

1. RAILWAYS





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1. RAILWAYS

Indian Railways (IR), managed directly by the Ministry of Railways, Government of India (Gol), is the third largest railway network in the world under a single management. With its network of 64,974 route km, IR has played a critical role in integrating markets and connecting communities throughout the length and breadth of the country.

INTRODUCTION

It is rightly referred to as ‘the lifeline of the Indian economy’ as it facilitates industrial and economic development by transporting materials such as coal, iron ore, fertilisers and foodgrains. It touches the lives of people in both tiny villages and urban metropolises and assists the evolution of social forces like urbanisation and inclusive development.

Railways in India are a tool for development, equity and integration of all parts to the mainstream. Railways are considered critical not only from the standpoint of connecting remote regions and providing affordable transportation services (especially passenger services) but also from the perspective of defence movements, (which cannot be passed on to the private sector) and meeting the transportation requirement in the wake of national emergencies and natural catastrophes. Given the strategic role played by railways in the transportation space, rail transportation has been one of the three areas reserved for public sector in successive industrial policies of the country (the others being atomic energy and defence).

IMPORTANCE OF RAILWAYS IN THE INDIAN TRANSPORT NETWORK

IR occupies a unique and crucial place in the country’s transport infrastructure. Presently, it operates 19,000¹ trains a day, transporting 2.65 million tonnes of freight traffic and 23 million passengers. IR is the topmost rail passenger carrier (in terms

of passenger km) and the fourth largest rail freight carrier in the world. During 2011-12, the freight loading by IR stood at 970 million tonnes, and the passengers transported, at 8.22 billion. The corresponding numbers in 1950-51 were 73.2 million tonnes and 1.28 billion respectively. Further, suburban traffic constitutes about 55 per cent of the total originating passengers and indicates the predominant role of IR in urban transport segment in the four metro cities of India. However, when viewed in terms of passenger kilometres—a measure of throughput—suburban transport makes up about 15 per cent of the total.

Over the years, the share of railways in freight and passenger transport has declined and road transport is emerging as the predominant mode for passenger and freight transport. The dominance of the road sector in freight transport in India is corroborated by two independent studies carried out by RITES Ltd² and McKinsey³. Both the studies estimate the share of Railways in freight transport in Net Tonne Kilometres (NTKMs) in India to be around 36 per cent⁴ (Tables 1.1 and 1.2). The modal share of railways in freight transport is much lower in India relative to other comparable large countries like the US and China whose share is close to 50 per cent (Table 1.2). Annex 1.1 summarises the railways’ share of domestic freight for seven countries and highlights the country specific factors affecting the modal share of freight.

The RITES study also shows that over the years IR’s share (in originating tonnage) has come down

1. Comprising 12,000 passenger trains and 7,000 freight trains.
2. Total Transport System Study (TTSS) on traffic flows & modal costs carried out by RITES for Planning Commission, Gol.
3. McKinsey’s Building India: Transforming the nation’s Logistics Infrastructure, 2010.
4. It is estimated that the share of railways in freight transport has declined further to about 33 per cent in 2011-12.

Table 1.1
Mode Share in Freight Traffic (2007-08)

MODE	MODAL SHARE IN TOTAL ORIGINATING TRAFFIC		PERCENTAGE SHARE IN TOTAL TRANSPORT OUTPUT (PER CENT)	
	TONNES(MILLION)	NTKMs (BILLION)	TONNES	NTKMs
Rail * @	769	508	30	36
Highways (Road) @	1,559	706	61	50
Coastal Shipping	59	86	2.3	6
Airways	0.28	0.29	0.01	0.02
IWT	55	3.5	2.1	0.24
Pipelines	113	105	4.5	7.5
TOTAL	2,555	1,409	100	100

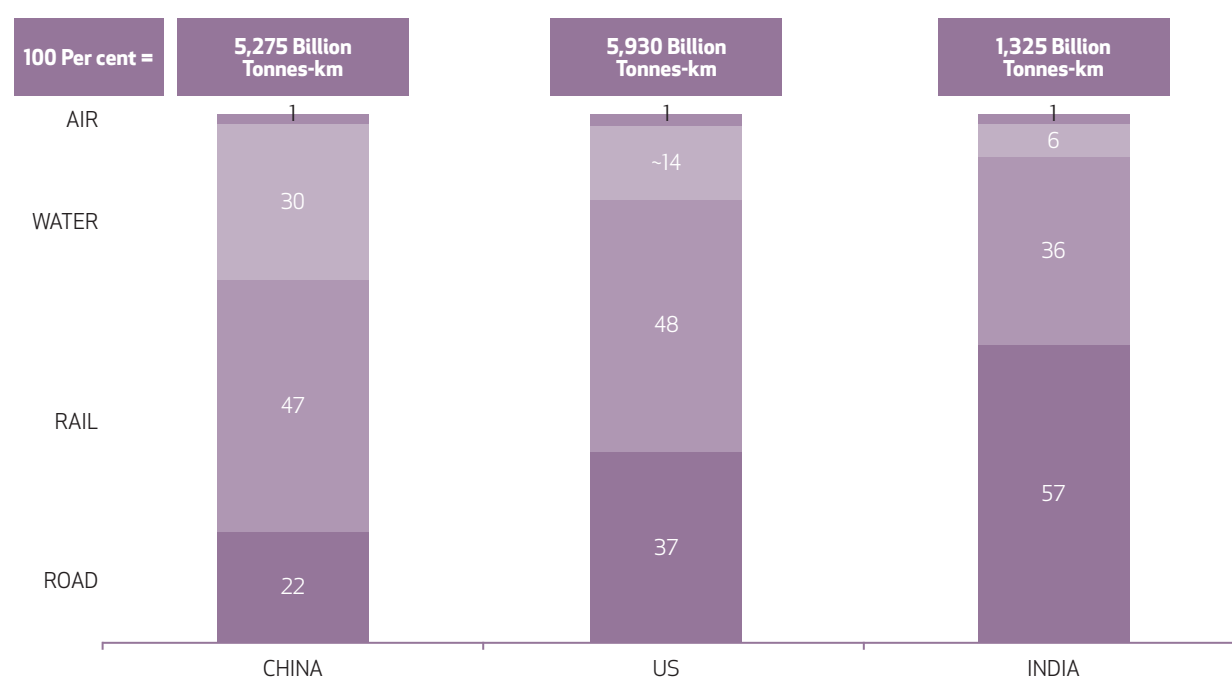
Source: Total Transport System Study (TTSS) by RITES Ltd. (for Planning Commission, GoI).

Note:

* Includes IR & KRC 'non-revenue' inter-regional traffic as well as NTPC's MGR traffic aggregating to 1.86 million tonnes and 26.1 million tonnes respectively.

@ Excluding intra-regional traffic of 96.6 MT by rail and 4640 MT assessed separately.

Table 1.2
Mode Share in Freight Traffic
 (Per cent of NTKM)



Source: McKinsey's Building India: Transforming the nation's Logistics Infrastructure, 2010.

Note: Mode share estimated for 2007, excluding pipelines.

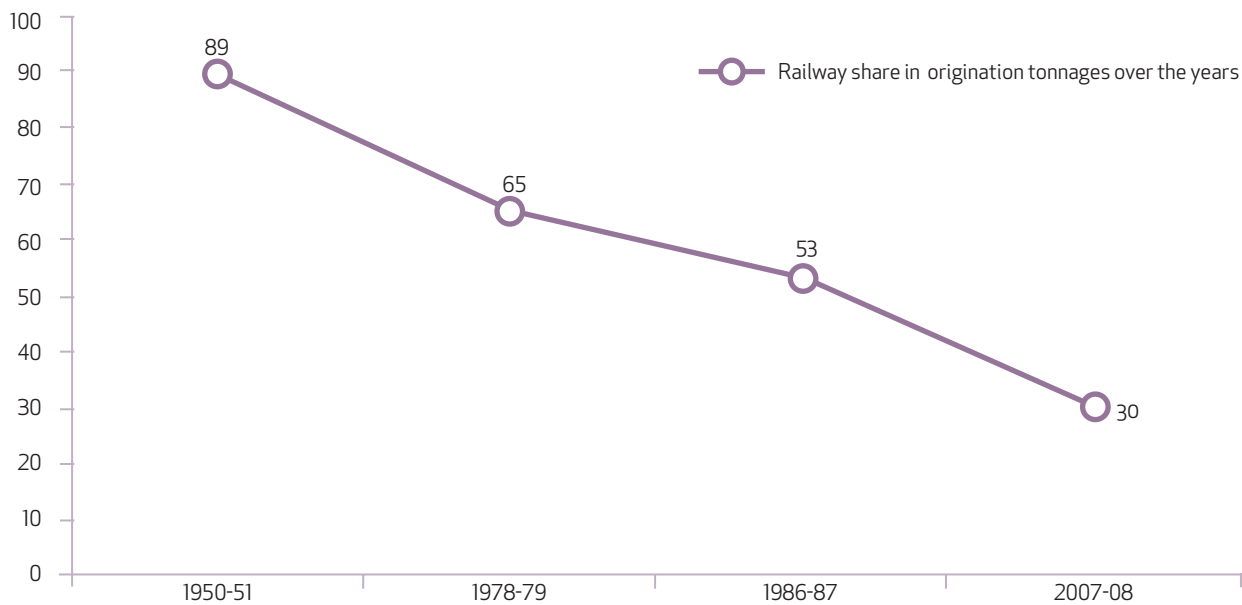
from 89 per cent in 1951 to 30 per cent in 2007-08 (Figure 1.1). A similar trend is observed in passenger transport, where the share of IR (in PKMs) has declined from 74.3 per cent in 1951 to 12.9 per cent in 2004-05, while the share of road has increased from 25.7 per cent to 86.7 per cent during the period⁵ (Figure 1.2). While the accuracy of this number could be open to challenge, the broad conclusion that road transport accounts for an overwhelming share of the total passenger transport is beyond dispute.

UNBALANCED MODAL MIX AND COST TO THE ECONOMY

Studies show that excessive reliance of India's freight transport on the roadways is not sustainable from the standpoint of both logistics and resource cost to the economy. The McKinsey study shows that transportation by road is the most economical form of transport for distances up to 400 km. However, as distance increases rail and waterways become more economical. Given that close to 65 per cent of the

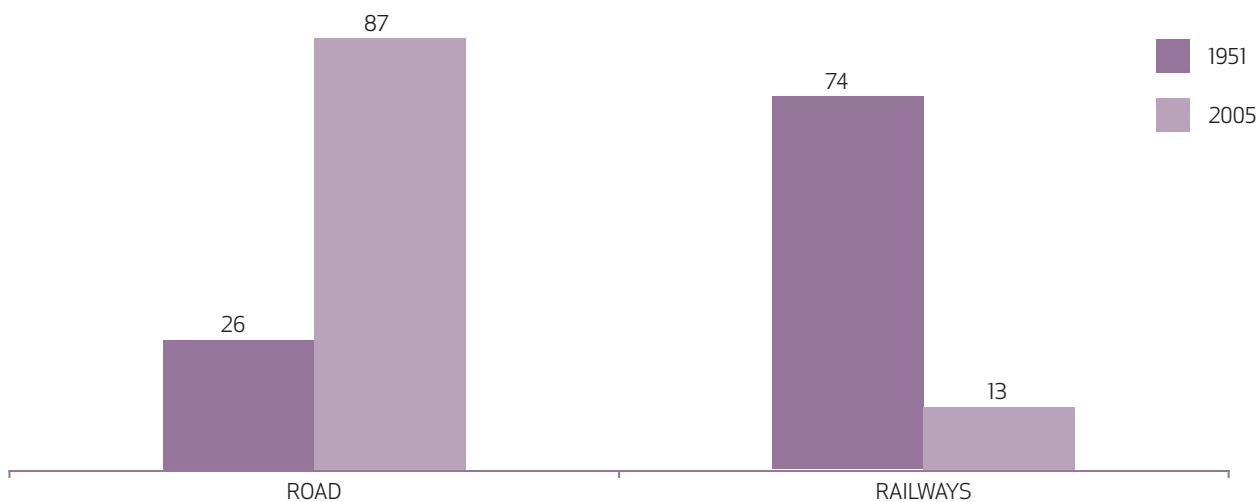
5. Report of the Working Group on Railways, NTDP (2012).

Figure 1.1
Railways' Share in Originating Tonnage
 [Per cent]



Source: Total Transport System Study (TTSS) by RITES Ltd. (for Planning Commission, GoI)

Figure 1.2
Relative Share: Passenger Transport
 [Per cent]



Source: Report of the Working Group on Railways, NTDP (2012).

India's freight traffic comprise bulk commodities and over 75 per cent (in NTKMs) is transported over distances of more than 400 km, it can be more economically served by rail and waterways⁶.

The RITES Total Transport System Study (TTSS) has estimated the total resource costs associated with different modes of transport, on the basis of financial user costs as well as the social costs, and based thereon had carried out an optimisation exercise that would assign transport flows to different modes

based on their total resource cost and break-even distances derived therefrom. The assessment of actual and optimal modal mix computed on the basis of this methodology is summarised in Table 1.3.

It shows that total throughput could increase by 44 billion tonne km (around 3 per cent) while cost of transportation could decrease by Rs 385 billion (constituting about 16 per cent of the total cost incurred on transportation during 2007-08), if the optimisation exercise could be undertaken in actual practice.

6. McKinsey and Company (2010).

Table 1.3
Actual vs Optimal Modal Mix (2007-08)

MODE	ACTUAL MODAL MIX			OPTIMAL MODAL MIX		
	FLOWS	COST	THROUGHPUT	FLOWS	COST	THROUGHPUT
	Million Tonnes	Billion Rs	Billion NTKM	Million Tonnes	Billion Rs	Billion NTKM
Rail	736	497	499	1,704	1,423	1,169
Road	1,559	1,556	692	591	245	66
Coastal	60	34	90	60	34	90
Total	2,355	2,087	1,281	2,355	1,702	1,325

Source: Total Transport System Study (TTSS) by RITES Ltd. (for Planning Commission, GoI).
 Note: Coastal flows not subjected to the optimal analysis.

Table 1.4
Comparison of Environmental and Social Sustainability of Rail and Road Transport

Energy Consumption	<ul style="list-style-type: none"> As compared to road, rail consumes 75 per cent to 90 per cent less energy for freight traffic and 5 per cent to 21 per cent less energy for passenger traffic
Financial Costs	<ul style="list-style-type: none"> Unit cost of rail transport was lower than road transport by about Rs 2 per NTKM and Rs 1.6 per PKM (in the base year 2000)
Environmental Damage	<ul style="list-style-type: none"> Rail transport emits 17 gram CO₂ equivalent per PKM as compared to 84 gram per PKM in case of road transport Rail transport emits 28 gram CO₂ equivalent per NTKM as compared to 64 gram per NTKM in case of road transport
Accident Costs	<ul style="list-style-type: none"> Accident costs on road are significantly higher than those on rail For passenger transport, road accident costs are 45 times higher than rail For freight transport, road accident costs are 8 times that of rail
Social Costs (All-Inclusive Costs)	<ul style="list-style-type: none"> In terms of all-inclusive costs or social costs, railways have a huge advantage over road transport (the advantage is more in case of freight traffic) For urban areas, the cost advantage of rail (in the base year 2000) was as much as Rs 2.8 per NTKM and Rs 1.7 per PKM For non-urban areas, the cost advantage of rail (in the base year 2000) was as much as Rs 2.5 per NTKM and Rs 1.7 per PKM

Source: AITD report on 'Environmental and Social Sustainability of Transport- Comparative Study of Rail and Road' (2000); International Union of Railways (UIC); McKinsey's Building India: Transforming the nation's Logistics Infrastructure, 2010; Report of the Working Group on Railways (NTDPC).

However, the optimisation model should be used with due caution as it represents an extreme theoretical case, with the share of rail in total throughput estimated as 88 per cent.

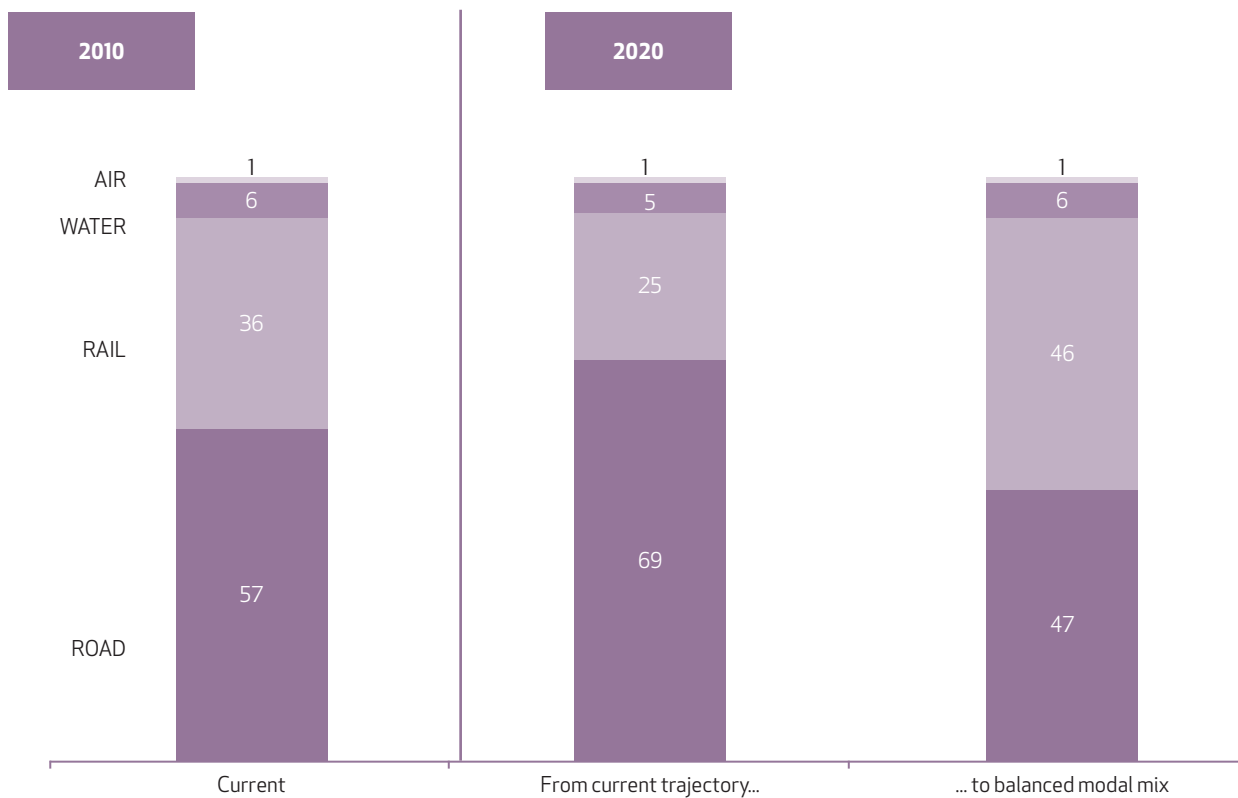
Social and Environmental Costs: A number of studies carried out in the global context have established that railways are more energy-efficient and eco-friendly than other modes of transport (Table 1.4). Any shift of traffic from road to rail, especially in freight, would, therefore, result in substantial savings in energy consumption as well as reduced social costs. In view of the expected uncertainties related to the availability of future crude oil supplies, the attendant implications for energy prices, and the adverse environmental impact of fossil fuels, it is essential that an attempt be made to maintain the

recommended modal mix in favour of railways. This requires making a strategic decision in terms of the relative allocation of resources between rail and road, and accompanying pricing and taxation policies which can then be used to nudge transport demand towards the desired modal shares.

