone Sub-structure and Arch-Bridges**

Rebuilding of such bridges may be undertaken on a programmed basis within the next 10 years, priority being given for rehabilitation of bridges in the backwater areas subjected to partial/full submergence for considerable part of the year or/and alternative wetting and drying. About 800 minor and 30 major bridges would need rebuilding during the next 10 years.

(v) **Masonry Arch Bridges**

Such bridges are having various types of problems which need careful inspection, investigation and diagnosis to formulate the remedial measures. It is estimated that about 5000 minor and 100 major arch bridges would need rehabilitation during the next 10 years.

(vi) **Timber Top, Rail Opening and Stone Slab Bridge**

It would be desirable to replace all such bridges by reinforced concrete/pre-stressed concrete slab on a programmed basis. Such works may, however, be taken on condition basis subject to availability of funds and engineering time allowance, 5000 such bridges (which constitute about 36% of the total of such bridges) may be rebuilt within next 10 years.

(vii) **Steel girders up to 6.1 M (20 ft.) span**

Steel plate girders up to 6.1 m span are to be replaced by ballasted deck RCC/PSC slab/girders on age-cum-condition basis. Approximately 8,000 such bridges would need to be rebuilt during the next 10 years.

(viii) **Strengthening of bridge sub-structure to take care of increase in loads**

So far large-scale re-building/strengthening of bridges on account of increase of loads has not been done on Indian Railways, mainly on account of available safety margins.

However, with increasing age & proposed heavier loading, strengthening of bridges on this account has now become unavoidable.

Based on these considerations, the number of bridge/spans required to be rehabilitated during next 10 years is given in Annexure II along with the cost of each category of work. This indicates that about Rs. 800 crores would be required during the next 10 years. About 50% of these works are proposed to be undertaken during the IX plan.

9.9 Introduction of Modern Technology

A new thrust has been given to the modern design and construction techniques, while re-building old bridges or constructing new ones as well as in the maintenance of existing bridges. Among the thrust areas identified in this regard are adoption of welded girders, wider adoption of pre-stressed concrete, RCC-framed sub-structure, pre-fabricated reinforced concrete/pre-stressed concrete elements, hi-tech protective coating, etc.

The following are the policy direction regarding bridge works.

- (i) In all future bridge re-girdering/rebuilding works and also for new construction, ballasted deck shall invariably be provided for spans up to 30.5 m. by adopting/reinforced concrete/pre-stressed concrete and composite type girders.
- (ii) Welded fabrication be adopted to the extent possible in the Engineering Workshops,
- (iii) Wider adoption of pre-stressed concrete.

In this context, the importance of training cannot be over-emphasised. This is particularly vital in the case of Engineering Workshops and other bridge works where substantial technological advancement and quantum jumps are to take place as a result of new techniques. Accordingly, training institutes have been provided on Central, Eastern, Western and Southern Railways which

will meet the training requirements of the Bridge as well as Engineering Workshops staff of all the Zonal Railways. The facilities provided at the institutes would be strengthened progressively to meet the training requirements.

There is also need for updating the inspection and testing equipment/practices so that the condition of the bridge structures could be monitored properly and timely action taken for their rehabilitation, wherever necessary. The equipment identified in this regard are mobile Inspection Unit by which underside of the bridge girders can be reached, ultrasonic testing equipment for objective inspection of steel and concrete girders and sub-structure, and suitable equipment for underwater examination of the sub-structure and measurement of scour during floods. The specification for these equipment are under finalisation after which procurement action will be taken by the various Zonal Railways.

9.10 Bridge Workshops

Railways' requirements of bridge girders, both open web as well as plate girder type, are mainly manufactured by the Engineering Workshops on the various Zonal Railways where facilities exist for fabrication of bridge girders or other steel structures like microwave towers, foot-over-bridges, cover for platforms, sheds, etc. All the Engineering Workshops have mostly been fabricating riveted girders so far. Welding has been resorted to in a limited way for the fabrication of structures for sheds, foot-over-bridges, platform shelters, etc. In view of the advantages of welded fabrication, fabrication of welded type bridge girders is being taken up in the Engineering Workshops.

Bridge works require replacement of a large number of machinery on age-cum-condition basis. Some additional machinery is also to be needed. Requirement of funds for replacement/additional machinery and plant as needed, programmed during the Plan would be Rs. 30 crore.

The requirements of funds under the Plan Head 'Bridges' for the IX Plan would be as under:

9.11 Throw forward from VIII Plan :

(i) Rebuilding/rehabilitation of distressed track bridges

At the beginning of IX plan, throw-forward on account of on-going works of rebuilding/rehabilitation of distressed bridges would be of the order of Rs. 80 crores.

(ii) Construction of Road Over/Under Bridges

At the beginning of IX Plan, throw forward on account of on-going works of Road Over/Under Bridges would be of the order of Rs. 200 crore.

Thus, even to complete the on-going works funds to the tune of Rs. 280 crore would be required during the IX Plan.

9.12 New 'Starts' in the IX Plan Period

(i) **Rebuilding/rehabilitation of distressed bridges**

Since during the VIII Plan, on account of paucity of funds, planned rebuilding/rehabilitation of bridges has not been carried out and the traffic carried by Indian Railways has been continuously increasing, the old bridges are likely to face greater distress in the coming years. Therefore, it is expected that during the IX Plan period about 200 bridges would have to be tackled yearly on account of development of distress. A sum of Rs 160 crore approximately would be needed to deal with these distressed bridges during the IX Plan period

(ii) **Planned rebuilding/rehabilitation/strengthening of existing bridges**

Majority of Railway bridges have already served for more than 80 years. They are also bearing higher density of traffic with heavier axle loads than for which they were designed. The traffic density is still increasing and as per projections for IX Plan, it would further increase. Railways are planning to use heavier axle loads to deal with the traffic in future. It is, therefore, desirable that the rebuilding/ rehabilitation to be done during the IX Plan period onwards is such as to be able to withstand the heavier axle load traffic

Railway Reforms Committee had recommended critical study to assess the magnitude of problem of rebuilding of old bridges. Accordingly, a Sub-Committee comprising CBEs of Northern and S.E. Railways, Director Stds (B&S), RDSO, and the Commissioner of Railway Safety (Northern Circle) was constituted to examine this aspect and make recommendations. The Committee in its Report submitted in April, 1988 observed that about 50% of Broad Gauge and 40% of Metre Gauge bridges are more than 80 years old. The Committee had also estimated that for rehabilitation of these old bridges funds to the tune of Rs 800 crore (at 1987 price level) would be required over a period of 10 years. Considering all these factors, a sum of Rs 415 crore was projected as requirement for planned rebuilding/ rehabilitation/strengthening of the existing bridges. However, no funds were made available during the VIII Plan for this activity. In the meantime on account of operation uni-gauge many of the MG bridges are getting strengthened/ rehabilitated as part of the gauge conversion. This leaves only Broad Gauge bridges for attention during the IX Plan period under Plan Head 'Bridges'. Taking into consideration the inflation and the fact that more punishment has already been taken by the bridges, it is proposed that a sum of Rs. 360 crore be provided during the IX Plan for this activity

(iii) **Strengthening on account of heavier axle loads on earmarked routes**

Since heavier axle loads are likely to be introduced on certain identified routes in near future, strengthening of bridges to cater to higher axle loads would need to be expedited. As far as these identified routes are concerned, it is proposed to provide a sum of Rs 50 crore during the IX Plan to carry out this strengthening on a programmed basis

(iv) **Road Over/Under Bridges**

With increasing road as well as rail traffic, pressure for construction of road over/under bridges would mount. It is expected that on an average, 15 works of road over/under Bridges would be sanctioned each year. During the entire Plan period 75 new works would require to be sanctioned. Railway's share of the cost of these works is expected to be about Rs. 250 crore. Since Road over/under bridges have a gestation period of about 3 to 5 years, it is proposed that only an outlay of about Rs. 150 crore be kept for these works during the IX Plan. The balance amount would be a carry forward for the next Plan period

Summing up, the outlay required in the IX Plan period under the Plan Head 'Bridges' will be as under:-

Works in progress		Figures in crs. of rupees
(a)	Rebuilding/rehabilitation of distressed bridges	80 00
(b)	Construction of Road Over/Under Bridge in replacement of level crossing	200.00
		280 00
New Works		
(a)	Rebuilding/rehabilitation of distressed bridges	160 00
(b)	Planned rebuilding/rehabilitation of bridges	360 00
(c)	Strengthening of bridges for heavier axle loads on identified routes	50.00
(d)	Road Over/Under Bridges in replacement of level crossing	150.00
	Total	720.00
Grand Total (of Works in Progress & New Works)		1000 crores

Design Loading Standards for Bridges

Year	Vertical Loads	Longitudinal Loads
Broad Gauge		
1892 (Bridge Rules were framed)	Coupled loco 0-8-0 with axle loads of 1/2 tons/ft. run (4.0 t/m), both in front and rear of loco	Traction and braking forces = 1/7 th of the train loads
1903	Maximum axle load of 18 tons for loco and 14 tons for coaching and goods stock with trailing load of 1.2 tons/ft. run (4.0 t/m)	Maximum tractive effort for coupled loco operation = 47.6 t
1926	Heavy mineral Loading : 28 tons axle load followed by train load of 2.3 tons/ft. run (7.67 t/m)	Braking forces = 20% of axle load
Standard I loading (BGML)	22.5 ton axle load followed by train load of 2.3 tons/ft. run (7.67 t/m)	Maximum tractive effort for coupled operation = 75 t
Standard II loading (BGML)	17 tons axle load followed by train load of 1.5 tons ft. run (5 t/m)	Braking force = 20% of the axle load.
1975 RBG standard loading	Maximum axle load of 22.5 t for loco, trailing load of 7.67 t/m behind loco with a maximum axle load of 22.9 t for train load.	Maximum tractive effort for coupled operation = 100 t
1987 MBG standard loading	Maximum axle load of 22.5 t for loco and the train load of 8.25 t/m on the both sides of the loco.	Braking force = 20% of the axle load.
Metre Gauge		
1929 MGML loading	13.2 axle load loco followed by train load of 3.87 t/m.	Maximum tractive effort for coupled operation = 24.8t Braking force = 10% of the axle load. Maximum tractive effort .
1988 MMG loading	16 t axle load loco hauling a trailing load of 5.5 t/m of both sides of axle load of train loads not to exceeds 14t.	(i) 32t for CO-CO type loco (ii) 24 t for BO-BO type loco Braking force for loco axle = 25% train load = 20%

Designs will cater for coupled operation of locomotives.

ANNEXURE -II

Details of Various Categories of Bridges which Require Rehabilitation on a Programmed Basis within The Next Ten Years.

S.No.	Type of Bridge	Programme for 10 Years		
		Approx No to be rehabi- litated	Rough estimated cost/span/ bridge (lakhs)	Total outlay required (Rs in crores) 1987 Price level
1	Early steel/wrought iron and other distressed open web girders	600 spans	40	240
2	C.I Screw piles	200 spans	35	70
3	Laterite Stone Bridge			
	(a) minor	800 bridges	4	32
	(b) major	30 bridges	30	9
4	Arch Bridges			
	(a) minor	500 bridges	2	10
	(b) major	100 bridges	15	15
5	Corrugated steel pipes/archs	200 bridges	2	4
6	Timber top, rail opening and stone slab	5000 bridges	0.4	20
7	Replacement of steel girders upto 6.1 m with ballasted deck	8000 bridges	1	80
8	Substructures which are distressed or which may need rehabilitation	1600 bridges	10	160
9	Other bridges steel plate girders	1000 bridges	LS	100
10.	Strengthening of substructure and replacement of fixed end bearing of steel girders for heavy haul operation and high horse power locos.		LS	50
Total		17,200		790
		span/bridges	Rs. 800 crores (1987 price level)	

CHAPTER- X

STAFF QUARTERS, STAFF AMENITIES AND OTHER SPECIFIED WORKS

10.1 STAFF QUARTERS:

10.1.1 The Railways have 6.32 lakh residential quarters of various types of which 5.89 lakh (93%) are of either Type I or Type II. When compared with the staff/officers' strength of 16.02 lakh, the housing satisfaction achieved on 1.4.95 was approximately 39.4%.

10.1.2 The Corporate goal, as declared in the Corporate plan 1985-2000, was to achieve a housing satisfaction of 42% by the year 2000 A.D. Assuming a net overall decline in staff strength of 2% per annum during the period 1995-2000, despite the expected steep increase in out-put on the Railways, the Railways can expect to have on its rolls 14.48 lakh employees by 1.4.2000 and, therefore, should have 6.08 lakh quarters if the level of 42% housing satisfaction aimed at is to be provided. This objective, keeping the availability of quarters in mind would, therefore, have been expected to be achieved without any significant addition in the form of new quarters over the IX Plan period. However, during a census conducted in 1993, it was noted that as many as 30,000 old quarters required replacement on 'condition basis'. Keeping the age profile of our quarters in mind, many of which are over the useful life of 60 years and with some approaching 100 years in age, it is estimated that the re-building requirement on replacement account would be about 6,000 quarters every year. Even for building 4000-5000 quarters per annum, at an average cost of Rs. 1.70 lakh per quarter would require, at current prices, an investment of Rs. 400 crores during the IX Plan, with an annual investment of the order of Rs. 80 crores.

10.1.3 Historically, construction on replacement account was funded from the Plan Head 'Staff Quarters'. Whereas construction of new quarters was funded from the Plan head 'Staff Quarters' as well as various other plan heads such as 'New Lines', 'Doublings', 'Gauge Conversion', 'Workshops', etc. where the provision of quarters form a part of the Projects executed under these Plan Heads.

10.1.4 It may be mentioned that on account of a resource crunch, the number of quarters being constructed has been declining sharply. From a figure of 9526 quarters constructed in 1990-91, the decline has been steep and only 2154 quarters were constructed during 1994-95. Efforts will be made to halt, if not reverse this trend, in the IX Plan.

10.2 STAFF AMENITIES

10.2.1 The major areas where improved staff amenities would be needed are

- (i) Medical
- (ii) Education

- (iii) Sub-standard housing
- (iv) Electrical works in quarters

Each of these major thrust areas is discussed below :

10 2 2 **Medical**

The level of medical facilities presently obtaining on the system is adequate. There is no need to go in for Specialist Hospitals or facilities as these are normally available outside and these existing facilities can be availed of by Railway employees. The emphasis should be on optimum utilisation of facilities which are insufficiently utilised on account of a lack of Medical/para Medical staff of appropriate equipment.

However, it is foreseen that there would be need to set up 10 New Divisional Hospitals, where new Divisional Headquarters are to be located and also the possible means of upgrading of 6 Divisional Hospital to Zonal Hospital status on the creation of a new Railway Zones. These works are expected to cost Rs. 80 crores.

10 2 3 **Education**

While there should not be any need for upgrading the existing facilities, in view of the rapidly increasing thrust on Computer Education in the country, it is felt a sum of Rs. 25 crores needs to be provided on this account in the IX Plan so that our Schools/Colleges are equipped with an adequate infrastructure for Computer Education.

10 2 4 **Sub-standard Quarters**

A census conducted in 1992-93 indicated that there were about 70,000 sub-standard quarters on the Railways. These single-room quarters lack basic amenities such as kitchen, bath-room, toilet etc. A concerted effort has been made since April, 1990 to eliminate these deficiencies in some of our existing quarters and it is expected that the number of such quarters at the beginning of the IX Plan would be about 60,000.

Eliminating these deficiencies at an average cost of Rs. 25,000 per quarter would require, at current price an investment of Rs. 150 crores during the IX Plan.

10 2 5 **Electrical Works In Quarters**

The works taken in hand include -

- (i) Electrification of staff quarters
- (ii) Rewiring of staff quarters
- (iii) Provision of fans in type I and Type II quarters
- (iv) Improvements in illumination in staff quarters, colonies, etc.

The average annual requirement for electrical works shall be Rs. 9 crores or a total of Rs. 45 crores at a current prices.

Summing up, an allocation of Rs. 300 crores shall be required under this Plan Head during the IX Plan period.

10.3 **OTHER SPECIFIED WORKS**

- 10.3.1 Under the Plan Head ‘Other Specified Works’ certain important item of works such as reorganisation of a Zone/Division; creation of a Sports infrastructure; Defence Sidings, Training Facilities which pertain to all Departments; Rail Museums; Office Buildings, Printing Presses; Rest Houses and certain Safety Works are taken up.
- 10.3.2 In order to achieve better operational efficiency, 6 new zones and 8 new divisions have been sanctioned recently. Complete infrastructure for the same has to be developed during the IX Plan period.
- 10.3.3 Railways are having an eminent position in the field of national sports. In order to maintain this status and also be in tune with the modern times, it is necessary that standard and up-to-date infrastructure is made available to our sports-persons. Accordingly, it has been decided that to plan for the development of suitable sports infrastructure at Zonal Headquarters as well as Divisional level in a phased manner so that standard sports facilities are available all over the country.
- 10.3.4 A provision of Rs. 800 crores is proposed for the IX Plan to meet these requirements.

10.4 **SUMMARY :**

The plan head-wise requirement of funds during IX Plan has been summarised as under:

<u>PLAN HEAD</u>	<u>IX PLAN ALLOCATION REQUIRED</u>
Staff Quarters	Rs. 400 crores
Staff amenities	Rs. 300 crores
Other specified works	Rs. 800 crores.

CHAPTER XI

RAILWAY RESEARCH AND DEVELOPMENT

11.1 INTRODUCTION

11.1.1 The Railway Design and Standard Organisation (RDSO) is the only organisation for research in Railway technology in the country. A few important research projects completed by RDSO during VIII Plan are:

- (i) *Design and manufacture of 2300 HP WDP1 and 3100 HP WDG2 locomotives.*
- (ii) *Prototype of BG Rail Bus and DMU to RDSO : design production.*
- (iii) *Design of 3100 HP WDP2 diesel locomotive completed and released to D.I.W for manufacture of prototype.*
- (iv) *WAP3 3900 HP high speed loco, WAG7H 5000 HP freight loco, WAP4 passenger loco and WCAM2 AC/DC locos introduced after design, prototype testing and acceptance.*
- (v) *AC 3 tier coach.*

11.1.2 Ongoing Important Projects

11.1.3 Some of the important ongoing projects of RDSO are:

- (i) Trials of high speed CASNUB bogies for 100 kmph.
- (ii) Reduction of speed differential on mixed routes. Improvement in pay load of trains by use of Superior pay load/tare ratio coaches and increasing axle loads.
- (iv) Design and development of WAP6 loco with Hitachi motors.
- (v) Design and development of AC/DC WCAM3 loco for Central Railway.
- (vi) Development of Wheel slip control system for tap changer locos.
- (vii) Validation of psycho-technical test battery for selection of drivers and switchmen.

11.2 MISSIONS

11.2.1 RDSO proposes to undertake the following missions during the IX Plan. The missions are centred around specific areas of research which are critical and crucial for Railway operations.

- (i) *Increase the utilisation of fixed and mobile assets.*
- (ii) *Identify and develop technology for 250/300 kmph. high speed passenger services.*
- (iii) *Increase the generation of funds from Non-Railway sources.*
- (iv) *Reduce energy consumption per unit of rail transport and make Indian Railways technology environmentally responsive.*
- (v) *Increase quality consciousness on all working units of Indian Railways.*

11.3 RESEARCH PROJECTS PROPOSED TO BE TAKEN UP BY RDSO IN IX PLAN:

- 11.3.1 Important Research projects proposed to be taken up by RDSO in IX Plan are :
- (i) *Equipment and facilities for 250/300 kmph. high speed operation.*
 - (ii) *Design of EMU bogies with air suspension.*
 - (iii) *Introduction of disc brakes on coaches.*
 - (iv) *Development of diesel engine capable of low specific fuel consumption (145 gm/bhp-hr).*
 - (v) *Development of dual voltage 3 phase system for EMU.*
 - (vi) *Development of OHE cum Track Recording Car.*
 - (vii) *Design and Development of continuous train control for increasing throughput of existing Railway assets.*
 - (viii) *Improvement in design of turnouts to achieve high speeds and better service life.*
 - (ix) *Reduction of wagon ineffective from 4% to 3%.*
 - (x) *Development of mechanised devices for cleaning and sanitation of platform and tracks.*

Details of Research Projects proposed to be taken up during IX Plan as well as Research Facilities proposed to be set up in IX Plan are enclosed as Annexures I & II respectively.

11.4 FUNDS REQUIREMENT AND RESOURCE MOBILISATION

- 11.4.1 Total funds requirement during IX Plan for Research Facilities as well as Research Projects is estimated at Rs.250 crores.

	(Rs. in crore)
1. Research Projects in IX Plan (Annexure - I)	138.63
2. Research facilities to be set up in IX Plan (which are not included in the project cost) (Annexure - II)	85.20
3. Cost of on-going projects in IX Five Year Plan (Annexure - III)	26.26
TOTAL	Rs. 250 crore

- 11.4.2 During the IX Plan, RDSO shall make all-out efforts to increase resource mobilisation and boost earnings from non-railway sources. In this respect, RDSO is holding consultation with ERRI and General Electric USA.

ANNEXURE - 1**RESEARCH PROJECTS IN IXth PLAN ALONG WITH LIKELY COST**

Sl no.	DIRECTORATE	RESEARCH PROJECT	APPROX. cost in Lakhs (Rs.)
1	Bridge and Structure	1. Development of composite sleepers for Bridge Girders.	30.00
		2. Development system of recording condition of bridges by recording vibrations and photography by digital cameras. The system should be such as can be mounted on a coach or the mobile bridge inspection unit.	100.00 (for item 2, 3 & 4)
		3. Develop system and design for safety at bridges by preventing derailments on bridges and approaches and in case of derailment minimise damage	
		4. Develop specifications for bridge structure for maintainability and durability minimum noise and safety.	
2	Carriage	1. Retrofitment of air springs in existing EMU bogies to improve the riding and reliability.	44 00
		2. Design and development of stainless steel coach shell.	40 00
		3. Design of coaches for MRTS	250 00
		4. Bogie mounted brake system for main line coaches.	Revenue
		5. Introduction of disc brakes.	Revenue
		6. Design of longer coaches	50.00
		7. Development of wheel set design capability and optimisation of design to improve reliability.	175.00
		8. Study and design crash-worthy coaches.	330.00
		9. Development of eco-friendly toilet systems.	25.00
		10. Design of EMU Bogies with air suspension.	135.00
3	Computer	1. Improvement in information technology infrastructure in RDSO.	80.00
		2. Upgradation of CAD facilities.	80.00
		3. H.R.D. in information technology.	80.00

4	Electrical Loco	1. Adoption of technology for manufacturing measuring wheels	50.00 (per unit)
		2. Indigenisation of equipment for existing 6000 H.P. 3-phase loco.	Revenue
		3. Development of rotary compressor.	Revenue
		4. Review of shed layout.	Revenue
		5. Standardisation of POH facilities for 3-phase locos.	Revenue
5	Engine Development	1 Development of Diesel Engines capable of sfc = 145 gm/bhp-hr	1630 00 (total for ED Dte)
		2. Development of locomotives for specific traction requirements of Indian Railways	These projects will be completed on
		3. Automatic engine diagnostic aids on board and for shed use.	Research facilities to be created in
		4. Automatic logging of engine performance on run.	IXth Plan The break-up of cost of
		5. Developing designs and component specification to achieve quantified reliability target.	Research facilities is given in annexure-II
6	Geo-tech Engineering	1. Development of Laser Particle analyser.	20.00
		2. Development of Computerised Tri-axial, Consolidation and Direct shear tests.	30.00
		3. Application of Geogrids and re-inforced Earth.	45.00
		4. Formation rehabilitation train.	1450.00
7	M & C	1. Determination of residual stresses.	20.00
		2. Upgradation of Improved non-destructive testing (NDT) and evaluating facilities.	20 00
		3. Application of Acoustic Emission Technology for Damage assessment of critical components and structures.	20 00
		4. Development of high performance organic coatings for bridges.	15.00
		5. Development of higher performance components for light weight coaches.	15.00
8	Motive Power	1. Upgradation of WDM2/WDP3 loco-motive.	1600 00
9	Power Supply and EMU	1. Development of dual voltage 3 phase drive system for EMU.	Revenue
		2. Development of A.C. package units for coaches using environment friendly refrigerant.	25.00
		3. Development of improved ventilation for EMU coaches.	10.00

		4. Reliability improvement of A.C. alternator and rectifier cum regulator for air conditioned coaches.	Revenue
10	Psycho-Technical	1. Upgradation of Ergonomic Research Laboratory for undertaking studies on ergonomic evaluation of tools, equipment and work places.	50.00
		2. Rationalisation of recruitment and selection procedures for improved productivity.	50.00
11	Research	1. Development of OHE cum Track Recording Car	80.00
		2. Upgradation of Tower Wagons for dynamic record of OHE parameters.	10.00
		3. To develop potential for consultancy in the field of instrumentation software to Rlys.	Revenue
		4. Study of track deterioration with time and traffic.	10.00
		5. Development of track wear profile	05.00
		6. Survey of spectral density of track geometry.	05.00
		7. Study of suspension parameters of locomotives.	24.00
		8. Development of indigenous measuring rail.	05.00
		9. Programmes to increase use of electronic Logic Systems.	50.00
		10. Develop systems for noise abatement to keep noise at internationally acceptable limits.	20.00
12	Signal	1. To design and develop continuous Train Control(CATC) with a view to increase the throughput of existing railway assets (Track and rolling stock).	400.00
		2. To develop system for centralized control and operation of ;trains from the control office to augment line capacity and provide information to traveling public.	200.00
13	Telecom	1. Use of V.S.A. Ts/brief case type terminals for accident relief trains.	10.00
		2. Development of specifications for -	
		(i) Universal emergency communication system from guard/driver to the nearest station.	Revenue
		(ii) 18/24 Fibre armoured fibre optical cable.	Revenue
		3. S&T interference trial for thyristor/ chopper rolling stock.	10.00
		4. Computerised testing of prototype samples of conventional telecom equipments.	60.00
		5. Computerised testing of prototype samples of microwave equipment.	(for items 4 & 5)

14	Track Design	1. Improvement in design of turn-outs to achieve better service life and speed.	25.00
		2. Development of higher UTS (100 kg/mm ²) rails suitable for heavier axle load at higher speeds.	10.00
		3. Improvement in rail manufacturing techniques and indigenous manufacture of head hardened rails.	10.00
		4. Rational methods of stress calculation in rails and other track components.	25.00
		5. Standardisation of gas pressure welding technique for rails.	75 00
		6. Development of rubber pads of improved quality.	10.00
		7. Use of finite element techniques for analysis and design of track components.	25.00
		8. Prediction of fatigue life of track components.	05.00
		9. Study of the effects of reduction of nominal gauge of B G. track.	75 00
		10. Computerisation of existing drawings of different track components and assemblies	50 00
		11. Optimisation of design and manufacturing of prestressed concrete sleepers.	20 00
		12. Improvement in the design of glued insulated rail joints.	20.00
		13. Rational design of ballastless track for high speed passenger traffic and heavy axle load freight traffic.	25 00
		14. Design of track structure and track components for high speed (250-300 km/h)	75 00
		15. Improvements in the technology for thermit welding of rails i.e. development of wide gap (70 mm) joints collarless thermit welds improved rail welding techniques etc.	15 00
15	Traction Installation	1. Development of prototype design for series compensation to reduce voltage drop in OHE	300 00
		2. Development of a shared thyristor switching device for installation at SP.	150 00
		3. Development of Amorphous metal core transformer s to reduce no load losses.	Revenue
		4. Development of silver bearing HDGC contact wire for better heat resistance, high mechanical/ electrical abrasion resistance.	Revenue

	5	Development of platform for 4-wheeler OHE car.	20.00	
16	Wagon	1. Reduction in wagon under repair percentage from 4% to 3%.	5,570 00	
		2. Increase in POH period for BOXN etc. from 18 months to 24 months.	(total for Wagon Dte.)	
		3. Increase in POH period for coal and other wagons from 4.5 years to 6 years from 2nd 1 POH onwards.		These projects will be completed on the test facilities to be created in the IX the five year plan
		4. Reduction in cartridge bearing rejection rate from 20% to 12%		The break-up of cost of Research facilities is given in Annexure-II.
		5. Increase in wheel life by 10% and reduction of 10% in rail gauge face wear.		
		6. Reduction in corrosion repair and unload-ability of new wagon.		
		7. Increase in through-put of coal rakes by 10% by new improved design of wagon.		
		8. Increase in speed potential of wagon to 100 kmph.		
		9. Design bogies with less rolling resistance.		
		10. Reduce derailment proneness of wagon bogies.		
		11. Bring future moving dimensions on selected routes for higher pay to tare ratio and to increase track loading density to 10.		
		12. Encourage use of jigs & fixtures in wagon manufacturing.		
Grand Total (Research Projects)			13863.00	

ANNEXURE - 2

RESEARCH FACILITIES TO BE SET UP FOR IX PLAN

Sl no.	DIRECTORATE	RESEARCH FACILITY	App. cost in Lakhs (Rs.)	REMARKS
1	Carriage	1. Dynamometer testing facility for axle mounted and wheel mounted disc for brake system.	200.00	
		2. Computer software for thermal analysis of wheel discs.	100.00	
		3. Upgraded version of NUCARS or equivalent vehicle dynamics software with air suspension simulation capability.	50.00	
2	Engine Development	1. Acquisition of 400 hp., 710 GM pack.	200.00	Cost of Reserch facilities of ED Dte. has already been included in the cost of Research Projects
		2. Emission measurement facilities confirming to I.S.O. 8178	300.00	
		3. Modernisation of Test Bed.	800.00	
		4. Acquisition of World Class Skill in Engine Design and Testing through appropriate Training.	100.00	
		5. Capability to measure Lubricating oil consumption on Test Bed.	100.00	
		6. Development or acquisition of software tools for simulation of ring pack performance, combustion modelling, finite element & boundary limit methods, computational fluid dynamics etc.	100.00	
		7. Electronic fuel injection equipment.	30.00	
3	Motive Power	1. Setting up of Locomotive system test facility.	600.00	
4	Psycho-Technical	1. Setting of Ergonomic Laboratory	50.00	Cost if included in Research Project cost.