NEED FOR A STRATEGIC PLAN FOR IR

India needs an efficient and sustainable transport infrastructure to sustain the pace of economic growth. The quality, capacity and performance of railways would be of crucial importance in this regard. Roads are the dominant mode of transportation in India today (for both passenger and freight traffic), while IR has been suffering from severe capacity constraints and remains underinvested.

Figure 1.3
Mode Share in Freight: 2010 to 2020



Source: McKinsey's Building India: Transforming the Nation's Logistics Infrastructure, 2010.

The road sector has witnessed a surge in investments (both public and private) as the government launched the ambitious National Highways Development Project (NHDP).

IR is uniquely placed to serve the needs of the rapidly expanding and modernising Indian economy and meet the aspirations of the country. It is imperative for IR to draw out a strategic plan/programme so as to restore the balance in intermodal mix, as the current trajectory will reduce the share of railways in freight transport to 25 per cent by 2020 (Figure 1.3). IR has to institutionalise a strategic planning process taking a forward view over the next 20 years. The strategic plan has to be necessarily prepared involving the Zonal Railways and key stakeholders and will clearly lay down the goals to be aimed at and attained and the path to be traversed. A multi-year investment plan fully supported by a credible funding plan will form the bedrock of the strategic plan.

CURRENT STATE OF INDIAN RAILWAYS

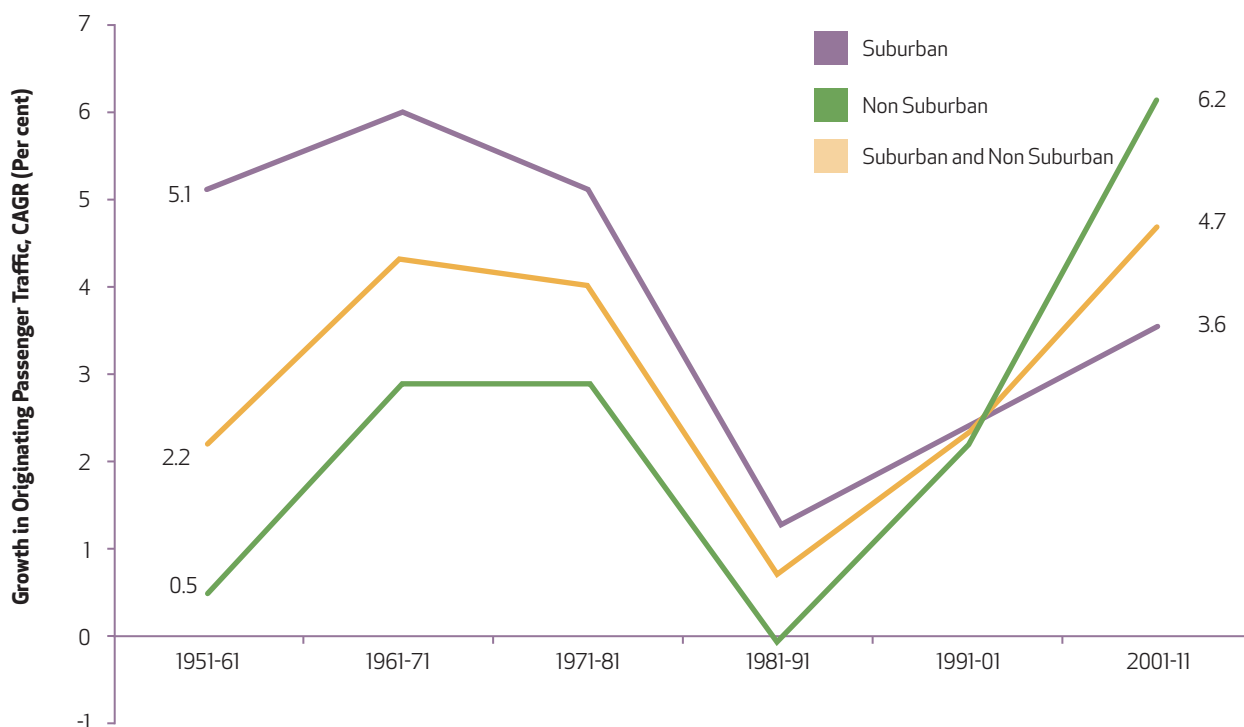
In order to analyse the current state of IR, operations and performance in each of its business segments have been looked into separately (passenger, freight, parcel and others). We have focused on the

growth experienced in the passenger and freight businesses underlining current trends, followed by an examination of the productivity and financial performance of IR as a whole. International benchmarking is necessary to realise the gap in productivity and technology that is prevalent in IR and the urgency needed to bridge this gap becomes clearly evident. Finally, a deeper analysis of tariffs and cost structures in the passenger and freight business brings out the challenges that currently exist due to cross-subsidisation, current tariff practices and capacity constraints. These practices have had a significant impact on IR's financial and operational performance over the years and understanding the current state of affairs of railways is the first step forward towards positive change.

PASSENGER BUSINESS

As mentioned earlier, Indian Railways provides passenger services of a large magnitude in both the suburban and non-suburban (that is, intercity/long distance) segments. In the latter category, there is a large variety—Rajdhani, Shatabdi, non-stop Duronto, mail/express, passenger trains, etc. Yet, IR is not able to meet the demand in full. Railways have an excellent operating protocol in place to run around 12,000 passenger trains a day. Train services are, by

Figure 1.4
Growth in Originating Passenger Traffic, CAGR
 [Per cent]



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2010-11.

and large, reliable and popular. However, these do not compare with best-in-class passenger railway systems elsewhere in the world in terms of speed, reliability and comforts; for a host of reasons such as infrastructural and capacity limitations, low level of technology, maintenance systems and procedures and poor upkeep of stations and coaches. While most developed countries have high speed railways (speeds up to 300-350 km per hour) and have rebuilt their conventional tracks for speeds up to 200 km per hour, the maximum permissible speed on IR is only 150 km per hour and the average speed actually achieved, lower in the range of 60-70 km per hour.

Over the last six decades, the number of **originating passengers** on IR has increased by almost six times, from 1.3 billion in 1950-51 to 7.6 billion in 2010-11. During the period 1951–2001, the suburban passenger category was driving the growth in total originating passengers with a compounded annual growth rate (CAGR) of 4 per cent as compared to a CAGR of 1.6 per cent for non-suburban category. However, during the last decade (2001-11) the trend reversed and non-suburban passenger category has been the key driver of growth in total originating passengers with a CAGR of 6.2 per cent, compared to 3.6 per cent for the suburban passengers (Figure 1.4).

Total passenger kilometres (PKM) increased to almost 15 times, from 67 billion in 1951 to 979 billion by 2011. The growth in PKM has been excep-

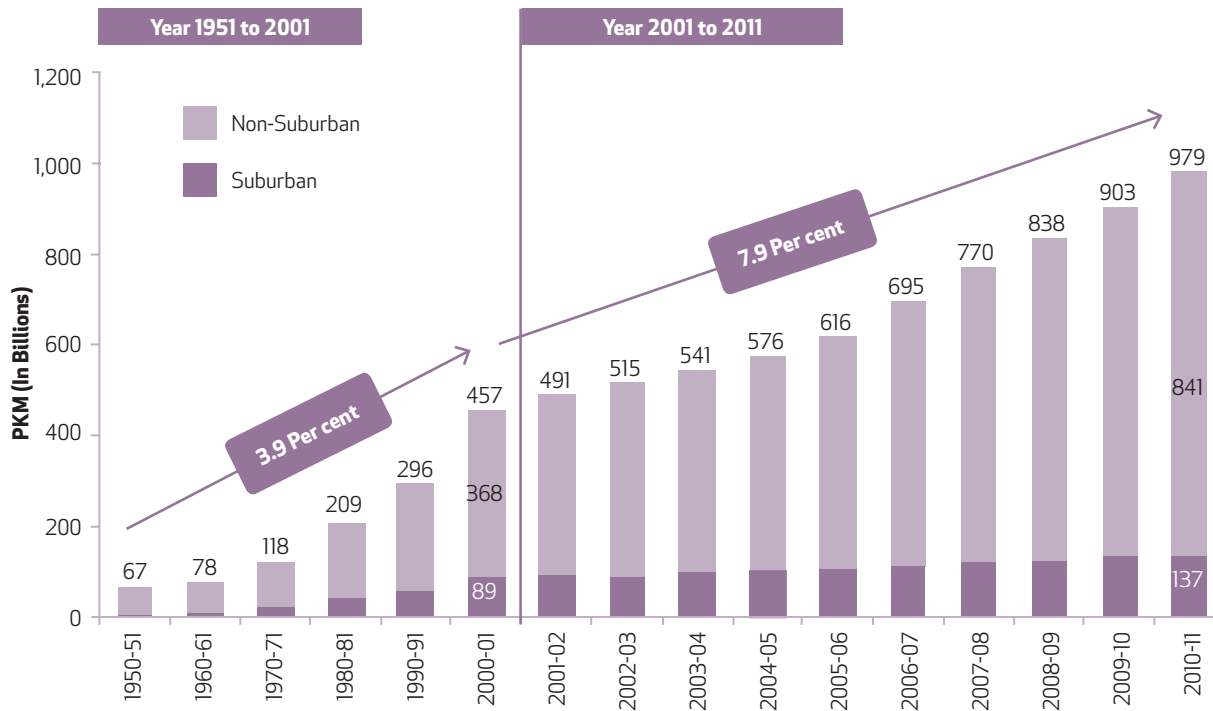
tionally high over the last decade (2001 to 2011), as it increased by 522 billion PKM (CAGR of 7.9 per cent), in comparison to an increase of only 390 billion PKM (CAGR of 3.9 per cent) during the preceding 40-year period (1951 to 2001). The growth in PKM over the last decade has been supported by the fast growth witnessed in non-suburban traffic. As of March 2011, non-suburban passengers comprised 47 per cent of the total originating passengers and accounted for close to 86 per cent of total PKM (Figure 1.5).

The **average lead** of passengers has increased from 52 km in 1951 to 128 km in 2011. While average lead in suburban category has become twice (16 km to 34 km), average lead in non-suburban category has grown more than 3.5 times (66 km to 234 km) over the same period. Further, over the last decade, lead in the non-suburban category increased much faster (CAGR of 3 per cent) compared to suburban category (CAGR of 0.8 per cent) over the same period (Figure 1.6).

Within the non-suburban category, passenger lead for the upper class segment has shown the highest rise, as it quadrupled from 152 km in 1950-51 to 623 km in 2010-11; while leads for the other two segments (second class ordinary and mail/express) doubled during the same time period (Figure 1.7).

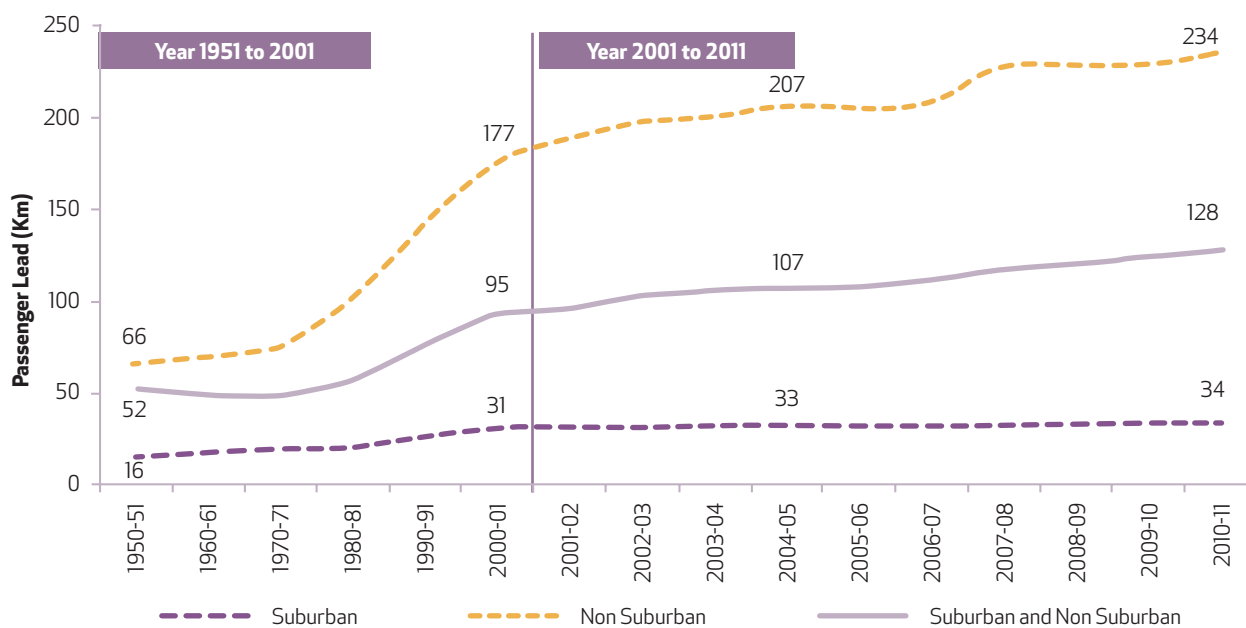
However, despite the spectacular rise in passenger lead, the upper class segment accounts for only 7 per cent of total PKM of the non-suburban cat-

Figure 1.5
Passenger Kilometres on IR
 [in Billions]



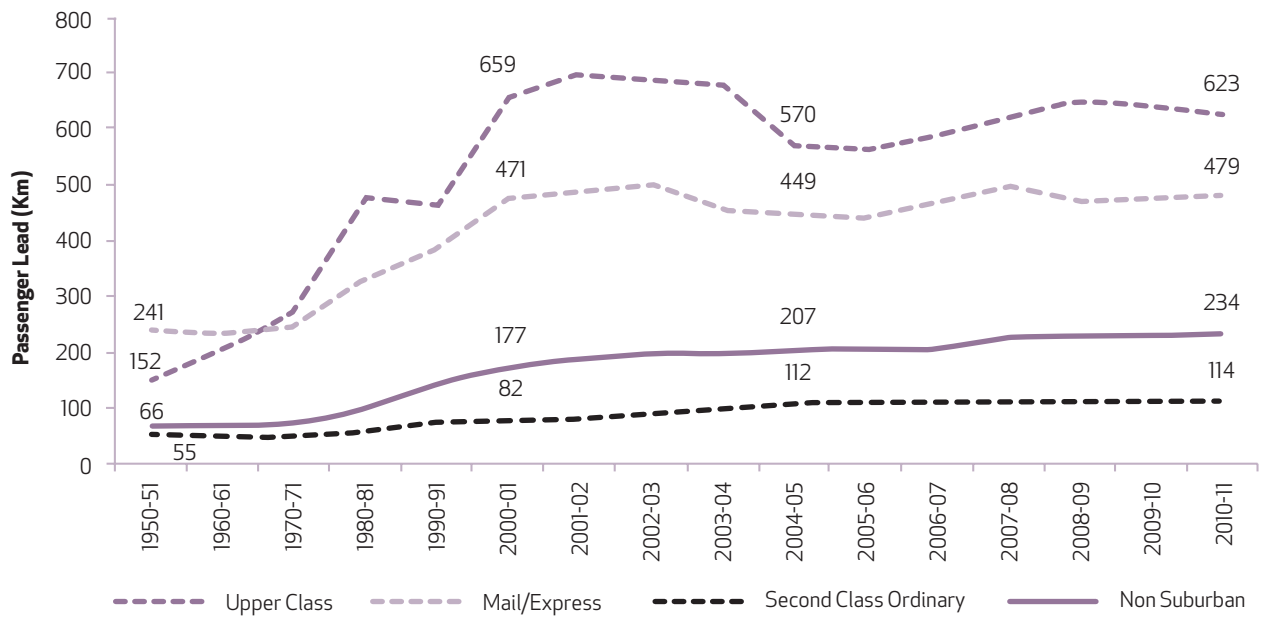
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11.

Figure 1.6
Passenger Lead on IR
 [Km]



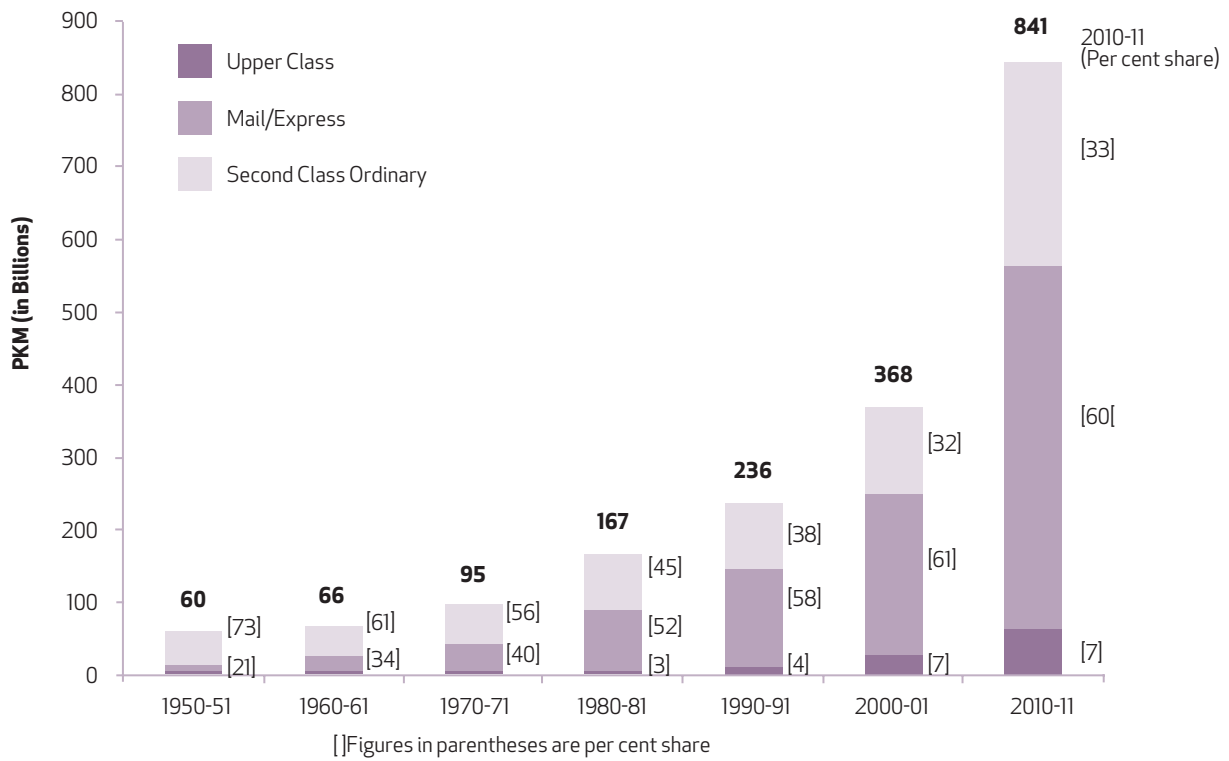
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11.

Figure 1.7
Passenger Lead in Non-Suburban Category
 [Km]



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11.

Figure 1.8
Passenger Kilometres for Non-Suburban Category
 [in Billions]



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11.

Box 1.1 Indian Railways' Network Capacity

64,460 km Length of route network as of March 2011

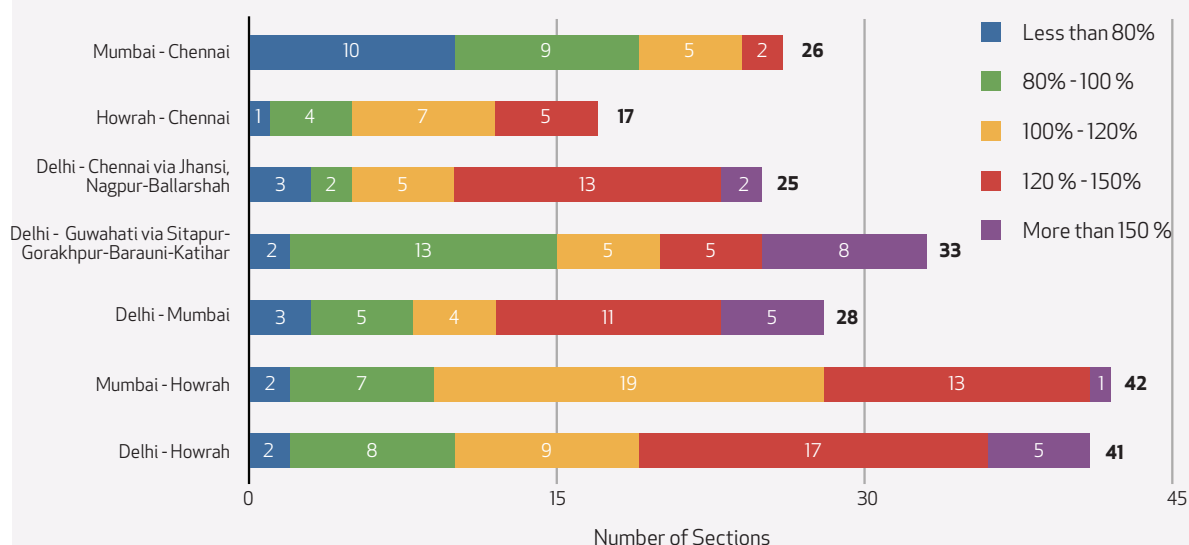
85.6 per cent Broad Gauge (BG)

10.6 per cent Metre Gauge (MG)

3.8 per cent Narrow Gauge (NG)

Traffic flows on IR's network are highly uneven and imbalanced. As of March 2011, the BG network, though forming 85.6 per cent of the route, generated almost 98 per cent of the passenger output (PKMs) and 99.9 per cent of the freight output (NTKMs). Further, passenger trains utilise nearly 65 per cent of network capacity but contribute to less than 30 per cent of the revenue. The Golden Quadrilateral and the diagonals connecting the four major metros, vis., Delhi, Kolkata, Chennai and Mumbai (along with the east-west diagonal extending to Guwahati) constitute less than 16 per cent of the route, but account for more than 50 per cent of the passenger and freight traffic. These routes have reached over saturated levels of capacity utilisation and at present are strained to the breaking point (See chart). A line-capacity utilisation of 80 per cent is considered optimum as smooth operation of trains requires some slack in the line-capacity to absorb and recover from unforeseen disruptions.

LINE CAPACITY UTILISATION OF SECTIONS ON HIGH DENSITY NETWORK IN 2009-10



212 Total sections on the High Density Network (HDN)

141 Sections with line capacity utilisation exceeding 100 per cent

189 Sections with line capacity utilisation exceeding 80 per cent

Source: Ministry of Railways, Yearbook 2010-11.

egory, as this segment has a small base of originating passengers (100 million in 2010-11), equating to 3 per cent of the non-suburban passengers and 1 per cent of the total passengers (Figure 1.8).

FREIGHT BUSINESS

Freight trains constitute approximately 35 per cent of the total 19,000 trains run daily on IR network, but yield more than 65 per cent of the revenue. Freight

services share the track and infrastructure with passenger trains, but have lower priority vis-a-vis the latter in operational matters. There is a huge imbalance in the pattern of train operations: the trunk routes of the railways, which comprise 16 per cent of the network (connecting the four metro cities), carry close to 60 per cent of the freight and more than 50 per cent of the passenger traffic and are, therefore, oversaturated (Box 1.1).

Box 1.2 Efficiency of Heavy Load Trains

In most of the freight railways reviewed high density flows of rail-friendly traffics have created beneficial opportunities to operate longer, heavier trains and attain lower unit costs. Australia, Brazil, Canada, China, Russia and the USA have all pursued heavy axle loads, better wagon design and minimisation of dead-running to provide higher net-to-tare ratio, coupled with longer freight train length to reduce unit crew costs and (in some cases) release useable capacity. Germany and Japan are more constrained by the limited market availability of bulk freights (particularly coal), by their relatively short freight-hauls, and by the constraints of network parameters basically geared to passenger demands, but nevertheless they have also sought within their constraints to achieve the same sorts of efficiencies.

COUNTRY	EXAMPLES OF HEAVY-LOAD TRAINS AND TYPICAL FREIGHTERS
Australia	Typical interstate freighters: East-West 5,000 tonnes, North-South 2-3,000 tonnes. Dedicated freight lines: Rio Tinto: 30,000 tonnes iron ore trains BHP Billiton: 44,500 tonnes iron ore trains Leigh Creek: 10,000 tonne coal trains
Brazil	Typical freighters: Various Dedicated: Carajas Railway: 23,000 tonne iron ore trains
Canada	Typical long-distance freighter: Canadian National bulk trains: up to 20,000 tonnes
China	Typical long-distance freighter: 4,000 tonnes Dedicated: Daqin Railway (mainly coal): 20,000 tonne coal trains
Germany	Trains typically constrained to 740 metres but 835 m trains being introduced Hamburg to/from Denmark and long-term feasibility of running 1,500 m trains on key routes is being examined.
Japan	N/A
Russia	Typical long-distance freighters: 4,000 tonnes Iron ore to Finland: 5,500 tonnes
United States	Typical freighters: 3,000-5,000 tonnes. Double-stack container trains: typically 5,000-8,000 tonnes Some iron ore and coal trains: 10-20,000 tonnes

International containers have been a major rail freight growth market in all the countries reviewed. The USA and Canadian railways are leaders in the field with further multi-billion dollar investments planned. Double stacking has been facilitated by the USA's high average axle-loads (more than 50 per cent higher than Europe) and the fact that primarily diesel locomotive haulage provides higher loading gauge than would an electrified system with overhead wires. Australia has introduced double-stack wherever density of flows and the loading gauge permit it and China is currently adapting a number of routes from ports for double-stack. In the other countries constraints of current loading gauge and/or lack of market density make it difficult economically to justify the heavy cost of adaptation works, but it is likely that at least a few key routes will be fitted for double-stack in due course.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011.

Lower operational priority and oversaturation have implications for quality of service of freight trains and severely restrict IR's ability to meet customer expectations. Speed of freight trains has largely remained stagnant and improved only marginally from 25 to 29 km per hour over the last three decades. These capacity constraints need to be further viewed in the context that IR does not operate truly heavy-haul freight trains that bring high level of cost-efficiency to freight operations as the infrastructure is common to both, the passenger and freight trains (Box 1.2). The maximum gross load carried on trains in IR is 5,400 tonnes, compared to 20,000-37,000 tonnes

in China, South Africa, Brazil and Australia. The position can change only when the Dedicated Freight Corridors (DFCs) get operational, as trains with maximum gross load of 12,000 tonnes are expected to run on the DFCs.

Furthermore, freight services are managed with excessive stress on productivity of assets rather than satisfaction of customers' needs. Productivity of assets is undeniably a worthwhile objective to pursue and improved rake utilisation over the years has enabled IR to meet requirements of bulk customers. However, there is a need to strike a balance between

Box 1.3

Auto-Carriage Opportunities

Auto-carriage is a typical example of what railways are losing and why. Globally, automobiles are mostly carried by rail. IR's share in India's growing automobile production and transportation is a mere 2 per cent. Railways do not have proper wagons to transport automobiles efficiently, nor well designed terminals. The few make-shift wagons that have been designed are not capable of carrying optimum number of cars per wagon. The terminal infrastructure for handling is absent. Investment by automobile companies does not come forth as the facilities cannot be shared with competitors and single-user volumes may not justify stand-alone investment. Automobile companies or third-party logistics providers can bring proven wagon designs from, say, the USA or Europe, but the RDSO's approval process is tedious, protracted and uncertain. Similar issues beset the transport of bulk cement, fly-ash and other potentially voluminous commodities not carried by rail in any sizeable quantity now.

The Ministry did announce a large number of policy initiatives in 2010 under the Public Private Partnership model to attract private sector investment in several areas - auto-carriage rolling stock, terminal development, development of ware houses, construction of railway lines, operation of tourist trains etc.

The initiatives have not been successful, indicating the need for a review of the terms and conditions including a dialogue with the interested parties for setting at rest their apprehensions.

Source: Report of the Working Group on Railways (NTDPC).

optimising asset utilisation and fulfilling the customer's requirements if the aim is to increase railway's share of cargo handled. IR does not perceive or define the freight business in terms of delivering transport or logistics solutions. Railways' customers have negative perceptions on its handling of demurrage (detention of rolling stock at terminals) and disposal of claims. Parcel size of cargo is presently restricted between the ranges 2,400 metric tonnes and 3,800 metric tonnes and, therefore, cuts out many customers even in the bulk cargo segment.

IR does not take responsibility for last-mile connectivity, nor does it incentivise customers to invest in such facilities. There is no institutional arrangement to attract and aggregate traffic of smaller parcel sizes (less than train-loads). As a result, IR is losing out in high potential markets like fast-growing consumer durables and information technology (CDIT), fast moving consumer goods (FMCG), hazardous chemicals, bulk cement, fly ash, automobiles and containerised cargo; where their share is low or negligible (Box 1.3). This traffic now moves mostly by road.

Given the above constraints, IR has focused on carrying bulk cargo in train-loads dominated by a narrow basket of nine commodities such as coal (46 per cent), iron ore, cement, fertilisers, steel, raw materials for steel plants except iron ore, foodgrains, petroleum products and container traffic, together these account for over 90 per cent of the freight traffic (Figure 1.9a).

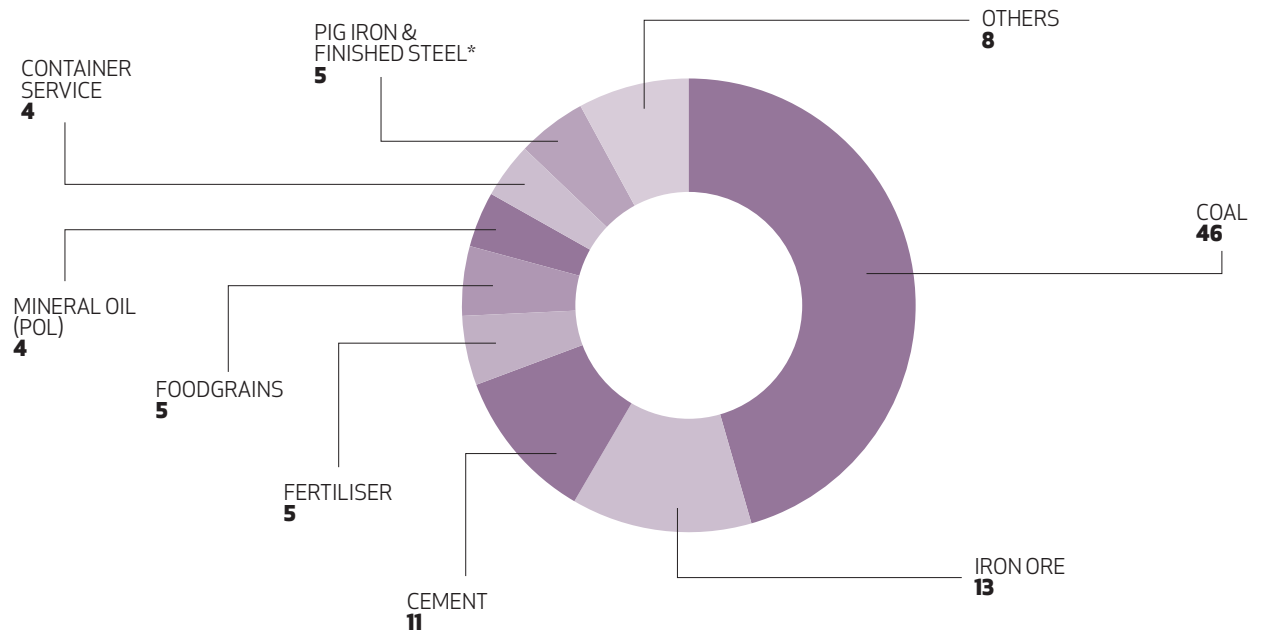
Figure 1.9b provides commodity-wise trends in freight growth over the period 2001-02 to 2010-11.

Growth and Performance of Freight: Figure 1.10 provides the growth of freight traffic in terms of total loading and freight output (in million tonnes and billion NTKMs respectively), as well as average lead (in km). Total loading of revenue earning freight traffic during 2010-11 was 922 million tonnes compared to 73 million tonnes in 1950-51. Similarly, the freight output increased from 38 billion NTKMs to 626 billion NTKMs over the same period. Further, during the last decade (2001-11), the growth rate in freight loading and output has been much faster (CAGR close to 7 per cent⁷), compared to the preceding five decades (1951-2001) when they grew at CAGR of around 4 per cent. The average lead increased from 513 km in 1950-51 to 754 km in 1980-81, but it consistently declined thereafter and stood at 679 km in 2010-11.

Despite the higher growth witnessed in freight traffic during the last decade, IR's performance is much below the potential. Given the average GDP growth of around 8.5 per cent from 2005-06 to 2010-11, and the transport elasticity to GDP of 1.25, IR's freight could have grown at CAGR of greater than 10 per cent, while it grew only close to 7 per cent during the period. In meeting the demand generated by the economic upturn, the main challenges faced by IR were the constraints of infrastructure, particularly line capacity on busy routes, and terminal detentions on account of underinvestment.

7. There was a dip in freight growth in 2008-09 due to the economic slowdown and the target of 850 MT of loading could not be met; consequently freight growth was only 5 per cent.

Figure 1.9a
Commodity Basket for IR (2010-11)
 [Per cent]



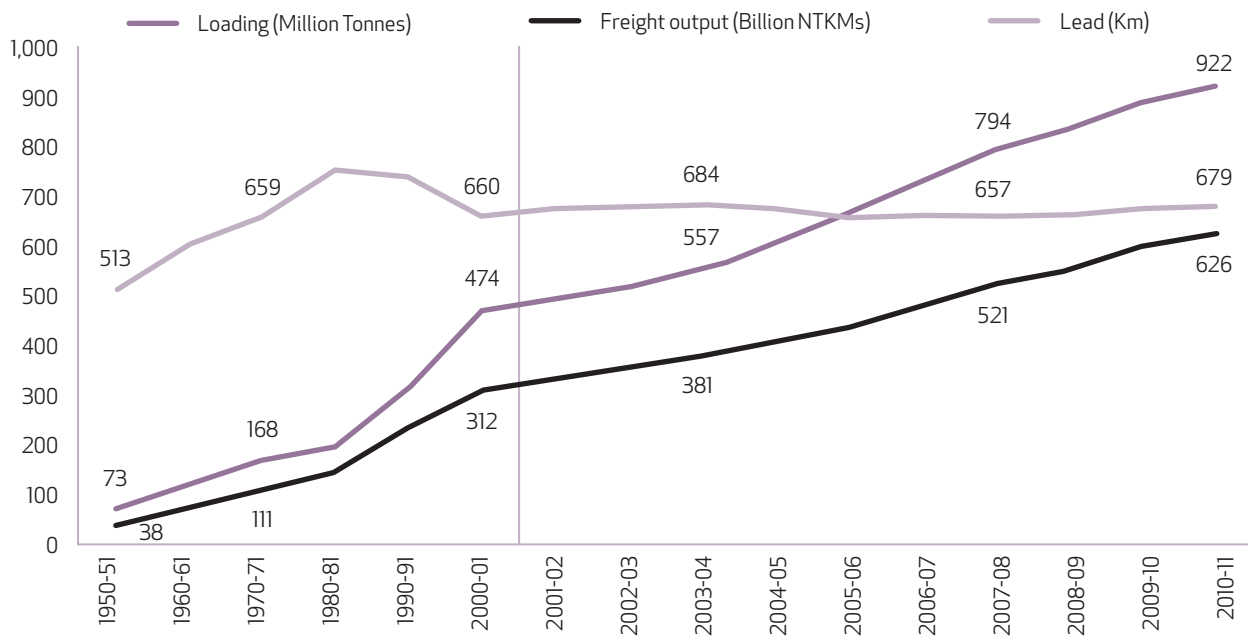
Source: Yearbook 2010-11.
 Note: *Pig iron and finished steel includes raw material for steel plants except iron ore.

Figure 1.9b
Freight Growth: Select Commodities



Source: Ministry of Railways Yearbook 2010-11, Yearbook 2005-2006, Yearbook 2004-2005.

Figure 1.10
Freight Traffic on IR



Source: Report of the Working Group on Railways (NTDPC), White Paper on Indian Railways, Year Book 2010-11.

Table 1.5
Parcel Traffic and Earnings

YEAR	TONNAGE (MILLION TONNES)	INCREASE OVER PREVIOUS YEAR (PER CENT)	EARNINGS (RS BILLION)	INCREASE OVER PREVIOUS YEAR (PER CENT)
2001-02	3.4	-	4.4	-
2002-03	3.5	3.2	4.6	5.0
2003-04	3.9	10.8	4.8	3.9
2004-05	4.2	7.2	5.3	11.7
2005-06	4.6	10.5	6.4	19.7
2006-07	4.9	6.7	9.0	41.2
2007-08	5.5	12.2	10.0	12.0
2008-09	5.9	6.7	10.8	7.2

Source: Special Study for setting up of FBO for parcel traffic, CRISIL Infrastructure Advisory, ADB TA No. 4053.