5	Research	1. Upgradation of data acquisition system.	125.00	Cost of item no 3&4 is included in Research Project cost
		2. Upgradation of transducers.	20.00	
		3. Upgradation of Vehicle Characterisation Facility to test locomotives.	24.00	
		4. Upgradation of facility for training in software	50.00	
		5. Track recording car to record and study track geometry, forces and acceleration between vehicles and track and to measure riding index of vehicle.	300.00	
6	Signal	1. To develop inhouse capabilities for testing of fail safe electronic signalling equipment and validation of software of such systems.	50.00	
7	Telecom	1. Computerised testing and generation of type test reports for various items tested in RDSO Lab.	60.00	Cost is included in Research Project cost
8	Track Design	1. Procurement of advance analysis and design software packages.	50.00	Cost is included in Research Project
9	Track Machine	1. Procurement of one High Speed Ultrasonic Rail Test Car.	700.00	
		2. Acquisition of Track-Recording Car for recording Track profile in real time.	1100.00	
		3. To develop facilities for the study of rail wheel wear profile and grinding patterns for rail track and development of material such as carbide tip tamping tools for fast wearing components.	50.00	
10	Wagon	The following equipment is required to be procured for the wagon project:	4500.00	Cost of Research Facilities has already been included in the Cost of Research Projects.
		(a) Rolling test rig.		
		(b) Test track	100.00	
		(c) Component testing machine	500.00	

		(d) Brake Dynamometer	220.00	
		(e) Creep testing machine	220.00	
		(f) Cartridge bearing testing machine	30.00	
		(g) Brake testing rig		
11	RDSO as an Organisation	1. Obtain ISO-9000 quality certificate and development of total quality management system.	25 00	
		2. Upgradation of library and information facilities.	1000.00	
		3. Equipment and facilities for 250/300 kmph High Speed Operation	4200 00	
		Grand Total (Research Facilities)	15954.00	Of which 7434 00 is included in Project cost

Thus cost of new facilities to be created at RDSO in IX th Five year Plan outside the cost of Research Project in lakhs of Rs.8520 (15954.00- 7434.00=8520.00).

ANNEXURE-3**COST OF ON-GOING PROJECTS IN IXTH FIVE YEAR PLAN**

S No	Description of Work	Anticipated cost	Outlay to end of VIII Five Year Plan	Throw forward in IX Five Year Plan
1	Acoustic Emission Technique for inspection of Railway Bridges	5570	1	5569
2	In-house development of micro-processor based control system for thyristor locomotives.	5679	5679	0
3	Development of microprocessor based Wheel Slip Control System of Electric locos	1526	2	1524
4	'Inhouse' development of micro-processor based synchronised wire-less remote control equipment	4870	3001	1869
5	Exhaust emission analysis equipment for Diesel Engines used for Rail Traction purpose	24733	500	24233
6	Fabrication & Supply of one set of 5 Aluminium alloy girders for laying of blanket under Traffic	4790	2000	2790
7	Procurement of Sub-surface Interface Radar (SIR) system for measuring ballast penetration in weak sub-grade	9700	10	9690
8	Fibre optic signalling and communication system for basin bridge (Mark II)	2482	1882	600
9	Solid State Interlocking	3544	3347	197
10	Design and Development of large capacity solid state interlocking system for junction/bigger stations	3580	2881	699

11	Development of Fail-safe signal multiplexer	2000	701	1299
12	Development of AWS for main line section	5864	1000	4864
13	Mobile Gas Pressure Welding equipment with accessories	1648	1	1647
14	Provision of Test Track facilities for RDSO at MGS	52860	21807	31053
15	Rail Profile Inspection and Analysis System	54866	1	54865
16	Development of pole mounted switching stations for 25 KV AC Traction System	2300	1001	1299
17	OHE Recording cum Test Car	99542	7001	92541
18	Thermal measurement and image recording system	3151	300	2851
19	Modernisation of Fatigue Testing Laboratory	59447	55800	3647
20	Two BG High Speed Coaches for Oscillograph Cars	6000	5999	1
21	Modernisation of Brake cum Dynamometer Cars	18299	15229	3070
22	Provision of Swimming Pool at RDSO/Lucknow	2038	1885	153
Total		374489	130028	244461
Works costing below Rs 15 lacs		36416	19358	17058
GRAND TOTAL		410905	149386	261519

CHAPTER - XII

TRAINING AND HUMAN RESOURCE DEVELOPMENT

12 0 INTRODUCTION

Indian Railways have a regular work force of over 16 lakh employees. Much of this work force especially in Group 'D' category is semi-literate and unskilled. Indian Railways are called upon to play the role of a "Public Utility" as also that of a "Commercial Undertaking" While some of the essential features associated with "Public Utility" role are likely to continue for a long time, there is a growing realisation on the IR on the need to move towards a business led organisation

12 1 REVIEW OF THE VIII PLAN

During the VIII Plan, the changing pace of technology and challenges put forth by rapid changes in environment particularly economic liberalisation demanded greater inputs towards Human Resource Development. Railways augmented training facilities in key areas. Two simulators for training of drivers and other modern training aids have been provided. Two more such simulators would be commissioned by June, 1997. New initiatives, like granting incentive for acquiring higher qualification by staff and Group 'B' officers, part- reimbursement of fee for part time professional courses undergone by the employees, institutional collaboration between leading Engineering Institutes/ Management Institutes and Railway Training Institutions etc., have been taken. All these clubbed with the overall improvements in infrastructure contributed towards increasing manpower productivity. During the first 3 years of VIII five year plan, staff productivity increased by 5.5%

12 2 FOCUS AREAS FOR ORGANISATIONAL AND HUMAN RESOURCE DEVELOPMENT DURING IX PLAN

12.2 1 For Indian Railways to be a dynamic, growth oriented and a successful organisation in the fast changing environment, the competency of its human resources need to be developed further. However, for this purpose "enabling" organisational culture is also essential. The enabling culture of the organisation would include employees using their initiative, taking risk, making experiments, becoming innovative and ensuring that things happen. It is also necessary to evolve a customer oriented approach at all levels without departmental bias. This attitude has to be developed among Managers, Supervisors and Staff right from the date of their induction. The entire HRD efforts have to be directed in the context of:

- (a) The emerging economic liberalisation in the country with increased economic activities resulting in higher growth in Transport sector.
- (b) The need to ensure commercial viability in face of declining budgetary support and increasing cost of market borrowing.
- (c) Rising Customer awareness in an increasingly competitive market.
- (d) Rapid Technological changes.

- (e) Private participation in Railway business.
- (f) Export potential for Railway Equipment manufactured by IR Production Units

12.2.2 The management practices also need to be changed through various management development programmes so that functional responsibilities at the managerial level are integrated to.

- (1) Provide cost effective services
- (2) Optimise investment in growth areas.
- (3) Speed up decision making
- (4) Ensure quality in service, and
- (5) Match accountability with responsibility

12.2.3 Transforming IR in to a business led organisation would call for developing their Managers to plan, introduce and manage the “change”

12.3 STRATEGY DURING IX PLAN

12.3 Organisational restructuring & changes in management ethos & practices

Some of the essential restructuring steps mentioned below are proposed

12.3.1 Changes in Organisational Structure

Action will be initiated to bring about changes in the Organisational Structure to provide for business orientation. Recommendations of various expert committees and task forces would form the basis for these changes.

12.3.2 Horizontal Integration & Communication

Increased horizontal communication will be encouraged at all levels by suitable delegation to facilitate choice of methods for achieving goals. This would be achieved by necessary revision of codes and manuals with a focus on individual's role in customer satisfaction.

A common seniority of officers belonging to different service will be prepared so that the selection for the general management posts could be held on the basis of common seniority without any prescribed quota for different services. It is expected that this will contribute to removal of departmental feelings and departmental bias amongst the management cadre.

12.3.3 Introduction of cost centre and profit centre, internal customer relationship and total quality approach

Responsibility centres within the Indian Railways would be identified and designated as cost/profit centres. Suitable performance measuring devices and relevant Management, information system to support, monitor and control the Responsibility centres would

also be developed. This would facilitate introduction of internal customer relationship and total quality approach.

12.3.4 Introduction of Marketing Function and Management Information System

Suitable organisation and methods would be developed to discharge the marketing functions on the Indian Railways so as to provide suitable service-mix designed to cater to the needs of the various segments of the customers. Assistance from reputed consultancy organisation in marketing would also be sought for this purpose.

To expedite the process of decision making, computer based management information system including investment planning model would be developed for different levels of the organisation.

12.3.5 Private Participation in Railway Business

Apart from contracting out ancillary services/activities to the private entrepreneurs, private participation would be extended to provide value added rail transportation services to specific segment of customers.

The concept of BOT, BOLT, would be extended for development of rail infrastructure and meeting the enhanced needs of rolling stock.

12.3.6 Improved Maintenance Management Strategies and Practices

To improve profitability in the maintenance function of IR and ensure quality and reliability of assets, the maintenance management strategy, methods and practices will be redefined so as to introduce "life cycle profit" concept in railway assets maintenance. The stress should be on achieving a significant improvement in the reliability of assets.

Integrated asset maintenance management approach with mobile maintenance team equipped with communications to permit simultaneous maintenance of all sub-systems of asset would be introduced thereby reducing maintenance down time and avoiding repeated blocks.

12.4 PROPOSED HRD MECHANISM

The proposed HRDs system would include the following process mechanism.

12.4.1 Human Resource Information System

A Computerised human resource data bank would be created at divisional and zonal headquarters level which would include basic information about each employee, training programmes attended, performance, recruitment source, accomplishment, career progression, etc. This data would be utilised, inter alia, for the following purposes,-

- to link manpower planning and organisational planning
- to decide recruitment levels

- to anticipate redundancies
- to study cost of over-heads and value of service functions
- to decide whether certain activities need to be sub-contracted, etc.

Human resource data would also be utilised in planning for shifting the balance of bulk of employees from Unskilled to Skilled. As the source of recruitment of group 'D' is largely through the process of regularisation of Casual Labours, bulk of whom are released from construction projects or gangmen engaged in Track Maintenance activities, most of them are illiterate/semi-literate or unskilled. Depending upon trainability of such Staff, an elaborate training programme on the pattern of ITI would be arranged. Efforts would also be made for certification through various State Technical Education Boards. Simultaneously, a minimum educational qualification of Metric or ITI for recruitment in Group 'D' posts/Casual Labour would be adhered to so that they could be developed for higher skills and responsibility.

12.4.2 Career Planning

A Career Planning Cell will be established whose function would include

- (i) Preparation of personnel inventory of the Deptt
- (ii) Mapping of career of employee in the department
- (iii) Continuous updating of job description and job designation, based on an action plan for job enrichment which will not only encompass job-enlargement by way of multi-skilling but also include the following -
 - (a) Broadening of qualifications, skills and responsibilities so as to reduce need for supervision and increasing responsibility of individuals for their own work
 - (b) Within the broad frame-work of job requirements, allowing greater degree of freedom for individuals to vary the method, sequence and pace of their work
 - (c) Creating groups for execution of specific jobs/activities i.e. a complete natural unit of work instead of task specialisation

In defining the above functions and designing Career Planning, consultants of repute on Personnel management would also be associated.

The job profile prepared by Career Planning Cell would include not only the job description but also responsibilities, authority and extent of freedom for doing the particular job.

12.4.3 Training

Indian Railways have clear cut policy of intensive training of staff in order to equip them with necessary knowledge and skills in their specialised area of work. The training programmes are organised in 4 broad sectors. Initial or induction, refresher, promotional

and job specialities. Training imparted is institutional as well as “on job” which are integral part of the general scheme of the training organised to develop both theoretical and technical knowledge.

The entire Training Plan has to be refocused with reference to the corporate objectives of IR as well as the objectives of 9th Plan and modified Management Practices.

A common training programme for staff & officers of all department in “Customer Care/ Marketing” would be introduced to make them aware of their role, responsibility and function in Customer Satisfaction. The following changes are proposed in the area of training of staff:-

12.4.3.1 Management of Training Functions

While training design and delivery is of paramount importance, at the same time without adequate machinery for managing the training function, real benefits from training cannot be derived.

The officer looking after planning function in each department of Zonal Railway would be re-designated as ‘Planning and Training’ Manager (e.g Chief Traffic Planning & Training Manager) to minimise frequent changes as well as in the nomination of Training Manager and emphasise the importance, relevance of management of training functions. The incumbent of this post would be trained in management of training functions in advance. He may discharge his functions with the assistance of the Career Planning Cell.

12.4.3.2 Training of Trainers & Preparation of Standard Lesson Plan and Standard Training Materials

A beginning has already been made to provide training to trainers in training techniques at Supervisory Training Centre, Bangalore. Since the number of trainers are large, requirements for training of trainers requirement cannot be met fully with the existing arrangement. In absence of standard lesson plan and training materials there is no uniformity in the training standard. It is proposed that a Centre for Instructional Design and Training be set up for this purpose.

12.4.3.3 Quality of Trainers

To attract better talent to discharge training functions including direct training, steps would be taken to restoration of scheme of grant of Training Allowance at the rate of 30% of the basic pay in place of the existing practice of granting 15% of basic pay as Training Allowance.

12.4.3.4 Supervisory Development Programme

With the proposed changes in management ethos, it is necessary that every supervisor is trained in “supervisory skill” in addition to training in the technical function which the supervisor has to perform. To ensure a general upgrading of supervisory skills, it would be necessary to set up Supervisory Development Programmes. A system of competency based supervisory training would be introduced with possibility of suitable accreditation.

12.4.3.5 Training Need Analysis

A training need analysis group in each department of the Zonal Railways and Production Centres would be created. Training need analysis group would comprise officers, supervisors and staff representatives from different activities centres. The technical and secretarial support to the training need analysis group would be provided by the Career Planning Cell. With their inputs, among others, the Centre for Instructional Design and Training would then prepare standard lesson plans and training materials for various types of training.

12.4.3.6 Supplementing In-House Training Facility

While the in-house training facility would be adequate to meet training requirement of staff in core areas, the training needs in new technology areas would be met by availing the facilities in non-railway institutions in India and abroad. For this purpose railways would be given full powers to avail training facility outside the Indian Railways in the country.

Suitable incentives/disincentives will be planned to ensure training of every staff at the different stages of career and full utilisation of in-house capacity.

12.4.3.7 Training Programmes in Electronics Applications in Railways

For training of staff in “electronics” as applied in various facets of rail operation and maintenance, training programmes on Electronics Application in Railway would be developed at one of the Centralised Training Institutes of the Indian Railways.

12.4.3.8 Application of Simulators in Training of Staff

A beginning has already been made by obtaining two simulators, one each for training of diesel loco drivers and electric loco drivers. However, considering the number of drivers who have to be trained initially and refreshed periodically, it would be necessary that each Zonal Railway has at least two simulators. Simulation technique would also be expanded in other areas of training.

12.4.3.9 Introduction of Computer Based Learning/Training

In order to extend learning facilities at the work place and mitigate staff inconvenience in attending out-station training programmes and for wider coverage of training activity, it is proposed that computer based learning/training systems be introduced at all major work centres where class room intervention is not required. The material for computer based training - software would be developed by the proposed Centre for Instructional Design and Training.

12.4.3.10 Management Development Programme:

The management development programme would be restructured to cover training programmes in the following areas:

1. *Marketing strategy.*
2. *Multi-modalism in transport.*
3. *Project management.*
4. *Total quality management in railway sector.*
5. *Build/Own/Lease and Transfer concept and application.*
6. *Planning and Management of 'change'.*
7. *Computerised Decision Support System.*
8. *Quantitative techniques including Operations Research and mathematical modelling.*
9. *Financial resource mobilisation and Managerial Finance and Management Accounting.*
10. *Development of regulatory mechanism for private participation in providing rail services.*

12.4.3.11 Trainee Reserve Posts :

Norms for trainee reserve posts would be reviewed so as to ensure training opportunities are not missed on account of staff not being released for training. Special attention in this regard would be given to posts in the Safety Categories.

12.4.4 Motivation

The existing reward system on the Indian Railway including the incentive schemes in workshops and PUs would be reviewed, after a detailed motivational study.

While setting up and modernising various activity centres, the need for ergonomically designed of lay-out facilities would be kept in view. In procurement of machinery and plants ergonomic design would be one of the essential criteria.

12.4.5 Performance Appraisal :

“Performance Appraisal Interview” between the Manager/Supervisor and subordinate will be introduced so that the performance appraisal is used as mechanism for supervisors to understand difficulties, strength & weaknesses of their subordinates and to develop them to accept greater challenges by acquiring new capabilities

Performance Appraisal interview will be scheduled every 3/6 months. In such interviews the supervisor will schedule individual meetings with each employee to discuss the employee's performance, communicate the performance areas that need attention and jointly establish areas to be worked on or goals to be achieved by the next scheduled discussion. Goals and objectives that are agreed upon in each meeting will be reviewed in the next meeting.

Before planning for modifications in existing performance appraisal system, assistance of reputed consultants would be needed.

12.5 ADDITIONAL INSTITUTES

As discussed above, the changes foreseen would require setting up of the following institutes -

(i) **Centre for Advanced Transportation Studies**

In order to keep abreast with emerging transport Business scenario owing to increased economic activities and shift in production and distribution pattern, it is necessary that officers and senior supervisors are trained in multi-modalism in transport and the role of railways in transport development. For this purpose it is proposed to set up a Centre for Advance Transportation Studies.

(ii) **Centre for Instructional Design and Training**

In order to train the trainers in “training techniques” and introduce standard lesson plans and training materials, it is planned to set up a Centre for Instructional Design and Training.

These centres would be located in one of the existing railway premises/training institutes so that there is no additional capital requirement on ‘building’ except to the extent of minor additions and alterations. A sum of Rs.30 crores would be needed for this purpose.

12.6 EXTH PLAN OUT-LAY

The requirement of funds for creation of additional class rooms, auditorium, hostel and other infrastructure facilities for additional training seats for training in the different areas as mentioned in the preceding paragraphs could be in the region of Rs 200 crores which is based on 40,000 additional training seats requirement at the cost of Rs 0.5 lakh per seat. Provision has to be made under the Plan Head “Other Specified Works”. The procurement of training equipment for the various schemes out-lined earlier would entail the following expenditure under the ‘Machinery and Plant Programme’:-

(a) Provision of Supervisory development programmes		
(i)	<i>Procurement of multi-media projection systems including LCD panels @ Rs.5 lakhs for 9 STCs and 9 ZTCs in each Zonal Rly. and 5 TTCs in PUs.</i>	<i>23x5 = Rs.1.15crores</i>
(ii)	<i>Working Models/See-through Models @Rs.2 Lakhs</i>	<i>23x2= Rs.0.46crores</i>
(b)	Development of Model Rooms and Labs. for training in application of electronics in the railways	Rs.18 crores
(c)	Hardware & software for Computer based learning for front line staff 10 sets each for 9 ZTCs	90x1.2=Rs 1.08crores
(d)	Additional requirement of mulit-media projection system for 40,000 additional trg. seats. 1 unit for 1000 addiitonal seats	40x5=Rs 2.0crores
TOTAL		Rs.22.69 crores

As mentioned above, the expenditure under the plan head “Other Specified Works “ would be:-

(a)	Addition/alteration for Setting up of the Centre for Advanced Transportation Studies and Centre for Instruction Design and Training.	Rs.30 Crores
(b)	Additional Training seats in the existing training institutions.	Rs.200 Crores

Against the above requirement of Rs.30 crores for additions/alterations for setting up of Centre for Advanced Transportation Studies and Centre for Instruction Design and training, a provision of Rs.20 crores is to be made under the Plan Head “ Other Specified Works”. Similarly against the request of Rs. 200 crores additional training seats in the existing training institutions, Rs 110 crores on basic structural work could be met under the Plan Head “Other Specified Works.”

The residual request of Rs. 10 crores for addition/alteration and Rs 90 crores for additional training seats is proposed to be met out of the provision under costing as the various projects

Thus the total requirement of funds for human resource development & planning during IX Five Year Plan works out to Rs 252.69 crores as under. -

(1)	For Machinery & Plant	Rs 22.69 crores
(2)	For Other Specified Works	Rs 130.00 crores
(3)	Out of provision under contingencies of Projects	Rs 100.00 crores
	Total	Rs 252.69 crores

CHAPTER XIII

POLICY OF FINANCE & TARIFF, RESOURCE MOBILISATION

EXECUTIVE SUMMARY

- 13.1 The Subgroup discussed in detail the terms of reference. The Members of the Group were unanimous that Railways projects are dependent upon the projections given by the various other sectors of the economy and the demand of transport is a derived demand and is influenced by the rate of growth in the economy. As indicated by the World Bank report, with the escalation in the rate of growth of Indian economy, it is expected that the demand for freight transport would double within the next 12 years while that of passenger transport would double within the next 8-12 years. Although the Railway's share of freight traffic has diminished from 90% in 1950-51 to about 40% today, Railway would have to maintain a minimum growth rate of 9% for a rate of growth of 6% in GDP if the market share is not to reduce further
- 13.2 In order to maintain the above growth rate (9%), investment required for the IX Plan period for Railways would be around Rs. 93,000 crores. The investment requirement for the 'expected materialisation' scenario is assessed as Rs. 65,000 crores which envisages a GDP growth rate of 5% per year with the historical elasticity of 0.9
- 13.3 In order to raise the above resources, the Railway will be heavily dependent on Central Government assistance keeping in view the Government control on the pricing policy of the railways. However, Railways will have to resort to both conventional and unconventional methods for raising resources. While market borrowing and budgetary support from the Central Govt. may constitute the major resource generation, the Sub-group felt that State Govt. should also fund the projects which bring about economic growth in the States. There is need to subsidise the railway projects that are taken up for social obligations and development reasons. In projects like MTP, ROB and RUB and additional level crossings on existing lines, full participation of the State Govt. For funding should be encouraged. The Sub-group endorses RFFC recommendation No. 149, 150 that 'consortium approach is required to finance metropolitan transport projects as it is inappropriate to think that IR can finance them out of its plan resources. Besides this, the Railway will also have to resort to market borrowing and generate resources internally. It was felt by the Sub-group that various types of lease financing, corporation, and privatisation of some of the activities will have to be resorted to. Railway should also try and exploit in full its assets like buildings, structures and the right of way by leasing out some of its land/buildings/structures. Railway will also have to be given a free hand for commercial exploitation of its vast land holdings and air space in order to bridge the gap between the budgetary support and the railway's requirement.

- 13.4 The Sub-group noted with concern that inspite of the improved performance of Railways in recent years, ensuring adequate return on capital remains a matter of serious concern. The financial viability on fresh investment at present is appraised at 14% of the return on capital. While this may be sufficient to consider investment in other public sector, keeping in view the increase in the cost of borrowing capital through IRFC and the opportunity cost of the money, there is need to increase the cut off ROR in the railway projects.
- 13.5. Apart from the above, the Sub-group feels that there is need to pay greater attention on the qualitative aspect of project appraisal and project parameters should be clearly spelt out and the basis for changing the same normally should not arise. Material modifications to the projects should be discouraged and all anticipated works should be included in the original project cost and, as far as possible, an integrated planning done and comprehensively appraised. Investment portfolio should be limited so as to avoid spreading of resources on a large number of projects.
- 13.6 The Sub-group agrees with the apprehensions expressed in the Study Report done by JNU at the instance of Paulose Committee, that the increased cost of leasing and financing from the market may create a debt trap like situation for the Railway. The high growth in leasing charges, estimated to be over 40% is the most disturbing feature. It is, therefore imperative that only those projects which give higher returns than the cost of raising capital from the market are executed.
- 13.7 The Sub-group feels that cross subsidisation in tariff policy is an overwhelming phenomena in fixing the rates of passenger and goods services. It is essential that a conscious policy decision is taken to get over this aberration over a period of time. There is need to adopt a more cost based freight structure and withdrawal of subsidies on certain commodities. In the new liberalised economic atmosphere, there is an urgent need for reduction of subsidies of any kind and to insist that various services should pay for themselves to a large extent. If at all the Railways are required to carry the burden of social responsibility of subsidies thereon, either there should be a relief in the dividend liability towards general revenue or the concerned Ministry/Department/State/Organisation should compensate the Railways towards these subsidies. In the IX Plan, the Railway Tariff Policy should be directed towards achieving a drastic cut in the social burden. There is also need that railway may be given the freedom of fixing the freight structure on certain commodities.
- 13.8 The railway has to gear up financially in generating enough revenue so as to be in a position to fund its projects. However, the burden of uneconomic branch lines should not be carried by the Railways. If at all these branch lines are required for the economic development or for any other considerations by the State Governments. The Sub-group holds the view that the financial assistance offered as package deal by the railways to the State Governments should be accepted. While a few of the 40 lines recommended for closure by RRC, have been so closed, the remaining should also be closed as the State Government have not agreed to the financial package deal offered by the Railway.

13.9 The Sub-group suggests the following strategies for future :—

- (a) The Railways will have to work as a Government Department for a long time to come and any move to privatise or corporatise the railways as a whole will not be in the interests of the nation.
- (b) Railways should seriously consider corporatisation/privatisation of some of the activities not directly connected with the railway operations
- (c) Railways should be given full freedom to exploit its resources both land and buildings to generate resources. With the liberalisation of the Telecom policy of the Government, the Railways should be given permission to utilise its telecom network commercially for generating additional revenue.
- (d) The Railways may be given freedom in fixing the fares and freight of the commodities as well as prioritising the movement of the commodities
- (e) Railways should take up only those projects which give returns higher than the cost of raising money from the market. Any project for the development of economy or for strategic or social considerations should be fully borne by the Central Government/ State Government/Organisation Department.
- (f) Railways should be allowed to close down all uneconomic activities including the uneconomic branch lines. State Governments should be persuaded to accept the financial package deal offered by the Railways or at least share the burden of operating these lines

DETAILED DISCUSSION ON POINTS OF REFERENCE

[1] To examine indepth financial resources required for the 9th Plan and suggest proper measures for raising the resources by conventional methods or unorthodox methods that can be thought of.