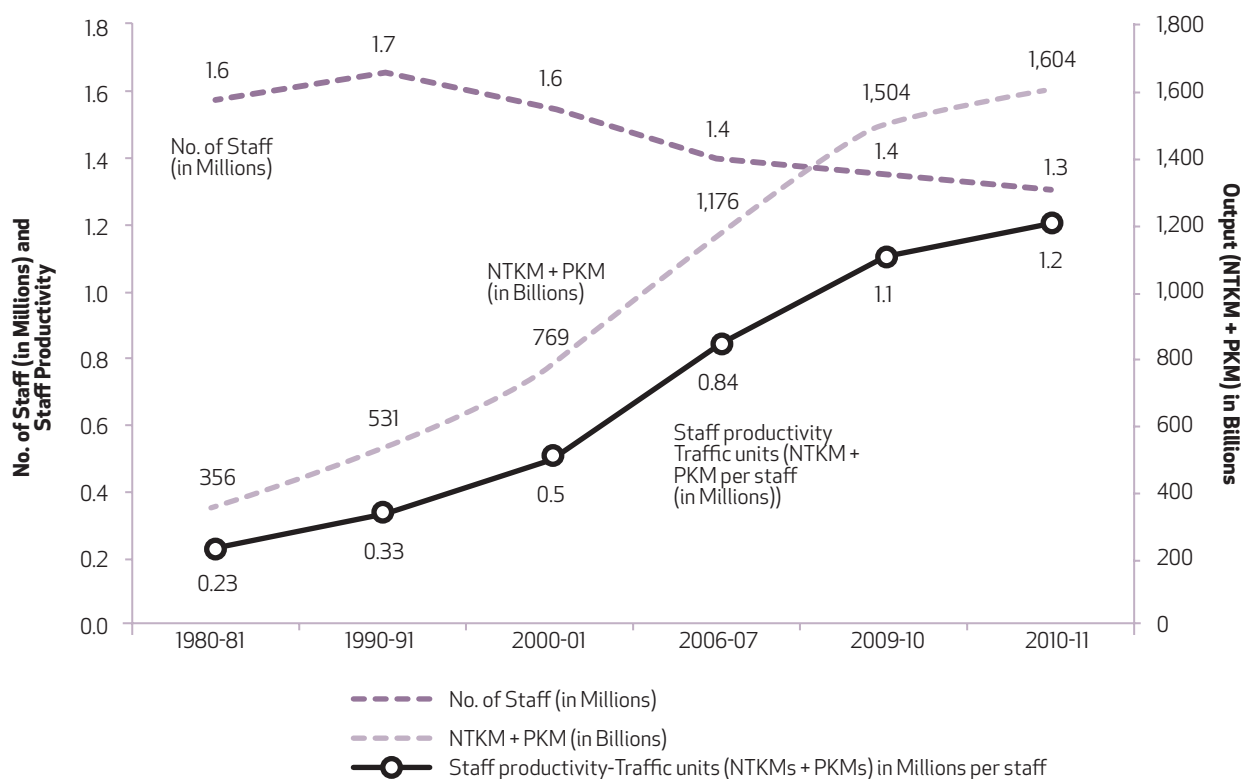
PARCEL BUSINESS

At present, parcel services are treated as a peripheral activity and managed as an associated service along with passenger trains; Railways Act defines a ‘parcel’ as ‘goods entrusted to a railway administration for carriage by a passenger train or parcel train’, there being no other elaboration or explanation. There is little marketing support and backward/forward services by IR. Freight and passenger segments of the business receive the attention of IR’s management at all levels and at all times; this is not the case with parcel traffic. This has handicapped the growth of the business. The end result is carriage of parcels is a loss-making activity for the IR; in the financial year 2008-09, the net loss for this segment of business was estimated to be as high as Rs 18 billion.

The importance IR attaches to this segment of business can be gauged from the fact that no separate statistics pertaining to parcels is maintained and published; the Indian Railways Statistical Year Book gives no figures. Table 1.5 indicates the quantum of parcel traffic carried along with other related statistics.

The higher growth, both in terms of tonnage and earnings, has been due to a number of steps taken by the IR such as leasing of parcel vans, relating tariff to the class of service chosen, instead of commodity as earlier; obtaining, designing higher capacity parcel vans and running of point-to-point parcel trains. And, despite the growth, in absolute terms, the quantum of parcel traffic is insignificant. A study done by CRISIL Infrastructure Advisory (for Asian Development Bank) for setting up of a focused business

Figure 1.11
Staff Productivity



Source: Report of the Working Group on Railways (NTDPC), Year Book 2009-10, Year Book 2010-11.

organisation for parcel traffic estimated⁸ that movement by road was over 400 million tonnes in 2007-08; IR's share is thus just 1 per cent.

The size of the parcel business in the country is huge and expanding rapidly but IR's share is negligible. A shift from road to rail is obvious for leads of 500 km and above. An efficient 'rail-borne parcel traffic' has to be multimodal if it has to be user-centric; institutional aggregation is a basic requirement. Collection and delivery have to be at locations decided by the users, with a single agency dealing with all matters documentation, enquiries, tracking, financial and tariff-related issues, claims, etc. This activity needs to be managed professionally as a separate business unit that combines the advantages and strengths of rail movement with those of road; otherwise IR will not be able to take advantage of the opportunities in the market for parcel movement.

OTHER BUSINESSES

Sundry earnings from sources like advertising and commercial utilisation of surplus land currently contribute around Rs 34 billion per annum (2010-11). The vastness of the network and large masses of people who use railway stations and facilities offer an attractive opportunity for advertising on freight and passenger trains, CCTVs at stations, on-board magazines for passengers, merchandising opportunities on tickets, foodstuffs and other materials

served on trains, etc. Laying optic fibre along the railway tracks and leveraging the optic fibre network for broadband would be yet another avenue. IR has not been able to fully exploit the potential from these sources as these activities are not managed professionally as separate profit-centres.

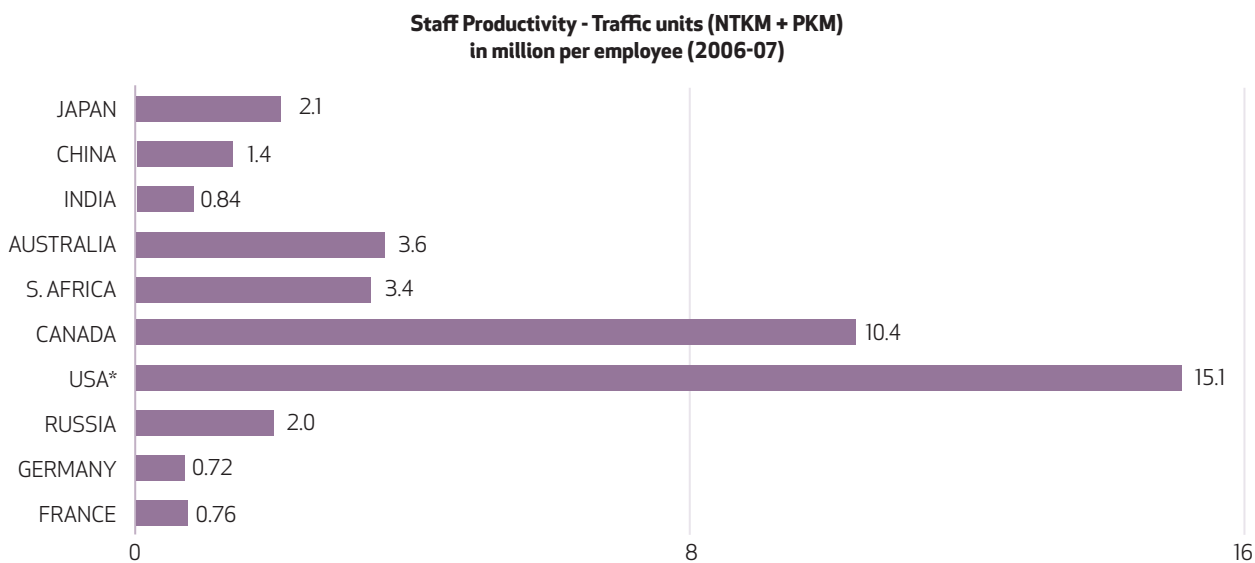
PRODUCTIVITY IN INDIAN RAILWAYS

Staff Productivity: Over the years, productivity measured in terms of transport output (NTKM+PKMs in millions) per employee of IR has increased from 0.23 (1980-81) to 1.2 (2010-11) (Figure 1.11). The major force driving the marginal increase in productivity has been the increase in transport volumes due to technology upgrade and appropriate operating strategies, combined with reduction in the number of employees from a peak of 1.65 million in 1990-91 to 1.32 million in 2010-11.

It is, however, important to compare productivity figures internationally. On doing so, we see that the productivity of employees measured in terms of average transport output for 2006-07 is relatively low for India (0.84) compared to the US (15), Canada (10.4), Japan (2.1), Russia (2) and China (1.4) (Figure 1.12). The much higher staff productivity in the US and Canada vis-à-vis India; China and Russia can be partly explained by the difference in overall freight and passenger mix, as the larger passenger volumes handled in India, China and Russia require

8. Based on the Total Transport System Study done by RITES, and 22 commodities that are amenable for transport as parcels by rail.

Figure 1.12
Staff Productivity Comparison (2006-07)



Source: Report of the Working Group on Railways (NTDPC), White Paper on Indian Railways, UIC 2007.
 Note: * US data for AAR Class 1 and Amtrak.

a more labour-intensive service response than freight. Similarly, several other factors such as the state of the infrastructure, the level of technology, the skill of the workforce and quality of the management, the degree of outsourcing, etc. also influence the productivity as measured by conventional parameters.

Asset Productivity: Box 1.4 provides estimates (based broadly on 2009 data) of asset productivity for India and five other countries.

FINANCIAL PERFORMANCE

Figure 1.13a provides a snapshot of IR's financial performance over the period 2004-05 to 2010-11. A combination of factors such as booming growth in the core sector and mineral industries; and IR's decisions to raise the axle load of existing wagons from 20.8 tonnes to 22.8 tonnes (thereby increasing the carrying capacity by 15 per cent), operate longer passenger trains, rationalise freight classification and introduce market-focused tariffs (e.g. lean season and empty flow discounts) contributed to improvement in the railway finances during the period 2005-06 to 2007-08. However, once these had run their course and the impact of award of the Sixth Pay Commission had to be absorbed, the operating ratio, which is used as a rough index of the health of the railway finance, has climbed back into the 90-100 range, leaving very little surplus for reinvestment. The sharp deceleration in revenue generation is mainly due to non-revision of passenger tariff for 10 years in a row and slowdown in the growth of the core sector, which is a primary contributor to railway freight. Further,

capacity constraints hamper IR's effort to diversify into other segments. Increase in expenditure due to higher wage and fuel bills complete the picture of financial distress.

Working Expenses: Operating and maintenance expenses incurred by IR can broadly be divided into staff costs (including payment of pension), fuel costs, material costs, lease charges and other miscellaneous expenditure. Of these, wages and pension constitute about 51 per cent, fuel 16 per cent, stores for operation and maintenance 4 per cent, lease charges for rolling stock procured through borrowings 4 per cent and miscellaneous expenditure 8 per cent of the earnings. Contribution to the depreciation reserve fund (DRF) for the replacement of assets takes away another 4 to 6 per cent of the earnings. Thus close to 85 per cent of the revenue is committed and invariable in the short run. Drastic restructuring or staff rationalisation and wage freeze are not politically and administratively feasible. Viability in the short run, therefore, dictates that the volumes expand at viable tariff levels. In 2008-09, there was a considerable jump in the working expenses of the railways, on account of the disbursement of Sixth Pay Commission arrears and increased salaries and wages and rates of allowances. Manpower productivity has steadily improved over the years and this has contributed to an increase in earnings and lower costs. However, the challenges of the coming years would necessitate much higher levels of productivity.

Earnings: Total earnings of IR have doubled over the period 2004-05 to 2010-11 from Rs 470 billion to Rs 945 billion (Figure 1.13b). Freight earnings have

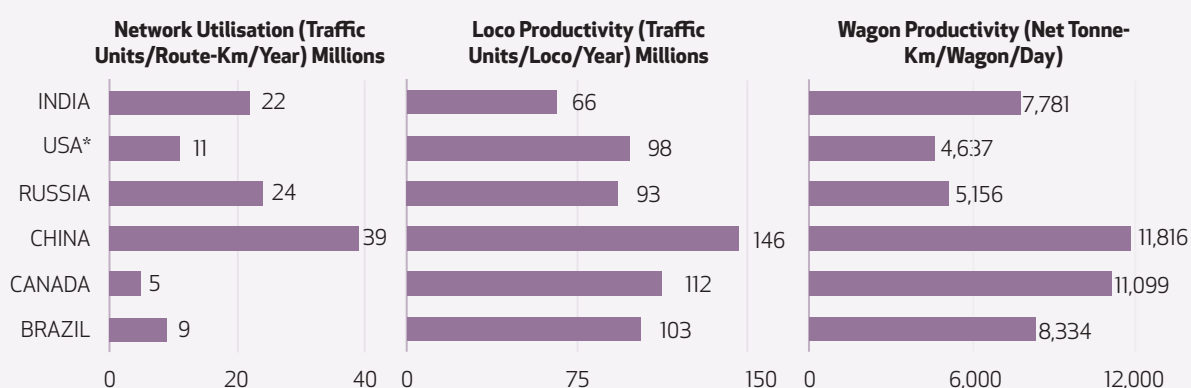
Box 1.4

International Comparison of Asset Productivity

Network utilisation: The three networks that handle substantial passenger volumes (India, China and Russia) as well as freight have the highest overall network use, but such use can also be heavily influenced by the technology and operational standards. The average is also affected by the relative intensity of use of different parts of the network. For example, whereas nearly China's entire network is heavily used, the Indian average contains around 9,000 kms (more than 14 per cent of the network) of little-used non broad-gauge lines carrying only around 1 per cent of rail traffic.

Locomotive productivity: The achievable productivity is partly influenced by the markets offering, which differ from country to country. Modern locomotive types and technologies also have higher haulage capability. Productivity is also influenced by the maintenance standards and efficiency of equipment. India is significantly behind other countries in locomotive productivity.

Asset Productivity Estimates (2009)



Note: * USA data for Class 1 railroads only

Wagon productivity: The achievable productivity depends partly on traffic mix; other things equal, it should be higher with longer length of haul, higher proportions of bulk relative to non-bulk traffic, and the use of non-specialist wagons for a variety of traffic types. It is also influenced by train operating strategies and the efficiency of customers' terminal operations. High utilisation generally assists in controlling operating costs, but it can occur at the expense of customers: for example many customers may prefer to use specialised wagons.

Source: Freight Railways Governance, Organisation and Management: An International Roundup; The World Bank; Paul F. Amos, 7 July 2011.

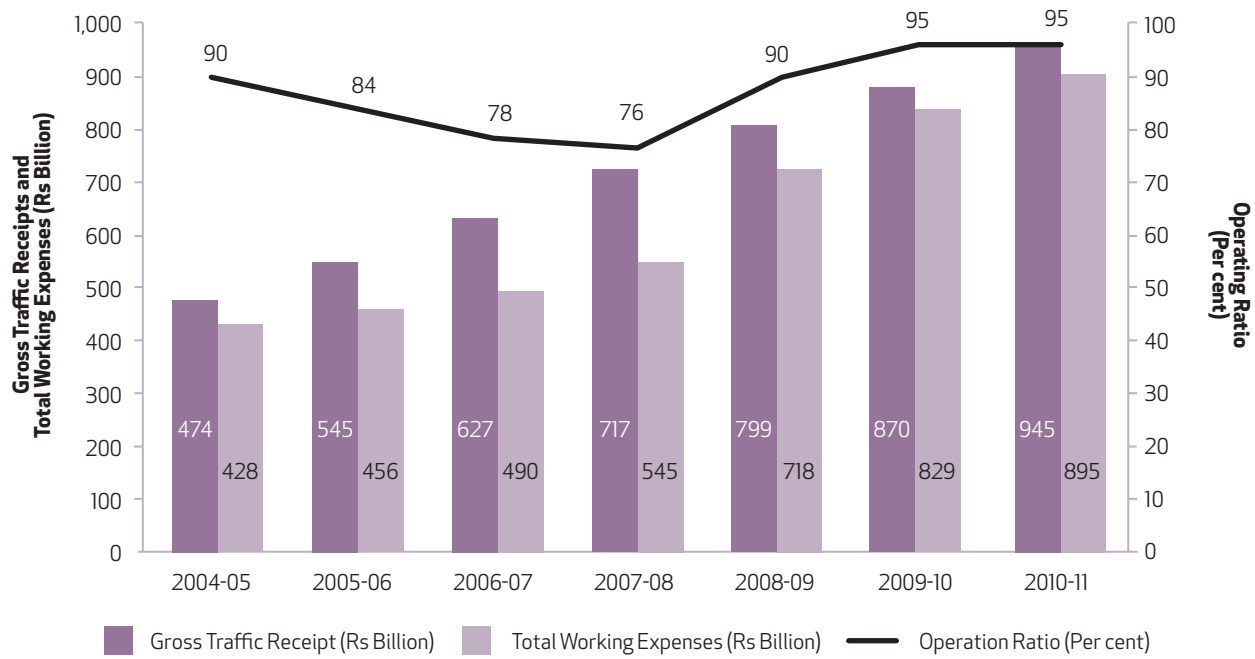
been the backbone of IR's revenues, accounting for almost two-thirds of the total earnings. Earnings through commercial publicity account for a very small percentage of IR's earnings even though great scope exists for advertising initiatives in the interiors of trains and at stations. Figure 1.14 shows the growth rate of earnings over the reference period. The growth rate of total earnings has declined in the recent years, after growing at CAGR of more than 14 per cent during 2004-05 to 2008-09 (led by the strong economic growth during that period). The growth of freight earnings has also declined to single digits in recent years, after growing at a peak of 18 per cent during 2005-06.

Investments & Sources of Funding: The total investment in railways in each successive plan started increasing at a sharp rate from the 6th Plan

(1980-85) onwards. The total public sector investment has increased manifold from around Rs 66 billion in the 6th Plan, to around Rs 1,900 billion in the 11th Plan. However, the IR's expenditure as a percentage of the transport sector expenditure has varied considerably over the Plan periods, as it moved from a peak of 67 per cent in the 3rd to a low of 30 per cent in the 11th Plan (Figure 1.15).

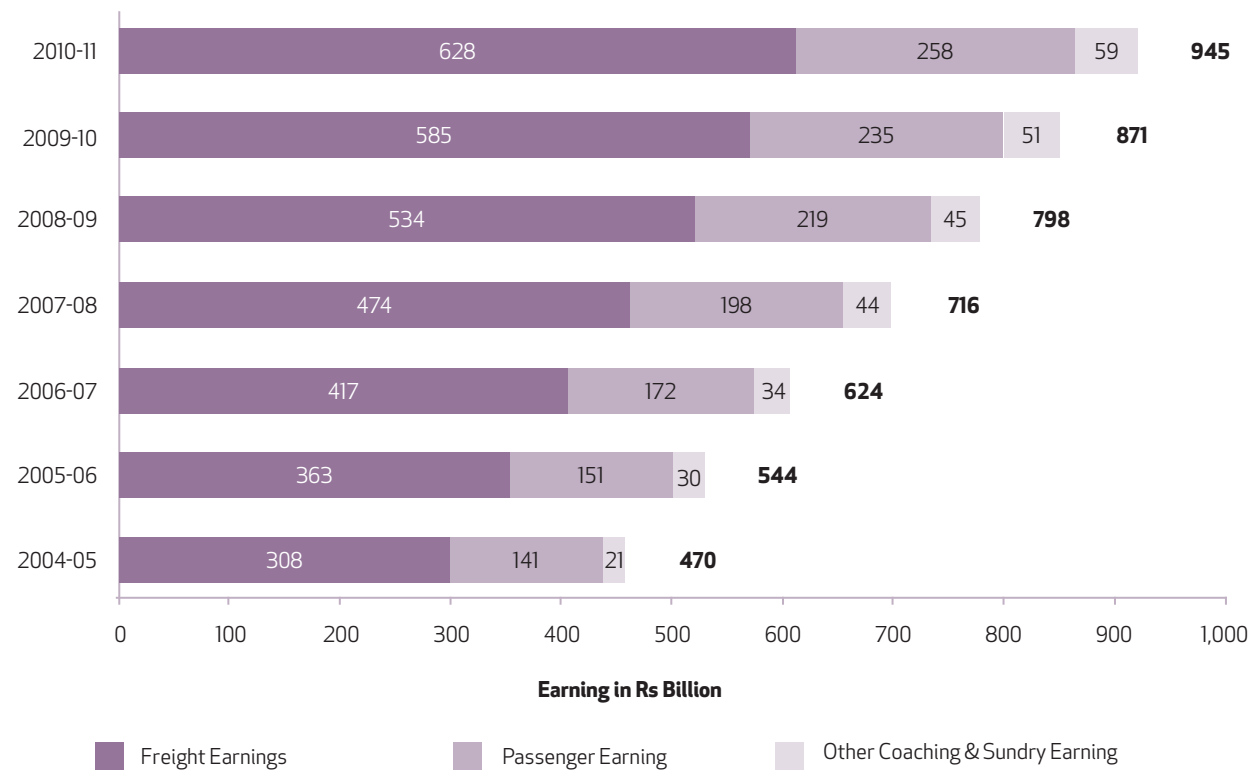
One of the key challenges faced by IR is finding resources to finance rail infrastructure that must be improved to bridge the current technology gap and capacity constraints. IR must not only meet operational expenses but must also generate adequate resources for replacement and planned investments. Railways Plan expenditure is financed through a combination of internal generation; money from the general exchequer extended as gross budgetary

Figure 1.13a
Gross Traffic Receipts, Total Working Expenses and Operating Ratio



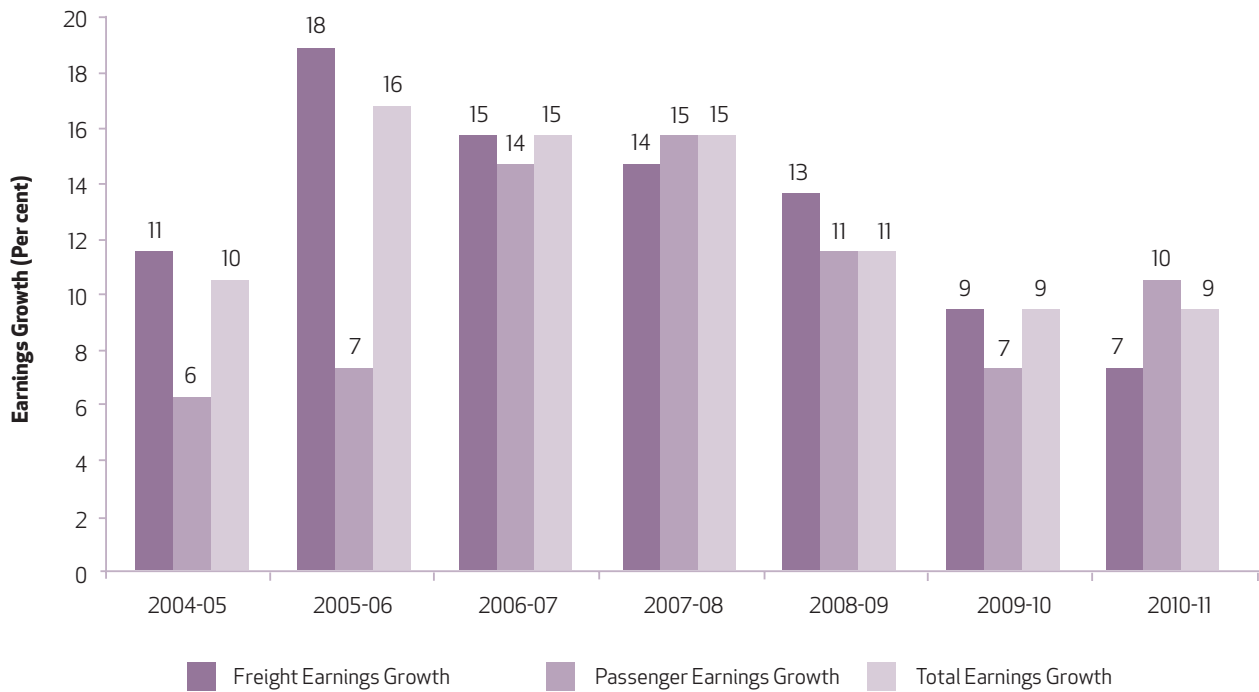
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2010-11.

Figure 1.13b
Total Earnings
 [Rs Billion]



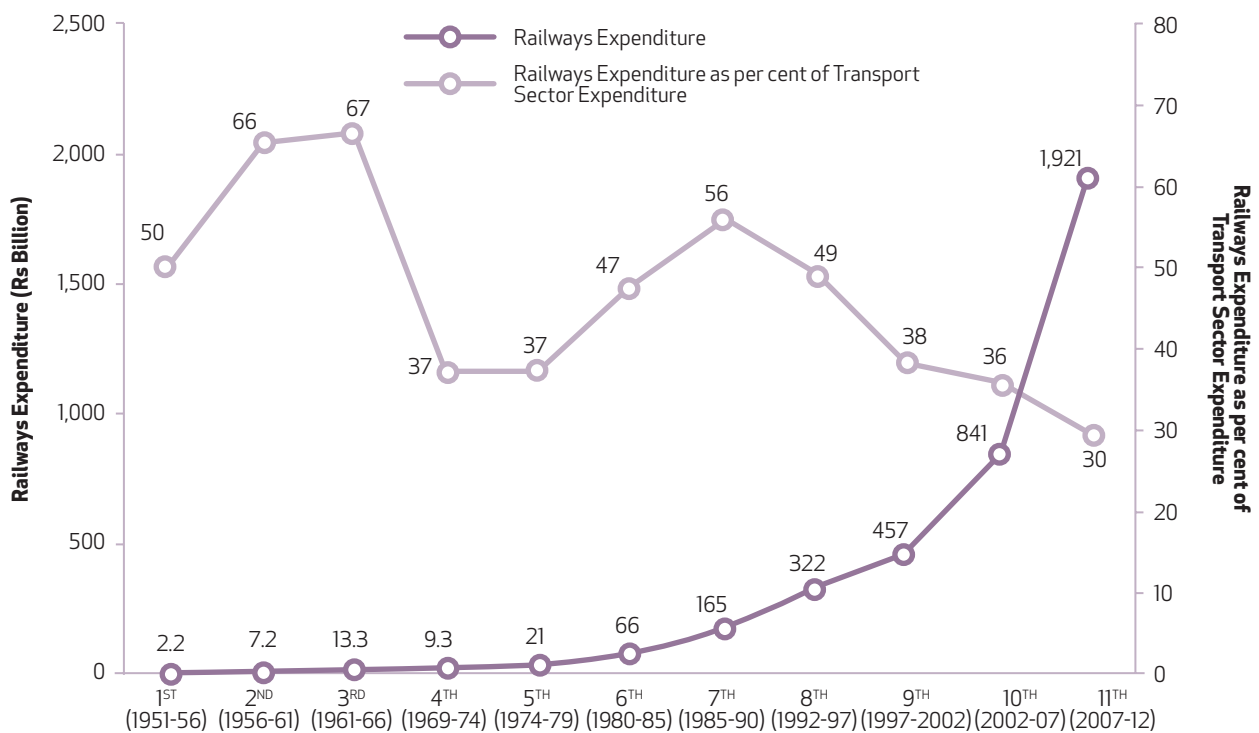
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2010-11.

Figure 1.14
Growth in Earnings
 [Per cent]



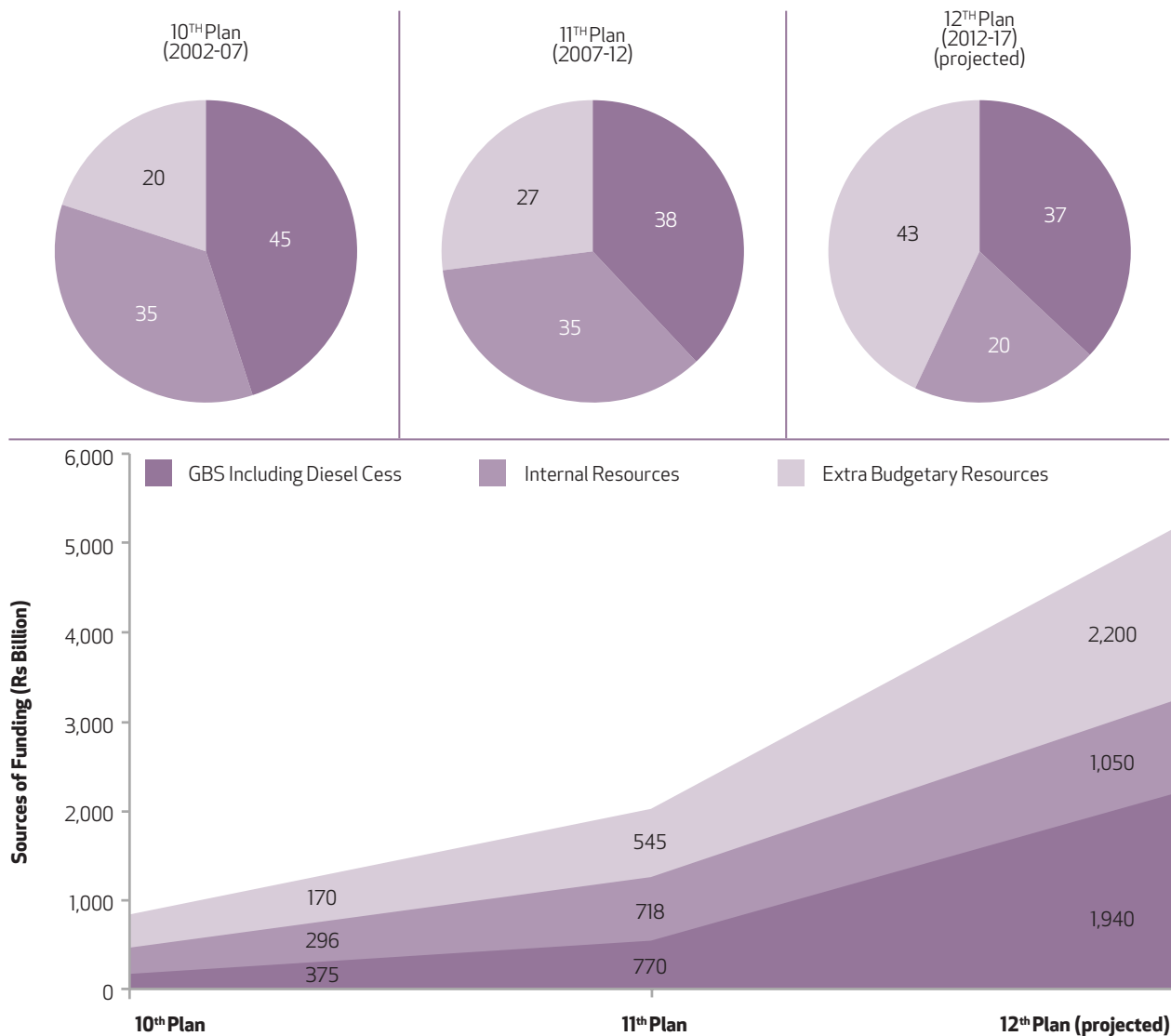
Source: White Paper on Indian Railways 2009, Yearbook 2010-11.

Figure 1.15
Trends in Railway Investments



Source: Various Five Year Plans, Planning Commission.

Figure 1.16
Sources of Funding for 10th, 11th and 12th Five Year Plans
 [Per cent and Rs Billion]



Source: White Paper on Indian Railways 2009, Report of the Working Group on Railways (NTDPC), Ministry of Railways.

support (GBS), and market borrowings. Internal resources of IR are operated through the DRF, the Development Fund (DF) and the Capital Fund (CF).

The share of different sources of finance has varied significantly over the Plan periods. The share of GBS started declining from 75 per cent during the 5th Plan (1974-78) to a low of 23 per cent during the 8th Plan (1992-97). However, with the beginning of the 9th Plan in 1997, the trend reversed and share of GBS started rising and increased from a low of 18 per cent in 1996-97 to 56 per cent in 2004-05. In this period, internal generation levels were low and reviving the internal resource generation capability of IR became a key concern. Figure 1.16 compares the share of different sources of finance during the last two Plan periods (10th and 11th) with the projections of the 12th Plan period. The Plan expenditure, which increased

by 2.5 times from the 10th Plan (~ Rs 840 billion) to the 11th Plan (~Rs 2,000 billion), is again projected to increase by about 2.5 times to reach close to Rs 5,200 billion for the 12th Plan.

Further, IR has set an ambitious target for public private partnerships (PPP) and borrowings through IRFC, given that the share of GBS remains at the same level (about 37 per cent); and share of internal resource generation is expected to fall from 35 per cent during the last two Plan periods to 20 per cent in the 12th Plan. As a result the share of extra budgetary resources (borrowings and PPPs) is slated to rise from 27 per cent in 11th to 43 per cent in the 12th Plan.

Considering the increasing dependence of IR on budgetary support from the government, it may be useful to review the financing framework and fund-

Box 1.5

China's Self-Funding Railways: A Sustainable Model for India?

The Chinese railway is the only one in the world of a similar scale to India's. The government has increasingly required China's railways as a whole to be **self-funding**. The Ministry of Railways (MOR) is responsible for the railway financing through 18 regional rail administrations. Although MOR is part of the government, the railway sector is not treated as part of the government budget. **China Rail receives no operating subsidies from the national budget for either train or infrastructure maintenance**, and only modest support for capital investment for new lines to remote areas—less than 5 per cent of current capital funds.

China Rail earns a financial surplus overall; freight transport finances the greater part of China's network infrastructure operating, maintenance and capital costs. This is unsurprising as freight constitutes roughly 75 per cent of total traffic-kms and comprises customers with greater capacity to pay than passengers. The author considers it likely that passenger traffic as a whole more than covers its train operating expenses and makes a positive financial contribution to network infrastructure costs.

China has not adopted any policy of explicit payments for specific loss-making passenger public service obligations. China does not have the kind of suburban or intra-regional service networks (it actively discourages shorter distance passenger trips) which in many countries constitute the most loss-making parts of a passenger railway business. Nevertheless, a mixture of more or less profitable services exists, whether looked at by route or time of day. Different regions also exhibit a range of financial performance (mainly related to freight density) and MOR reallocates net revenues between regional rail authorities to ensure financial balance in each.

The Rail Construction Fund Surcharge is an important source of funding for major new construction projects and is possibly unique to China Railways. The surcharge has been imposed on the basic freight tariffs since 1990 and generates around 16 per cent of revenue. The surcharge revenue is 'ring-fenced' by the Ministry of Finance who administers the Fund. It is not subject to tax and can only be used for major upgrading, new construction and associated debt service. A second, electrification surcharge, was introduced in 1993 for all freight traffic moving on electrified lines and this revenue is used for extending electrification over the network.

A **joint venture (JV) model** was adopted in 2005 which is funded 50:50 by debt from local banks and equity from MOR and third parties (typically provinces and potential customers). Provincial equity often comes in the form of cleared land (and associated population resettlement costs). The JV model is now used for almost all new construction and upgrading projects, though regional rail administrations continue to operate the train services and question marks remain about how to get the right balance between railway system co-ordination/integration and protecting the interests of individual JV investors. China's MOR also raises **debt through loans and bonds** (usually short term), mostly through China's state-owned banks. The rapid build-up of such debt to finance the development of the High-Speed Rail network has provoked much comment regarding its sustainability. The burden would be mitigated if the debt were refinanced over tenures much more appropriate to the long-term nature of infrastructure provision. It is possible that the sovereign may need to absorb part of the debt directly.

Source: Passenger Railway Institutions and Financing, Paul F. Amos, 5 September 2011.

ing sources in Chinese Railways which require only modest support from the government (Box 1.5).

INDIAN RAILWAYS: AN ASSESSMENT OF DEMAND AND GOALS FOR 2032

In any exercise of transport planning with a time horizon up to 2032, delineating the role the IR will have to play, an assessment of the desirable market

share for the railways, both in the freight and passenger segments, is essential, as also an enunciation of the strategies to achieve the objective.

VISION FOR INDIAN RAILWAYS

The Ministry of Railways has set up several expert groups in the recent past to formulate a vision for the Railways. **Report of the Expert Group on Railways** of 2001 (headed by Dr. Rakesh Mohan), the

White Paper on Indian Railways and ‘**Indian Railways Vision 2020**’ brought out by the Ministry in 2009, the recent **Report of Sam Pitroda Committee on Modernisation of Railways** and the **Dr. Kakodkar Report on Safety**, provide guidance on strategies to aid transformation of the railways.

In **Indian Railways: Vision 2020**, the Ministry of Railways has articulated the following vision:

‘Indian Railways shall provide efficient, affordable, customer-focused and environmentally sustainable integrated transportation solutions. It shall be a vehicle of inclusive growth, connecting regions, communities, ports and centers of industry, commerce, tourism and pilgrimage across the country. The reach and access of its services will be continuously expanded and improved by its integrated team of committed, empowered and satisfied employees and by use of cutting-edge technology.’