13 10 1 Indian Railways continues to play a predominant role in the economy by providing transport for bulk materials and inexpensive services for passengers. The strategy for investment adopted since the I and II Plan periods relied on intensive utilisation of the available network. Investment was directed at increasing the payload of trains, deploying higher horse power locomotives and streamlining operational systems. Over the last 45 years the growth in freight and the passenger transport output has not been matched by a corresponding increases in the size of the network, the wagon fleet and the tractive effort of locomotives. This development has resulted in saturation of the arterial routes of the system which is very clear from the following :

INDICES OF GROWTH OF TRAFFIC OUTPUT AND INPUTS (1950-51 = 100)

Year	Output Indices		Investment Indices		Input Indices	
	Freight traffic (NTKMS)	Passenger traffic (PKMS) *	Wagon capacity	Passenger coaches	Route kms.	Tractive effort of locos
1951	100	100	100	100	100	100
1961	199	110	152	154	105	144
1971	289	159	226	188	112	178
1981	359	279	269	210	114	201
1991	550	394	278	219	116	192
1994	583	384	273	233	117	188
1995	575	419	260	229	117	198

* NTMKMS : Net Tonne Kms. PKMS : Passenger Kms. (Here non-suburban traffic only)

- 13 10 2. As a result of the recent liberalisation in Indian economy, industry has shown a very healthy growth rate and IR is today on the threshold of a quantum jump in freight and passenger movement to keep pace with the rapid growth of the economy. After registering small growth rates for the last three years, the incremental traffic moved during the last financial year was of the order of 25 million tonnes. It is expected that this trend would continued during the coming years. The transport capacity generated by the strategy of investments in expansion of network, rolling stock and technology are required to meet the challenges of the future

Expected Demand

- 13 10 3 The demand for transport is a derived demand and is influenced to a large extent by the rate of growth of the economy. According to a study conducted by the World Bank, the elasticity of demand for tota freight transport with respect to GNP is 1.5. In the case of passenger transport the elasticity has been estimated as 1.9. With the acceleration in the rate of growth of the Indian economy, it is expected that demand for freight transport would double within the next 12 years while that for passenger transport would double within the next 8-10 years. The various modes of transport in the country may find it extremely difficult to cope with such fast increasing demand. Historically however the ratio of growth in rail freight transport output in the rate of growth of GDP has been about 0.9. Thus, for a rate of growth of 6% in GDP, the corresponding growth in demand for freight transport would be 5.4% for the railways
- 13.10.4 An estimate of the Railway's inter-modal share made by the Committee on Perspective Planning (1987-88), Planning Commission had placed it at 88 per cent in 1950-51 and at about 51.5 per cent in 1986-86. It dropped from 68.4 per cetn to 22.4 per cent for the passenger traffic over the corresponding period. By implication of the estimate given in the Economic Survey 1995-96, the present share of the railways would work out to about 40

per cent in freight traffic and 20 per cent in passenger traffic and, if the trend continues, would decline to 35 per cent and 13 per cent respectively by the turn of the century. In spite of the conceptual and methodological limitations of such estimates a long term trend of a substantial decline in the railways inter-modal share is discernible. Considerable enhancement in the capacity of rail transportation is, therefore, warranted both to cope with the expected fast increase in overall transport demand and to maintain its inter-modal share.

13.10.5 The flow of traffic on IR's network is uneven. The broad gauge which forms 63% of the network generates about 95% of the freight and 89% of the passenger output. On the broad gauge, the 6 routes connected the 4 metropolises of Bombay, Calcutta, Delhi and Madras, carry around 10% of the traffic. These 6 routes are referred to as the golden quadrilateral. It is anticipated that during the next five years most of the incremental traffic would move on these routes which are already saturated.

13.10.6 The demand for rail freight transport for the IX Plan period has been assessed using three methods. The forecast for traffic under the three scenarios for 2001-02 are :

	Net Tonnes (billions)	Tonnage (million tonnes)	Lead (kms)
(a) Time trend analysis	341.0	490.0	695
(b) GDP-rail traffic correlation	360.2	533	695
(c) Users' projections	379.4	571	664

INVESTMENT REQUIRED

13.10.7 To create sufficient capacity within the available time IR may have to construct double/triple/multiple lines on saturated routs or on the routes approaching saturation levels. Opening of alternative routes is also being attempted primarily through the conversion of metre gauge track to broad gauge. In the sphere of rolling stock the efficiency of utilisation is planned to be improved through introduction of wagons capable of higher payloads, changing of desings to facilitate rapid uploading at terminals, reducing the maintenance time and by increasing the speed of freight trains by provision of higher power locomotives.

13.10.8 The investment requirement for the 9th Plan period on the basis of user's projection is of the order of 93,000 crores. IR's efforts in raising part of the resources required and the expected unfilled gap to be filled by unconventional methods and by raising fare & freight during IX plan ae dealt with in paras below.

13.10.9 The budgetary support available from the Central Government has been reducing steadily from a level of 75% in 78-80 to 15% in 1995-96. With the Government control on the pricing policy and the provision of same services at prices below costs it is unlikely that IR would be able to generate enough resources required to finance the investment required for

carrying the traffic during the next 10 years. It is imperative, therefore, that the Govt should give financial support to IR.

13 10 10 Investment required by Indian Railways to be met from the following sources :—

(a) Budgetary support from Central Government

- (a.i) Cental Government assistance to Railways has been steadily reducing over the years. IR is not likely to find resources from the market or from other unconventional sources to the extent required in IX Plan Railway is a very capital intensive industry with long gestation period and therefore, does not attract private investors. Even in most modern foreign countries like Japan, U.K. & USA, there is substantial Government support to Railways for raising infrastructure and generating additional capacity. The development in transport sector has to precede the development in other sectors of the economy and therefore, needs substantial Government support
- (a.ii) The Indian Railways being a departmental undertaking, has to contribute to and reflect priorities and concerns of social and economic policies of Government of India. Unlike a sheer commerical concern, it cannot determine rates of freight for basic commodities like coal, fertilizer, foodgrains, etc and passenger fares keeping in view sheer profit anlge. In addition, priority in the entire movement operations is to be accorded to certain essential items Thus, the railway has to move a substantial quantity of low rated commodities at the cost of high revenue earning capacity
- (a.iii) Besides, a number of railway projects are to be taken up keeping in view the overriding objective of defence and development of backward areas/integration of remote areas, in addition to other considerations The Committee notes that such social obligations and the burden of development projects have got substantial costs for the railways. While the essential social obligations cannot be wished away, the Indian Railways will continue to be in the need of a fair degree of budgetary support to remain financially viable and to generate adequate surpluses for investment so as not to become a constraining sector for the test of the economy.
- (a.iv) In veiw of the fact that Railway is forced to take up a number of social obligations and development projects, which either give less than the required, or negative returns, the Committee feels that budgetary support from the Central Government will not only have to continue but would have to be substantially enhanced to a very large extent in raising resources for Railways for years to come. The RFFC in its report in Chapter 14 has brought out the burden of social costs borne by the Railways in relation to the dividend paid to the General Revenues on the capital at charge. The social burden which was less than the dividend paid to the General Revenues until 1979-80, sharply exceeded the dividend thereafter, reaching more than double the dividend level by 1983-84. However, the extent of net social costs in 94-95 is assessed

at Rs. 1215-64 crores excluding the staff welfare and law & order costs amounting to Rs. 758.16 crores. There is need to take cognizance of these costs while deciding the Central Government assistance to the Railways

(b) State Governments Participation

- (b.i) So far there are hardly any projects which are supported by State Governments. Since work is taken up often for development purposes in which Railway has no financial advantage or for linking the remote areas or for passenger safety, The Committee is of the opinion that State Governments should also share the burden of these social obligations. At present, even if the Railways taken up these works with Central Government support, it is called upon to pay dividend charges on the capital invested, although the Railways gets no financial advantage, which actually goes to the State Governments.
- (b.ii) MTP, ROB, RUB and additional level crossings on existing lines are some of the works in which it is felt, State Governments participation & funding is very important. Railway is presently considering MTP extension in Bombay area in which CIDCO and State Government are also financing besides the Railways on 1/3 sharing basis. RFFC in its recommendations no 149 & 150, has also suggested that 'consortium approach is required to finance metropolitan transport projects. Since the financial requirements of these projects are enormous, it would be difficult to think that IR can finance them out of their plan outlay. The general approach is that since Railway falls in the Union List, it is the responsibility of the Central Government to build, finance and operate the Railway lines even within the metropolitan area. Therefore, all Metropolitan Transport should be put in the Concurrent List of the Seventh Schedule of the Constitution so that resource mobilisation for projects can be done by State Government & Municipal Corporations.'

(c) Market borrowing

- (c.i) Due to diminishing Central Government's budgetary support, Railway has been exploring the market for borrowing through IRFC. Due to poor appetite for taxable and tax free bonds, IRFC has been able to raise only Rs 744 crore and 985 cores during 94-95 & 95-96 through domestic issues but added to the other resources available for investment. The total significantly falls short of the requirement of IR. Also the cost of raising finance from the market is very high-around 18% in 95-96 through taxable bonds and if we add redemption costs, the borrowing costs for such bonds would be around 23%. Even tax free bonds at 10.5% are not popular and even at 12%, only limited nos. could be sold. If we add the redemption costs, the overall cost to Railways would be 17% and the average cost of for both in 95-96 (including redemption) may come to around 20%, whereas Railway projects are cleared at 14% return. There still remains a large gap to be fulfilled. We should,

therefore, depend less on such borrowings. JNU study got done for Poulse Committee has also come to this conclusion. Both in view of the high cost of raising resources through borrowings as well as the uncertainty in realising the targets, large scale reliance on this source would not be advisable.

13.1.11 The Sub-group considered various options available for financing the Railway projects and came to the conclusion that Railway will have to resort heavily on unconventional methods of generating resources. Some of the unconventional methods could be —

- (i) Lease financing the railway projects under BOLT, BOO or BOT scheme if such lease finance is available on attractive terms.
- (ii) A time has come for Railways to seriously consider corporatisation/privatisation of some of the activities on the lines of CONCOR.
- (iii) Railway is in unique position of having its network through out the country. The potential for exploitation of right of way by Railways is tremendous and the option of raising resources by leasing/licencing the right of way for laying optic fibre cable and other cables needs to be seriously taken up.
- (iv) Commercial exploitation of Railways' vast land and holdings and its air space, some of it in prime urban areas, should be allowed by the Government. This is likely to generate huge amount of resources which can easily meet most of Plan fund requirements.

(d) Internal Resources

(d.i) The Sub-group is aware of the fact that Railway will have to generate resources internally to a certain extent to meet the planned expenditure. In the table attached at Annexures 1 to 6, a broad assessment of the resources available for investment during each of the years of the Ninth plan, period through internal generation, market borrowings assumed, new measures of BOLT and Own Your Wagon Scheme, etc. other non-conventional measures and the required budgetary support against the Plan sizes corresponding to "materialisation" is worked out on the basis of estimated elasticity of railway traffic to GDP and aggregate of the projected sectoral demands. For this purpose, four different scenarios have been worked out as budgetary support at the fixed level with bonds as well as without bonds; and with increasing budgetary support by 10% each year with bonds and without bonds (Annexures 1 to 4). The required plan sizes, as was also indicated earlier, represent needs of the economy which the railways must meet without becoming a constraining sector for future growth. This is also in consonance with the Government's policy which not only accords highest priority to the infrastructure sectors but also envisages a considerable step up in investment in them with a view to concretising such a strategy.

(d.ii.) The Sub-group notes the seriousness of the resource constraints which haunts the prospects of our development endeavour and the intense prioritisation which has become imperative as a result thereof. With due regard to such

considerations, the extent of market borrowings assumed in the Annexure I would seem to be on the higher side, especially as the JNU study has so convincingly brought out the danger of the Railway falling in a debt-trap if recourse to such a source is continued beyond a certain limit. At the same time, going by the experience of the last two years, the borrowings cannot be reckoned as a certain or dependable source of financing. Moreover, the logic of resource allocation in the economy would indicate that borrowed resources—whether in the public or in the private sector—should finance activities where the returns are the highest so that not only the investors' interests are protected but the burden on the borrower is also not unmanageable and the turnover of capital in the economy is also high. Railway projects with their long gestation periods and rates of return moderated considerably by considerations of overall socio-economic priorities would not seem to justify a high share of borrowings in investment financing.

(d.iii) The schemes financed under BOLT and the Own Your Wagon Scheme are still to take off in a substantial way. To a considerable extent, they mean postponement of present liability into the future whose sustainability, if large magnitudes are involved, itself will require a very considerable improvement in railway finances. Some of the non-conventional sources of raising resources contemplated at present are in the stage of nascent ideas only. They would require not only concretisation into attractive viable schemes but also political sanction and institutional support to return realisations of any substance. At any rate, all such sources, their potential not underestimated, do not add up to a sizable and promising investment aggregate commensurate with our needs.

13.10.12 In view of the above, the Sub-group feels that,

- (1) the Railways must do its best to raise resources from the extra budgetary sources, improve operational efficiency and effect economy.
- (2) Higher market borrowing by Railway cannot be continued beyond a certain limit without the danger of Railway falling into a debt-trap, as brought out by the independent study conducted by JNU.
- (3) All the above unconventional methods will not be able to meet the resource requirements of the Railways to meet the declared Government policy of acceleration GDP growth rate of 7% p.a. The budgetary support to Railways has to increase which would only be in fulfilment of the present Government's objective to raise the investment in infrastructure sector from the present 3.5% to 6% of GDP. Large additions needed in its investment programme must mainly be supported by the budgetary finance. A strait-jacketed approach in slashing budgetary support in view of the recent experience and the crucial role of the Railways would be counter-productive and make it a constraining sector for the rest of the economy.

[2] 'To examine in depth the return on capital in major railway projects and to suggest improvement'.

- 13.11.1 The ratio of 'net revenue receipts to capital-at-charge', inspite of some conceptual limitations, does broadly reflect the systemic efficiency over an extended period of time. It is noted that this ratio which generally ranged between 5 and 7 per cent in the eighties - a few aberrations excluded - has improved perceptibly in the nineties, and was 13.71 per cent in 1993-94 and 15.28 per cent in 1994-95. Similarly, the operating ratio, which in the eighties had been well above 90 per cent, has also improved in the nineties and came down to 82.93 per cent in 1993-94 and further to 82.64 per cent in 1994-95. However, the position changes significantly when dividend payments, reflecting interests on capital, are excluded. The percentages of surplus after dividend on capital-at-large and on investment have historically been below 2 per cent generally and even negative in some of the years. An improvement in this regard is also perceptible in 1990s with the 'surplus after dividend payment' as percentage of 'capital-at-charge' going up to 8 and 9.8 in 1993-94 and 1994-95, respectively. It must, however, be kept in mind that in the past few years some reliefs on dividend-payment have been provided.
- 13.11.2 Notwithstanding the historical resilience of the Railways in financial matters and improved performance in recent years, ensuring adequate return on capital remains a matter of serious concern. The RITES in 1980 had recommended that a return of 10 per cent should be the aim to be pursued over a period of time. But even this modest rate has not been realised.
- 13.11.3 Taking into account the higher cost of raising capital, the pattern of financing investment and the depreciation and risk factors, for the last 3-4 years, the minimum norm of financing viability on fresh investments has been raised to 14 per cent in the appraisal of return of capital. While this cut-off level is higher than the 12 per cent financial return norm reckoned by the PIB' in the case of other Ministries, we need to consider the special circumstances of the Railways. In view of the much reduced proportion of the budgetary support, increase in interest rates accompanying a liberalised capital market, the opportunity cost of money, high cost of borrowing capital through IRFC, enhanced cost of project being taken up under BOLT scheme etc., and the need to improve the ratio of surplus to capital generally, it is felt that this norm needs to be suitably revised upwards.
- 13.11.4 The Sub-Group's work was constrained by the fact that in spite of the codal provision that all projects involving capital investment of over Rs. 1 crore (latest revised norm) must be evaluated after completion, such work is not being regularly done. Nor are any categorywise rates of return available. This work, by its very nature, cannot also be accomplished especially, or within a short period of time which could provide some specific details to the Sub-Group. However, a brief review of 26 new line projects opened in the last 15 years, included in the Indian Railways Yearbook 1994-95 revealed that in some of the new lines, the net returns

on investment were either commensurate with or higher than the projections whereas on the others the returns were lower than expected. Of the seven industrial and mining projects-oriented new lines, five gave more than expected returns and the two others posted lower returns. Majority of the nine new lines constructed to provide missing links amongs sections or to relieve bottlenecks have shown lower returns 'due to poor materialisation of traffic'. All the remaining ten lines justified on the grounds of pormoting development of backward areas of linking the remote areas with rest of the country, have shown 'negative' or 'unremunerative' returns. This does indicate that the initial estimates of materialisation of traffic were either optimistic or purposely or erroneously overstaed and the costs in most of the cases were kept lower than required

- 13 11 5 The above position cannot be, on the whole, considered, satisfactory. Although specific information on post-evaluation of other categories of projects is not available in a similar manner, they are also believed to be having a mixed status. There is, therefore, an urgent need to ensure streamlining of investment planning in the Railways, as a well laid down system support by the requisite expertise that already exists.
- 13 11 6 Proper prioritisation, accompanied by comprehensive appraisal of major projects, is the initial stage of a meaningful investment planning. The Financial Code clearly lays down 'Except in the case of residential buildings, assisted sidings and rolling stock to which special rules are applicable, no proposal for fresh investment will be considered as financially justified unless it can be shown that the net gain expected to be realised as a result of the proposed outlay would, after meeting the working expenses , yield a return of not less than 10 per cent (since revised to 14 per cent) on the initial estimated cost'. (Chapter II, para 204) Over the years, a good system in this regard has come to be established both in the Zonal Railway system as well as in the Railway Board. Reviews (e.g. by the Mirchandani Committee in 1969) of contents and methodology of project-appraisal have let to the adoption of the Discounted Cash Flow (DCF) technique in estimating the returns and working out the net present value (NPV) of investments. This is in conformity with the Planning Commission's guidelines on project appraisal. Detailed formats have also been included in the Financial and Engineering Codes of the Railways to collect and process the relevant information. With the setting up of the Expanded Board since February 1995, the system of consideration of project proposals involving investment of over Rs. 50 crore has been further formalised. Getting the best out of the existing system would, however, need continuous attention to realistic estimation and projection of data and parameters in the zonal railways and expert examination of the estimates in the Railway Board.
- 13 11 7 Although, comperehensive evaluation of individual projects after their completion is not available, in several of the cases where the performance has been reviewed, marked deviations from the original estimates are observed. Such deviations, mostly on the adverse side, take place inspite of some conservative assumptions made in estimating the rate of return (ROR)

in the appraisal stage, e.g. the practice of stabilising traffic 15th year onwards, assuming the project life of 30 years, and considering traffic estimates on leads with the zones rather than on origin to destination lead, etc. Such deviations from the originally estimated rates of return result in the wake of cost and time over-runs, and often from unrealistically high projections of traffic. In some cases, material modifications have also caused significant changes as against the original estimates. All these underscore the need for a more realistic and integrated investment planning.

13.11.8 A phenomenon which has directly got a bearing on productivity of capital is sanctioning of new proposals in spite of a heavy throwforward of a large number of ongoing schemes. The resultant thin spread of capital over a large number of schemes locks in scarce capital resources and causes time and cost over-runs.

13.11.9 Keeping in view the above, the Sub-Group would emphasize and recommend the following:

- (a) Although an elaborate system of preparation of survey reports and project appraisal exists, greater attention must be paid to the qualitative aspects. In particular, the bases for traffic projections need to be spelt out to make them more realistic.
- (b) Any recasting and revision of project proposal, if required, must be done with utmost care. Reasons and basis for changing the project parameters should be clearly spelt out. Detailed formal comments/approval of the FA & CAO must accompany the revision.
- (c) Material modifications should be discouraged and all project related works should be anticipated and included as part of the original project. In case of doubling, gauge conversion, electrification, etc., as far as possible, integrated planning of a large system should be done and comprehensively appraised. Individual projects, as part thereof, may be undertaken in a phased manner. This is, indeed, necessary to take account of the variety of costs, savings and earnings, etc. in a realistic perspective.
- (d) Given the medium-term policy thrusts of the Indian Railways, which may continue to guide broad allocation of investible resources, the desirability of an explicit inter se prioritisation of projects within each category (e.g., new lines, electrification and gauge conversion) cannot be overemphasized. On the one hand, this would check the thin spread of capital resources causing time and cost over-runs, and on the other, the application of financial returns norm would resist crowding out of and/or languishing for funds of more promising projects due to pressure those brought up for approval on extra-economic/financial considerations.
- (e) The present cut-off norm for measuring the financial viability of projects is 14% return on capital. This is higher than the 12% return norm allowed by the PIB in case of the projects of other Ministries. However, keeping in view the hike and liberalisation of interest rates, high opportunity-cost of capital in fast growing Indian economy, adequate coverage of risk, and the desirability of enforcing stricter discipline in the selection and approval of projects, there is urgent need to suitably revise upwards the return on

capital norm for the railway projects.

- (f) There should be a continuous effort to make the financial and economic appraisal of the projects more comprehensive. Emerging new patterns in financing of the projects (e.g. BOLT), increasing privatisation, cost-sharing arrangements, etc. reinforce the desirability of the same. There is urgent need to strengthen capabilities - in terms of staff, training and expertise - both in the railways and in the Economic Units of the Railway Board, to cope up with the requirements of growing sophistication in this regard.
- (g) In some cases, issuance of 'completion certificate' is observed to be unduly delayed. This formally keeps the projects out of the ambit of post-evaluation and start of the process therefor. This needs to be discouraged.
- (h) Delay in the release of funds, and in inadequate measure, is often cited as a cause for the delay in the completion of the projects. Such a tendency would be curbed if prioritisation in undertaking the projects is effected and greater discipline exercised in their selection and approval.
- (i) Absence of systematic evaluation/review of individual projects (costing over Rs. 1 crore), in spite of the codal provision, is a serious matter. In view of its obvious significance in providing useful feedback and rectification of weaknesses, a strict monitoring mechanism needs to be set up in the Railway Board. A quarterly review of progress in this regard would be desirable. In view of the substantial and continuous nature of this work, it would be desirable to entrust this responsibility exclusively to a separate cell within the Finance Directorate of the Railway Board to monitor and examine the evaluations made by the railways and submit periodical reports for the consideration of the full Board. Such a cell will have to be equipped with the desired expertise and facilities.
- (j) Simultaneously, it is considered desirable, in view of the fall in the value of the rupee and cost-escalation, to raise suitable the codal floor limit of the projects requiring post-evaluation from the present Rs. 1 crore. This will also make their numbers manageable for evaluation.

13.11.10 There are a host of other factors which are germane to raising productivity of capital at the implementation and operational stages, e.g. aspects like pricing of railway services. These are dealt with by the respective sub-groups. Some aspects have also been examined and commented upon elsewhere in this report.

[3] To assess the impact of market borrowing on long term finance of the Railways, keeping in view the trends of returns on investments in the past.

- 13.12.1 The Sub-group assessed the impact of market borrowings by the Indian Railway. In this regard, it also took note of a recent independent expert study conducted by the Jawahar Lal Nehru University at the instance of the Railway Capital Restructuring Committee.
- 13.12.2 So far the railway has been getting budgetary support and majority of its assets are created with Central Government assistance. Railway is required to pay a fixed amount of dividend, which is recommended by the Railway Convention Committee and approved by Parliament from time to time on the investment made in perpetuity. Thus, Indian Railways continues to pay dividends on the investment that no longer is giving any returns. With the steep decline in budgetary support, the Indian Railway has been forced to go for market borrowing mainly through IRFC. Unfortunately, all the parameters of system of leasing of assets from IRFC have not yet been determined and one has only tentative indications regarding how this would evolve in future. JNU report in its study has indicated that even under the most optimistic assumptions and the most favourable leasing arrangements, it would be more expensive for the railways than the budgetary support.
- 13.12.3 The Railway Capital Restructuring Committee in its final report has suggested that there should be a ceiling applied to the market borrowing. This has been suggested mainly to avoid Indian Railways falling into a debt trap. This Sub-group agrees with the apprehensions expressed in the report. The present market borrowing rate through IRFC's Taxable Bonds is as high as 18% for the assets created from these borrowings. It is expected that at this rate of proposed IRFC borrowing as well as redemption charges, from 98-99 or thereabout the Indian Railways may find themselves in debt trap like situation when the cost of operations including that of depreciation, leasing charges, dividend which is estimated to be over 40% is the most disturbing feature. The increase in the trend may continue in future due to decline in budgetary support. Leasing through IRFC as an option was considered by the Indian Railways because certain tax benefits through depreciation, were available. This however, is no more true as IRFC has already accumulated depreciation benefits and IR is not able to get any benefits out of this. Lease financing from other financial institutions may be more attractive as they are likely to get the benefit of depreciation. However, railway will be increasing its lease charges liability even in this case. The fact remains that the lease charges are going up as not only the cost of borrowing is going up but also because more and more amount is being raised through IRFC. However, despite this, it is true that budgetary support is not forthcoming and if sufficient generation of funds cannot take place, there is no option for IR but to borrow through IRFC or to resort to lease finance even at higher cost. The only safeguard that is to be taken is about how this money should be invested.
- 13.12.4 The sub-group feels that if the market borrowing is to continue, the benchmark for ROR on projects would have to be suitably hiked so that the returns are higher than the cost of money. It also feels that the project appraisal would have to be made more realistic

13.12.5 The Sub-group considered the issue and recommends that :—

- (a) The project which has returns higher than the capital being raised through market only should be accepted.**
- (b) The cash inflow and cash outflow should be duly worked out for the project and investment may be made if there are positive cash flow proper discounting**
- (c) The benchmark for IRR must be increased so that the return on investment is higher than the cost of borrowing**

[4] To suggest making tariff policy on Indian Railway, more customer responsive, but at the same time reducing the burden towards social obligation.

13.13.1 The tariff policy on the IR has traditionally been one of restraint with regard to increase in passenger fares and moderate increases periodically in the case of freight traffic. Over the years, the Railways have by and large conformed to the principle of cross-subsidisation in order to offset the losses incurred in passenger and other coaching services through additional revenue for freight movement. The policy thus is directed to achieve the following broad objectives :—

- (i) that the organisation is financially viable and for that purpose the tariffs are periodically adjusted to cover increases in the cost of inputs
- (ii) that the individual services are so priced so as to conform to the principle of what the traffic can bear
- (iii) that the cross-subsidisation is resorted to for the balanced growth in the socio-economic environment, but at the same time services are not priced at a level lower than cost
- (iv) that the railway tariffs take due notice of the relative advantage of different modes of transport for different distances and volume and be tailored to suit optimum coordination between different modes of transport

13.13.2 With the cost of inputs going up over the years, it has become imperative for the Railway to take notice of the important relationship between cost and rates, so that a certain amount of parity is maintained between the two. However, as a public utility service, Railways are still called upon to shoulder higher burdens in the form of subsidised tariffs for certain essential commodities and concessional fares for certain categories of travel, which do not cover the fully distributed cost.

13.13.3 In view of the dichotomy that continues to exist in the perception of the role of the Railways as a transport agency in the overall economic development of the country by viewing Railways both as a commercial undertaking and as a public utility organisation, certain aberrations have crept in hampering a more equitable and cost based freight and fare structure to be evolved. Successive expert committees have dwelled at length on this aspect and have categorically recommended a cost based system, so that each service pays for itself in the overall Railway transport effort. Unfortunately, it has not been possible to get out of the shackles of this dichotomy, so much so that the perception continues to be aberrated and cross-subsidisation continues to be an overwhelming phenomenon in the Railway rating.

13.12.4 Notwithstanding the facts mentioned above, it is essential that at least a conscious policy decision is taken to get over this aberration over a period of time, say over the next 10 to 15 years, so that a more equitable and cost based freight and fare structure is evolved. That would mean a continuous exercise for the next two five year plan periods at least, if not more,

towards rationalising the fare and freight structure. A beginning has already been made in this regard on the basis of the recommendations of the Railway Fare & Freight Structure Enquiry Committee, 1991, in the form of adopting a more cost based freight structure and withdrawal of subsidies on certain commodities. Even in the passenger fare structure, efforts are on to make it more cost based class-wise.