It is of the utmost importance that the various strategies set forth and the objectives mentioned in the above documents are pursued with determination for a transformational change of IR. An example of resoluteness to improve infrastructure that can be quoted is of NHDP which has brought about a phenomenal improvement in the national highways. Any failure to achieve the objectives or any slackening of the effort will only accelerate the loss in the IR’s transport share to road, leading to greater pollution and environmental degradation. IR has to make a bold beginning in this direction, together with the required organisational changes.

An efficient railway transport system, along with expansion of the network, will bring in collateral benefits for the economy through industrial growth resulting from an efficient transport infrastructure and the enhanced demand for steel, wagons, engines, coaches, telecom, signalling, etc. The 12th Plan should initiate policies that encourage modern manufacturing facilities and innovation in these critical areas.

PLANNING FOR 2032

If India has to emerge as one of the largest economies of the world by 2032, railways must play its part in facilitating it. To be able to play its rightful role and attain the optimal share in the freight and passenger transport, IR would need to critically assess the business environment it faces and the internal capabilities it has. It also has to envision the future and align its resources towards attainment of the goals.

Existing scenario of freight and passenger traffic

Transport in India is dominated by road; in freight tonne-km, it contributes 57 per cent as against 36 per cent by the railways. In comparably large countries

(examples: US. and China), railways’ share is 50 per cent (McKinsey’s study: Building India: Transforming the Nation’s Logistics Infrastructure). RITES in their Total Transport System Study have estimated that the railways’ share in originating tonnage has come down from 89 per cent in 1951 to 30 per cent in 2007-2008; and by assigning transport flows to different modes, based purely on total resource costs and break-even distances derived there from, non-optimal intermodal distribution has cost the economy Rs 385 billion in 2007-2008, constituting 16 per cent of the total transport cost. This is a theoretical exercise as it implies railways’ increasing its share to 75 per cent of the total transport output; further, nearly half of the commodities transported by road are non-bulk in nature, not easily amenable for movement by rail without an organised intermodal transport arrangement. Notwithstanding this, consistent shift of traffic to road is at considerable cost to the economy.

The McKinsey study too has touched upon this extra cost to the economy in its above study and estimated it at 4.3 per cent of the GDP. If the present trajectory of modal share continues, the railways’ share in freight tonne km may decline to 25 per cent by 2020 and 20 per cent by 2030. McKinsey estimates the loss to the nation’s economy at 5 per cent of the GDP by 2020. GDP growth at 9 per cent is also at risk.

Similarly, road transport has emerged as the predominant mode of passenger transport over the last few decades. The share of road assessed in passenger km has increased from around 26 per cent in 1951 to 87 per cent in 2005 while that of the railways has declined from 74 per cent to 13 per cent.

The current trend is unsustainable from resource cost to the economy. Energy security would become increasingly important in times to come, as also environmental and social considerations, making a positive shift towards rail transport an imperative.

An integrated approach and an enabling policy framework are required to correct the existing distortion in favour of road. And it is obvious that IR will have to be prepared to rise to the challenge. The paragraphs that follow deal with desirable market share for sustainable growth of the economy.

Desirable Market Share for sustainable growth of economy

a. Potential for Freight Business

As discussed, RITES, in their Total Transport System Study, have estimated the total transport output in 2007-2008 at approximately 1,400 billion NTKMs (Table 1.1). Further, the TTSS has also estimated the total transport output (for select 52 commodities) in 2007-2008 at approximately 1,200 billion NTKMs, and the total transport demand for the year 2025-2026 at approximately 5,300 billion NTKMs (for these 52

Table 1.6
Projections of Total Freight Traffic
 [Billion NTKM]

TERMINAL YEAR OF THE PLAN PERIOD	11 TH PLAN 2012	12 TH PLAN 2017	13 TH PLAN 2022	14 TH PLAN 2027	15 TH PLAN 2032
GDP Growth Projections (Per cent)		6.9 ^P	8.0 ^E	8.5 ^E	9.0 ^E
Transport Elasticity	1.2				
Freight Traffic (Billion NTKM)	2,053 ^E	3,056	4,834	7,856	13,118

Source: NTDPCC.

Note:

1. P: Projected in 12th FYP document.
2. E: Estimated (based on NTDPCC research).

commodities). This figure has been arrived at by assessing the increased transport demand due to growth of 11 commodities that constitute a share of 53 per cent in a basket of a total of 52 commodities, and then applying the figure so arrived at for all the 52 commodities. The CAGR in percentage terms comes to 8.5 per cent. If the projection of RITES is extrapolated to 2032 at the overall growth rate of 8.5 per cent, the size of inter-regional freight movement comes to about 8,700 billion NTKMs.

The above approach is too conservative. A fast-growing Indian economy is expected to be accompanied by a proportionately high demand for transportation. If the country's GDP grows at an average of 8 per cent per annum over the 20-year period (2013-2032) and the elasticity of total freight traffic-to-GDP is estimated at 1.2, the transport growth rate would come to about 9.7 per cent per annum. At this rate, the total freight tonne kilometres would grow by a factor of 6.4, from about 2,050 billion NTKMs in 2011-12 to more than 13,000 billion NTKMs by 2032 (Table 1.6).

No attempt has been made for any detailed commodity-wise projections but the current trends and development plans of major freight generating sectors corroborate the conclusion that transport would continue to grow. Major freight generating sectors such as power, steel and cement industries and consequently coal, both domestically mined and imported, are poised for a massive expansion. Coal constitutes close to 45 per cent of the total railways' freight movement. Although part of the coal movement may shift to non-rail alternatives (e.g. pit-head or port-based power plants relying on merry-go-round or conveyor belt systems), concerns on pollution overload and energy security at state/regional level would lead to continued expansion of thermal generation capacity across the country. Both the volume and lead of coal transport would increase as a result. A large part of the movement would involve linkages to new mines or ports. IR can grow very fast in these segments and increase its share provided network and terminal capacity are built up expedi-

tiously and its service offerings satisfy the increasingly cost-conscious customers who now operate in a fiercely competitive environment. According to the McKinsey study, 65 per cent of the total freight traffic is bulk in nature and 75 per cent of the traffic, in terms of NTKMs, moves over distance slabs exceeding 400 km. This presents a huge opportunity for railways to increase their share.

As mentioned earlier, nearly half of the freight moved by road is in the non-bulk segment, and a substantial part of it, with a lead of over 500 km. If the objective of a shift to rail is to be achieved, the imperative need is for an organised intermodal transport system which will combine the advantages of rail with that of road. In this context, the need for the IR to capture a significant share of the fast-growing FMCG, Consumer Durable and Information Technology (CDIT), containerised cargo and other segments like automobiles, where its presence is negligible or minimal, is obvious. The 12th Plan has also recommended containerisation as a major strategy to gain share of the freight market (Box 1.6). Internationally also large rail freight providers have redefined their role beyond just running trains into the larger world of multi-modal freight transport and logistics (Box 1.7).

Given the realities of cost, economics and customer convenience, as also the modal share in comparable countries (China and the US), the Working Group on Railways (for NTDPCC) has recommended that the Indian Railways must achieve a market share of 50 per cent by developing a sharper commercial focus. Table 1.7 provides the estimates for rail freight output till 2032.

In order to attain the desired market share of 50 per cent, railways' freight traffic has to grow at an average of 12 per cent over the next 20 years, which looks challenging given the growth rate of 8 per cent achieved in the last six years. A business as usual approach is just not an option as growing at 8 per cent per annum, while the transport market expands

Box 1.6 Containerisation in Railways

Due to the economic and technological attributes of the railways, it has always been a challenge to attract consignments which are less than at least a thousand tonnes. Container trains combine the operational efficiency of unit trains with the commercial flexibility of booking 20 tonnes or even less at a time. According to the Total Transportation Study (TTS) conducted by RITES for the Planning Commission, the volume of non-bulk traffic in 2006–07 was 227.17 million tonnes out of the total traffic of 2386.97 million tonnes.

Indian Railways set up Container Corporation of India (Concor) in 1988 as a public sector company to spear head containerisation. It commenced operations in 1989 at which stage Indian Railways transferred all Inland Container Depots (ICDs) and container related business to Concor. From the 7 ICDs it took over from Indian Railways at inception, Concor has now expanded the network to more than 44 ICDs and 14 domestic and port side terminals and has 213 rakes of flat wagons. Using IR's network and haulage, it has pioneered the concept of multi-modalism through its core activities as a carrier of rail borne container traffic and terminal operation.

Anticipating higher container traffic at Indian ports, Railways liberalised the entry of private players in the area of rail-based haulage of containers in 2005. The response has been quite good with 15 new entrants. These 15 new operators have procured 132 rakes and developed 9 new terminals. Sizeable on-track competition has emerged in some of the exim sectors as well as the domestic sector. Competition also led to an increase in the growth of rail based intermodal traffic at a rate of 15.5 per cent in the period 2007–08 till 2011–2012 although there has been a negative growth rate in the domestic sector during 2011–12 due to introduction of container class rate for some of the commodities moved normally by conventional wagons. There is a need to expand containerisation business and improve Railways share in transport sector. Policies in the 12th Plan will aim at this.

Source: 12th Five Year Plan, Planning Commission, Gol.

Box 1.7 Intermodalism, Multimodalism and Logistics Capability

Larger rail freight providers in the 8 countries (refer table below) have redefined their role beyond just running trains into the larger world of multi-modal freight transport and logistics. They have done so not only to better serve their markets but also to avoid becoming disconnected from final markets, and thereby becoming passive 'price-takers' from the 'middlemen', including freight forwarders and logistics companies who in many countries are increasingly responsible for overall transport organisation under contract to ultimate freight shippers or receivers. By engaging more effectively in supply chains the railways have increased market 'reach' without increasing network length.

COUNTRY	RAILWAYS AND LOGISTICS
Australia	Rail freight operators have had close partnering arrangements with freight forwarders for decades but since railway restructuring freight companies with wider logistics businesses now run most interstate freight trains in Australia.
Brazil	Many of Brazil's railways deal with bulk mining and agricultural products but the company with the largest network (with concessions in Brazil and Argentina) 'America Latina Logistica', markets itself as a full service logistics company.
Canada	CN promotes itself as a transportation company that offers integrated services: rail, intermodal, trucking, freight forwarding, warehousing and distribution. Canadian Pacific stresses ability to plan and manage logistics solutions and provides one-stop shopping for door-to-door transportation using long-haul capabilities of the railway and the local market access of trucking, for both rail and non-rail served customers.

(Contd...)

COUNTRY	RAILWAYS AND LOGISTICS
China	China Railway Container Transport Company was established to manage the container business, including rail and intermodal transport, cargo handling and delivery, the sale and leasing of wagons, containers and facilities. JV with international investors to establish 18 major intermodal centres linked by regular container train services.
Germany	DB Schenker, the main national rail freight operator, is a multimodal transport company offering through separate LOB divisions and subsidiaries services in rail freight, land transport, air freight, ocean freight, contract logistics.
Japan	With limited bulk traffic Japan Rail Freight Company has necessarily concentrated on efficient inter-modal logistics linking 140 container rail terminals with road, sea, and air routes.
Russia	Has established subsidiary companies to provide overall logistics services in shipping containers, domestic container service, automobiles, perishable goods.
United States	Many different models but Class 1 railways now typically have overall Logistics Planning capability offering solutions and management of logistics across modes, as a LOB or as subsidiary or associated companies.

One early form of integration with other modes was the so-called piggy-back service. After about 1975, there was substantial growth in the carriage of road truck trailers on rail flat-cars in N.America. The modest net/tare ratio of such arrangements and the sometimes cumbersome and labour-intensive loading process inevitably raises the costs of train operations and potential margins are at best thin. More substantially, maritime freight containerisation over the last 30 years has created a new niche for railways in an integrated transport market. This is particularly so for ISO containers on routes between international ports and inland cities but traffic can then take advantage of unbalanced container loadings and the availability of the low-cost container liner services. In the last few years' inter-modal traffic has overtaken coal as the single biggest generator of revenue in US railways. But the trailer traffic has declined & container transport, which is more cost-efficient for railways to handle (even more so with double-stacking) now dominates the intermodal market.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011.

Table 1.7
Projections of Rail Freight Output
 [Billion NTKM]

TERMINAL YEAR OF THE PLAN PERIOD	11 TH PLAN 2012	12 TH PLAN 2017	13 TH PLAN 2022	14 TH PLAN 2027	15 TH PLAN 2032
GDP Growth Projections (Per cent)		6.9 ^P	8.0 ^E	8.5 ^E	9.0 ^E
Transport Elasticity	1.2				
Freight Traffic (Billion NTKM)	2,053 ^E	3,056	4,834	7,856	13,118
Modal share: Rail Freight (per cent) (Assumption)		35	39	45	50
Rail Freight Output (Billion NTKM)		1,070	1,885	3,535	6,559
CAGR (per cent) - Rail Freight Output		10	12	13	13

Source: NTDPCC.

Note:

1. P: Projected in 12th FYP document.
2. E: Estimated (based on NTDPCC research).

at close to 10 per cent, would mean that railways' share would actually decline to less than 24 per cent by 2032. Even to retain the existing share of 36 per cent, IR has to keep growing at more than 10 per cent per annum. However, given the severe capacity constraints and various other challenges, a more realistic goal would be to grow at 9-10 per cent till 2022 and

accelerate the growth to 14-15 per cent per annum thereafter to reach 50 per cent market share by 2032. This will also be consistent with the proposed capacity creation and augmentation plans, whereby the two Dedicated Freight Corridors (DFCs) are likely to be operational only after 2017.

Table 1.8
Passenger Growth for IR

YEAR	PASSENGER KILOMETRES (IN BILLIONS)		
	SUBURBAN (PER CENT)	NON-SUBURBAN (PER CENT)	TOTAL
2011-12 ^A	144 (14)	903 (86)	1,047
2016-17	189 (12.5)	1,320 (87.5)	1,509
2021-22	253 (11)	2,047 (89)	2,300
2026-27	342 (9.5)	3,254 (90.5)	3,596
2031-32	461 (8)	5,304 (92)	5,765

Source: NTDPCC, Report of the Working Group on Railways (NTDPCC).

Note:

1. A: Actual (from Railways Yearbook 2011-12)
2. GDP growth projections:
 - 12th Plan: 6.9 per cent (projected in 12th FYP document);
 - 13th Plan: 8 per cent; 14th Plan: 8.5 per cent; 15th Plan: 9 per cent (NTDPCC estimates).

b. Potential for Passenger Business

The RITES study did not attempt an assessment of the size of the total passenger transport market in the country and its intermodal distribution among the various modes. Reliable information is available only in respect of rail and air transport, the two sectors which maintain statistics on a continuous basis.

RITES has also not carried out any optimisation exercise in respect of passenger transport, as has been done for freight. There is thus no reference base available for determination of an optimal share for the railways and projection of figures for 2032. This approach, that is, 'optimality consideration', may not be relevant as railways' passenger transport has long been operating under manifest supply constraints. There is also an imbalance in the passenger mix in that a preponderant proportion of passengers carried by IR are of short lead in nature, which perhaps could be better served by road.

Urban population constituted 30 per cent of the total population in 2010; this is projected to grow to 40 per cent by 2030 (India Urbanisation Econometric Model, McKinsey Global Institute). India's economic growth rate also presents a potential for higher demand for transportation; rapid urbanisation and the on-going structural transformation of the Indian economy would give rise to increased demand for travel. Extensive use of information technology for ticketing, reservation and overall improved convenience of passengers in recent years also presents an opportunity for the growth in passenger travel. Past

trends may not, therefore, be an accurate guide for projecting the figures for 2032.

Over the past 15 years, the elasticity of growth of passenger kilometres vis-a-vis GDP growth has been 1.1. Using this elasticity and the GDP growth estimates, the passenger traffic (in PKM) is expected to grow by a factor of 5.5 over the next 20 years. Further, the current trends of progressively declining proportion of suburban passengers and the increasing share of upper class and longer lead passengers would also need to be taken into account in planning. On the basis of this assumption, projected passenger growth is shown in Table 1.8.

c. Potential for Parcel Business

Parcel traffic, mostly transported along with passenger services, presently forms an insignificant proportion of about 2 per cent of the non-bulk traffic of the country. As per the data for 2011-12, IR transported approximately 7 million tonnes of parcels, generating revenue of about Rs 16 billion. Parcel business is at present a loss-making activity for IR.

The potential, however, is large. As mentioned earlier, CRISIL Infrastructure Advisory study has assessed the total movement by road of 22 commodities, out of a basket of 52 commodities, carried as per the data for 2009-10, at about 400 million tonnes. These 22 commodities are easily amenable for movement by rail as parcels for distances of 500 km and over.

If the modal share of the railways has to improve, a shift of long distance (500 km and above) trans-

port of parcels essentially non-bulk packaged items to rail is a must. It needs no reiteration that the IR has a major share of bulk movement and the need is for an ever-increasing market share of the non-bulk commodities.

The above would, however, need a market oriented strategy, with focus on total logistics support, value added services, rational cost and value based tariff, state-of-the-art IT applications for providing real-time online access to information on movement of consignments and adequate and appropriate rolling stock and public private participation in terminal operation and road bridging. Dedicated parcel terminals with mechanised handling facilities, specifically targeted at agricultural produce, automobiles, other industrial products and general parcels and a focused business organisation that would concentrate on marketing, sales and transport of parcel services within an agreed transit time through time-tabled trains and parcel specials form an essential feature of the strategy.

Indian Railways Vision 2020 recognises the above and has set a target of revenue of Rs 80 billion by 2019-2020. However, this segment being small on the whole cannot be the mainstay of freight traffic volumes.

SERVICE DELIVERY AND CUSTOMER ORIENTATION

IR must provide services to meet customers' requirements and expectations. It has to devise solutions that anticipate and meet customers' needs in different segments. In the freight service, bulk and non-bulk commodities would demand different approaches. In passenger services, premium and non-premium passengers, and suburban and intercity passengers would similarly demand different approaches.

The goal for service delivery should provide for the following:

A. FREIGHT BUSINESS

The goal for freight business is to have segregated freight corridors, improving the speed of transit and cost-efficiencies in bulk transport. The strategy for freight business should also specifically provide for:

- **Construction of six Dedicated Freight Corridors.**
- **Setting up of a focused business organisation for multimodal transport** of non-bulk commodities (e.g. parcels) under the PPP mode, combining the efficiency and advantages of rail and road.
- Improved connectivity to industry clusters as well as significant ports (major and non-major), based on their current and projected traffic volumes. Development of last-mile connectivity should be encouraged through PPPs.