13.13.5 The details of social cost borne by the Railways in the last 3 years are as under :—

(in crores of rupees)

Year	Loss on Non sub. coaching sevicees	Loss on suburban services	Loss on essential commodities carried below cost	Total losses	Net social obligation after deduction of social welfare & law & order cost
1992-93	1744	216	250	2210	1549
1993-94	1656	205	65	1926	1217
1994-95	1716	211	47	1974	1216

13.13.6 The losses on commodities carried below cost during the last 3 years are as under

(in crores of rupees)

S. No.	Commodity	92-93	93-94	94-95
1.	Foodgrains	160.1	-	-
2.	Sugarcane	32.2	20.3	14.01
3.	Salt	15.6	16.9	10.38
4.	Fruits & Vegetables	7.9	3.5	7.95
5.	Livestock	3.6	3.0	5.25
6.	Edible oils	2.9	1.2	-
7.	Coil products	2.7	2.7	2.10
8.	Oil products	2.6	-	-
9.	Fodder	2.3	-	-
10.	Bamboos	2.1	-	-
11.	Firewood and other fuel	-	1.8	1.47
		1.4	-	-
12.	Provisions	-	1.4	-
13.	Other commodities	18.3	14.2	1.60
14.	Other ores	-	-	-
Total		250.8	65.4	46.66

- 13 13 7 The RFFC have recommended that the new policy of IR in respect of cross-subsidisation should be that losses due to social responsibilities should be the least component of IR's corporate aim. Even the new liberalised economic policy of the Govt. of India clearly underlines the need for reduction of subsidies of any kind and that services should pay for themselves. In keeping with this overall policy, it is essential that the IR also reorient their perspective and attempt to rationalise the fare and freight structure in line with the cost escalation, **so that subsidies get reduced, concessions get eliminated and the element of social burden on the Railway system is substantially reduced.**
- 13 13 8 With the continued reduction in the budgetary support for the Railways coupled with the added responsibility of generation of internal resources to meet the growing investment demands, it has become necessary for the Railway to keep the social burdens to the barest minimum. If at all the Railway is required to carry the burden of social responsibilities and subsidies thereon, either there should be a relief in the dividend liability towards the general revenue or the concerned Ministries/Departments should compensate the Railway towards these subsidies. The Railway Convention Committee, 1991 in their 5th Report have clearly recommended that the Railway should be appropriately compensated for carrying the social burdens. During the 9th Plan period, the tariff policy of the Railway should be directed towards achieving this objective of drastic reduction in the social burdens through appropriate and cost based rationalisation of the freight and fare structure.
- 13 13 9 The Sub-group makes the following recommendations —
- (a) A more equitable and cost based fare and freight structure should be evolved over a period of time, say 10 to 15 years, and subsidy on various items should be withdrawn to reduce the phenomenon of cross-subsidisation.
 - (b) There is over-whelming need to reduce losses due to social responsibilities in Railway in the new liberalised economic policy of the Govt. The subsidy on passenger fares should be reduced and all the services should pay for themselves.
 - (c) The Railway should be adequately compensated for the losses due to social responsibilities. There should be relief in the dividend liability towards general revenue on the losses borne by Railway due to social responsibility.

[5] To suggest methods of reducing losses on uneconomic branch lines.

13 14.1 In the wake of the challenges thrown up by the new economic policy, the Railways have to gear up themselves financially by not only focusing on revenue earning traffic but also plugging losses in uneconomic operations. In this context, the need to address the problem of loss-making branch lines acquires a greater urgency.

13 14.2 As per the recommendation of the Uneconomic Branchline Committee 1969, branchlines are those lines on broad gauge and metre gauge which join the main system at one end only. They also include all narrow gauge lines on the railway system. Of the total branchlines on the Indian Railways, there were 115 uneconomic branchlines as on 31.3.1994. The losses incurred on these lines totalled to about Rs. 144.66 crores, excluding the dividend payable to the General Exchequer. Annexure 7/1 to 7/9 give the details of these lines.

13 14.3 The main factor responsible for making a line uneconomic is the low density of traffic on that line. The narrow gauge lines, in particular, suffer from various disadvantages like peak of gauge involving transshipment, short lead and severe competition from road traffic.

13 14.4 In order to reduce the losses on the branch lines, various steps have been taken by the Railways. These are:

- (a) Reduction in staff. This has been achieved through,
 - (i) Downgradation of stations into contractor-operated halts.
 - (ii) Introduction of "one engine only" system whereby only one train can be in the section at any time. This obviates the need for block working and hence reduces the staff requirement.
 - (iii) Curtailment of train services including running of trains only during day time, cancellation of trains on Sundays and other holidays etc.
 - (iv) Issue of passenger tickets by Travelling Ticket Checkers/Booking Clerks on the trains running on the section.
- (b) Reduction in infrastructure through
 - (i) Dismantling of sidings.
 - (ii) Dismantling of signalling equipments.

Despite adoption of these measures, however, the likelihood of these lines becoming viable is remote since the density of traffic on these lines is extremely low. The comparative statement of losses incurred on these lines (contained in Annexure 8) during 1992-93 and 1993-94 would indicate that there has been little impact of the above measures on the expenditure incurred on these lines.

13 14.5 The Railway Reforms Committee 1983, in its Report, identified 136 uneconomic branchlines which were classified into the following categories:

- (i) 40 lines where adequate alternative road transport facilities are already available and hence can be closed. (List at Annexure 9)

- (ii) 17 lines in the State of Gujarat which can be closed provided 'kutcha' roads which become unserviceable during the monsoon are converted into all weather metalled roads
- (iii) 74 lines having strategic/tourist importance, or serving remote/hilly areas which cannot be closed.
- (iv) 5 lines for which surveys for gauge conversion have been ordered.

13.14.6 The Railways Reforms Committee also recommended that in case the State Governments did not agree to the closure of the 40 lines recommended for closure, they should share the losses on these lines with the Railways on 50 : 50 basis.

13.14.7 The Committee further recommended that the Railways should set off 50% of the losses on such lines against the share of Grants payable to the States in lieu of the passenger fare tax after a period of 2 years of completion of the State Railways dialogue, in consultation with the Finance Commission. The Eighth Finance Commission before whom the Committee's recommendations were placed stated that this issue was to be resolved by negotiations between the Govt. of India and the States concerned. In response to the proposals made by the Ministry of Railways, replies have been received from most of the State Governments indicating their disagreement with both the closure of uneconomic branchlines and the sharing of losses with the Railways.

13.14.8 The Railway Convention Committee, in its Report of 1973, had called for a review to identify the lines which could be closed keeping in view the availability of alternative modes of transport in the concerned sections. This review was carried out by the alternative modes of transport in the concerned sections. This review was carried out by the Railway Board in consultation with the zonal railways and 23 lines were identified for closure. The Railway Reforms Committee also carried out a detailed review and suggested the closure of 40 lines. However, there seemed to be little hope of the Railways succeeding in the attempt to close the lines in view of the State Governments' opposition to the closure. Keeping in view these facts, the Railway Convention Committee therefore, made the following recommendations —

- (i) The Railway Board should continue the dialogue for the closure of the uneconomic branchlines (in the areas where modes of transport have developed) with the State Governments and convince them of advisability of closing those lines whose conversion may not be viable.
- (ii) With regard to the 17 lines in Gujarat State where the Railway Reforms Committee had recommended conversion of 'kutcha' roads into all weather metalled roads, the Railways must consider giving financial assistance and other incentives necessary to the State Government to make them agree to the withdrawal of the Railway lines.

13.14.9 The financial assistance offered as a package deal by the Railways to the State Governments includes the following :

- (i) One time subsidy for the procurement of adequate number of buses to meet the de-

- mand following the withdrawal of train services
- (ii) One time lumpsum financial assistance for development/important of roads in these areas.
 - (iii) Offer of the railway embankments in respect of 17 lines referred above, for conversion into all weather metalled roads.
- 13 14 10 Of the 40 lines recommended for closure by the RRC, 15 lines have since been permanently closed. Out of 17 lines recommended for closure by the RRC where alternative road services are available, 2 lines have been permanently closed. The remaining branch lines could not be closed because the concerned State Governments have not agreed
- 13 14 11 Surveys for the conversion of the 5 lines have since completed. Out of these one line has been converted, on line whose conversion is in progress and proposal for conversion of two lines has been included in 9-96 Action Plan
- 13 14 12 The Ministry of Railways have accepted the recommendation to retain the 74 branch lines identified by the Railway Reforms Committee
- 13 14 13 State Governments must accept the fact that branch lines particularly on the narrow gauge and metre gauge which do not yield any remuneration to the Railways and on the other hand are a drain on the Railways resources must be closed down in the national interest. The Ministry of Railways have repeatedly referred this matter to the concerned State Govts and even offered a financial package already referred to above, as a incentive. The State Governments have without exception taken the line that the uneconomic branch lines cannot be closed down for one reason or the other. No attempt appears to have been made by the State Govts to create a viable alternative to rail transport. In view of the State Govts' reluctance to take a firm decision on this issue, the Ministry of Railways would be constrained to take a decision unilaterally to close down all lines which are not economically viable. In any case, the Railway are approaching the State Governments only as a matter of courtesy and would be well within their rights to close these lines
- 13 14 14 The Ministry of Railways suggest the following plan of action to be followed in regard to the closure of uneconomic branch lines
- (a) Immediate closure of 40 lines recommended by the Railway Reforms Committee (of these 15 lines have already been permanently closed)
 - (b) Immediate closure of such of those 17 lines in Gujarat where adequate road facilities exist at present (of these two lines have since been closed)
 - (c) Working out of individual package deals with concerned State Govts in respect of the other uneconomic branch lines identified by the Railways. The deals would include the financial incentive already offered by the Railways namely one time subsidy for procurement of buses and one time lump sum financial assistance for development or improvement of roads in concerned areas.

- 13 14 15 The Railway Fare and Freight Committee (RFFC) in their report had examined various aspects of uneconomic branch lines in the chapter on social burdens-subsidies and cross subsidies. It has been brought out in the report that the Railways transport service serves as a public good and for this purpose the Railways have to undertake several services which though patently unremunerative in nature form a part of the overall social burden. It has been brought out that with the development and urbanisation, many of the branch lines have lost their original utility, yet there is a reluctance on the part of State Govts for closure of such lines in the wake of public resistance. A review of the working results of such uneconomic branch lines in 1991-92 indicated that the Rlys are incurring operational loss of Rs 123 crores on 116 branch lines. The RFFC had interacted with several State Govts and they had observed a strong opposition for any action relating to closure of uneconomic branch lines even though adequate road systems exist in many places.
- 13 14 16 The RFFC had quoted that over the years the loss on account of uneconomic branch lines was increasing. They had also brought out the fact that Railways in foreign countries are compensated for losses that they incur on operating uneconomic services. However in the case of IR not only no compensation is received from either the Central or State exchequers for carrying on with such uneconomic services but there is a reluctance on the part of State Govts for closure of the same.
- 13 14 17 The RFFC had brought it to the notice of the State Govts that on the recommendations of the 9th Finance Commission Rs 150 crores is transferred from the Centre to the State as their share in the form of a grant in lieu of Passenger Fare Tax and they should meet at least a part of the losses from such receipts. The State Govts on the other hand are of the view that they are unable to meet the losses on uneconomic lines out of the grant and accepted that the Central Govt which owns the Railways should find necessary fund for continuing to operate such uneconomic lines.
- 13 14 18 In such a scenario the RFFC recommended that the losses incurred in the cases of uneconomic lines should be fully reimbursed by the Central Govt in the event where State Governments' cooperation for reimbursing the losses to the Railways is not forthcoming. The RFFC recommendation on the Uneconomic Branch Lines is an update of what has earlier been stated by the RRC in 1983 and the RCC in 1995. The State Governments should accept the fact that in a changing scenario of economic liberalisation, the Railways should be allowed to play a greater role whereby branch lines services which are uneconomical should be closed down or the losses so incurred be borne by the State Govts. This would be in consonance with commercial principles. Since the Railways cannot close down the services, unilaterally, the matter should be pursued at the highest level of MR with the respective Chief Ministers.
- 13 14 19 The 10th Finance Commission has hiked the quantum of grant in lieu of Passenger Fare Tax for the period 1995-2000 from Rs 150 crores to Rs 380 crores. As per the existing

practice a part of this expenditure would be borne by the Railways but the major chunk, is expected to be borne by the Ministry of Finance. The State Governments, therefore, would be recipients of an increased quantum of grant in lieu of Passenger Fare Tax. As recommended by the RFFC, this grant can be used to compensate the Railways for the loss on UBLs by the respective Governments.

13 14 20 The Sub-group recommends as under —

- (a) Immediate closure of 40 lines recommended by RRC (of which 15 lines have already been closed)
- (b) Immediate closure of these 17 lines in Gujarat where adequate road facilities exist at present (of these 2 lines have been closed)

Working out of individual package deal with concerned State Governments in respect of the other uneconomic branch lines identified by the railways. The deal may include the financial incentive offered by Railways namely one time subsidy for procurement of buses.

- (d) Losses incurred in operation of Uneconomic Branch Lines should be fully reimbursed by the Central Government in the event where State Governments' cooperation for reimbursing the losses to the Railways is not forthcoming.

[6] To Suggest New Strategies For Future :

13.15.1 After detailed discussion on all the points referred above, the Sub-group feels that Railway will have to function as a Government Department for a long time to come. It will not be in the interest of the country or for the Railways to become an independent profit making organisation devoid of any social responsibility and needs for the economic development of the country. However, there is also need for reorganising certain functions of the Railways so as to bring a more business like attitude and to generate more resources within for meeting some of its financial requirements. Some of the strategies that can be considered for the future are as given below :—

- (a) Railway should seriously consider corporatisation/privatisation of some of its activities on the lines of CONCOR. Production Units can function on more commercial lines by taking up private work to use spare capacity. Maintenance activities in the workshops etc. can also be considered for private participation. Associate services like catering can be the easily privatised.
- (b) Railway should be allowed to commercially exploit its land and buildings and air space to generate more resources.
- (c) With the liberalisation in economy and a new telecom policy, the Railway should be allowed to lease its land and right of way to Telecom Operators for commercial exploitation by laying their own cables. This will give Railways additional revenue and, will also strengthen the telecom network for the Railway.
- (d) Railway should be given some liberty in fixing fares and freight of the commodities as well as in prioritising their movement so as to earn adequate revenue. In keeping with the overall liberalised economic policy of the Government, it is essential that Indian Railways also reorient its perspective and attempt to rationalise the fare and freight structure in line with the cost escalation so that the subsidies get reduced, concessions get eliminated and the element of social burden on the Railway system is substantially reduced.
- (e) Railway should take up only those projects which give returns which are higher than the cost of raising money from the market. Any project which is taken up for strategic considerations or economic or social development of the country should be funded by the Central Government.
- (f) Railway at present called upon to construct lines which incur losses. This should be discouraged. Even existing uneconomic branch lines should be either closed down or the State Government with wants to continue with these branch lines, should bear the losses for these lines. Sub-group would recommend closure of 40 most uneconomic branch lines as recommended by the Railway Reforms Committee.
- (g) The future operations of the Railways must be viewed in the overall context of growth in transport demand and gearing up of the various modes of transport to meet the same. Such an integrated and comprehensive planning is essential to improve the system with considerations of cost effectiveness, efficiency & creation of capacity ahead of demand. The financial needs and budgetary allocations for the Railway will, therefore, have to correspond to the emergent fair share for its full capacity utilisation and a financial structure which is not only sustainable but is oriented towards future growth of the economy.

Financial Results with appropriations to DRF (Rs. 2000 Crores) being maintained as at the end of Terminal year of VIII Plan and Budgetary Support assumed at Rs. 1831 Cr. every year of the IX Plan period-Scenario 1 (With Bonds)

Terminal Year of VIII Plan		ANNEX-1					
		IX PLAN					
1996-97 RE		1997-98	1998-99	1999-2000	2000-01	2001-02	
1	Capital-at-charge	23536	25197	26978	28559	30240	31921
	Capital Fund	7356	8380	9030	9717	10277	10904
	Passenger Through project (Billion PKms)	347	351	363	374	387	399
	Goods throughput projected (Billion NTLMs)	281	293	307	322	337	353
2.	Earnings						
a.	Passengers	6640	7106	7333	7555	7817	8060
b.	Other Coaching	550	592	616	641	667	694
c.	Goods	16650	19322	20201	21188	22175	23227
d.	Sundry Other earnings	480	550	520	541	563	586
e	Total (a+b+c+d)	24320	27520	28670	29925	31222	32657
f	Suspense	130	335	-25	-25	-25	-25
g.	Gross Traffic Receipts (e+f)	24450	27855	28645	29900	31197	32542
3.	Ordinary Working Expenses	14671	19070	19393	19727	20256	20626
4	Lease Charges to IRFC	1479	1865	2491	3117	3743	4369
5	Appropriation to Pension Fund %%	2700	2200	2354	2519	2695	2884
6	Total Working Expenses (3+4+5)	18850	23135	24238	25363	26694	27879
7	Net Traffic Receipts (2g-6)	5600	4720	4407	4537	4503	4663
8	Net Miscellaneous Receipts	316	329	356	396	436	476
9	NET REVENUE (7+8)	5916	5049	4763	4933	4939	5139
10	Dividend Payment to General Revenues	1515	1630	1763	1896	2029	2162
11.	Excess/Shortfall (9-10)	4401	3419	3000	3037	2910	2977
	Proposed Plan	8300	8300	14175	14175	14175	14175
12.	Appropriation to Depreciation Reserve Fund	2115	2000	2000	2000	2000	2000
13.	Appropriation to other Rly. Funds	2286	1419	1000	1037	910	977
	Unfilled resource gap to be filled by the following	3899	4881	11175	11138	11265	11198
	Budgetary Support **	1439	1831	1831	1831	1831	1831
	IRFC Bonds	1930	2150	2150	2150	2150	2150
	BOLT/OYW Scheme	530	900	900	900	900	900
	Balance Unfilled gap	0	0	6294	6257	6384	6317
	Unconventional methods						
	Commercial Exploitation of Land						
	Balance unfilled gap to be covered by fare & freight hike						
14.	OPERATING RATIO	86.3%	91.3%	91.5%	91.4%	91.9%	91.7%
15.	& Ratio of Net Revenue to Capital + Cap. Fund	12.2%	9.1%	7.7%	7.7%	7.3%	7.3%
16.	% Ratio of surplus/shortfall to Capital + Cap. Fund	14.2%	10.2%	8.4%	7.9%	7.2%	7.0%

** Budgetary support for each year in IX Plan has been assumed at Rs. 1831 cr.

%% Pension fund appropriation has been hiked @ 7% every year

Appropriation to DF assumed as Rs. 350 cr. every year

@ Rs. 45 cr. are kept for OLWR and NMR have been inflated by that amount.

Financial Results with appropriations to DRF (Rs. 2000 Crores) being maintained as at the end of Terminal year of VIII Plan and Budgetary Support assumed at Rs. 1831 Cr. every year of the IX Plan period-Scenario 2 (Without Bonds)

Terminal Year of VIII Plan		ANNEX-2 IX PLAN				
1996-97 RE		1997-98	1998-99	1999-2000	2000-01	2001-02
1. Capital-at-charge	23536	25197	26978	28559	30240	31921
Capital Fund	7356	8380	9844	11971	14598	17916
Passenger Through project (Billion PKms)	347	351	363	374	387	399
Goods throughput projected (Billion NTLMs)	281	293	307	322	337	353
2. Earnings						
a. Passengers	6640	7106	7333	7555	7817	8060
b. Other Coaching	550	592	616	641	667	694
c. Goods	16650	19322	20201	21188	22175	23227
d. Sundry Other earnings	480	550	520	541	563	586
e. Total (a+b+c+d)	24320	27520	28670	29925	31222	32657
f. Suspense	130	335	-25	-25	-25	-25
g. Gross Traffic Receipts (e+f)	24450	27855	28645	29900	31197	32542
3. Ordinary Working Expenses	14671	19070	19393	19727	20256	20626
4. Lease Charges to IRFC	1479	1677	1677	1677	1677	1677
5. Appropriation to Pension Fund %%	2700	2200	2354	2519	2695	2884
6. Total Working Expenses (3+4+5)	18850	22947	23424	23923	24628	25187
7. Net Traffic Receipts (2g-6)	5600	4908	5221	5977	6569	7355
8. Net Miscellaneous Receipts	316	329	356	396	436	476
9. NET REVENUE (7+8)	5916	5237	5577	6373	7005	7831
10. Dividend Payment to General Revenues	1515	1630	1763	1896	2029	2162
11. Excess/Shortfall (9-10)	4401	3607	3814	4477	4976	5669
Proposed Plan	8300	8300	14175	14175	14175	14175
12. Appropriation to Depreciation Reserve Fund	2115	2000	2000	2000	2000	2000
13. Appropriation to other Rly. Funds	2286	1607	1814	2277	2976	3669
Unfilled resource gap to be filled by the following	3899	4693	10361	9698	9199	8506
Budgetary Support **	1439	1831	1831	1831	1831	1831
IRFC Bonds	1930					
BOLT/OYW Scheme	530					
Balance Unfilled gap	0	2862	8530	7867	7368	6675
Unconventional methods						
Commercial Exploitation of Land						
Balance unfilled gap to be covered by fare & freight hike						
14. OPERATING RATIO	86.3%	90.7%	88.7%	86.6%	85.3%	85.3%
15. & Ratio of Net Revenue to Capital + Cap. Fund	12.2%	9.6%	9.7%	10.8%	11.2%	11.7%
16. % Ratio of surplus/shortfall to Capital + Cap. Fund	14.2%	10.2%	10.4%	11.0%	11.1%	11.4%

** Budgetary support for each year in IX Plan has been assumed at Rs. 1831 cr.

%% Pension fund appropriation has been hiked @ 7% every year

Appropriation to DF assumed as Rs. 350 cr, every year

@@ Rs. 45 cr. are kept for OLWR and NMR have been inflated by that amount.

Financial Results with appropriations to DRF (Rs. 2000 Crores) being maintained as at the end of Terminal year of VIII Plan with increasing Budgetary Support @ 10% every year of the IX Plan - Scenario 3 (With Bonds)

Terminal Year of VIII Plan		ANNEX-3					
		IX PLAN					
1996-97 RE		1997-98	1998-99	1999-2000	2000-01	2001-02	
1	Capital-at-charge	23536	25197	26978	28559	30240	31921
	Capital Fund	7356	8380	9030	9717	10277	10904
	Passenger Through project (Billion PKms)	347	351	363	374	387	399
	Goods throughput projected (Billion NTLMs)	281	293	307	322	337	353
2.	Earnings						
	a. Passengers	6640	7106	7333	7555	7817	8060
	b. Other Coaching	550	592	616	641	667	694
	c. Goods	16650	19322	20201	21188	22175	23227
	d. Sundry Other earnings	480	550	520	541	563	586
	e. Total (a+b+c+d)	24320	27520	28670	29925	31222	32657
	f. Suspense	130	335	-25	-25	-25	-25
	g. Gross Traffic Receipts (e+f)	24450	27855	28645	29900	31197	32542
3.	Ordinary Working Expenses	14671	19070	19393	19727	20256	20626
4.	Lease Charges to IRFC	1677	2241	2805	3369	3933	4497
5.	Appropriation to Pension Fund	2700	2200	2354	2519	2695	2884
6	Total Working Expenses (3+4+5)	19048	23511	24552	25615	26884	28007
7.	Net Traffic Receipts (2g-6)	5402	4344	4093	4285	4313	4535
8.	Net Miscellaneous Receipts	316	329	358	402	446	491
9.	NET REVENUE (7+8)	5718	4673	4451	4487	4759	5026
10.	Dividend Payment to General Revenues	1515	1630	1769	1915	2063	2213
11.	Excess/Shortfall (9-10)	4203	3043	2682	2772	2682	2813
	Proposed Plan		8300	14175	14175	14175	14175
12.	Appropriation to Depreciation Reserve Fund	2115	2000	2000	2000	2000	2000
13.	Appropriation to other Rly. Funds	2286	1419	1000	1037	910	977
	Unfilled resource gap to be filled by the following		5257	11493	11403	11479	11362
	Budgetary Support **	1439	1831	2014	2216	2437	2681
	IRFC Bonds	1930	2150	2150	2150	2150	2150
	BOLT/OYW Scheme	530	900	900	900	900	900
	Balance Unfilled gap	0	376	6429	6137	5992	5631
	Unconventional methods						
	Commercial Exploitation of Land						
	Balance unfilled gap to be covered by fare & freight hike						
14	OPERATING RATIO	86.3%	92.7%	92.7%	92.3%	92.5%	92.1%
15	& Ratio of Net Revenue to Capital + Cap. Fund	12.2%	8.0%	6.8%	7.0%	6.8%	7.1%
16.	% Ratio of surplus/shortfall to Capital + Cap. Fund	14.2%	9.1%	7.5%	7.2%	6.7%	6.6%

** Budgetary support for each year in IX Plan has been assumed to have increased by 10% over the previous year

%% Pension fund appropriation has been hiked @ 7% every year

Appropriation to DF assumed as Rs. 350 cr, every year

@@@ Rs. 45 cr. are kept for OLWR and NMR have been inflated by that amount.

IXPLAN-LWK3

Financial Results with appropriations to DRF (Rs. 2000 Crores) being maintained as at the end of Terminal year of VIII Plan with increasing Budgetary Support @ 10% every year of the IX Plan - Scenario 4 (Without Bonds)

		Terminal Year of VIII Plan					ANNEX-4	
		IX PLAN						
		1996-97 RE	1997-98	1998-99	1999-2000	2000-01	2001-02	
1	Capital-at-charge	23536	25197	26978	28559	30240	31921	
	Capital Fund	7356	8380	9030	9717	10277	10904	
	Passenger Through project (Billion PKms)	347	351	363	374	387	399	
	Goods throughput projected (Billion NTLMs)	281	293	307	322	337	353	
2.	Earnings							
a	Passengers	6640	7106	7333	7555	7817	8060	
b	Other Coaching	550	592	616	641	667	694	
c	Goods	16650	19322	20201	21188	22175	23227	
d	Sundry Other earnings	480	500	520	541	563	586	
e	Total (a+b+c+d)	24320	27520	28670	29925	31222	32567	
f	Suspense	130	335	-25	-25	-25	-25	
g.	Gross Traffic Receipts (e+f)	24450	27855	28645	29900	31197	32542	
3.	Ordinary Working Expenses	14671	19070	19393	19727	20256	20626	
4	Lease Charges to IRFC (without Bonds)	1479	1677	1677	1677	1677	1677	
5	Appropriation to Pension Fund	2700	2200	2354	2519	2695	2884	
6	Total Working Expenses (3+4+5)	18850	22947	23424	23923	24628	25187	
7	Net Traffic Receipts (2g-6)	5600	4908	5221	5977	6569	7355	
8	Net Miscellaneous Receipts	316	329	358	402	445	491	
9	NET REVENUE (7+8)	5916	5237	5579	6379	7015	7846	
10	Dividend Payment to General Revenues	1515	1630	1769	1915	2063	2213	
11	Excess/Shortfall (9-10)	4401	3607	3810	4464	4952	5633	
	Proposed Plan		8300	14175	14175	14175	14175	
12.	Appropriation to Depreciation Reserve Fund	2115	2000	2000	2000	2000	2000	
13.	Appropriation to other Rly. Funds	2286	1607	1810	2464	2952	3633	
	Unfilled resource gap to be filled by the following		4693	10365	9711	9223	8542	
	Budgetary Support **	1439	1831	2014	2216	2437	2681	
	IRFC Bonds	1930						
	BOLT/OYW Scheme	530						
	Balance Unfilled gap		2862	8351	7495	6786	5861	
	Unconventional methods							
	Commercial Exploitation of Land							
	Balance unfilled gap to be covered by fare & freight hike							
14	OPERATING RATIO	86.3%	90.7%	88.7%	86.6%	85.3%	83.5%	
15	& Ratio of Net Revenue to Capital + Cap Fund	12.2%	9.6%	10.0%	11.4%	12.4%	13.7%	
16	% Ratio of surplus/shortfall to Capital + Cap Fund	14.2%	10.7%	10.6%	11.7%	12.2%	13.2%	

** Budgetary support for each year in IX Plan has been assumed to have increased by 10% over the previous year

%% Pension fund appropriation has been hiked @ 7% every year

Appropriation to DF assumed as Rs. 350 cr. every year

(a/a) Rs. 45 cr. are kept for OLWR and NMR have been inflated by that amount

IXPLAN-LWK3

ANNEX-5

Scenario 1 - with DRF kept constant @ Rs. 2000 cr., Budgetary Support at Rs. 1831 cr. of each year of IX Plan (With Bonds) (At 1996-97 Prices)

	Item	1997-98	1998-99	1999-2000	2000-01	2001-02
	Proposed Plan	8300	14175	14175	14175	14175
1.	Budgetary Support	1831	1831	1831	1831	1831
2.	Internal & Extra Budgetary Resources					
	DRF	2000	2000	2000	2000	2000
	Capital Fund	1024	605	642	515	932
	OLWR	45	45	45	45	45
	DF	350	350	350	350	350
	IRFC Bonds	2150	2150	2150	2150	2150
	OYW/BOLT	900	900	900	900	900
	Non-Conventional Methods					
	Unfilled gap	45	6339	6302	6429	6012

Scenario 2 - With DRF kept constant @ Rs. 2000 cr., Budgetary Support at Rs. 1831 cr. of each year of IX Plan (Without Bonds)

	Item	1997-98	1998-99	1999-2000	2000-01	2001-02
	Proposed Plan	8300	14175	14175	14175	14175
1.	Budgetary Support	1831	1831	1831	1831	1831
2.	Internal & Extra Budgetary Resources					
	DRF	2000	2000	2000	2000	2000
	Capital Fund	1212	1419	2082	2581	3274
	OLWR	45	45	45	45	45
	DF	350	350	350	350	350
	Non-Conventional Methods					
	Unfilled gap	2907	8575	7912	7413	6720

ANNEX-6

Scenario 3 - With DRF kept constant @ Rs. 2000 cr., Increasing Budgetary Support @ 10% every year of the IX (With Bonds)

	Item	1997-98	1998-99	1999-2000	2000-01	2001-02
	Proposed Plan	8300	14175	14175	14175	14175
1.	Budgetary Support	1831	2014	2216	2437	2681
2.	Internal & Extra Budgetary Resources					
	DRF	2000	2000	2000	2000	2000
	Capital Fund	1024	605	642	515	582
	OLWR	45	45	45	45	45
	DF	350	350	350	350	350
	IRFC Bonds	2150	2150	2150	2150	2150
	OYW/BOLT	900	900	900	900	900
	Non-Conventional Methods					
	Unfilled gap	0	6111	5872	5778	5467

Scenario 4 - With DRF kept constant @ Rs. 2000 cr., Increasing Budgetary Support @ 10% every year of the IX (Without Bonds)

	Item	1997-98	1998-99	1999-2000	2000-01	2001-02
	Proposed Plan	8300	14175	14175	14175	14175
1.	Budgetary Support	1831	2014	2216	2431	2681
2.	Internal & Extra Budgetary Resources					
	DRF	2000	2000	2000	2000	2000
	Capital Fund	1024	1395	2075	2579	3264
	OLWR	45	45	45	45	45
	DF	350	350	350	350	350
	Non-Conventional Methods					
	Unfilled gap	2914	8371	7489	6764	5835

ANNEX-7/1
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND

CENTRAL RAILWAY

(Figures in thousands of Rs.)