- **Development of 15 to 20 logistics parks** as the main network hubs viz. Mumbai Bengaluru, Cochin, Hyderabad, Kolkata, Delhi NCR, Ahmedabad, Nagpur, Vishakhapatnam and Siliguri, etc. IR must work in **partnership (in a joint venture) with state and city authorities** to set up rail-based multi-modal logistics parks to attract increasing volumes of miscellaneous cargo to rail.
- Upgrade rail wagons (higher axle load, better tare to payload by shifting away from carbon steel to stainless steel and aluminium/other light-weight bodies, increased payload of covered wagons (BCN) through use of well wagons, better maintenance cycles, etc).
- Upgrade wagons and track to 25 tonnes axle load.
- Improved infrastructure and rolling stock maintenance.
- Running of freight trains at 100 km per hour.
- Running of premium freight services with differential pricing and assured deliveries.
- Supply of rakes on demand with differential pricing for different demand lead times.
- Running of trains on schedule with guaranteed transit time.
- Development of a few selected corridors for heavy-haul operations.
- Running of automobile, hazardous material trains, movement of bulk cement, etc by private train operators.
- Reduction in cargo parcel size to 1,000 tonnes and aggregation mechanism for even smaller parcel-sizes.

B. PASSENGER SERVICES

Quality of services in terms of punctuality, safety, security, sanitation, and other value-added services needs to be upgraded. Access to railway services needs to be improved using existing and innovative networks of distribution channels like Internet, mobile telephones and other vending mechanism. Speed of trains should be enhanced on segregated passenger routes. The strategy for passenger business will include:

- Augmentation of supply (more trains and longer trains) to ensure full satisfaction of demand.
- Shift of focus to long-distance and inter-city transport and suburban corridors involving dense passenger movements.
- Upgrade speed to 160-200 kmph on selected corridors.
- Redevelopment of stations for smooth flow and comfortable experience of passengers as also to ensure clean and hygienic environment.
- Redesign of coaches to enhance travel comfort.
- Conversion of all stopping passenger trains to EMUs/DMUs or railcars; invitation to state governments to manage uneconomic and unpatronised services.

Box 1.8

A Competitive Freight Market

Indian Railways' freight services are moving from a captive to a competitive market. In order that the freight segment grows to its full potential, reliance on marketing alone will certainly not suffice. Even marketing in combination with innovating pricing solutions will not be adequate. The target customer and traffic stream needs to be considered at the stage of designing the scope of projects and determining the investment.

Developing a strategy for the bulk/non-bulk freight business:

Railways have traditionally focused on the bulk long haul traffic. With the increasing growth rates of the non-bulk segment, there is need to address the long haul non-bulk segment. This would involve developing multi-modal transportation solutions with road and other private industry participation. A detailed assessment of the bulk and non-bulk transport opportunities available for the Railways as also the organisational imperatives that need to be addressed to increase customer focus and responsiveness would be a critical step towards developing a profitably growing freight business.

The non-bulk and manufactured goods are high value traffic that can bear higher freight rates and yield higher profit. To improve the mix of goods as well as earn higher revenues and higher profits, it is necessary that Railways devise cost effective and efficient services, pricing structures and operational strategies to cater to this traffic. Railways must adopt the principle of logistics and supply chain management that offer total transportation solutions to the customers. For this purpose, it must move towards integration and partnership with complementary entities in other modes of transport and promote multi-modal transport systems.

The key imperatives and challenges to develop a cohesive strategy for the freight business would be to involve freight customers in the exercise and to gear the organisation for improved customer focus.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways.

- Development of select High Speed Rail (HSR) corridors (speed of 350 kmph), if and when deemed to be economically viable.

INVESTMENT REQUIREMENTS AND FINANCING PLAN

INVESTMENT REQUIREMENTS⁹

The previous section sets out the following broad goals for IR for 2032:

- Achieve 50 per cent share in freight transport; and
- Meet the passenger service demand in full.

However, while the potential to grow in both freight and passenger traffic segments is immense, without adequate capacity all efforts to capture traffic would come to naught. *Therefore, capacity creation is the single biggest challenge confronting IR in the next few years. It is of the utmost importance that a vision similar to that of NHDP is laid down for the railways now so that we may expect a transformed network by 2032.*

Plans for capacity creation must encompass both infrastructure and rolling stock and cater to projec-

tions for both, the existing traffic streams and capacity needed to cater to new traffic streams. An analysis done by Long Range Decision Support Systems (LRDSS) of Ministry of Railways indicates that most of the traffic growth would come along the existing Golden Quadrilateral and Diagonals. This is also reinforced by the McKinsey report. Further, investments needed to modernise the railway system and ensure a zero-accident and fully reliable systems need to be ensured.

An investment plan for 20 years clearly articulating the goals and fully backed by a funding plan is needed. The following sections discuss the investment needs⁹ (tentative) over a time-horizon of 2012 to 2032, spanning four Five Year Plans (12th to 15th). The broad heads for investments are as follows:

- Capacity Augmentation (including safety works)
- Rolling Stock
- Stations & Terminals, Technological upgrade and modernisation

CAPACITY AUGMENTATION

Any serious effort at capacity augmentation must first and foremost focus on decongestion of congest-

9. The investment needs have been estimated assuming that IR attains a freight share of 50 per cent by the year 2032 with high GDP growth rate (about 9 per cent).

Dedicated Freight Corridors (DFCs): A Game Changer for the Indian Rail Sector

The Dedicated Freight Corridors on the Western and the Eastern routes is a strategic capacity augmentation initiative taken by Railways and involves construction of 3,338 kms of dedicated freight lines to carry predominantly coal and steel on the Eastern corridor and containers on the Western corridor. The ports in the Western region covering Maharashtra and Gujarat would be efficiently linked to the Northern hinterland and similarly on the Eastern side, coal would move to the power plants in the North. The Project completion cost is estimated at Rs 959 billion. A major part of the project is being financed through multilateral/bilateral debt. World Bank funding of part of Eastern DFC is estimated at US \$2.73 billion (Rs 136 billion) and Japan International Cooperation Agency (JICA) funding of 504 billion Yen (Rs 315 billion). Dankuni–Sonnagar section of Eastern DFC (Rs 100 billion) is to be implemented through PPP. The balance requirement would need to be met through Budgetary Support. Both Eastern and Western DFCs are targeted for completion in the terminal year of the 12th Plan.

Dedicated Freight Corridor can be justifiably called an innovation in rail transport in India because of a number of reasons. The average speed of freight trains will go up from 25 kmph to 70 kmph which will reduce the transit time by less than half from the present levels.

Railway technology would get a major up-gradation with the help of heavy hauled freight trains of 15,000 tonnes capacity and 1500 metres length. The axle loads of DFC routes will also go up from 25 tonnes to 32.5 tonnes which would enhance the track loading capacity from 8.67 tonnes per metre to 12 tonnes per metre. Wagons with much better pay load to tare ratio would also get introduced through this technology. Newer technology in signaling, train communication, track-maintenance and operations would get introduced in the Indian Railways system. The capacity released by freight trains can be used for running more passenger trains at higher speeds after upgrading the existing mixed corridors of Indian Railways.

In addition, this initiative is expected to offer significant reduction of Greenhouse Gas (GHG) emissions in transport sector of India.

Pre-feasibility studies have also been completed on the four new Freight Corridors, viz. North-South, East-West, East-South and Southern corridors and Preliminary Engineering cum Traffic Survey (PETS) is being undertaken by RITES. Based on the outcome of the PETS a beginning would be made in the Twelfth Plan in implementation of the new corridors in a phased manner.

Source: 12th Five Year Plan, Volume II, Planning Commission, Govt.

ed routes and segregation of freight and passenger traffic on the most heavily trafficked routes. This can be achieved by:

- Construction of Dedicated Freight Corridors (DFCs) on the busy high density network such as Delhi-Mumbai, Delhi-Kolkata, Delhi-Chennai, Kolkata-Mumbai, Chennai-Goa and Kolkata-Chennai routes, with specifications that enable high traffic and heavy-haul freight operations; and
- Construction of third and fourth lines on other saturated routes.

Six DFCs totalling 9,538 km that would be needed are:

- Western DFC (Delhi-Mumbai) 1,534 km;
- Eastern DFC (Ludhiana-Kolkata) 1,839 km;
- East West DFC (Howrah-Mumbai) 1,976 km;
- East-Coast DFC (Kharagpur-Vijaywada) 1,097 km;

- South DFC (Chennai –Goa) 902km; and
- North South DFC (Delhi-Chennai) 2,190 km.

Of these the first two are already under construction (expected to be commissioned by March 2017), and for the others pre-feasibility studies have been carried out. It is suggested that private sector participation should be encouraged by IR for development and operations of the DFCs.

Quadrupling (non-DFC lines) and fifth and sixth Lines: In addition to the DFCs, a number of other saturated stretches (approximately 14,500 km) would also need third and fourth lines. Lines approaching major metropolises would also require additional fifth and sixth lines to effectively segregate commuter lines from non-commuter lines.

Doubling and Gauge conversion: Similarly, around 24,000 km of single lines facing congestion

would need to be doubled. In other words, roughly 48,500 km of the network (which should exceed 90,000 km by 2032) would need to be either double or quadruple lines. Gauge conversion would have to be completed for the remaining part of the network (roughly 8,000 km).

Freight bypasses and traffic facility works such as splitting of block sections, construction of terminals and additional loops, etc. would also need to be taken care of in full.

Speed raising: A major effort is also required to upgrade speed on segregated passenger corridors to 160-200 kmph this would imply deployment of advanced signalling technology (ATP/Cab signalling/CTC), elimination of level crossings, fencing of tracks, removal of permanent speed restrictions, etc. The investment on this account would be of the order of Rs 1,000 billion.

Other safety works (signalling, removal of level-crossings, renewal/modernisation works for track/signalling, etc.) will entail investment to the tune of Rs 2,500 billion.

New Lines: Since independence, the pace of new lines construction has been roughly 200 km per annum. The Working Group on Railways (for the NTDP) has suggested that network expansion by way of new lines should be planned on a much bigger scale than has been done so far, and recommended to accelerate the construction of new lines to a level of at least 2,000 km per annum over the next 20 years. Accordingly, the Working Group envisaged that the total length of new lines to be constructed would be around 30,000 km (including national projects and projects required for strategic regions and international corridors), costing around Rs 3,000 billion at present-day costs.

However, the Committee (NTDP) is of the view that it is essential to abandon or not commence work on the many extraneous lines that have been initiated in the past, and on which almost no work has been done if consistent economic growth of 8-10 per cent per annum is to be achieved and IR has to achieve the goal of 50 per cent share in freight transport over the next 20 years. These extraneous lines are not only expected to be uneconomic routes but also meet the traffic requirements to a very limited extent. The 12th Plan also emphasises that excessive sanctioning of new projects annually, much beyond the resources available is a major problem in the railways and it only increases the throw-forward (number of projects under implementation). It shows that 132 new line projects (totalling about 14,200 km in length) are under implementation as of April 2012.

Further, acknowledging the importance of enhancing transport connectivity for inclusive growth, the Committee (NTDP) recommends that focus should be on developing interconnectivity between different modes, e.g. instead of investing resources in uneconomic rail lines, the connectivity to the existing rail network should be strengthened through investments in improving road connectivity (e.g. PMGSY) and bus transport. This will ensure that people have access to economic transport services at a lower overall cost to the economy.

High Speed Rail (HSR): HSR is defined as a distinct category of passenger rail transport system that normally operates with separate track and rolling stock at speeds faster than 250 kmph. HSR has been in operation for nearly 50 years in Japan and for over 30 years in France. As of July 2012, about 17,500 km of HSR tracks were in operation, about 9,300 km were under construction and another 15,500 km were in the planning stage globally.¹⁰ China has the longest HSR network in the world today, even though it launched its HSR network only in 2003.

A review of the most important HSR projects carried out to date around the globe highlights that the potential demand for services must be particularly high in order to make investment in them socially profitable and that these projects must target the corridors linking densely-populated metropolitan areas, suffering from severe road congestion, and having deficient air links. Table 1.9 summarises the lessons learned from HSR implementation across Japan, France, Germany, Spain and Italy.

The Working Group on Railways (for the NTDP) has suggested that about 4,000 km of high-speed corridors costing Rs 4,000 billion could be planned in India. *However, the Committee (NTDP) is of the view that given the current financial situation of IR (limiting the funds available for expansion), priority should be given to projects such as DFCs which are self-financing, as compared to projects such as HSR network which require continuous fiscal support (Box 1.10).*

Further, the Committee believes that a more integrated approach is required to be taken of transport as a whole and choices will need to be made on the priorities to be placed on different investments. At present, this prioritisation and decision-making is disjointed as the decisions on investments in road expressways, on the one hand, and potential railway DFCs and high speed trains, on the other, are being made in isolation of each other. The investment in DFCs is critical if IR has to achieve the target of 50 per cent share of railways in freight transport by 2032. With the construction and commissioning of DFCs, freight trains would get substantially diverted

10. Singh (2013).

Table 1.9
Summary of Lessons Offered by International Experiences of HSR Projects

SUMMARY OF LESSONS	
Motivation	HSR has to be devoted to solving congestion in corridors between large populated cities. Political or administrative objectives and extension of lines for regional equity and development lead to the economic failure of the project.
Design and Functions	The international experience shows that passenger-oriented HSR has a minimum economic impact on the territory served. Lower construction costs are associated with combining HSR and conventional rail. Routes have to be established according to demand (commercial basis). Adequate multimodal connections are needed.
Economic Cost	The development of an HSR network entails huge construction and operation costs (especially important land expropriation cost, bridges, and tunnels). The key decision that affects cost concerns complementarities (passenger/freight) and the extent of combination with existing conventional rail. Political pressures (connection and station costs) can increase HSR cost and constrain its profitability because of opportunism or private interests from both politicians and bureaucrats.
Mobility Impacts	Provide significant travel time savings when compared to conventional rail services, but similar door-to-door timings are reported for air transportation on routes of around 400 miles. Modal distribution of traffic is affected when HST starts operation, with the greatest impact on the airline industry.
Environmental Cost	Energy consumption and carbon dioxide emissions are lower for HST than for air transportation. However, they are also greater for HST than for conventional rail per seat mile. In fact, it is necessary to wait more than three decades to compensate energy and pollution generated during construction.
Economic and Regional Effects	HSR does not generate any new activities, nor does it attract new firms and investment, but rather it helps to consolidate and promote ongoing processes as well as to facilitate intraorganisational journeys, for which mobility is essential. For regions and cities whose economic conditions compare unfavorably with those of their neighbors, a connection to the HSR may even result in economic activities being drained away and an overall negative impact. Medium-sized cities may suffer the most because of the centralisation of activities in large nodes. Tourism and the services sector are the only activities favored, while no effects are reported for industrial and agricultural activities.

Source: HSR: Lessons for Policy Makers from Experiences Abroad, *Public Administration Review*, June 2012.

to the new freight corridors. This would present an opportunity to increase the maximum permissible speed of passenger trains on the existing corridors to 160-200 kmph (at present the maximum permissible speed for passenger trains on IR is 150 kmph for a few trains and the average commercial speed is in the range of 70 kmph). This would, in turn, enable operation of overnight inter-city services in the distance range of 1,000-1,500 km, as also help connect cities within distance of 500-700 km with high-speed day services.

Increasing speeds to 160-200 kmph would need inputs by way of removal of speed restrictions, yard remodelling, fencing, improved signalling, easing of sharp curves etc; the most opportune time would be to commence the exercise and implement the scheme when any section of the Dedicated Freight Corridor gets commissioned, relieving the pressure of operating freight trains on an existing congested section. The aim can be to successively increase the average speed in phases, reaching 120 kmph ultimately. The end result is shown in Table 1.10. These services would be able to satisfy the requirement of high speed travel in a large measure. Annex 1.2 shows a

map of the suggested routes for increasing the maximum permissible speed to 160-200 kmph.

Thus, given the substantial funding required from government to implement HSR projects, a programme for raising speed to 160-200 kmph on selected existing routes should be undertaken till the time the HSR projects are found commercially justified or operationally required to cater to the country's growth and mobility needs.

Summary of Capacity Augmentation: Figure 1.17 shows the summary of investments required for capacity augmentation by 2032. The total cost for various capacity augmentation initiatives discussed above is close to Rs 12,500 billion, excluding the investments on new lines and HSR (the investment requirement increases to Rs 18,200 billion including these initiatives).

ROLLING STOCK

Along with the envisaged investments in capacity augmentation, there would be a huge requirement of rolling stock, both for replacement combined with technological upgrade and increased needs of traffic, if IR has to achieve the goals set for freight and

Box 1.10 High Speed Rail in Indian Context

High-speed rail (HSR) is defined as a distinct category of passenger rail transport system that normally operates with separate track and rolling stock at speeds faster than 250 kmph. It uses a different level of rail technology and management principle that positions it at an unbeatable advantage vis-a-vis other modes like cars and air-planes in the distance range of 500-1000 kilometres.

HSR has emerged as a fast and efficient transportation system for medium-distance travel of up to 1000 km. Some of the main reasons for introduction of HSR internationally are need for generation of additional capacity on the conventional network; regaining share from airlines and road; and energy security and environmental concerns. HSR network has various benefits such as lower energy consumption, lesser land usage for a given capacity compared to motorways, decongestion of metro cities, significant savings in journey time etc.

However, HSR networks world over require continuous fiscal support due to high costs of construction and rolling stock. It is estimated that an annual ridership of at least 20 million passengers are required just to cover the working expenses and interest costs and probably double that number to have any possibility of recovering the capital cost. In India, the cost of construction of a high-speed double line rail corridor between Pune-Mumbai-Ahmedabad has been estimated at Rs 630 billion (excluding rolling stock) for 640 kms i.e. around Rs 800 million per km. In comparison, cost of the construction for DFC is estimated to be Rs 250 million per km.

Source: Report of the Working Group on Railways (NTDPC).

Table 1.10
Possible Savings in Travel Time with Speed Raising on Suggested Routes

ORIGIN	DESTINATION	DISTANCE (KMS)	CURRENT DURATION (HOURS)	PROPOSED DURATION (HOURS)	TIME SAVING (HOURS)
Delhi	Ahmedabad	934	13.5	8.0	5.5
Delhi	Mumbai	1,384	16	11.5	4.5
Delhi	Allahabad	634	7.5	5.5	2.0
Delhi	Kolkata	1,453	16.5	12.0	4.5
Delhi	Chennai	2,176	28.5	18.0	10.5
Mumbai	Ahmedabad	491	6	4.0	2.0
Mumbai	Kolkata	1,968	26.5	16.5	10.0

Source: NTDPC.