S. No.	Name of the Branch Line	Cost	1993-94
1	N. G. Daund - Baramati (44 Kms.)	15,09	53,71
2	B. G. Ait - Konch (14 Kms.)	6,09	90,86
3	N. G. Gwalior - Sheopur-Kalan (200 Kms.)	65,79	6,20,84
4	N. G. Gwalior - Bhind (84 Kms.)	27,21	1,81,63
5	N. G. Dholpur-Tantpur-Sirmutra (89 Kms.)	9,00	1,76,65
6	N. G. Neral - Matheran (21Kms)	14,20	3,05,84
7	N. G. Pachora - Jamner (56 Kms.)	18,23	56,25
8	N. G. Miraj-Kurduwadi-Latur (327 Kms.)	1,79,13	4,01,43
9	B. G. Panvel-Uran (27 Kms)	1,91,65	35,86
Total		5,26,39	19,23,37

No. of Uneconomic Branch Lines		BG	MG	NG
Total				
1993-94	2	-	7	9

ANNEXURE-7/2
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND

ESTERN RAILWAY

(Figures in thousands of Rs.)

S. No.	Name of the Branch Line	Cost	1993-94
1.	B. G. Bakhtiyapur - Rajgir (53 Kms)	2,71,94	32,87
2	B. G. Bhimgarh - Palashtali (27 Kms)	25,50	31,52
3	B. G. Barasat - Hasnabad (53 Kms.)	2,64,12	2,09,00
4.	B. G. Santipur - Nabadwaipghat (27 Kms)	11,96	49,72
5	B. G. Tinpahar - Rajmahal (12 Kms.)	7,70	19,00
6	N. G. Bardgnab - Katwa (53Kms)	26,18	84,96
7.	B. G. Bhagalpur - Mandar Hill (50 Kms.)	46,70	48,51
8.	B. G. Baruipur - Lakshmikantpur (37 Kms)	1,24,34	44,66
9	B. G. Jamalpur - Monghyr (10 Kms.)	6,24	20,23
10	B. G. Sonarpur - Canning (29 Kms.)	87,85	27,54
11.	B. G. Dildarnagar - Tarighat (19 Kms.)	13,20	9,34
Total		8,85,73	5,77,35

No. of Uneconomic Branch Lines			BG	MG	NG
Total					
1993-94	168	9	-	2	11

NORTHERN RAILWAY

(Figures in thousands of Rs)

S. No.	Name of the Branch Line	Cost	1993-94
1	B. G. Bataja - Qadian (19 Kms.)	8,97	82,39
2	M. G. Garhi - Harasaru - Farukhnagar (11 Kms.)	6,48	21,10
3.	B. G. Verka - Dera - Baba Nanak (45 Kms)	77,07	3,66,36
4.	M G. Pipar Road - Bilara (42 Kms)	15,26	29,66
5	M G. Samdari - Munabao (248 Kms)	41,11	3,3775
6.	N. G. Kalka - Shimla (97 Kms)	2,77,93	2,76,04
7.	N G Pathankot - Jogindernagar (46 Kms)	2,72,12	2,91,16
8.	B G Raja-Ka-Sahaspur - Sambhal Hatim Sarai (20 Kms)	54,13	15,13
9	M G Makrana - Parbatsar (22 Kms)	3,85	32,59
10	B G Phagwara - Jaijon Doaba (36 Kms)	99,77	1,68,50
11	M G Raniwara - Bhildi (71 Kms)	1,60,22	39,98
12	M G Ratangarh - Sardarshehr (43 Kms)	7,05	18,85
13.	B G. Damlu - Daryapur (25 Kms)	22,24	23,27
Total		10,46,20	17,02,78

No of Uneconomic Branch Lines

BG	MG	NG
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Total

1993-94	ANNEXURE-7/4	5	6	2	13
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STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND

NORTH EASTERN RAILWAY

(Figures in thousands of Rs)

S. No.	Name of Branch Line	Cost	1993-9
1.	M G. Banmankhi-Bihariganj (27 kms)	23,01	1,14,00
2.	M G Sakri-Jayanagar (70 kms)	33,19	2,20,75
3.	M G. Narkatiaganj-Bagaha (56 kms)	7,76	1,67,16
4.	M G Narkatiaganj-Bhikhanthori (47 kms)	6,91	1,13,23
5.	M. G. Kaptanganj-Chitauni (64 kms)	13,62	1,30,49
6.	B G. Salempur-Barhaj Bazar (20 kms)	7,48	50,33
7.	M G Indra-Dohrighat (40 kms)	8,65	79,49
8.	B G Mankapur-Katra (30 kms)	5,03	1,00,46
9.	M. G. Anand Nagar-Nautanwa (49 kms)	34,77	2,90,21
10.	M. G. Gainsari-Jarwa (20 kms)	10,77	37,86
11.	M.G Mathura-Vrindaban (14 kms)	6,58	18,99
12.	M. G Mandhana-Brahamvart (9 kms)	4,21	18,2
13.	M. G. Thanabihpur-Mahadeopur Ghat (27 kms)	35,85	82,84
14.	M.G. Jhanjharpur-Lauhaha Bazar	7,86	1,74,40
15.	M G. Bichla-Tikunia	2,26,90	1,85,37
	Total	4,32,59	17,83,43

No. of Uneconomic Branch Lines

BG	MG	NG
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Total

1993-94	169	2	13	-	15
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ANNEXURE-7/5
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND
NORTHEAST FRONTIER RAILWAY

(Figures in thousands of Rs.)

S. No.	Name of the Branch Line	Cost	1993-94
1	N. G. New Jalpaiguri-Darjeeling (88 kms)	87,95	95,24
2	M. G. Katihar-Manhiarighat (36 kms)	118,74	2,36,26
3	M. G. Katihar-Jogbani (108 kms)	45,22	5,51,66
4	B. G. Old Malda-Singhabad (24 kms)	93,50	1,22,80
5	M. G. barsoi-Radhikapur (53 kms)	22,19	2,53,88
6	M. G. Alipurduar-New Gitaldah Bamabhat (71 kms)	31,41	2,66,75
7	M. G. Rangapara-North-Tezpur (27 kms)	10,81	70,88
8	M. G. New Mal-Domohani (37 kms)	25,96	1,16,62
9	M. G. Fakiragram-Dhubri (65 kms)	27,22	1,96,54
10	M. G. Karimganj-Mahisashan (10 kms)	7,29	56,97
11	M.G. Raraigram-Dullavcherre (29 kms)	16,75	72,96
12	M. G. Simalugiri-Naginimara (14 kms)	7,48	25,43
13	M. G. Mariani-Jorrahhat Niamati (18 kms)	25,49	35,12
14	M. G. Makum-Dangari (30 kms)	25,83	58,96
15	M. G. Simalugiri-Moranhat (54 kms)	28,68	90,64
16	M. G. Chaparmukh-Silghat (81 kms)	31,00	2,05,71
17	M. G. Katakhal-Lalabazar (36 kms)	8,91	1,15,86
Total		5,14,43	25,72,28

No. of Uneconomic Branch Lines	BG	MG	NG	Total
1993-94	1	15	1	17

ANNEXURE-7/6
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND
SOUTHERN RAILWAY

(Figures in thousands of Rs)

S. No.	Name of Branch Line	Cost	1993-94
1.	B. G. Shoranur-Nilambur (66 kms)	1,09,80	4,70
2	M. G. Tiruturaipoondi-Point Calamere (46 kms)	40,93	32,71
3.	M. G. Mettupalayam-Udhagamandham (46 kms)	95,02	1,79,56
4.	M. G. Madurai-Bodinayakanpur (90 kms)	81,79	59,73
5.	M. G. ChickJajur-Chitradurg (34 kms)	12,95	56,33
6	N. G. Yelahanka-Bangarapet (Bangalore City) (163 kms)	49,61	1,17,26
7.	M. G. Tirunelveli-Tiruchandur (62 kms)	40,00	1,39,00
8.	M. G. Sagara-Talaguppa (16 kms)	10,40	12,00
9.	M. G. Villupuram-Pondicherry (38 kms)	18,68	33,73
10.	B. G. Bangarapet-Marikuppam (16 kms)	12,56	80,72
Total		4,71,74	7,15,54

No. of Uneconomic Branch Lines	BG	MG	NG	Total
1993-94	2	7	1	10

ANNEXURE 7/7
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND

SOUTH CENTRAL RAILWAY

(Figure in thousands of Rs)

S. No.	Name of Branch Line	Cost	1993-94
1	M G Hospet-Kotturu (69 kms)	15,52	1,31,14
2	M G Jankampet-Bodham (20 kms)	7,90	3,01
3	M G Bellary-Rayadurg (53 kms)	7,94	31,70
4	M G Gunda Road-Swami Halli (40 kms)	9,36	95,60
5	M G Alnavar-Dandeli (31 kms)	7,47	40,88
6	B G Gudivada-Machihpatnam (40 kms)	26,08	24,15
Total		74,27	3,26,48

No. of Uneconomic Branch Lines	BG	MG	NG	Total
1993-94	1	5	-	6

ANNEXURE-7/8
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND

SOUTH EASTERN RAILWAY

(Figures in thousands of

S. No.	Name of Branch Line	Cost	1993-94
1	N G Nawapada-Gunupur (90 Kms)	7,37	1,07,84
2	N G Rupsa-Talbundh (89 Kms)	24,71	1,40,68
3	N G Purulia-Kotshila & Ranchi-Lohardaga (104 Kms)	86,20	2,68,34
4	N G Raipur-Dhamtari (89 Kms)	19,46	2,77,17
5	N G Satpura-Railways (1007 Kms)	1,29,54	22,13,19
6	B G Tata-badampahar (99 Kms)	8,57,96	46,03
7	B G Bondamunda-Nawgaon-Purnapani (29 Kms)	2,11,73	24,24
8	B G Kanhan-Ramtak (24 Kms)	30,62	49,92
9	B G Khurda Road-Puri (43 Kms)	3,19,19	3,00,06
10	B G Tumsar-Tirodi (24 Kms)	41,93	(+) 15
Total		17,28,71	34,27,322

No. of Uneconomic Branch Lines	BG	MG	NG	Total
1993-94	5	0	5	10

ANNEXURE 7/9
STATEMENT SHOWING THE FIGURES OF LOSS ON WORKING OF
UNECONOMIC BRANCH LINES EXCLUDING DIVIDEND

WESTERN RAILWAY

(Figures in thousands of Rs.)

S. No.	Name of Branch Line	Cost	1993-94		
1.	N. G. Billimora-Waghai	30,04	61,59		
2.	N. G. Chhuchapura-Tankhala	18,20	13,00		
3.	N. G. Kosamba-Umarpada	29,68	36,11		
4.	N. G. Jhagadia-Netranj	14,44	15,90		
5.	N. G. Chorenda-Notikoral	8,94	10,95		
6.	N. G. Samni-Dahej	18,81	22,16		
7.	N. G. Godhra-Lunawada	19,48	24,05		
8.	N. G. Dabhoi-Timba Road	48,08	56,61		
9.	N. G. Broach-Jambusar-Kavi	36,48	42,14		
10.	N. G. Chota Udaipur-Jambusar	72,03	99,14		
11.	N. G. Chanded-Malsar	41,46	1,02,18		
12.	N. G. Ankleshwar-Bajpipla	29,98	35,99		
13.	N. G. Nadiad-Kapadvanj	21,39	27,35		
14.	N. G. Nadiad-Bhadran	27,63	29,00		
15.	M. G. Gandhidham-New Kandla	74,75	1,80,76		
16.	M. G. Malvi Junc -Bari Sadri	39,91	2,65,30		
17.	M. G. Sihor-Palitana	15,68	48,19		
18.	M. G. Mahsana-Taranga Hill	23,56	41,59		
19.	M. G. Himmat Nagar-Khed Brahm	14,92	54,45		
20.	B. G. Borvivadtal-Swami Narayan	7,31	35,94		
21.	B. G. Anand-Cambay	23,74	1,30,11		
22.	M. G. Rajula Jn.-Rajula City	5,41	30,05		
23.	M. G. Pranchi R.d-Kodinar	14,68	67,40		
24.	M. G. Ralala-Delvada	40,55	8,39		
Total		6,77,15	14,38,35		
No	of Uneconomic Branch Lines	BG	MG	NG	Total
	1993-94	2	8	14	24

ANNEXURE-8

UNECONOMIC BRANCH LINES

**COMPARATIVE STATEMENT OF LOSSES
INCURRED ON UNECONOMIC BRANCH LINES**

Railway	No. of Uneconomic Branch Lines				1992-93 Loss (in	1993-94 Loss (in
	BG	MG	NG	Total	thousands of Rs.)	thousands of Rs.)
Central	2	-	7	9	16,40,41	19,23,37
Eastern	9	-	2	11	4,96,18	5,77,35
Northern	5	6	2	13	16,79,84	17,02,78
North Eastern	2	13	-	15	16,25,98	17,83,43
Northeast Frontier	1	15	1	17	32,39,90	25,72,26
Southern	2	7	1	10	6,48,48	7,15,54
South Central	1	5	-	6	4,28,95	3,26,48
South Eastern	5	-	5	10	26,61,59	34,27,32
Western	2	8	14	24	15,06,45	14,38,35
Total	29	56	32	115	139,27,78	144,66,90

ANNEXURE-9

LIST OF 40 UNECONOMIC BRANCH LINES RECOMMENDED FOR CLOSURE BY RRC

WESTERN RAILWAY

- 1 Piplod — Devgarh Bariya
- 2 Than — Chotila
- 3 Bavnagar — Mahuva
- 4 Hadmatdiya — Jodiya
- 5 Khambhalia — Salaya
- 6 Chanasma — Harij
- 7 Kunkavav — Bagasra
- 8 Botad — Jasdan
- 9 Ningala — Gadhada — Swaminarayan
- 10 Shapur — Saradiya
- 11 Horvi — Tankare
- 12 Himmatnagar — Kned — Brahma
- 13 Navli — Badri — Sadri
- 14 Billimora — Waghai

NORTHERN RAILWAY

- 1 Pipra Road — Bilara
- 2 Makrana — Parbatsar
- 3 Bakotra — Pachpadra
- 4 Ratangarh — Sardarshahar
- 5 Tilwara — Tilwara Mela
- 6 Berhan — Etah
- 7 Raja-Ka-Gaspus — Sambhal — Hatim Surai
- 8 Garni — Harsaru — Farukhanagar

NORTH EASTERN RAILWAY

- 1 Indara — Dohrighat
- 2 Dudwa — Gauri Phanta
- 3 Shahbeznagar — Keruganj
- 4 Mendhana — Brahmavart
- 5 Dudwa — Chandanchowki
- 6 Sanebpur — Kamal Longhyar Ghat

SOUTHERN RAILWAY

1. Snoranur — Bilambur Road
2. Peralam — Karaikal
3. Sngar Jambagaru — Talguppa
4. Mayarm — Tarangambadi
- * 5. Nidemangalam — Mannargudi

CENTRAL RAILWAY

- Dhaulpur — Tarrlapur — Sirmuttra
1. Dholpur — Sirmuttra
 2. Ait — Konch

SOUTH EASTERN RAILWAY

1. Naupada — Gunupur
2. Puspa — Talband

EASTERN RAILWAY

- Bardhaman
1. Lurdwar — Katwa
 2. Bakntiyarpur — Rajsir

N. F. RAILWAY

1. Katinar — Maninari Ghat
- * Line Closed.

CHAPTER XIV

RAILWAY ELECTRIFICATION

14.1 REVIEW OF VIII PLAN, 1992-1997

14.1.1 At the beginning of VIII Plan, 10,809 route km of electrification had been completed. During the Plan it was programmed to electrify 2700 route km at a cost of Rs 1350 crore.

14.1.2 The progress of electrification vis-a-vis allocation of funds during the VIII Plan is indicated below

Year	Allocation (Rs. in crores)	Route km. electrified (Km)
1992-93	235	479
1993-94	278	505
1994-95	291	473
1995-96	348	609
1996-97(BE)	360	634
Total	1512	2700

14.1.3 It would be seen that the target of electrification, as envisaged at the beginning of VIII Plan, would be achieved

14.2 Ongoing Schemes

14.2.1 The work of electrification of 2330 route km is in various stages of progress. The status as on 1.4.1996 is as under

S No	Section	RKM	Balance on 1.4.1996	Route/ Railway	Target for completion
1.	Delhi-Ambala-Ludhiana	314	46	NR	March, 1997
2.	Sonnagar-Patratu	291	60	ER	March, 1977
3.	Gumia-Patratu	72	72	ER	March, 1977
4.	Vijayawada-Visakhapatnam	366	179	SCR	March, 1977
5.	Jamadoba-Mohuda	22	8	SER	March, 1977
6.	Chandil-Muri-Barkakana	119	119	SER	March, 1999
7.	Bokaro-Barsuan	398 +36	395 +36	SER	March, 1999
8.	Erode-Ernakulam incl. Cochin Harbour Terminus	324	192	SR	March, 1999
9.	Sitarampur-Mughalsarai	562	528	ER	March, 2002
10.	Adra-Midnapur	155	155	SER	March, 2002
11.	Kharagpur-Bhubaneswar	540	540	SER	March, 2002
TOTAL			2330		

14.2.2 In addition, the following two sanctioned works are frozen for the time being

- | | | |
|----|-------------------------------------|---------|
| 1. | Ambala-Moradabad (Northern Railway) | 274 rkm |
| 2. | Renigunta-Guntakal (S.C. Railway) | 448 rkm |

14.2.3 In the case of electrification works, a number of activities have to be handled in series and considerable time is required for preparation of detailed estimates, tender schedules and finalisation of tenders, establishing field set up, stores depots etc. before physical execution of the work. The work has to be carried out mostly under traffic block conditions on high density routes. Accordingly, 4 to 5 years is the optimum period for completion of an electrification project. Judged by this yardstick, the progress of electrification projects such as Delhi-Ludhiana, Gumia-Patratu, Vijayawada-Visakhapatnam, Jamadoba-Mohuda has been quite satisfactory. However, the progress in relation to the following projects has not been satisfactory due to reasons mentioned against each

- | | | |
|-----------------------|---|---|
| Sonnagar-Patratu |) | Due to failure of the contractor and poor law |
| Bokaro-Barsuan |) | and order situation in the area |
| Kharagpur-Bhubaneswar |) | This work has been approved for execution |
| |) | under BOLT scheme is not taking off due to |
| |) | very high cost as compared with railway |
| |) | funding Planning Commission is being |
| |) | approached for executing this work through |
| | | railway funding |

14.3 NEW SCHEMES FOR THE IX PLAN

14.3.1 With the rapidly increasing traffic on the golden quadrilateral and the diagonals, certain remaining un-electrified sections of the quadrilateral and certain missing links as indicated below are under consideration for sanction during the IX Plan

S.No.	Section	Rkm
1.	Kharagpur-Visakhapatnam	983
2.	Jalgaon-Udhna	306
3.	Talchar-Paradip via Cuttack	195
4.	Kanpur-Lucknow	74
5.	Indore-Ujjain	78
6.	Sirhind-Nangal Dam	120
7.	Ambala-Kalka	69
8.	Andal-Pandubeshwar	22
9.	Pune-Guntakal	642
10.	Sanatnagar-Wadi	175
11.	Bina-Kota	303

14 3 2 On completion of above projects, the entire golden quadrilateral along with diagonals will be on electric traction

14 4 IX Plan Electrification Programme

14 4 1 All the Projects mentioned in para 14 2 1 above would be completed during IX Plan. However, frozen works of Ambala-Moradabad section and Renigunta-Hospet may be funded in X Plan

14 4 2 It has been planned to commission 2300 Route km of track in the IX Plan, and the same would require an outlay of Rs 1800 crore at present day cost.

CHAPTER XV

OTHER ELECTRICAL WORKS

15.1 INTRODUCTION

15.1.1 In order to achieve the corporate goal of handling the projected level of traffic and at the same time ensure safety of operations, it is essential that the basic infrastructure is strengthened by providing the necessary inputs for traction sub-stations, replacing over-head equipment (OHE) when necessary, replacing obsolete remote control equipment by Microprocessor-based supervisory control and data acquisition systems and by strengthening/rationalising power supply arrangements in workshops and railway colonies

15.1.2 The assets of the electrical department have been expanding rapidly. The position regarding increase in the electrical assets during VIII Five Year Plan is indicated in the Table below

ELECTRICAL ASSETS

Year	No. of electric locomotives	No. of EMU/MENU coaches	No. of AC coaches-I, II & Chair car	Electrified route km
1991-92	1871	3366	930	10,653
1992-93	2012	3444	988	11,064
1993-94	2117	3527	1139	11,260
1994-95	2324	3681	1356	12,266

15.1.3 With progressive electrification, the energy consumption is also increasing as is shown below.

ENERGY CONSUMPTION

(Million Units)

Year	In traction	Other than traction	Total
1991-92	4598.78	1584.26	6183.04
1992-93	4994.90	1589.82	6584.72
1993-94	5450.34	1637.13	7087.47
1994-95	5824.45	1677.78	7502.23

15.2 VIII Five Year Plan Review

Originally, for the VIII Five Year Plan, an amount of Rs. 225 crores was allotted for the Plan Head "Other Electrical Works". During the Mid-term Review, the outlay was proposed to be increased to Rs. 322 crores. The actual expenditure during the Plan period is expected to be around Rs. 333 crores. The sanctioned programmes have been commensurate with the increase in work load, thereby enabling the system to cope with the requirements

Year	Throw-forward	Cost of new works	Throw-forward + new works	Outlay (actuals)	Ratio
1994-95	137.57	93.44	231.01	60.60	3.81
1995-96	168.76	88.33	257.29	90.00	2.85
1996-97	142.59	103.15	245.74	90.30	2.72

15.3 Objectives of the IX Five Year Plan

The prime objective of the IX Five Year Plan would be to strengthen the infrastructure facilities for electrical assets to enable IR to reduce the cost of operation for hauling the increasing passenger and freight traffic on the electrified routes. Emphasis will also be laid on strengthening of overhead equipment to meet the requirements of heavy haul freight trains and longer passenger trains at higher speeds

15.4 IX Five Year Plan Programme

In order to meet the challenges of increasing traffic, the following works are required to be taken up

- (i) Replacement of OHE on age-cum-condition basis in electrified railways, i.e. CR, NR, SR, ER, SER and WR in order to improve the reliability of the system
- (ii) Obtaining Power Supply directly from NTPC as it has a cheaper tariff in comparison with the tariff offered by SEBs at present so as to reduce the traction energy bill
- (iii) Augmentation of traction sub-stations or construction of new traction sub-stations to cater to the requirement of the growing traffic demand and increasing the through-put of the system
- (iv) Installation of capacitor banks to improve the power-factor with a view to eliminating payment to State Electricity Boards for low power factor
- (v) Replacement of electromechanical remote control equipment with microprocessor based supervisory control and data acquisition system
- (vi) Conversion of 1500 V d.c. traction system to 25 kV a.c. traction system in Bombay area to cater for requirements of rapidly increasing traffic
- (vii) Augmentation and rationalisation of power supply arrangements in workshops and sheds, railway stations and important yards due to increase in activities on account of growing traffic
- (viii) Replacement/augmentation of general power supply system to improve the safety and reliability of electrical installations

15.5 IX Five Year Plan - Outlay

The proposed outlay for IX Five Year Plan is expected to be Rs. 1500 crore as indicated below

- (i) Replacement of OHE on age-cum-condition basis in electrified Railways i.e. Central, Eastern, Northern, Southern, South Eastern and Western Railways : Rs. 250 crores

(ii)	Augmentation of traction sub-stations or construction of new traction sub-stations to cater for the requirement of growing traffic demands	Rs. 150 crores
(iii)	Replacement of existing remote control equipment with micro-processor based supervisory control and data acquisition system	Rs. 25 crores
(iv)	Replacement/augmentation and rationalisation of general power supply system	Rs. 100 crores
(v)	Availing of direct power supply from NTPC	Rs. 145 crores
(vi)	Installation of capacitor banks to improve the power factor	Rs. 20 crores
(vii)	Upgradation of existing OHE for running of trains at higher speeds	Rs. 50 crores
(viii)	Conversion of 1500 V d.c. traction system to 25 K V a.c. traction system in Bombay area to cater for requirements of rapidly increasing traffic	Rs. 760 crores
TOTAL		Rs. 1500 crore

15.6 X Five Year Plan Programme

Some of the activities of the IX Five Year Plan are expected to spill over into X Five Year Plan. More activities may have to be added. Replacement of electrical assets and OHE will be required to be done on a larger scale not only due to ageing of the installations but also on account of the increased wear and tear consequent upon the increasing traffic hauled on the electrified routes. Traction sub-stations will require to be augmented and additional sub-stations provided for running of heavier trains at higher speeds to meet the additional traffic that would be generated. The general power supply system in workshops, sheds, etc. will also be required to be augmented and rationalised.

CHAPTER XVI

SIGNALLING & SAFETY

16.1 INTRODUCTION

16.1.1 One of the basic requirements for increase of line capacity, improving safety and increase of speeds is to have improved signalling. To improve the overall efficiency of the railways, reliable telecommunication is necessary to cope with increased traffic handling capacity. Without appropriate signalling and telecommunication it will be difficult to handle the increasing traffic. In view of the fact that improved signalling and telecommunication have a direct impact on the traffic handling capacity and safety, a number of committees have, in the past stressed the need to modernise these so that optimum utilisation of the assets is achieved.

16.1.2 The Indian Railway system has about 5600 interlocked stations. The present signalling consists of stations with different standards and types of signalling, which have been installed in different periods to meet the varying traffic needs of the different sections. With the electrification of trunk-routes having been taken up, the mechanical signals are getting replaced with multi-aspect colour light signals. Introduction of route relay interlocking in major yards and panel interlocking and solid state interlocking have been taken up progressively wherever the equipment have become due for replacement. A number of measures for upgradation of safety, like track circuiting of lines, interlocking and provision of telecommunication for level crossing gates, approach warning to gates, automatic proving of block clearance, auxiliary warning systems (AWS) etc., have been taken up progressively.

16.2 VIII PLAN - REVIEW

16.2.1 The details of works programmed, completed and main reasons for shortfall are as shown in the statements below

S. No	Description of works	Programmed during VII Plan	Completed	Short fall	Reasons for shortfall
1.	Replacement of overaged signalling equipment (Stations)	593	632	Nil	Approach operated warning system at unmanned LC under development
2.	Safety works:				
	a. Track circuiting (stations)	1278	1936	Nil	
	b. Safety devices at level crossing gates (locations)	5218	1900	3318	

	c. Auxiliary warning system (rkm)	5850	227	5623	Non-availability of suitable equipment that can work satisfactorily under Indian conditions
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16.2 2 The availability of relays, point machines etc have considerably improved during VIII plan and it is expected that the production of concrete sleepers for points and crossings would also increase substantially with setting up of more manufacturing facilities. These will facilitate the speeding up of signalling and safety works in the IX plan. There are good prospects of Auxiliary Warning System (AWS) equipment suiting Indian conditions being developed. Both imported and indigenous SSIs have already been installed and would become available. These factors will facilitate the realisation of objectives of IX Plan.

16.3 IX PLAN OBJECTIVES

The main objectives for the Signalling and Safety Works Programmes during IX Plan would be

- (a) To accelerate the pace of replacement of worn-out assets so that on the heavy density routes the arrears of replacement are wiped out and in other routes, the replacement programme is completed in respect of stations where gears are badly worn-out
- (b) Speed up completion of safety works of track circuiting viz
 - (i) Track circuiting between FM and FM on important main lines,
 - (ii) Track circuiting between FM and BSL on trunk routes and important main lines
 - (iii) Track circuiting by axle counter on loop line of control panel stations
- (c) Substantially accelerate the pace of provision of safety devices at level crossing gates
- (d) Provision of AWS and stop system on busy routes.
- (e) Modernisation of signalling on the trunk routes.
- (f) Trying out innovative technologies to meet future needs.

16.4 IX PLAN PROGRAMME

16.4.1 Signalling

- (i) Replacement of worn-out assets:
 - (a) On the trunk routes and some of the important main lines where the traffic density is high and replacement of signalling gears has become due on age-cum-condition basis, a total of 653 stations will be replaced with panel interlocking. This will cost Rs. 400 crores. In arriving at this figure, the actual condition of equipment and density of traffic have been the criteria and not the codal life. In order to experiment with new technology which has the potential to meet future requirements, solid state inter-locking had been installed at 7 stations and future replacement/new works on trunk / important main line routes with SSI are envisaged.

- (b) On the other main lines, based on condition of equipment, replacement will be taken up at 60 stations by suitable signalling equipment (non panel type). This will cost Rs. 25 crores.
- (c) Route relay interlocking to improve operational efficiency in major yards will be taken up at 45 yards mainly in multi-cabin locations where replacement of assets has also become due. This will cost Rs. 305 crore.
- (ii) Microprocessor based Train information System e.g Train Descriptor, Split-Flap display board, etc. to provide Real Time Train Information to travelling public. The system is provided for Delhi Area and is in progress in Western & Central Railway suburban areas. This will cost Rs. 25 cr.
- (iii) 5000 number of turn outs are proposed to be replaced/with thick web switches during the IX Plan Period. These will have to be operated by electric point machines/ clamp locks in replacement of existing mechanical operation and an amount of Rs 110 crores will be required towards this at these locations.

16.4.1.2 Recommendations of various Accident Enquiry Committee, CRS, etc on the pace of safety works:

Based on the recommendations of Kurzn Committee, Wanchoo Committee, Sikri Committee and CRS recommendations etc. track circuiting and safety works were undertaken and the present status and further planning for IX Plan is as under:-

Track circuiting was to be provided on trunk routes and main important lines. The priority of track circuiting is as under:-

- (1) Fouling Mark to Fouling Mark
It was proposed to be provided on run through lines on all trunk route and main lines
- (2) FM to Block Section Limit.
It was proposed to be provided on trunk routes and main important lines.
- (3) FM to FM on loop lines .
It was proposed to be provided on those stations with panel interlocking.

By the end of VIII Plan track circuiting from FM to FM and FM to BSL will be completed. However, the arrears of completing TC as loop line will be completed in IX Plan. Further, due to revised traffic pattern, it has become necessary to provide FM to FM & FM to BSL track circuiting on other routes. Accordingly, an outlay of Rs. 300 crore has been provided to cater for track circuiting works during IX Plan.

16.4.1.3 Other Safety Works

- (i) Signalling circuits are to be updated to ensure that the reception signals cannot be taken off till the starter of the concerned line and advance starter which were lowered for the preceding train are put back to 'on' position. This is to be completed on trunk routes and on important main lines.
- (ii) SM's slide control to be provided on Home and Advance Starter signals at all interlocked stations
- (iii) One slot one train to be provided wherever it does not exist
- (iv) Track circuiting should be provided ahead of starter signal to put it back to 'ON' as soon as it is occupied by a train. Free starter should be eliminated and at stations with frequent shunting, shunt signal should be provided below starter.

Wherever advanced starters are far ahead of starters, these should be relocated and fixed at 180 metres from outer most facing point/FM at double line stations, except at those stations where frequent shunting is involved in which case full length between starter and advance starter should be track circuited. This work is to be completed on trunk routes at important main lines.

16.4.2 Safety works

(i) Provision of safety devices at level crossings

- (a) Provision of various safety devices at level crossings is a continuous process. With the increase in traffic in rail/road, safety requirements of level crossings have to be constantly upgraded. During the IX Plan period, it is proposed to extend level crossing safety works to 2950 Nos. of gates consisting of, inter-locking of 200 gates (Rs. 30 crores), telephone communication to 2000 gates (Rs. 20 crores) and provision of lifting barriers at 750 gates (Rs. 15 crores).
- (b) To serve as an additional aid to manned level crossings with poor visibility and at unmanned L-Xings, it is proposed to install approach warning arrangements at 500 locations on high density routes at a total cost of Rs. 60 crores.

(ii) Auxiliary Warning System

Provision of AWS was programmed for the suburban sections of Bombay covering the Central and Western Railways and the trunk route of Delhi-Mughalsarai, Delhi-Bombay and Delhi-Agra. In view of non-availability of suitable equipment, only suburban sections of Bombay area were covered to suit the running of EMU trains. The AWS for the trunk routes will be thrown forward to the IX Plan.

- (c) New Delhi-Jammu Tawi.
- (d) New Delhi-Trivandrum
- (e) New Delhi-Bombay Central

This is already sanctioned for provision at about 500 stations, and remaining about 1000 stations are expected to be covered in the IX Plan.

16 7 SUMMARY OF FUNDS REQUIRED IN THE IX PLAN

16.7.1 The details of funds required for major items of Signalling and Safety Works are as under:-

S.No.	Item	Outlay (Rs. in crores)
(i)	Provision of SSI/PI/RR1 etc in replacement of aged and worn out Signalling and interlocking gear.	730
(ii)	Safety Devices at level Crossing Gates.	125
(iii)	Provision of Track Circuiting.	260
(iv)	Provision of Auxiliary Warning System.	250
(v)	Provision of Second Distant Signal and MACL Signalling	100
(vi)	Train Information System	25
(vii)	System Upgradation viz Clamp, Lock, AFTC, Axle Counter Block etc	110
Total outlay for IX Plan for Signalling and Safety Works		<u>1600</u>

Annexure

OUTLAY FOR SIGNALLING, TELECOMMUNICATION & SAFETY WORKS

(In Rs. Crores)

S No	Description	Outlay for throw-forward from VII Plan	Outlay for new works to be taken in IX Plan	Total outlay for IX Plan	Projected Outlay for X Plan
A	Replacement of Signalling Gears				
1	Panel interlocking	-	400	400	825
2	RRI (Route Relay Interlocking)	-	305	305	650
3	Non-panel type of equipment	-	25	25	75
	Total for 'A'		730	730	1525
B	System upgradation and Improvement for High Speed				
1	Train Information System	-	25	25	125
2	System Upgradation viz Clamp, Lock, AFTC etc	100	10	110	110
3	Second Distant Signalling and MACL Signalling	-	100	100	350
	Total for 'B'	100	135	235	585
C	Safety Works				
1	Track Circuits				
	(a) FM to FM	-	80	80	1
	(b) FM to BSL	-	90	90	30
	(c) Other Loop Lines	20	70	90	50
2	Safety Devices at Level Crossing Gates				
	(a) Telephones	15	05	20	25
	(b) Interlocking	30	-	30	40
	(c) Lifting barriers	15	-	15	20
	(d) Train Actuated Warning Devices	60	-	60	15
3	Auxiliary Warning System	250	-	250	300
	Total for 'C'	390	245	635	490
	GRAND TOTAL (A+B+C)	490	1110	1600	2605

CHAPTER XVII

ENERGY CONSERVATION

17.1 INTRODUCTION

17.1.1 Transport activity is a major indicator and determinant of the economic development of a country. Transport demand in India has been growing faster than the economic growth. Further, energy intensity in transport sector (ktoe/billion Rs. of value) in 1987 was 304.4 while with respect to the GDP it was only 12.8, indicating the relatively high energy input into the transport sector. Considering India's meagre energy resource this transport growth is obviously not sustainable. Suitable policy directions have, therefore, to be evolved which are consistent with the twin goals of minimising the energy consumption and also ensuring that the transport capacity does not become a bottleneck in India's economic development.

17.1.2 The energy bill of Indian Railways amounts to 23% of its total working expenses. During 1995-96, the total energy bill of Indian Railways was Rs. 3274.91 crores (approx.). Consumption of energy is mainly for traction purposes. About 98% of HSD oil consumed by Indian Railways is used for diesel locomotives and about 77% of electrical energy consumed is used for traction. Other major areas for use of electricity are lighting, pumping of water and workshop machinery. Energy conservation measures on the Railways are, therefore, largely focused on savings in energy used for traction.

17.1.3 In areas other than traction, a number of energy audits have been undertaken on Indian Railways and considerable savings in electrical power consumption has been realised by adopting good housekeeping practices.

17.2 ACHIEVEMENTS DURING VIII PLAN

- (a) Development of fuel efficient kits for 16, 12 and 6 cylinder diesel locomotives
- (b) Development of new high power diesel locomotives
- (c) Use of on-board power factor correction equipment on electric locomotives
- (d) Use of wheel flange lubricators
- (e) Introduction of low idling feature in diesel locomotives
- (f) Introduction of wear adapted wheel profile
- (g) Use of simulators for more intensive training of drivers.
- (h) Conducting energy audits in areas of major power consumption.
- (i) Complete phasing out of B.G. steam traction.

17.3 PROJECTS CURRENTLY ON HAND FOR REDUCING ENERGY CONSUMPTION

- (i) Phasing out of plain bearing stock
- (ii) Reduction of tare weight of wagons as well as coaches

- (iii) Wider application of low idle feature to reduce consumption of fuel on diesel electric locomotives during idling.
- (iv) Use of multi-grade lubricating oil in diesel locomotives
- (v) Welding of rails to reduce rolling resistance
- (vi) Introduction of high horse power, fuel efficient GM diesel locomotives.
- (vii) Provision of Series Capacitor banks on traction sub-stations to reduce the maximum demand and power factor.
- (viii) Introduction of energy efficient 2X25 KV AC system for traction supply
- (ix) Introduction of energy efficient AC-DC locomotives

17.4 ENVIRONMENT

With a view to improve ecological balance and environmental conditions, Indian railways have embarked upon an ambitious plan of afforestation on vacant Railway land, mostly alongside the Railway track

The saplings are selected for plantation depending upon local conditions, availability of water, interference from cattle, need for maintenance and aftercare, etc. These saplings are mostly of hardy and fast-growing variety, requiring the least aftercare and protection. Plantation done mainly consists of Eucalyptus, Subabool, Neem, Keekar, Juliflora and Shisham

By virtue of concerted efforts, Railways have been able to provide a forest cover with around 11 crore plants. The Railways have an ambitious plan to raise the forest cover by about another 3 crore plants during the IX Five Year Plan

17.5 NON CONVENTIONAL SOURCES OF ENERGY

The uses of non-conventional sources of energy are manifold on Indian Railways. Use of solar panel to power signals and to provide street lighting is now past the experimental stage. Solar stills for the production of distilled water, and bio-gas plants have been used so far in a limited manner.

The following systems have been installed so far

(i)	Solar Hot Water System	237
(ii)	Solar Stills for Distilled Water	76
(iii)	Solar Photo-Voltaic Cells	
(a)	For signalling	4182
(b)	For level crossing	12
(c)	For lighting way side stations	85

Use of non-conventional renewable sources of energy, particularly Solar Hot Water Systems, shall be further emphasised during the IX Plan

17.6 ENERGY PERFORMANCE OF INDIAN RAILWAYS

17.6.1 Reduction in specific energy consumption:

Indian Railways regard energy conservation as a major thrust area. Constant monitoring of the progress of various projects undertaken in this direction has yielded significant improvement in energy consumption per thousand GTKM, as would be seen from the following figures:

Year	Energy Consumption (In terms of coal equivalent in Kgs/1000 GTKM)
1988-89	24.73
1989-90	24.63
1990-91	24.46
1991-92	24.53
1992-93	23.93
1993-94	23.56
1994-95	23.12

17.6.2 Reduction in share of energy consumption on Indian Railways vis-a-vis the national demand:

The share of energy consumption on Indian Railways vis-a-vis national demand is tabulated below:

		1989-90	1996-97	1999-2000
Coal (in billion KWH)	National	220	378	420
	I.R.	5.2	0	
	%	2.4%	0%	0%
Diesel (in billion KWH)	National	53	81	91
	I.R.	1.4	1.3	1.1
	%	2.7%	1.9%	1.1%
Electricity (in billion KWH)	National	243	450	633
	I.R.	5.2	8.5	9.8
	%	2.1%	1.9%	1.5%

It will be seen from the above that there is a decreasing trend in the share of energy demand/consumption on Indian Railways as compared to the total national projected demand.

17.7 PROJECTS FOR THE IX PLAN

The various measure/schemes of energy conservation enumerated above will be continued in the IX Plan also to achieve further reduction in energy consumption

It is proposed to take up the following projects during IX Plan.

- (a) Introduction of 3 phase AC-AC transmission locomotives
- (b) Adaptation of regenerative braking on electric locomotives
- (c) Microprocessor based locomotive control, condition monitoring and diagnostic systems
- (d) Wider use of wheel flange lubricators
- (e) Further improvement in traction diesel engine(s) to bring down fuel/lube oil consumption
- (f) Further development of aerodynamic profile to reduce air resistance
- (g) Improved maintenance practices
- (h) Increasing payload/tare ratio
- (i) Introduction of higher axle load wagon
- (j) Development of energy efficient lighting and air conditioning equipment
- (k) Introduction of AC-DC EMUs with 3 phase AC drive and regenerative braking features, which are more energy efficient
- (l) Provision of series capacitor bank on traction sub-stations to reduce the maximum demand and hence, the penalty charges on electricity use
- (m) Study of clearance between rail gauge and wheel set to reduce energy consumption
- (n) Study of rail top lubrication technique to reduce energy consumption
- (o) Use of industrial drive motors, which are more efficient in various workshops
- (p) Increase in average speed of freight trains and reduction of speed differential
- (q) Increased availability and use of cab simulators for crew training

CHAPTER XVIII

PUBLIC SECTOR UNDERTAKINGS

18.1 INTRODUCTION

There are 5 public sector undertakings under the Ministry of Railways, RITES (1974), IRCON (1976), IRFC (1986), CONCOR (1988), KRC (1990), set up in the years shown in the brackets against each:-

18.1.1 RITES and IRCON were primarily set up with the objectives of providing consultancy services in the field of rail transportation, and execution of railway projects in India and abroad respectively. Over the years the two companies have diversified into non railway sectors as well.

18.1.2 IRFC has been set up with the objectives of raising funds for financial investments of the railways.

18.1.3 CONCOR was set up with the objective of bringing containerisation to the hinterland and to set up a network of inland container depots and container freight stations all over the country to serve as dry ports to boost international trade.

18.1.4 KRC has been set up to construct a 760 km coastal BG line to connect Mumbai and Mangalore. The project is to be commissioned in all respects by 1997. With the experience of construction in difficult terrain, the Corporation also proposes to enter into joint ventures along with other railway PSUs for securing contracts for railway construction and allied fields in India as well as abroad.

18.1.5 Capital Structure:

The authorised capital and paid up capital of the five companies are given below:

Name of the Company	Authorised Capital (Rs in crores)	Paid up Capital (Rs in crores)
RITES	2.0	1.0
IRCON	25	4.94
IRFC	500	232
KRC	600	587.94
CONCOR	100	65.00

The performance of the companies, their future plans and projections in respect of finance, investment profiles, diversification and technological upgradation, are outlined below:

18.2 IRFC

18.2.1 Present Scenario & Objectives

At present Company is engaged in raising its resources through market borrowings to fund Indian Railway Plan investments -

The fund raising has been undertaken through:-

- (a) Floating of tax free bonds as permitted by Ministry of Finance and Planning Commission.
- (b) External commercial borrowings.
- (c) Market borrowings at the prevailing market rates.

18.2.2 Target turnover for the next five year plan:

During 1996, a target of Rs. 1850 crores has been set in consultation with MOF and Planning Commission. It is expected that IRFC may be asked to raise a similar amount every year.

18.2.3 Thrust areas

The following thrust areas have been identified:

- (a) Increase market borrowings.
- (b) To sustain growth in the operation of leasing to IR.
- (c) To check the growth of administrative cost.

18.2.4 Future expansion Plans & strategies

IRFC has no place to diversify its operations into other areas or, for leasing to other clients. In order to raise more and more resources, the following methods may be adopted:

- (a) External commercial borrowing
- (b) Cross border leasing and other leasing through IDBI
- (c) Bonds
- (d) Fixed deposit

The above measures will be considered only after appropriate expansion of IRFC has been done.

18.3 IRCON INTERNATIONAL LIMITED

18.3.1 Present Scenario and Objectives:

At present the company is engaged in implementation of projects related with railway construction, roads, signalling, railway electrification, high-ways, ports, construction and development of housing complexes. Recently they have also entered in the field of export of rolling stock, leasing and commercial aviation. The company is operating in Bangladesh, Malaysia, Nepal, Turkey, Tanzania, Angola and Iran in addition to domestic projects. The Company has recently been rechristened as IRCON International Limited for a true reflection of its image.

18.3.2 Target Turnover for the next five years.

It is aimed to increase the turnover to Rs 800 crores by 2001 A D

18 3 3 Thrust areas

The following strategies will be adopted by the management to achieve the required results

- (a) Development of brand image
- (b) Aggressive decentralised marketing approach
- (c) Enhanced organisational capabilities for participating in turnkey projects
- (d) TQM approach to be institutionalised
- (e) Plan development and institutionalisation of acquired knowledge to enhance human capital value

18 3 4 Future Expansion Plans and strategies

The increasing requirements of clients for financing of the projects by bidder has resulted in the dwindling of new contracts abroad and more than 65 projects secured are in India To offset this imbalance and increase the presence of IRCON in international arena, joint venture with local companies in Malaysia and Bangladesh etc are being actively pursued Further to widen the opportunities IRCON has entered the area of BOT and BOLT projects

18 4 RITES

18 4 1 Present Scenario and Objectives

RITES has diversified from railway consultancy to transport consultancy including high-ways, airways, urban transport, ports and harbours etc RITES have recently taken up packages of export of rolling stock and locomotives The possibility also exists to enter into the field of BOLT and BOOT projects

18 4 2 Target turnover over the next five years

The turn over has increased from Rs 54 crores in 1990-91 to Rs 81 7 crores in 1994-95 A growth rate of 10% per annum in turnover and gross profit has been projected over the IX Plan

Year	Turnover	Net profit before Tax
1997-1998	112	24 3
1998-1999	118	26 7
1999-2000	124	29 65
2000-2001	133 50	33 90
2001-2002	143 50	38 6

18.4.3 Thrust areas

- (a) **Operations** RITES intends to concentrate on capturing business in infrastructural sector in the developing countries. Export of rolling stock will continue to be the thrust area during the IX Plan. On domestic front aggressive marketing will be done in airport, urban transport, harbours and highways. It is further intended to adopt a consortium approach with leading multi-nationals.
- (b) **Technology upgradation**
As a consistent effort to upgrade technology the following areas have been taken up for the technology upgradation during the IX Plan period:
- (a) Computerisation of architectural designs
 - (b) Computer aided learning programmes and audio-visual training modules
 - (c) Technology upgradation in the field of survey of highways and railways
 - (d) Training of personnel for value addition

18.5 KRC

18.5.1 Present Scenario and objectives

Out of 760 kms, 230 kms have been commissioned for passenger traffic. The section from Chiphun to Kudal, a distance of 235 kms has been opened for goods traffic in Sept '96. With this, 465 kms of route length has become operational. 188 kms from Kundapura to Canacona in the south has also been proposed for opening shortly. This would leave about 107 kms in Goa sector where 3 difficult tunnels exist. It will be the effort of the corporation to commission the whole length of traffic latest by June 1997.

18.5.2 Turnover over the next five years

After the full route length is commissioned, traffic share and turnover projections during the 9th plan period are as under:

Projections of Freight Traffic

	(in million tonnes)	
	1996-97	2001-02
Industrial Traffic	3.39	11.93
Diverted from Road	0.82	1.22
Diverted from other Railways	3.20	3.72
Total	7.41	16.77

Projections of Passenger Traffic

	(No of trips in '000)	
	1996-97	2001-02
Diversion from road	18,410	23,659
Diversion from other railways	2,787	3,329
Total	7.41	16.77

18.5.3 Thrust areas

- (a) Safety of passengers and goods of rail users
- (b) Punctual, mail express and passenger trains
- (c) All efforts to capture the rail-on and rail-off traffic between Mumbai and Mangalore
- (d) To exploit the tourist potential of Konkan area and tourist related activities KRC intends to open Yatri Niwas type complexes and other facilities in consultation with tourism department of the concerned states

18.5.4 Future Expansion Plan and strategies

- (a) Adopting marketing plans for passenger traffic
- (b) Provision of line capacity works to meet the increased requirement of traffic, originating due to major refineries, power houses, steel works and other industries This will be done by opening additional stations, additional loops and provision of sophisticated signalling
- (c) Adopting integrated computer system by which control of trams, freight and passenger operations, financial control and store inventories will be fully computerised
- (d) KRC proposes to enter into joint ventures with other railway PSUs for securing construction contracts in India as well as abroad
- (e) Leasing out of the spare capacity of optic fibre cables between Mangalore and Mumbai

18.5.5 Assistance from the Government

KRC is facing resource crunch which is coming in the way of implementation of the project. The total requirement of funds till March, 1997

(a) Cost of Project	Rs.2,230 crores
(b) Original financing cost	Rs. 550 crores
(c) Addl. financing cost on account of interest payment on 1.1.1997 etc	Rs. 100 crores
Total	Rs.2880 crores

Funds so far raised

Equity	Rs. 598 crores
Tax free Bonds	Rs. 1495 crores
Sale & lease back permanent way	Rs. 90 crores
Shortfall in raising funds	Rs. 697 crores

The Govt. of India has recently permitted the corporation to retain 70 million USD and the agreement for the same was signed at Hong Kong in September '96. The corporation is also entering the market with a public issue of tax free bond to the tune of Rs. 150 crores. The net shortfall of Rs. 317 crores has to be made up by the Government.

The Corporation has recently obtained the approval of the Ministry of Railways for increasing its equity base from Rs. 600 crores to Rs. 800 crores of which Railways'

contribution would be Rs. 102 crores (51%); the balance will have to be contributed by the concerned State Governments. The net shortfall after this, will have to be met either by commercial loans or through another ECB.

18.6 CONCOR

18.6.1 Present Scenario and Objectives

CONCOR's business is both international and domestic. CONCOR's international traffic handled at the beginning of 8th Plan period was 12300 TEUs and has grown close to 4 lacs TEUs in the terminal year by 8th Plan, registering an annual compound growth of 139%. CONCOR's domestic container traffic of 33,000 TEUs in 1992-93 is expected to be about 3,05,000 by 1996-97 indicating a compound annual growth of 77%.

Since the international traffic growth is dependent on the growth rate of container traffic at the ports and this is projected to increase at a rate of 12% to 15% per annum, and out of the existing container traffic, 60% has origin destination in the locations more than 400 km. from the ports and, therefore, can be moved by rails. International traffic, can increase at a significantly higher rate provided matching facilities like availability of terminals and faster and assured transit times, etc. are made available.

Domestic traffic is of two types. While CC commodities are transported in train loads from point to point, W commodities move in piecemeal wagon load or even less than wagon load. The CC traffic is not likely to increase because of the shortage of wagons. The W traffic may grow very slowly.

18.6.2 Turnover over the next five years

Container traffic is projected to grow at a rate of 20-22% during the 9th Plan as projected below:

Year	International TEUs	Variation from previous year
1997-98	500	25%
1998-99	600	20%
1999-2000	720	20%
2000-2001	870	21%
2001-2002	1050	21%

18.6.3 Thrust areas

1. To provide a fast reliable and guaranteed service.
2. To minimise traffic time by improving terminal facilities.
3. To sustain the traffic growth rate during the IX Plan.

18.6.4 Future Expansion Plan and Strategies

The average lead in domestic traffic in CC category will continue to remain at 700-750 km. and that of international traffic at 1400-1450 kms. CONCOR will make fullest use of substantial traffic growth from Navasheva and Madras ports.

CHAPTER XIX

IMPROVING CUSTOMER SATISFACTION

1.0 INTRODUCTION

1 1 The inexorable logic of IR's development has the largest transport organisation enjoying monopoly privileges has shaped its attitude, culture and ethos. As a consequence, the emphasis so far has been in meeting the demands of the customers in quantitative terms, achieving physical targets and expansion of network rather than on quality of service and customer satisfaction. The situation is fast changing due to :

- (i) Gradual erosion of IR's share of traffic with growth of other modes of transport, particularly road.
- (ii) Emergence of a large number of activist groups, growth of consumer movement in the country and larger awareness in public of their rights with regard to both quantity and quality of service.
- (iii) New emerging trends with the opening of the economy and liberalisation and resource cost assuming a key role in formulation of any business strategy.

1.2 Consequently, India Railways have to change their approach in order to .

- (a) Retain and enlarge its share of business,
- (b) Reduce cost of operations and maintenance to avoid the eventuality of outpricing itself in the expanding market.
- (c) Generate internal resource to finance operation, maintenance and expansion of the system as also to ensure quality of service to its customers.

1 3 Consequently focus has to necessarily shift to those areas of corporate endeavour which has so far been on the back burner; premium on quality of service at least cost to society. This has to be the corner stone of the philosophy for 9th Plan document.

2.0 Opinion Survey - a mechanism to gauge customer's perception.

2 1 Opinion surveys conducted at frequent intervals to gauge rail users' needs and their perception towards railway passenger and freight services have to be adopted as an institutionalised arrangement for assessing the needs and aspirations of various segments of rail users for effecting changes to suit better customer satisfaction. As a part of IR's effort at system improvement, a mechanism for arranging such surveys at regular intervals needs to be evolved. Last such survey was conducted in 1992 by the Operations Research Group on behalf of the Railways. It needs to be conducted at the inception of 10th Plan followed by a mid-term assessment to carry out mid-course corrections.

3.0 Non-bulk Freight Traffic & Parcels

- 3 1 The strength of IR is that it is eminently suited to perform the role of a bulk carrier. This, unfortunately, is also its biggest weakness, in that it is poorly equipped to handle non-bulk, less than trainload, traffic. A long term view will be taken to devise strategies for handling this traffic, as market forces will compel more and more industries to cut down on their inventory levels and movement in block rakes may soon become uneconomical for a large number of them
- 3 2 Management of parcel traffic, similarly, will be given a re-look. There are complaints of non-delivery, deterioration, and transit delays and the claims paid on them are extra-ordinarily high as compared to the revenue that they generate for the Railways. This has also spawned a system reeking with vested interests and corruption
- 3 3 Non-bulk traffic and parcels have not been the thrust areas for Railways and the time has, perhaps, come to devise strategies for addressing ourselves seriously to the task of handling this segment of traffic. The attempt so far made in the direction of formulating Freight Forwarder Scheme, SLR leasing provision of pick-up/delivery service etc. have at best been half-hearted
- 3 4 CPCS Ltd. Montreal, engaged as consultants for a study sponsored by Asian Development Bank, has suggested that IR should withdraw from terminal management and concentrate on-line haul service, terminal portion being off-loaded to other agencies. The railways should concentrate on their core business i.e., transportation alone, chartering trains on lump-sum negotiated rates on moving them to destination purely on a line haul concept
- 3 5 During 9th Plan, provision will be kept for off-loading management of some selected freight and parcel terminals to CONCOR or other such operators
- 3 6 More and more goods sheds will be closed down with concentration of activity at major modal points for serving as hubs to the goods offered in radius of 160 Kms or so
- 3 7 Out of the 54 nodal points identified by the CPCS Ltd. 34 origin and destination pairs have been found feasible for development as nodal points for dealing with non-bulk traffic. These nodal points would be equipped with facilities for warehousing, packaging, storing, refrigeration etc. and would also have the infrastructure for providing inter-modal services
- 3 8 A corporate decision for permitting leasing of SLR space without any limitation needs to be taken. IR would, thus, act only as line haul managers transporting parcels with SLRs leased out to highest bidders and parcel vans at lumps negotiated contract rates. Parcel handling will be confined to selected few stations to help traffic gravitate to such nodal points. Parcel offering would, thus automatically get bulked facilitating formation of parcel trains and a more rationalised handling
- 3 9 Non bulk and parcel movement will be organised as a separate business product. As IR is not geared to market such a product, its marketing and terminal handling need to be privatised

- 3.9.1 A beginning could be made by off-loading this sector of business to CONCOR. They can have necessary tie-ups with road hauliers for the purpose of road-bridging wherever necessary as also to provide door to door service to the customers
- 3.9.2 CONCOR shall have to play their role of inter-modal co-ordinator so that bulking of traffic and its amalgamation into trainload formation are facilitated

4.0 Passenger Services :

- 4.1 The subject may be dealt with under three heads ,
- (i) Improvement/expansion of services at stations
 - (a) basic amenities at stations
 - (b) additional facilities at stations
 - (ii) improvement and augmentation of train services

4.2 Passenger Amenities

- 4.2.1 Passenger amenities provided at stations were subjected to a comprehensive review during the year 1995 at the instance of Standing Committee of Parliament on Railways. As a consequence all facilities were re-classified into two groups, viz Infrastructure facilities and Passenger Amenities. All such facilities which are operationally required and are an essential feature of a station have been redefined as 'Infrastructural Facilities'. All other Public amenity service and/or conveniences provided over and above 'Infrastructural facilities' are classified as 'Passenger Amenities'. It was also decided that Railways shall draw up their 'Perspective Plan' for provision of Passenger Amenities in order to ensure that the same are provided in a planned manner.
- 4.2.2 At the beginning of VIIIth Plan there were a large number of deficiencies in basic passenger amenities which were identified and listed out for corrective action. Increased budget allocations under Passenger Amenities were made in the Plan and the deficiencies were completely eliminated by 31.3.95.
- 4.2.3 For the IX Plan adequate provision is proposed to be made for augmentation of various amenity services at stations. The tentative requirement has been worked out as Rs. 130 crores and with increase of 10% per year a total fund requirement of about Rs. 800 crores from the entire IX Plan period has been envisaged.
- 4.2.4 Depending on the importance and volume of traffic handled at each station, stations have been classified in five different categories. The scale of infrastructural facilities has been laid down for all these categories of stations.

4 3 Additional Services

4 3 1 Adequate provision will be made during IX Plan for additional facilities at stations, viz

- (i) Approach roads, circulating areas, packing facilities, beautification etc.
- (ii) booking of unreserved ticket-replacement of manual ticketing system by micro processor based self printing machines bring about qualitative change in the service and a greater transparency in this area of interface with large segment of rail users. Approximately 500 stations with an earning of Rs. 1 crore and above would need to be covered under this scheme during IX Plan at an anticipated expenditure of Rs. 40 crores.
- (iii) Reservation Facilities Computerisation of reservation system would need further consolidation. Travel agencies of repute can be associated in task of providing and managing terminals at important locations in the city to provide a wider coverage as also to relieve load on existing terminals
- (iv) Provision of hand trolleys for transportation of luggage.
- (v) Provision of micro-processor controlled electronic boards giving display of reservation status in various trains at all PRS locations.
- (vi) Catering Servicing of standard food item, pre-cooked in static base kitchens, and packetd in disposable containers/wrappers, has been adopted for middle catering on trains This is to be supported by vending pre-cooked snacks from small insulated trollies on the platforms and service of hot beverages in thermos flasks
- (vii) Washable aprons At terminal stations or at stations where the trains have long halts there is heavy discharge of night soil. Consequently, provisoin of washable apron facilities, with ancillary sewage disposal system, has become inescapable on busy platform lines at important stations The thrust to would be provide washable aprons every large and medium stations including metro towns, capital cities etc
- (viii) **Passenger Enquiry and Information System** : The system will be to enable people to have ready access to correct and timely information. During 8th Plan Computerised Passenger Information system was to be provided at 28 stations handling over 3000 and more per day Anticipated cost Rs 5.5 crores
- (ix) **Provision of wheel chairs** : Wheel Chairs for invalid and sick passengers are already available to important stations The facility would be extended during 9th Plan to all stations with paved platforms.

5 0 Amenities on train

5 1 The various amenities to be provided on trains are :

- (i) Provision of pantry car service on long distance superfast trains On the nodal of Shatabdi Express, the coaches of Superfast trains could be provided with a mini-pantry
- (ii) cushioning of all second class coaches
- (iii) provision of adquate linen space in AC coaches.
- (iv) communication/telecom facilities on broad.

6.0 Claims, Claims Prevention and Refunds

6.1 Another area of customer dissatisfaction is claims, delay in settlement of claims and refunds

6.2.0 Claims-Claims Prevention

6.2.1 Financial powers for setting of claims have been revised to effect greater decentralisation, and consequently more expeditious disposal. The filing of claims has also been decentralised to enable claimants to file their claims with Stations Masters of destination stations.

6.2.2 Computerisation of claims has been done on a few Railways. This will be During 9th Plan to cover all Zonal Railways.

6.2.3 Mobile Claims Offices have been set up to enable officers to arrange spot settlement of claims

6.2.4 Commodity-wise cells have been set up to streamline disposal of claims.

6.3.0 In addition to the usual claims prevention measures, working of Not Received Cell has brought about a salutary change in the area of Claims Prevention. As a result there has been a progressive decline in arising of fresh claims cases (approx. 7.5%) as large number of wagons and parcel consignments are getting connected on day-to-day basis obviating the need for registration of claims. The system will be revamped by proper strengthening of communication channels. Net working of NR Cells by providing linkages on independent circuits will be planned, to make information exchange almost instantaneous. The unconnected wagons and packages as also those which are suffering inordinate detentions would be instantly linked with missing wagons/packages or unlinked RRS/Waybills as well as claims preferred on them. This will be a thrust area during 9th Plan Period.,

6.4.0 Refunds

6.4.1 For expeditious granting of refunds, rules which, earlier, were extremely cumbersome, have been largely simplified. Powers have been given to a large number of Stations Managers for granting refunds. Further rationalisation of the procedure for reducing delays in granting refunds is underway.

7.0 Improvement in Ticket Checking

7.1 Ticketless travel has become an endemic social evil, robbing the Railways of its legitimate revenue and also avoidable harassment to bonafide passengers.

7 2 The proving measures are proposed to reduce the incidence of this :

- Opening of more booking counters to reduce queuing
- Extension of PRS terminals and their large dispersal to reduce the load at PRS centres.
- Larger coverage of booking of unreserved tickets, platform tickets, season tickets etc. through extension of micro-processor self-printing machines.
- Opening of booking windows at smaller stations for considerably longer periods
- Introduction of automatic ticket vending machines particularly for dispensation for platform tickets to reduce queues at booking counters.
- Enforce system of voluntary checks-every officer with an identify card should have authority to conduct ticket checking.
- Increase the cash award payable under the incentive scheme introduced for the ticket checking staff.
- Provide teeth to the ticket checking activity by larger deployment of RPF staff for ticket checking duties Suggestion for creation of an exclusive squad of RPF personnel for ticket checking at the disposal of commercial officers

7 3 Vacancies of all TTEs' It has been decided to create 1/3rd of additional post required as per the present norm without insisting for matching surrender wherever such matching surrenders are not available

7 4 All long distance trains for effective ticket checking and manning of coaches A comprehension of ventilating

8 0 Alarm Chain Pulling

8 1 A number of steps has been taken by Railways for reducing incidence of alarm chain pulling which is one of the major factors causing loss of punctuality of trains Apart from blanking off alarm chain apparatus on selected trains, alarm chain pull points from lavatories and from locations near the doors have been removed

8 1 1 North Eastern Railways has recently developed modified passenger alarm system both for airbrake and vacuum braked trains. The system will be made adopted on selected trains passing through vulnerable areas to begin with and extended to other train in phased manner.

8 1 2 RDSO has developed an Audio Visual Passenger Emergency Alarm Indication for Air Braked Trains.

CHAPTER - XX

SECURITY

20 0 INTRODUCTION

The requirement of security for the Railway system had been felt from the date the first train steamed off from Bombay in 1853. The Private Railway Companies raised their own Watch & Ward, which ultimately matured as a statutory force by an Act of Parliament called RPF Act, 1957 (as modified in 1985). The conferring of the status of an Armed Force of the Union to RPF in 1985 has brought RPF at par with BSF, CRPF, CISF and ITBP. The RPF in addition to providing protection to gigantic amount of property of Railways also protects consignments entrusted to a Railway for carriage and is frequently called to render aid to civil powers, in all nooks and corners of the country in times of National need. RPF provides invaluable assistance to the Railways for their smooth working and for this purpose, the Force requires to be maintained at its highest level of efficiency.

The concept of Railway security still depends on point to point guarding and efforts towards its modernisation had been quite meagre. Inputs in the form of modern gadgets, better mobility, sophisticated weapons and computerisation are the need of the hour to make RPF more result-oriented and more useful for the Indian Railways. At the same time, the morale of the staff requires to be kept high by providing them with adequate accommodation which will spur them to protect Indian Railways under the present difficult security scenario.

20 1 OBJECTIVES OF IX PLAN

The objectives of the IX Plan programme would be as under -

20 1 1 Modernisation of the Force by —

- (a) Better mobility
- (b) Better weaponry
- (c) Modern Security Gadgets
- (d) Better training
- (e) Setting up of Information System
- (f) Upgradation of RPF - Fire Service Wing

The above objectives shall be met with the same manpower by means of improved efficiency.

20 2 MODERNISATION OF FORCE

20.2 1 Better Mobility

The requirement of quick, efficient and dedicated transport for RPF cannot be over-emphasised as the criminals operating on Railways use quick means of escape after

commission of a crime. Even if information reaches RPF the raiding party can reach the spot only if it is equipped with reliable transport. It is, therefore, imperative that RPF is provided with adequate number of transport vehicles for quick and efficient operations.

Since RPF is an Armed Force of the Union and like other Armed Forces performs the duties in aid to Civil power and provides protection to Railway property, in addition to investigating RP(UP) Act cases, the duty more akin to District Police, the requirement of transport for RPF should be at least at par with Para Military Forces and more so like CISF, which performs duties quite similar to RPF and is also an Armed Force of the Union, the observations made by the Expert Committees like High Powered Committee, 1968 (headed by the then Dy. Minister of Railways) and Saldhana Committee, 1971 were also on the same lines. Based on this scale, the total requirement of all 9 Zonal Railways and RPSF has been worked out as under. -

Cars	-	83
Jeeps	-	680
Pick-up Van/ Matadors	-	26
Trucks	-	57
Motor Cycles	-	1028

The total outlay required to fulfil this programme would be Rs.28.13 crores

Keeping in view the constraints of the IX Plan period, only the inescapable requirements have been proposed to be included in this Plan, carrying forward the balance to X Plan period. However, the requirement of motor cycles, which is the basic means of mobility at the post/out post level, has been fully included in the IX Plan to improve the efficiency and effectiveness of the Force. In all other categories, care has been taken to project minimum requirement during IX Plan period. In view of this, the requirement will be as under:

Cars	-	42
Jeeps	-	240
Pick-up Van/ Matadors	-	13
Trucks	-	30
Motor Cycles	-	1028

The approximate cost of this requirement would be Rs. 14.88 crores. It will also be ensured that requirement of drivers and maintenance staff will be met from the existing strength and no additional staff will be sanctioned for this purpose.

This will not include the vehicles being procured on replacement account through the normal M&P Programme. The remaining requirements of Rs. 14.88 crores would be provided in the X Plan.

20.2.2 Better Weaponry:

During the VIII Plan, modernisation of RPF weaponry could not be taken up fully due to the uncertainties in the policy of the Government (proposal for induction of private security guards, cut in the RPF manpower, etc) In 1995-96 and 1996-97, part of the RPF weaponry has already been taken up for replacement by new weapons Excluding these, the number of weapons and their cost for the IX Plan will be as under

Rifles (SLR)	7.62 mm	4908 nos.	Rs 1250 lakh
LMGs	7.62 mm	55 nos.	Rs 55 lakh
Pistol Auto	9 mm	250 nos.	Rs 50 lakh
Carbine	9 mm	680 nos.	Rs 145 lakh
Total			Rs 1500 lakh

The above projection is for replacement of obsolete and unserviceable weapons and part replacement of current use weapons which are likely to become unserviceable during the Plan period. The estimate excludes cost of ammunition and cost of maintaining current weaponry The estimated cost of purchasing the above weapons will be Rs 15 00 crores.

20.2.3 Modern Security Gadgets

The concept of security in RPF had been manpower oriented A change in thinking is required in this aspect as the field of security has undergone a sea change with the advent of different modern gadgets, introduction of which will make the RPF men more efficient and effective and in some areas can give room for re-deployment of the security staff Modern security gadgets like CCTV, Infra red detectors, Walkie-Talkies, binoculars, wireless sets, etc. ill be introduced after preparing project reports for important workshops and yards which are crime prone. The availability of these equipments at present is approximately nil except for a few wireless sets/walkie-talkies. After due scrutiny of the project reports with the help of technical experts, modern gadgets will be introduced in Production Units, Workshops, Yards on different Railways in a phased manner It is, therefore, proposed that Rs. 6 crores be provided during IX Plan.

20.2.4 Better Training

RPF personnel are imparted initial and in-service training at 8 zonal RPF Training schools (One located on each Zonal Rly) and RPF Academy located at Lucknow In addition, RPSF personnel are also trained at 2 Bn RPSF Lucknow which is a training Bn for RPSF personnel

At present, RPF training schools are not having sufficient area to accommodate all the training facilities required to train RPF personnel in the various requirements of their profession. The basic input presently required is bigger training schools with at least 100 acres of land available for each of them. This will help in properly locating the schools and providing proper parade grounds, sports grounds, auditorium, class rooms, barracks, hurdle courses, staff quarters and other facilities like canteen, armoury, administrative wing, etc. The trainees will also get better trained as they will be able to imbibe the basics of the Force more closely, as they will be in a better environment having all the basic infrastructure for the training institution.

The role of RPF after it has become an armed force of the Union in the year 1985 has undergone a sea change. The RPF personnel will have to be trained properly to efficiently perform their duties, in their role as members of an Armed Force of the Union. The RPF personnel have to be kept constantly at a high level of fitness and training so that they can meet challenges of day-to-day working. All the Zonal Training Schools and RPF Academy Lucknow have to be totally revamped and provided with modern gadgets and audio visual aids, computers, overhead projectors, video recorders, slide projectors, TVs, Cameras, photographic units, electronic aiming devices, wireless sets, etc. The basic facilities of barracks, administrative blocks, auditoriums, libraries, recreation rooms, firing ranges, etc. have to be provided to all the training schools and Academy. It is proposed to make a provision of at least Rs2.5 crores per training school and RPF Academy for this purpose. This will cost about Rs 25 crores in all.

20.2.5 Setting up of Information System

Railway Protection Force has not been included so far in computerisation and office automation. The day to day working in RPF is still manual, especially documentation and compilation of data. Even pay-bills in various Divisions, Production Units and Zonal Headquarters is being prepared manually for RPF staff. Lack of computers is affecting the efficiency of the Force and also causes delay. Computerisation in RPF requires to be taken up at least in the IX Plan period. Many of the current recruits at the level of probationers and sub-inspectors (cadets) are computer literate. Even some of the Constables have computer training. Required number of staff will be put through computer training at CRIS and NIC.

Local Area Network (LANs) are required at DG's Headquarters (26 work stations with 15 incomplete), CSCs Headquarters (14 work stations with 8 printers), medium Divisions and Production Units (7 work stations with 3 printers), No 6 & No 2 Battalions, RPSF (8 work stations with 3 printers), other 6 RPSF Battalions (5 work stations with 2 printers), RPF Training Academy, Lucknow (14 work stations with 8 printers), Zonal Railway Training Centres (5 work stations with 3 printers).

An LCD Projector System is required at RPF Training Academy. Personal Computers with printers are required in the minor divisions/sub-divisions/lines (13 such units)

Computerisation may be taken up in phases spread over the Plan period

I Year	-	DG's Headquarters
	-	CSCs Headquarters
II Year	-	RPF Academy
		Major Divisions
		No 6 Bn , RPSF
III Year	-	No 2 Bn , RPSF
		Medium Divisions
		Production Units
		(other than W & AP)
IV Year	-	Zonal RPF Training Centres
		RPSF Battalions (other than
		No 2 & No 6 Bns)
V Year	-	Minor Divisions
		Wheel & Axle Plant
		Major RPF Lines

The total cost is estimated to be around Rs 2 crores

20 2 6 **Upgrading of RPF - Fire Service Wing**

During IX Plan there will be rapid overall increase in all spheres of railway working like Power Sector, Passenger Sector and Freight Sector All these activities will also generate increased Fire hazard in all these spheres calling for stringent Fire Prevention, Fire Protection and Fire fighting measures ensuring proper safety from the ravages of Fire We shall have to plan for the strengthening of Fire Prevention, Fire Protection and Fire fighting arrangements on Railways to meet with the challenges posed by increased Fire hazards. The Fire safety measures as per following details needs to be established and upgraded to keep pace with the latest technological development and need of the hour

(a) **Setting up Additional Mobile Fire Stations**

The Sub-Committee of the Consultative Committee of MPs' for the Ministry of Railways have recommended that Railways may set up Fire Station in each Divisional Head quarters. To meet with the increased Fire hazards at least one mobile Fire Station in each Divisional Head quarters is most essential to respond to emergency calls on Railways Presently out of 58 Railway Divisions, 15 are not having any mobile Fire station These Divisions needs to be provided with one mobile Fire Station, each to be located in the Divisional Headquarters The total expenditure on this account is estimated at Rs.3 crores (cost of 15 standard Fire Station

Buildings, Fire engines, equipments and accessories). 7 static Fire stations are still existing on the Railways. These Fire stations need to be upgraded to mobile Fire stations with provision of necessary mobile Fire Tenders for promptly and speedily responding to emergency calls as well as to provide Fire safety coverage to the large area which these Fire stations presently are not capable of serving in the absence of mobility. The total expenditure on this account is estimated at Rs 42 lakh

(b) Phasing Out Halon Type Fire Extinguishers

India having become signatory to the Montreal Protocol from June, 1992 and is committed to phase out Ozone Depleting Substances including HALONS in accordance with the Protocol guidelines Railways in 1991 had decided to provide HALON TYPE Fire extinguishers almost in all areas replacing conventional Soda Acid and Foam type Fire extinguishers. The production of HALON TYPE FIRE extinguishers will cease after 31st December, 1999 and we have to plan for the replacement of these extinguishers with dry chemical powder type Fire extinguishers containing ABC powder. Approximately, 65,000 Fire extinguishers containing dry chemical powder type containing ABC powder will be needed for this purpose. The total expenditure on this account is estimated at Rs 13 crores. 50% of this expenditure is proposed to be incurred during IX Plan and the remaining 50% to be carried over to the X Plan. Thus the whole exercise of HALON phase out is proposed to be completed in 10 years time.

The total expenditure on strengthening of Fire Safety measures on Railways is estimated to be Rs. 13 crores out of this 6.5 crores is proposed to be carried over to X Plan and Rs 6.5 crores needs to be allocated for IX Plan.

20.3 IMPROVEMENT IN LEVELS OF ACCOMMODATION

1. Proposals for IX Plan -

RPF personnel upto the rank of head constable as per the statutory requirements, are to be provided with residential accommodation upto 50% of their total strength and subordinate officers from the rank of ASI to inspectors are required to be provided with 100% residential accommodation. The level of satisfaction of residential requirement of the RPF personnel upto the rank of head constable is 58% and those from ASI to Inspector is 15%. The satisfaction level is particularly low in the case of RPSF personnel spread over Eight battalions, which is only 37%.

The overall requirement of both barrack and residential accommodation for the Force has been arrived at keeping in view the above norms. The accommodation already available and sanctioned during the VIII Plan period has not been reflected and only urgent requirements have been projected.

The cost for construction of 1717 number of type III quarters for officers and of the 11,259 number of type I and II quarters for RPF staff works out to be Rs 193.14 crores. This has been proportionately distributed in the IX Plan and for the subsequent two Plans at Rs 64.38 crores each.

With the amount projected for the IX Plan period the following requirement of quarters for RPF and RPSF will be met

Type III	572 no. of quarters
Type II	3753 no. of quarters

The estimated cost for the IX Plan would be Rs 64.38 crores

The total requirement of administrative buildings (RPF post/outpost and Barracks) would be to the tune of Rs 64.37 crores. However, this requirement has been spread over IX, X and XI Plans and only essential requirements have been projected for IX Plan which will be as under -

Administrative building	175 nos
Barracks	248 nos

Approximate cost of the above requirement during IX Plan would be Rs 15 crores

In fine total number of quarters and administrative buildings (RPF posts and Barracks) during the IX Plan would be as under

Type III	572 no. of quarters
Type II	3753 no. of quarters
Administrative Building	58 nos
Barracks	82 nos

On the basis of above break up, the total number of quarters and administrative buildings (RPF post and Barracks) to be included in the X Plan works out for RPF as under

Type III	572 no. of quarters
Type II	3753 no. of quarters
Administrative Building	58 nos
Barracks	82 nos

CHAPTER - XXI

PRIVATE PARTICIPATION IN RAILWAY INFRASTRUCTURE

- 1 (ii) **Own Your Wagon Scheme :**

The 'Own Your Wagon' scheme was started by IR in March' 92. The Scheme was conceived as part of marketing strategy to enhance the rail transport capacity to meet the needs of various sections of the economy by encouraging private parties to own their wagons and thereby help supplement the resources available with the Railways for acquisition of rolling stock. The scheme invites investment from bulk users and financing/leasing companies for ownership of wagons in unit of trains.
- 2 The Scheme was reviewed on the basis of suggestions received from trade and industry during meetings held with them. A revised scheme was launched in February' 94. (The response to the scheme has not been too encouraging.)
- 3 The salient features of the scheme are as under .
 - (i) The Indian Railways will pay to the owners 16% lease charges for first 10 years and 1% lease charges for the subsequent 10 years.
 - (ii) The participants in the scheme can own any number of wagons in units of train load
 - (iii) Investors can procure the wagons either through the railways or directly from the approved wagon builders. If it is procured through Railways, party will pay Railways 3% of the cost of wagons as service charges which will cover design, inspection & administration charges. If, however, the party procures the wagons directly from the approved manufacturers, it will have to pay only 1½% for design, & inspection charges
 - (iv) Party will have to deposit only 10% of the cost of wagons with the Railways at the time of placement of orders on the railways. The rest will be paid at the time of delivery
 - (v) The user/owner unit will also have the benefit of guaranteed clearance of a mutually agreed specified quantum/tonnage of the specific commodity/product during a specified period
 - (vi) The general service wagons will be maintained by the Railways at Railway's cost except for special repair/modification
 - (vii) Under Category C - Guaranteed Clearance with Special Wagons, lease charges will not be payable to the owners of special wagons moving in dedicated circuits and involving empty running in one direction
 - (viii) A lump-sum freight rate mutually negotiated would be quoted for the identified dedicated movement taking into account the cost of haulage in the loaded and empty direction, terminal, marshalling and other costs

The lump-sum rate would be subject to revision every year alongwith the annual Railway Budget exercise.
- 4 From 1993-94, till 31.5.96, orders for a total of 10,792.5 wagons (in terms of 4 wheelers) have been placed on wagon manufacturers at a value of Rs. 514.27 Cr. (approx.). While 3487.5

wagons have already been received, balance 7305 wagons are in the process of being supplied by the wagon industry

A number of major companies like Indian Oil, Raymonds, TISCO, KRIBHCO, IFFCO, ACC, SAIL, L & T, GNFC, ESSAR GUJRAT and RSMML have so far participated in the scheme. At present M/s Grasin Industries, Century Textiles & Industry Ltd, Modi Cement, OCL India Ltd., Malvika Steel Ltd have placed orders for procuring 1917.5 wagons (4 wheeler units) during 1996-97. In addition, proposals from M/s Rashtriya Chemicals & Fertilizer Ltd, Rajshree Cement, IOC and ACC are under process

- 5 With a view to assess the reasons for the poor saleability of the scheme as also to address the problems being faced by our clients, a User - Interactive meeting was recently organised on 10.4.96 in the Railway Board. The meeting was attended by all existing customers, prospective clients and some leasing financing companies. The meeting was aimed at getting a first hand view of the problems being faced by the customers who had opted for OYW scheme as also to get the view of the industry in how to recast the scheme by removing impediments. Based on the views received during the meeting, the scheme is being modified. The amended scheme is likely to become available soon.

(iv) Bolt Scheme

With a sharp reduction in budgetary support for infrastructure development plans, the Railways have decided to undertake some of the projects through investment by private sector under Build-Own-Lease-Transfer (BOLT) Scheme. Under this scheme, private entrepreneurs and financial institutions are invited to build/manufacture/arrange finances and lease the Assets to the Railways. Lease charges are paid in turn, to the entrepreneur, for the use of Assets during the period of lease on terms and conditions mutually agreed upon. On the expiry of the lease period, the asset is transferred to a nominee of the Railways. Under the Bolt Scheme, entrepreneurs and financial institutions are selected after inviting open bids for the projects to be executed. Projects identified for taking up under BOLT Scheme are Gauge Conversion, Doubling of existing single lines, Electrification Projects, Telecom Projects, supply of Rolling Stock such as Wagons and Passenger Coaches, Diesel & Electric Locos, supply of Tracks, Machines, etc. So far, projects worth Rs. 3770 crore have been identified for execution as per details given below :

(a)	Gauge Conversion	-	Rs. 650 crore
(b)	Doubling of lines	-	Rs. 684 crore
(c)	Electrification	-	Rs. 613 crore
(d)	Telecom	-	Rs. 51 crore
(e)	Rolling Stock	-	Rs. 1559 crore
(f)	Track Machines	-	Rs. 214 crore

During 1995-96, Gauge Conversion projects of Rs. 252 crore have already been awarded and offers for Rolling Stock worth Rs 1405 crore are under finalisation. Other projects worth Rs. 2114 crore are under process.

Salient features of the BOLT Scheme are as under :

- Bids are obtained in the most competitive manner through open tenders
- Bidders are required to indicate yearly lease rental charges to be paid on monthly basis and also transfer fee at the end of lease period.
- Ministry of Finance have permitted a 5 year tax holiday on the income of the constructing agencies This is in addition to the normal depreciation benefits available under extant rules.

(v) **Running of Tourist trains :**

With a view to bridge the gap in tourist transport infrastructure, Ministry of Railways invited global bids for ownership, marketing and management of tourist trains on 5 BG tourist circuits Contracts have been awarded to the following four companies

	Name of Company	Route of train circuit
1	M/s Sterling Holiday Resorts Pvt. Ltd	(i) Delhi-Jaipur-Agra-Gwalior-Jhansi (Khajuraho) Varanasi - Lucknow - Delhi (ii) Bangalore-Mysore-Madras-Kodaikanal Road-Kanya Kumari-Trivandrum-Cochin-Mettupalayam (Ooty)-Bangalore
2.	M/s. S. S. Patil, Secunderabad	Bombay-Aurangabad (Ajanta/Ellora)
3	M/s. East-West Travel and Trade Links, New Delhi	Nanded-Secunderabad-Hyderabad-Pune-Bombay Goa (Madgaon)-Mangalore-Mysore-(Belur/Halebid)-Hospet (Hubli) - Bangalore-Goa (Madgaon)
4	M/s. L. S. Patil, Secunderabad.	Bangalore-Mysore-Madras-Kodaikanal Road-Kanyakumari-Trivandrum-Cochin-Mettupalayam (Ooty)-Bangalore.

IR would provide all ground facilities and infrastructure related with the running of these trains including locos, train crew, track, signalling and communication system and use of its stations, while the operator would provide catering on board/ground, entertainment of board/ground, surface transport for sight seeing etc. Other features are

- Capital cost of owning the train would be Rs. 20 crore.
- Railways operational cost of haulage and maintenance would vary between Rs 10-12 lakhs per trip basis on specified circuits
- Bids have been evaluated and decided on the basis of highest offer of turnover above 15%

For acquiring the Rolling Stock, the bidders have the option (a) to acquire a fully fitted train from IR, (b) procure it from external source (c) obtain bare shell from IR and furnish it and (d) procure shell from outside and have it fitted and furnished in IR workshop.

(vii) **Operation of Cloak Room :**

With a view to reducing expenditure and generating more revenue and at the same time providing improved services to the passengers, Zonal Railways were advised to give the running of cloak room at important stations to contractors. South Central Railway has already made a bidding in this regard by engaging contractors for privatisation and maintenance of cloak rooms at Secunderabad and Hyderabad Stations for a period of three years at an annual licence fee of Rs. 3.78 lakhs and Rs. 1.81 lakhs respectively. Besides an annual saving of Rs. 1.1 lakh at Secunderabad and Rs. 1.47 lakhs at Hyderabad in staff cost is also expected. Steps are being taken by other railways also for extending this facility. Southern Railway has also introduced this Scheme at Madras Central and Bangalore Stations.

OTHER AREAS WHICH COULD BE CONSIDERED FOR PRIVATE PARTICIPATION IN FUTURE ARE :

(a) **Private ownership of Freight Terminals :**

Efficiency of terminal operations constitutes one of the most important parameters of asset utilisation of the Railways. It has been estimated that terminal detentions constitute nearly a third of the total detention of rolling stock. The productivity of goods terminals is likely to become more and more critical to mobility and productivity as the volume of traffic carried by the railway increases. With the closure of yards in a big way, the avoidable traffic delays have by and large been eliminated or controlled. This by itself is not sufficient to raise the productivity of assets to the desired level unless corresponding improvement in terminal detention are also effected.

Thus the idea of franchising terminal operations, in order to increase efficiency, reduce manpower costs and improve service to the customers, is being mooted. This would be made possible through the introduction of electronic data processing and other management techniques which cannot be introduced without substantial financial investment. It is expected that the private entrepreneur would install these facilities to maximise efficiency and keep personal costs to the minimum.

(b) **Telecom facilities :**

The Telecom sector in the country has been opened up for private companies. The Railways have a large established telecom network with established right of way.

The private sector could be encouraged to participate in the development of Railway Telecom.

(c) **Marketing of special freight trains which will have guaranteed transit time and shall run on time table paths :**

This service has been attempted in the past with mixed results. In view of the increased competition from road and the possibility of introduction of multiple axle trucks on Indian roads in the near future it is important that the railways establish its credibility in the market as a mode which is capable of guaranteeing scheduled movement of products

(d) **A proposal has been received for running of Road Railer trains on the IR system. The haulage charges and other ancillary subjects like liability, signing of MOU etc are under finalisation**

(e) **One of the firms from Hyderabad had given a proposal for piggy backing of loaded trucks on to Railway flat wagons and transporting them in trainloads between different nominated O-D points. The proposal is under active consideration of the Ministry of Railways for quotation of haulage charges, signing of MOU etc**

(f) **Construction of boundary walls :**

It is proposed to allow private entrepreneurs to construct boundary walls at their cost in return for exclusive advertisement rights on the wall for an agreed period of time after which the rights for this advertisement would pass back to the railways. The boundary wall shall always remain the property of the Railways.

In this manner, the Railways would be able to more than double their output of construction of boundary walls which is a crucial element in affording protection to prime railway land presently lying vacant. The construction of boundary walls prevents encroachment of land.

(g) **Privatising of printing :**

During 1992-93 the value of printing and stationery work undertaken by the Railways amounted to Rs 33 crore approx. This is a very large value of business and is an activity which can be easily done by entrepreneurs already engaged in this line and perhaps at a much lower cost. The offloading of this activity would help the Railways to reduce the overhead costs and perhaps enjoy better services from entrepreneurs who are specialists in this area.

Commercial exploitation of Railway land

The proposal for commercial exploitation of land/airspace with a view to generating much needed additional resources has been under consideration of this Ministry for a long time.

Introduction

Indian Railways own about 4.19 lakh hectare of land, spread along the railway network across the length and breadth of the country. Out of this, about 3.33 lakh hectare is under direct use for track and structures, stations, yards circulating areas, workshops, offices, staff colonies etc. A portion of the remaining land has been put to intermediate uses like plots licensed to rail-users for afforestation, commercial licensing, GMF etc.

Capital requirement of Indian Railways

Budgetary support to the Railways from General Revenues has dwindled from 75% of development needs in the V Plan to as little as 14% now. This support may also not be available after the VIII Plan. Also for ongoing projects of new lines, gauge conversions, doublings, traffic facilities and railway electrification, railways require huge amount of capital funding. Thus, there is urgent need to identify and tap internal resources to generate the much needed funds for modernisation and expansion of the railway system.

Background to the proposal

Keeping the urgent need for funds for Railway Development in view, it was decided to propose Property Development at prime sites around the country in which a portion of the proposed development would be utilised by the Railways and the remaining floor space created utilised commercially to gain revenue which would be utilised for development purposes.

IX FIVE YEAR PLAN

TERMS OF REFERENCE & COMPOSITION OF SUB GROUP

1.0 SUB-GROUP No.1

Freight business including Inter-modal and container traffic

Composition

Coordinator-Addl.Member (Traffic)

Addl. Member (Commercial)

Economic Adviser

ED(Coaching)

EDTT(M)

EDTT(M&S)

MD/CONCOR

Shri R. V. Kanoria, Chairman, Infrastructure Committee, FICCI House, New Delhi.

Shri Pratap Narain, Executive Director, Fertilizer Association of India, 10, Shahid Jeet Singh, New Delhi - 67.

Adviser (Transport), Planning Commission.

JS(Coal) & Jt. Secy. of other Core Sector Ministries.

JS(Ports), Ministry of Surface Transport.

ED(S&E)

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Prof. M.N. Murthy, Institute of Economic Growth, Delhi University, Delhi - 110007

DG/Roads, Ministry of Surface Transport, Transport Bhawan, New Delhi.

Joint Secretary(PF-II), Ministry of Finance, North Block.

Representative of Gujarat & Maharashtra Maritime Board.

Terms of References :

- (i) To draw up estimates of production and rail-share of freight traffic in major commodities and lead for each year during the period 1997-2003 in consultation with economic Ministries.
- (ii) To draw up estimates for each year of the Plan period for the transport outputs
- (iii) To identify major streams of traffic flows so as to help in the planning of ground infrastructure both section capacity and terminals.
- (iv) To define various operational strategies and policy thrusts to achieve the objectives.
- (v) Planning for new types of wagons congruent with operational strategies formulated.

- (vi) To identify corridors for running of heavy haul train including high axle load trains (25/30 tonnes)
- (vii) To study the possibility of introducing the concept of modal goods shed
- (viii) Joint ownership and working of terminals for improved efficiency
- (ix) To assess the potential for container traffic in the country and identify pairs of stations between which container services need to be introduced in the IX Plan
- (x) To suggest location for setting up of container terminals and inland container depot
- (xi) To suggest measures for technology upgradation and new strategies for future

2 0 SUB-GROUP No. 2

Passenger business

Composition

Coordinator - Addl Member(Commercial)

Addl Member (Budget)

Economic Adviser

ED(Chg)

ED(S&E)

EDEE(RS)

EDTC(R)

D T P

Adviser(Transport), Planning Commission

Joint Secretary(Road Wing), Ministry of Surface Transport, Transport Bhawan, New Delhi

Nominee, National Highway Authority

Director General/Roads, Ministry of Surface Transport, Transport Bhawan, New Delhi

Joint Secretary(PF-II), Ministry of Finance

Prof M N Murthy, Institute of Economic Growth, Delhi University, Delhi - 110007

Terms of References:

- (i) To draw up estimates of non-suburban traffic by rail for each year during the period 1997-98 to 2002-2003, in different distance-slabs, using time trend analysis, regression analysis and other techniques; note should be particularly taken of unfulfilled demands and new growth centres.
- (ii) To estimate inter-city passenger traffic flows
 - (a) between the four metropolitan cities of Bombay, Calcutta, Delhi and Madras and
 - (b) selected pairs of other important cities
- (iii) To lay down guidelines for the type of coaches to be provided
- (iv) To identify new schemes for expansion of existing passenger terminals and to suggest strengthening of maintenance infrastructure.

- (v) To identify routes/sections on which trains with speed of 130/160 kmph should be introduced
- (vi) To suggest the load and composition of long-distance passenger trains
- (vii) To suggest suitable strategies for improvement of slow-moving passenger trains
- (viii) To suggest methods of improving measure from uneconomic branch line
- (ix) To suggest strategies for decongesting major passenger terminals
- (x) To identify corridor for running of 26 coach passenger trains
- (xi) To suggest new strategies for future.

3 0 SUB-GROUP No. 3

Commuter traffic

Composition

Coordinator - Addl Member (Comml)

Additional Member (Budget)

Additional Member (MTP)

Economic Adviser

ED(Chg)

ED(S&E)

EDEE(RS)

EDTC(R)

Adviser(Transport), Planning Commission

Director General(Roads), Ministry of Surface Transport, Transport Bhawan New Delhi

Joint Secretary, Ministry of Urban Affairs & Employment, Nirman Bhawan, New Delhi

Shri Krishan Lal, Railway Consultant, BMRDA, B K C , Bandra(East), Mumbai - 400051

Terms of References:

- (i) To review all on-going schemes and lay down an appropriate schedule for their completion taking into account likely availability of EMU rakes and estimate requirement of funds for them in the IX Plan
- (ii) Identify schemes for expansion/improvement of suburban services in metropolitan cities of Bombay, Calcutta, Madras and Delhi taking into account availability of EMU stock and estimate requirement of funds in the XI Plan
- (iii) To identify areas where EMU based suburban-like services should be introduced and suggest schemes indicating requirement of funds for inclusion in the IX Plan
- (iv) To identify schemes to cater to commuter-like traffic around big cities for inclusion in the IX Plan and the requirement of funds for them
- (v) Identification of corridors for DMUs/EMUs and rail buses.

4.0 SUB-GROUP No. 4

Norms for asset utilisation including Traction and Rolling Stock

Composition

Coordinator - Addl. Member (Finance)

Additional Member (Planning)

Additional Member (Mechanical)

Additional Member (Electrical)

Additional Member (Commercial)

Additional Member (Budget)

E.D.(S&E)

ED(E&R)

ED(RE)

ED(Chg)

D.P. (ME)

Dy Adviser(Transport), Planning Commission

GM/RCF, Kapurthala

Prof. M N Murthy, Institute of Economic Growth, Delhi Univ. Delhi-110007

MD/CONCOR

JS(Ports), Ministry of Surface Transport, Transport Bhawan, New Delhi

Shri J S Sondhi, Railway Consultant, World Bank, 55, Lodhi Estate, New Delhi - 110003

Terms of Reference:

- (i) The sub-group will critically examine the existing norms for asset utilisation, productivity and reliability
- (ii) Considering the various resource inputs, technological upgradation, rationalisation of maintenance philosophy, the sub-group shall evaluate and recommend improvement in the existing norms
- (iii) To suggest method of using information available in electronic form for generating detail report on asset utilisation.
- (iv) Develop a master plan for location of electric and diesel loco sheds
- (v) Suggest development of new types of locomotives, if any, needed and give their main user requirements and design parameters.
- (vi) Suggest a suitable rolling stock strategy including design parameters and induction of new rolling stock suitable for bulk handling and with better pay-load tare ratios
- (vii) In line with the long-perspective corporate objective, to suggest new design for coaches.
- (viii) To consider the question of improving the average speed of freight trains, to reduce the differential between the speed of passenger and freight trains and to broadly identify improvements that would be necessary in the system

- (ix) To consider the question of running of heavier freight grains and identify inputs that would be necessary in the area of rolling stock (both wagons and locomotives), braking, signalling, track and terminals
- (x) Estimate requirements of special rolling stock and other facilities suitable for the container traffic in the IX Plan
- (xi) To suggest new strategies for future

5 0 Sub-Group No. 5

Workshops, production units including inventory control

Composition

Coordinator - Addl Member(PU)

Addl Member(RS)
 Addl Member (Sig)
 Addl Member(Tele)
 Addl Member(Elec)
 Addl Member(Fin)
 Addl Member (C&IS)
 Addl Member(CE)
 EDME(W)
 EDF(S)
 DP(ME)

GM/RCF

GM/CLW

GM/WAP

Shri Satish Kumar, Jt Secy.(OF), Ministry of Defence, Room No 184-G, South Block, New Delhi.

Terms of References:

- (i) To review the existing maintenance facilities, particularly, their productivity and measures for improvement
- (ii) To tabulate the capacity of workshops for POH of locomotives (diesel and electric), coaches, wagons and EMUs/DMUs/Rail Busses indicating capacity at the beginning of the VIII plan, capacity expected to be added by the end of the VIII Plan and the capacity expected to be available on completion of on-going schemes.
- (iii) To estimate the POH requirements for various types of rolling stock and to consider the question of modernisation of workshop practices to cut down POH cycle time, decrease the periodicity of POH and improve reliability in services

- (iv) To assess the requirements of machinery and plant in work shops and sheds, depots both on replacement and additional account and to estimate the outlay required in the IX Plan
- (v) To indicate the augmentation of production capacity required for diesel/electric locomotives, EMUs, coaches and to indicate the requirement of funds
- (vi) To suggest programme of statistical quality control for introduction in manufacturing establishments, workshops and major maintenance depots
- (vii) Details the requirements and modernisation of other specialised civil engineering and bridge workshops
- (viii) Detail the requirements and modernisation of S&T workshops
- (ix) Formulate a plan of improved materials management in the IX Plan with a view to reducing costs without impairing efficiency
- (x) Suggest more efficient purchase and disbursal procedures so as to reduce inventory levels and control wastage and pilferage
- (xi) Suggest phased plan for improving the inventory-turnover ratio
- (xii) Techniques of inventory management should be progressively modernised and targets laid down
- (xiii) To suggest new strategies for future.

6.0 SUB-GROUP No.6

Computerisation and telecommunication including appraisal of cost of operation and introduction of managerial accounting system for more effective operational and management control

Composition

Coordinator - Addl Member (C&IS)

Addl Member (Traffic)
 Addl Member (Telecom)
 Addl Member (Finance)
 Addl. Member (Planning)
 Addl Member (ME)
 Addl. Member(Elec.)
 Addl. Member(Sig.)
 Addl. Member (MS)
 ED(S&E)
 ED(E&R)

ED/CRIS

Dr. N. Sheshagiri, Director General, NIC, CGO Complex, Lodhi Road, New Delhi

Adviser/Deptt. of S&T

Shri Om Kumar, Jt. Secretary(O), Ministry of Defence, Room No. 198-B, South Blocik, New Delhi.

Adviser(Transport), Planning Commission.

Terms of Reference:

- (i) To estimate requirement of funds for putting in place an effective FOIS which would provide on line/real time freight information.
- (ii) To suggest areas where computers need to be introduced in the IX Plan
- (iii) To suggest methods of introducing computer based managerial accounting system which could be capable of providing information on activity based costs and profits, and would help in an effective operational and management control
- (iv) To suggest methods of generating more details reports regarding asset utilisation from electronic data already available.
- (v) The group will also appraise the existing costs of various operations and services performed.
- (vi) To formulate specific measures and changes in policy to achieve reduction in costs.
- (vii) To suggest new strategies for future

7 0 SUB-GROUP NO. 7

New Lines, including gauge conversion, Dublin and Other Traffic Facility Works for freight and passenger traffic

Composition

Coordinator -Addl Member (Works)

Addl. Member (Signal)
Addl. Member (Project)
Addl member(Traffic)
Addl member(Budget)
Addl Member(CE)

Joint Secy(Ports), Ministry of Surface Transport, Transport Bhawan, New Delhi
Adviser(PA&MD), Planning Commission

FICCI/CII Representative

Smt Pratibha Karan, Joint Secretary, Ministry of Industry, Deptt. of Industrial Development, Udyog Bhawan, New Delhi.

Joint Secretary, Deptt.of Public Enterprises, CGO Complex, Lodhi Road, New Delhi

Shri Om Kumar, Joint Secretary(O), Ministry of Defence, Room No.198-B, South Block, New Delhi.

JS of CORE Sector Ministries

Director Planning

Terms of References:

- (i) To review the on-going schemes, fix their inter-se priority and estimate requirement of funds for their completion at current price level keeping in view availability of physical inputs like rails, track components, sleepers, etc.

- (ii) Identify new schemes required to serve new industrial units/mines for inclusion in the IX Plan and estimate requirement of funds so that their completion synchronises with the units they are intended to serve.
- (iii) To make a Master Plan for requirement of new lines keeping in view in the emerging traffic trends and to specify parameters for these new lines
- (iv) To review all on-going traffic facility works including gauge conversion schemes, fix their inter-se priority and estimate requirement of funds for their completion having regard to availability of necessary inputs like rails, sleepers, track components, etc.
- (v) To identify existing / likely bottlenecks / constraints (approaches to major yards, by pass lines, single line bridges) in particular on the quadrilateral, diagonals and other densely worked routes, suggest works to ease them and estimate requirement of funds in the IX Plan. The needs of passenger traffic should be explicitly taken into account.
- (vi) To suggest works for modification/augmentation of freight terminals taking into account recommendations of Kumar mangalam Committee and introduction of new rolling stock
- (vii) To suggest work for modification/augmentation of facilities of passenger terminals and to suggest new terminals and estimate requirement of funds for them in the IX Plan
- (viii) To identify routes/sections for running heavier freight trains and to identify facilities needed and estimate requirement of funds for them in the IX Plan
- (ix) To identify routes/sections for running longer passenger trains and to identify facilities needed and estimate requirement of funds for them.
- (x) To determine facilities needed to extend nodal terminal concept for loading unloading and distribution of commodities like cement, fertilizer, foodgrains, steel, and coal, etc
- (ix) To suggest new strategies for future.

8.0 SUB-GROUP NO. 8

Track and bridges

Composition

Coordinator - Addl. Member (CE)

Director (B&S)/RDSO

EDCE(B&S)

DG(Roads)

Director (PSU)

Terms of References:

- (i) To estimate requirements of track renewal/rehabilitation in the IX Plan indicating the likely arrears of track renewal at the end of the VIII Plan and expected arising in the IX Plan.

- (ii) To estimate the requirements of physical inputs like rails, sleepers, etc. for renewal and rehabilitation of track and, therefore, having regard to availability of physical inputs estimate requirement of funds for track renewals in the IX Plan.
- (iii) To draw up a master plan for modernisation including use of higher poundage rails, longer turn-outs, etc, and to identify sections/routes which should be taken up for such modernisation of track in the IX Plan.
- (iv) To draw up a master plan for rehabilitation of distressed bridges and identify those which should be included in the IX Plan, and estimate requirement of funds for them. Special emphasis should be for routes identified for heavier freight trains.
- (v) To suggest new strategies for future.

9.0 SUB-GROUP NO. 9

Staff quarters, Staff Members other specified works for improvement of staff morale and management

Composition

Coordinator - E.D.(LM)

Addl. member (Staff)

Addl. member(MS)

DG/RHS

EDPA

Terms of References:

- (i) To assess the requirement of quarters to increase the housing satisfaction related to the Corporate Plan objectives at the end of the IX Plan and requirement of funds.
- (ii) To identify the bstaff amenity works for inclusion in the IX Plan.
- (iii) To identify schemes for improvement to existing quarters and work places and to estimate funds required for the purpose.
- (iv) To identify health and educational schemes for inclusion in the IX Plan.
- (v) To suggest new strategies for future.

10.0 SUB-GROUP NO. 10

Railway research and Development

Composition

Coordinator - E.D.(E&R)

DG/RDSO

Director Planning(ME)

Adviser(Tpt.), Planning Commission

Adv./Deptt. of S&T

Shri Satish Kumar, Joint Secy.(OF), Room No. 184-G, South Block, Ministry of Defence, New Delhi

Adviser(Energy), Planning Commission.

Terms of References:

- (i) To draw up research programme that should be taken up in the IX Plan with particular emphasis on:
 - (a) Specific allocation-oriented research to improve the reliability of assets between stipulated schedules of maintenance,
 - (b) Specific application oriented research to improve pay load to tare ratio while exploiting the standard moving dimensions available.
 - (c) Induction of new manufacturing processes and quality assurance programmes in manufacture of rolling stock with a view to increasing the interval between maintenance schedules and
 - (d) preparation of designs that would reduce material costs and permit easy reclamation of parts.
- (ii) To suggest development of specific low-cost productivity aids to improve quality of work and to reduce manhours required per units of output
- (iii) To consider ergonomics in railway working, particularly in the context of improving safety
- (iv) To consider the question of transforming RDSO as a window on technological developments and use of superior technology on the Railways and also making RDSO an independent body.
- (v) To define new mission areas for technological upgradation of the Indian Railway system.
- (vi) To assess the facilities needed and to estimate the requirement of funds, separately on capital and revenue account.
- (vii) To develop computer based simulation models for analysis traffic movement patterns and impact of asset failures.
- (viii) To suggest new strategies for future.

11.0 SUB-GROUP NO. 11

Training, Human resource planning and development and uprating technical skills including improvement in managerial ethos introduction of office automation and towards paperless office.

Composition

Coordinator - Addl. Member (MS)

Addl. Member (Staff)

Addl. Member(Finance)

Addl. Member(Safety)

Addl. Member(PU)

Addl. Member(Planning)

Secy./Railway Board

Addl. Member(C&IS)

ED(E&R)

DP(Spl.)

Principal, Railway Staff College, Baroda.

Terms of References:

- (i) To consider the question of planning and development of human resources and suggest necessary measures.
- (ii) To review the existing training programmes for different categories of staff and suggest changes
- (iii) To consider the question of uprating the technical skills in the context of new technologies proposed to be adopted
- (iv) To develop a deliberate programme of job enrichment
- (v) To identify ways and means of shifting the balance of numbers from unskilled to skilled and thus improve unit productivity
- (vi) to assess the need for restructuring of organisation and bringing about greater efficiency
- (vii) Outline the managerial and administrative innovations proposed to be adopted by the Railways in order to bring about a positive change in the management system, culture and methods
- (viii) To suggest new strategies for future

12 0 SUB-GROUP NO. 12

Policy on Finance and tariff, resource mobilisation, social burden and uneconomic branch lines

Composition

Coordinator - Addl Member(Budget)

Additional Member(Finance)

Additional Member(Commercial)

Economic Adviser

EDTC(R)

EDME(Tr)

D T P

Joint Secretary(PF), Ministry of Finance, North Block, New Delhi

Adviser(Transport), Planning Commission.

Terms of References:

- (i) To examine in depth the financial resources required for the IX Plan and suggest appropriate measures for raising the resources by conventional methods or unorthodox methods that can be thought of
- (ii) To examine in depth the return on capital in major Railway Projects and to suggest for its improvement
- (iii) To assess the impact of market borrowing on long term finance of the Railways. Keeping in view the trends of return on investment in past
- (iv) To suggest making tariff policy of Indian Railway, more customer responsive, but at the same time reducing the burden towards social obligation
- (v) To suggest methods of reducing losses on uneconomic branch lines
- (vi) To suggest new strategies for future.

13.0 SUB-GROUP NO. 13

Electrification

Composition

Coordinator - E.D.(RE)

Additional Member(Traffic)

Additional Member(ME)

Additional Member(Planning)

Additional Member(Elec.)

Additional Member(Fin)

Additional Member(Tele)

Additional Member(Sig.)

Economic Adviser

Director Planning

Dy.Adviser(Transport), Planning Commission

Terms of References:

- (i) Review the progress of on-going schemes and determine the throw-forward into IX Plan.
- (ii) Update the master Plan
- (iii) Identify new schemes for inclusion in the IX Plan
- (iv) Assess the requirement of funds for IX Plan for both spill over and new works
- (v) To suggest new strategies for future

14 0 SUB-GROUP No. 14

Signalling and safety works

Composition

Coordinator - Addl.Member(Safety)

Additional Member(Sig)

Additional Member(Tele)

EDF(S)

EDME(RSM)

ED(Safety)

Director Planning

Adviser, Deptt. of S&T

ED/CRIS

Dy Adviser(Tpt), Planning Commission

Terms of References:

- (i) Review the progress of on-going schemes and determine the throw-forward into IX Plan.
- (ii) In the light of recommendations of various Accident Enquiry Committees, CRSs, etc accelerate the pace of safety works
- (iii) Itemise and estimate in detail the requirement of funds for the IX Plan
- (iv) To suggest new strategies for future

15 0 Sub-Group No. 15

Energy conversion including Environment and containing losses on specific fuel consumption

Composition

Coordinator - E.D.(E&R)

Addl Member(CE)

EDME(Traction)

EDEE(RS)

EDME(F)

EDLM

DG/RHS

D(PSU)

ED(E&R)

Adv.(Energy), Planning Commission

Shri S.P. Bindra, Addl General Manager, BHEL, Integrated Office Complex, Lodhi Road, New Delhi.

Joint Secretary Ministry of Petroleum, Shtri Bhawan, New Delhi

Rep. from PCRA

Jt.Secy., Ministry of Environment and Forest, CGO Complex, Lodhi Road, New Delhi

Terms of References:

- (i) Review the present energy consumption patter on Indian Railways both in traction and non-traction areas and formulate a comprehensive plan to achieve savings in the level of energy consumption
- (ii) Identify possibilities of adopting non-conventional source of energy like solar, wind, bio-gas, etc and lay down region wise targets
- (iii) Identify the specific areas of energy conservation through energy audit
- (iv) Suggest short term and long term energy conservation measures
- (v) To lay down region-wise quantity targets for tree planta tions during the IX Plan period as part of afforestation drive.
- (vi) To suggest new strategies for future

16 0 SUB-GROUP NO. 16

Public Sector Undertakings

Composition

Coordinator - Addl.Member(Planning)

D(PSU)

EDTT(M&S)

EDA

Addl. Member(B)

Addl.Member(W)

MD of PSUs under Ministry of Railways

DP(Spl)

Shri Satish Kumar, Joint Secretary(OF), Ministry of Defence, Room No. 184-G, South Block, New Delhi.

Terms of References:

- (i) The policies and objectives of the PSUs should be reviewed with a view to achieving a sustained growth rate in turnover and profit margin
- (ii) PSUs should diversify their operations to ensure that their order books are full
- (iii) The companies should upgrade their technology adopted for all the disciplines Apartfrom absorbing foreign technology they should be able to upgrade indigenous technology and expertise for all their operations there by contributing to sustained improvement in productivity
- (iv) PSUs through their experiences and expertise gained specially abroad should be contributing to the Indian Railways, operational efficiency by adopting modernb methods in planning construction, operation and maintenance of the Railway System
- (v) To suggest new strategies for future

17 0 **SUB-GROUP NO. 17**

Improving Customer satisfaction, with a view of reduction in claims, alarm chain pulling, Ticket Checkings

Composition

Coordinator - E D P A

EDLM

EDEE(RS)

EDME(Tr)

Director Planning

Dy Adviser(Tpt), Planning Commission

Prof P M Murthy

Rep of FICCI & CII

Terms of References:

- (i) To appraise the present standard and quality of services rendered to customers both in freight and passenger services
- (ii) To formulate measures to improve the customer satisfaction and to suggest studies to be undertaken to assess the response of customers on services by Railways
- (iii) To identify and assess the requirements for passenger amenity works including model stations
- (iv) To assess the requirement of funds for the various schemes to be identified for inclusion in IX Plan
- (v) To suggest methods of reducing claims and also incidents of Alarm chain pullings
- (vi) Suggest mentods of improving the system for ticket checking
- (vii) To suggest new strategies for future

Security

Composition

Coordinator - DG/RPF

Additional Member (Comml.)

Additional Member(RS)

DME(Fuel)

Terms of References:

- (i) To review existing security arrangements at various Railway premises and suggest ways of improving the same
- (ii) To suggest various activities which can be off-loaded to private parties
- (iii) To suggest new strategies for future

19 0 Sub-Group No. 19

Private participation in rail infrastructure and commercial exploitation of railway land

Composition

Coordinator - Addl member(Project)

Addl. Member (Elec.)

Addl. Member (W)

Addl. Member(B)

Addl. Member(F)

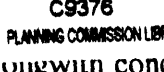
EDLM

Director Planning

Shri R V Kanoria, Chairman, Infrastructure Committee, FICCI House, New Delhi

Dy Adviser(Tpt), Planning Commission

Terms of References:

- (i)  n-going schemes offered for private participation, including our Wagon Scheme" (OYWS).
- (ii)  bus activities which can be offered for private participation, along with concept behind it
- (iii) To identify various projects which can be offered under BOLT to private entrepreneurs.
- (iv) To suggest and identify the Railway land in major cities which could be exploited commercially.
- (v) To suggest new strategies for future