Note:

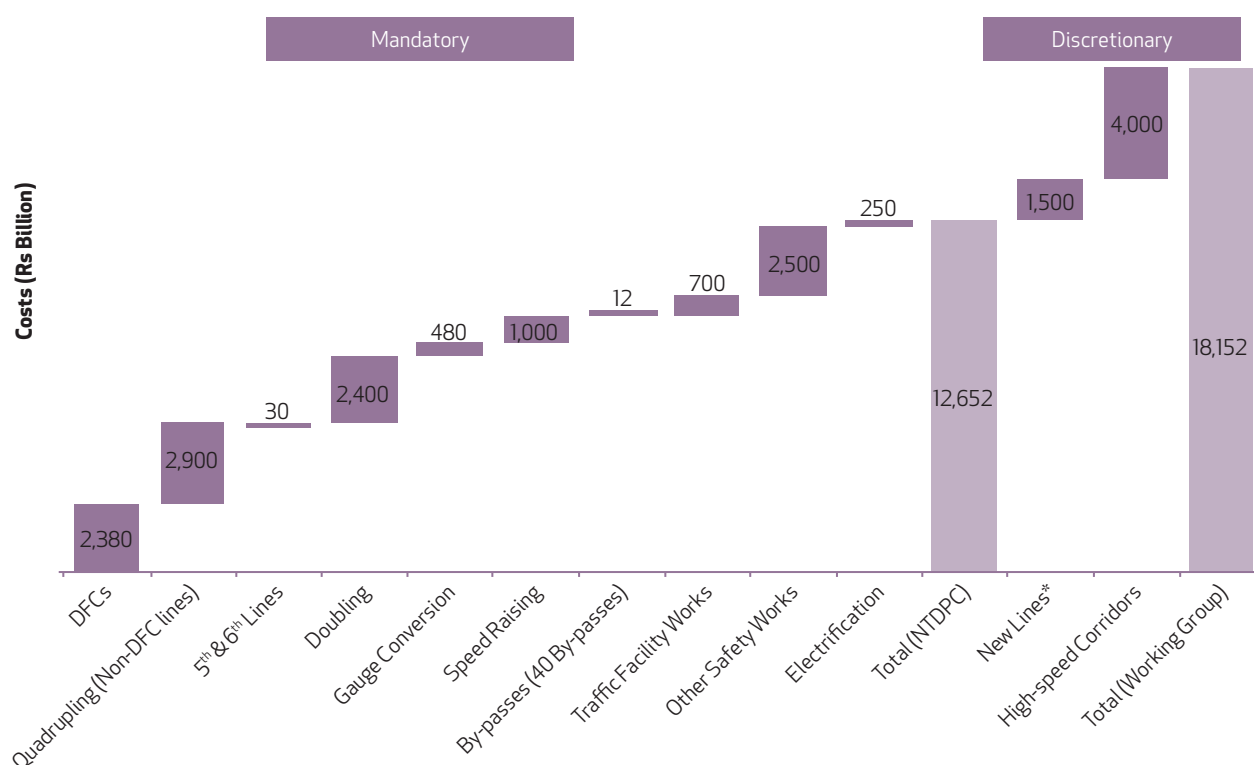
1. Current duration has been calculated based on scheduled departure and arrival timings of Duronto or Rajdhani trains between the origin and destination.
2. Proposed duration has been calculated assuming an average speed of 120 kmph, post commissioning of DFC and upgradation of speeds on the identified corridors.

passenger transport. Figure 1.18 provides the rolling stock requirement on the basis of the projections discussed earlier (Table 1.7). The rolling stock requirement has been worked out by taking into account 100 per cent improvement in utilisation of freight wagons, 50 per cent improvement in efficiency utilisation of freight locomotives, 20 per cent improvement in utilisation of passenger locomotives and the replacement requirements. These improvements may appear to be too high, but would need to be aimed at and realised given the scale of investment in track capacity, zero-accident/failure and high-horse power

locomotives envisaged. The investment required for rolling stock is estimated to be close to Rs 15,000 billion. In addition to the above, upgrade of Production Units (PUs) and Workshops for maintenance of the rolling stock would also require investment to the tune of Rs 750 billion.

The Committee is of the view that given the massive investment requirement for rolling stock, IR should encourage participation of private players (both domestic and international) in setting up manufacturing facilities for rolling stock and components.

Figure 1.17
Investment Requirement for Capacity Augmentation Needed by 2032



Source: Report of the Working Group on Railways (NTDPC), NTDPC.
 Note: Investment for new lines includes - (a) 132 projects already sanctioned and under implementation (11,200 km to be constructed out of 14,200 km); (b) new lines for economic development serving the industry estimated at 200 km p.a. for 20 years (these include international corridors and port connectivity works).

This would facilitate induction of world-class technology, besides being a source of capital for the resource constrained IR. As a first step, IR should corporatise its existing PUs/workshops. This aspect has been discussed in detail in the section on Organisational Reforms.

STATIONS AND TERMINALS

Indian Railways' operations require efficient terminals to make any impact in the transport market. At present, most of the freight transport is carried out in customer-owned private sidings. These are basically meant for exclusive use of major customers. There are roughly 1,300 goods sheds owned and managed by the Railways. Of these, around 500 handle more than 10 rakes per month. IR needs to augment some of its good sheds to handle at least one rake per day with planned investment in lighting, circulating area, approach roads and facilities for customers. Moreover, the private sector should be encouraged to come forward and build efficient terminals, equipped with related logistics services like warehousing and inter-modal transfers, etc.

Similarly, major passenger stations catering to more than one lakh passengers a day must be upgraded. This would require segregation of incoming and

outgoing passengers, seamless connectivity with the surrounding city, ample parking space, comfortable concourse areas and platforms, etc. Further, modern coaching maintenance terminals capable of ensuring quick maintenance and washing of train-rakes with utmost safety and cleanliness will also be needed.

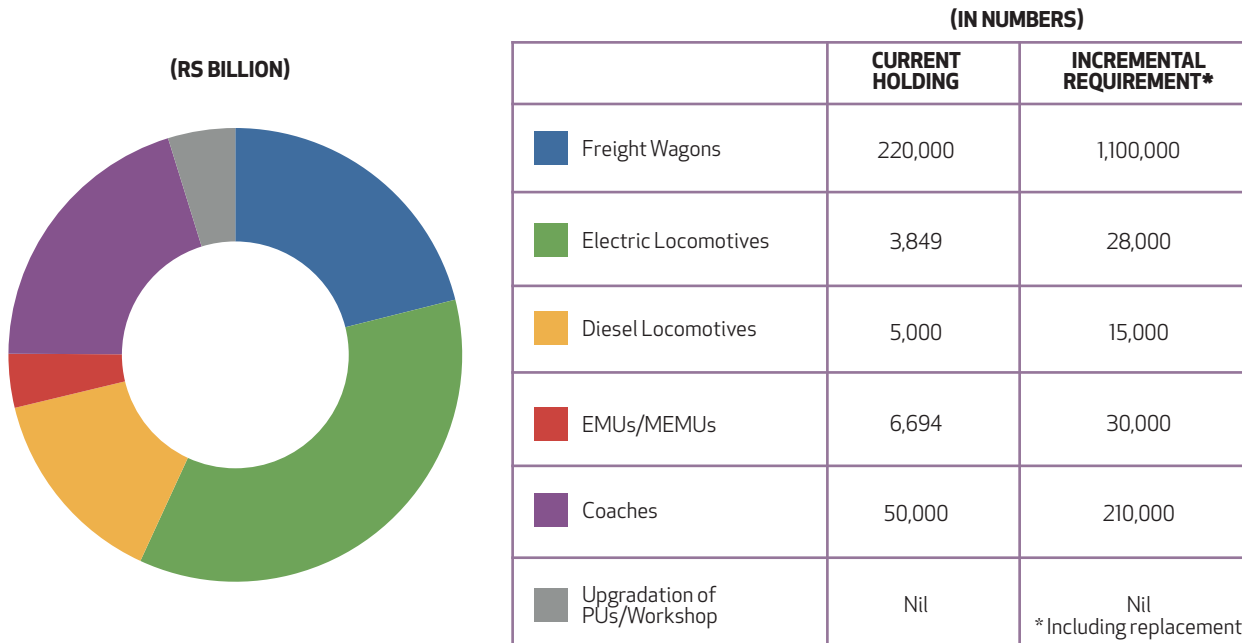
While investment for redevelopment of stations (roughly Rs 1,000 billion) and development of freight terminals (roughly Rs 500 billion) could be mobilised through private sector participation, investment in coaching terminals (around Rs 500 billion) would have to be publicly funded.

TECHNOLOGICAL UPGRADATION

In order to match the best of the railways in terms of technology and safety standards, investment would be required for upgrade of assets (track and bridges for better loading standards, relocation of structures to permit larger moving dimensions, signal and telecom, etc.), information technology and research & development. Given the prevailing security environment in India, investment would also be needed in beefing up security at stations, in trains and other railway installations. It is estimated that all these

Figure 1.18

Rolling Stock: Estimated Investment Requirement; Current Holding and Incremental Requirement



Source: Report of the Working Group on Railways (NTDPC).

works may add up to about Rs 4,000 billion over the next 20 years.

SUBURBAN TRANSPORT

Indian Railway’s network running through the country’s fast-growing urban agglomerations, including major state capitals, already carries significant volumes of commuter traffic. In cities like Mumbai and Kolkata (and to some extent, Chennai), IR’s commuter network constitutes the lifeline of suburban transport. As per central government policy, urban mass transport is now under the purview of state governments and Ministry of Urban Development. However, the existing suburban services on IR would continue to meet passenger demand. Its role will continue to be relevant despite the advent of metro rail networks that have started altering the urban transport landscape in several cities.

From the railways’ standpoint, the foremost concern stems from the operational losses suffered on these services, in addition to the capacity constraints. These services are loss-making and have become a bottleneck for running of long-distance trains and freight trains on the same tracks. They contribute roughly 53 per cent in number of passengers over the IR’s total passenger traffic; however, their earning share is only 7 per cent (2010-11).

Railway networks in urban areas were primarily built for long-distance inter-city transport. It is sug-

gested that IR should achieve physical separation of the long-distance network and the suburban network. The segregation of suburban and long-distance passenger/freight traffic is necessary for efficient provision of commuter service. A separate organisation should be created for suburban services with freedom to coordinate with state governments for connectivity/integration (Box 1.11). Modern accounting practices would ensure that infrastructure and rolling-stock resources used by these lines of business can be properly costed and charged for. MRVC in Mumbai and MMTS in Hyderabad are two successful models of financial participation and cooperation with state governments. Other states need to be engaged for similar initiatives. Viable cost-sharing arrangements need to be created for both infrastructure and rolling stock investment and management of commuter operations.

It is envisaged that over the next 20 years, IR’s share of expenditure (@ 50 per cent) in augmentation of suburban networks would amount to roughly Rs 600 billion (Rs 30 billion per annum). In addition, two elevated rail corridors using the existing right of way of railways in both Western and Central Railways in Mumbai (Churchgate-Virar and Mumbai VT to Karzat) costing approximately Rs 400 billion could be implemented through PPP along with Viability Gap Funding (VGF). Similar other projects in Mumbai and other cities will come up in future. Overall, it is estimated that an investment of the

Box 1.11

Separation of Suburban Services from Other Train Services

Suburban services could be separated from other train services. The sequencing of actions could be separation of accounting, followed by organisational separation creating suburban entities, followed by partnership with state government and private sector in SPV. Such SPV should also have the mandate for modernisation and upgradation of services at the request of state government.

State Governments should agree to finance on the basis of Peak Cash Deficit Funding by the Indian Railways similar to the funding of Phase II of the rail component of the MUTP being implemented through MRVC. SPV should enter into an agreement with IR for gradually reducing the operating losses reaching zero within a time frame of 5-10 years. SPV should be allowed to develop alternative sources of revenues through advertising rights, leasing of spaces to service providers etc. IR should get better track availability for its long distance passenger and freight trains after such upgradation.

Source: Report of the Working Group on Railway Programmes for the 11th Five Year Plan.

order of Rs 1,000 billion would be required for sub-urban transport over the next 20 years.

SUMMARY OF INVESTMENTS REQUIRED AND PHASING OF FUNDING

Figure 1.19 provides a summary of the investment required over the next 20 years (2012 to 2032) along with its phasing over the corresponding Five Year Plan periods. The total investment required over the 20-year period is estimated to be around Rs 35,000 billion¹¹. It is envisaged that bulk of the funding and project execution will take place during the 13th and 14th Five Year Plan periods (between 2017 and 2027). By the 15th Plan Period (2027-2032) most of the network capacity and modernisation works would have been completed and the spending would, therefore, slow down in the final five years.

The bottom-up assessment of the investment required has been crosschecked from a macroeconomic perspective. In 2009-10, investment in IR was 0.6 per cent of GDP. It is considered essential that the investment in railway infrastructure is ramped up to reach at least a level of 1.3 per cent of GDP by 2030 and stay at that level till 2032¹². Following this approach would imply that approximately Rs 58,000 billion would need to be invested in railways during the period 2012-13 - 2031-32, i.e. Rs 2,900 billion per annum on an average over the next 20 years¹³. The gap is explained by the fact that the Committee has been conservative on certain investment-intensive projects like HSR. Further, the Committee feels that once growth-inducing investments are made, enhanced efficiencies could bring down the need for

more investment purely from the view point of satisfying demand for freight and passenger traffic at the improved service level.

PRIORITISATION OF INVESTMENTS IN RAIL NETWORK

Given the massive investment requirements for development of the railway network, it is essential that priority is given for development of projects/routes that can quickly ease the capacity constraints or improve the operations and that have the highest impact. Further, given the high share of bulk commodities in India's freight traffic¹⁴, it is suggested that investments in railways be prioritised as follows:

- **Prioritisation of Dedicated Freight Corridors (DFCs):** As discussed in the Chapter 8 on Transportation of Energy Commodities, the Eastern DFC is likely to carry an overwhelming share of the long distance coal traffic, with its share increasing from about half currently to about two-thirds by 2031-32. Therefore, **the Eastern DFC must be given the highest priority among the DFCs, and should be completed within the 12th Five Year Plan.**

The Western DFC will carry imported coal and container traffic mostly from Gujarat to the northern and north-western states, and is already slated for completion by the end of the 12th Plan. However, because it is not as important for movement of bulk materials, we suggest that about 80 per cent of the investment be done in the 12th Plan and the remaining 20 per cent in the 13th Plan. The East-West, East-Coast and North-South DFCs will carry about

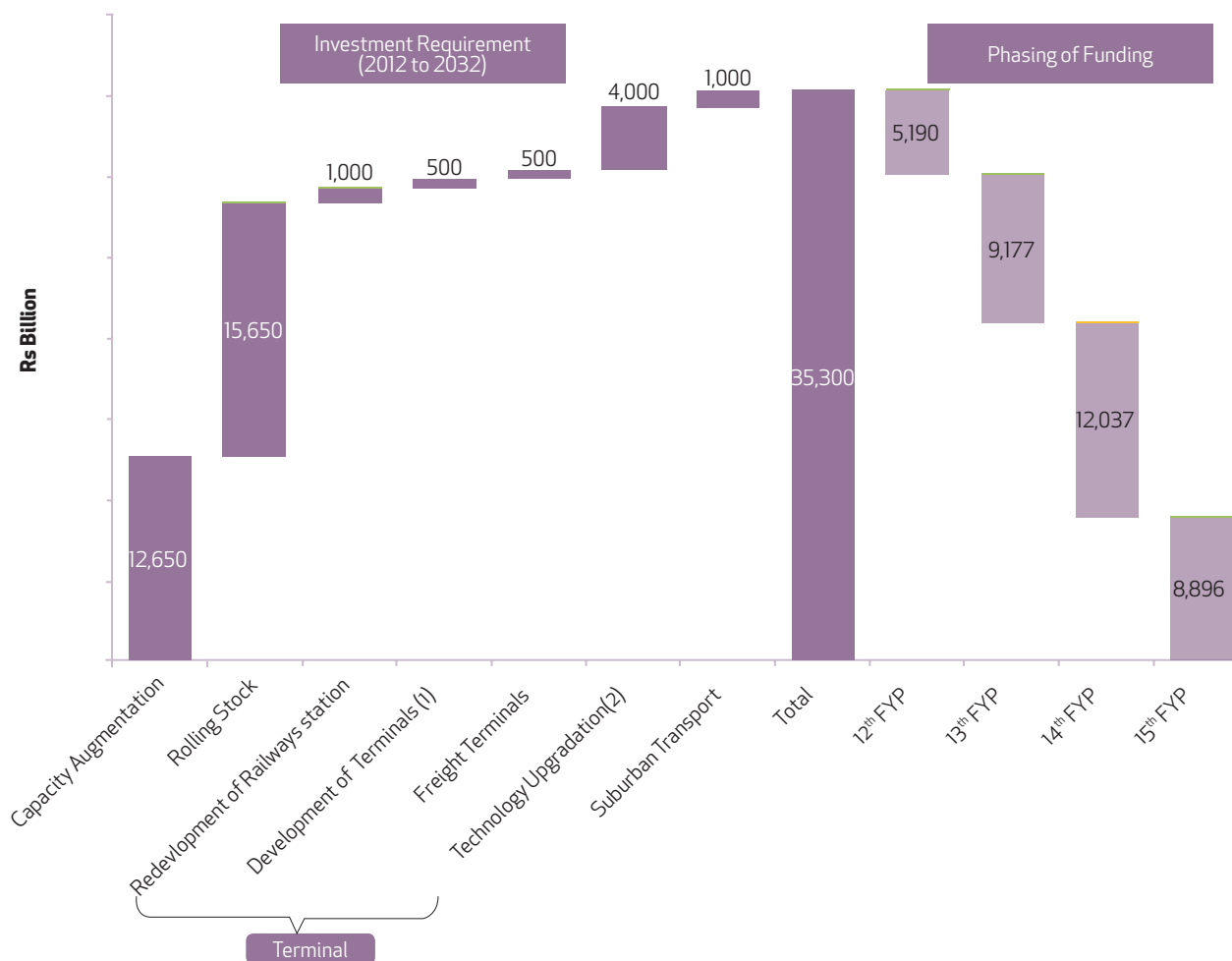
11. Rs 40,500 billion if investment in HSR and new lines is included.

12. In the year 2001, investment in Chinese Railways by the Government of Republic of China represented 0.8 per cent of the GDP. In the year 2009, this figure stands at approximately 1.7 per cent of GDP.

13. This is based on the assessment of GDP growth @ 9 per cent made by the NTDP secretariat.

14. 65 per cent of the total freight traffic is bulk in nature and 75 per cent of the traffic, in terms of NTKMs, moves over distance slabs exceeding 400 km (McKinsey: Building India: Transforming the nation's Logistics Infrastructure, 2010).

Figure 1.19
Investment Required by 2032 and Phasing of Funding



Source: Report of the Working Group on Railways (NTDPC); NTDPC.

Notes: 1. Development of coaching maintenance terminals.

2. Technological upgrade and modernisation (tracks, bridges, Signal & Telecom, Information Technology, Research & Development and other miscellaneous works).

the same amount of coal as each other but much less than the Eastern DFC and should be completed by the end of the 13th Plan. The Southern DFC, which is not important for movement of bulk commodities and is expected to carry almost no coal, can be completed by the end of the 15th Plan.

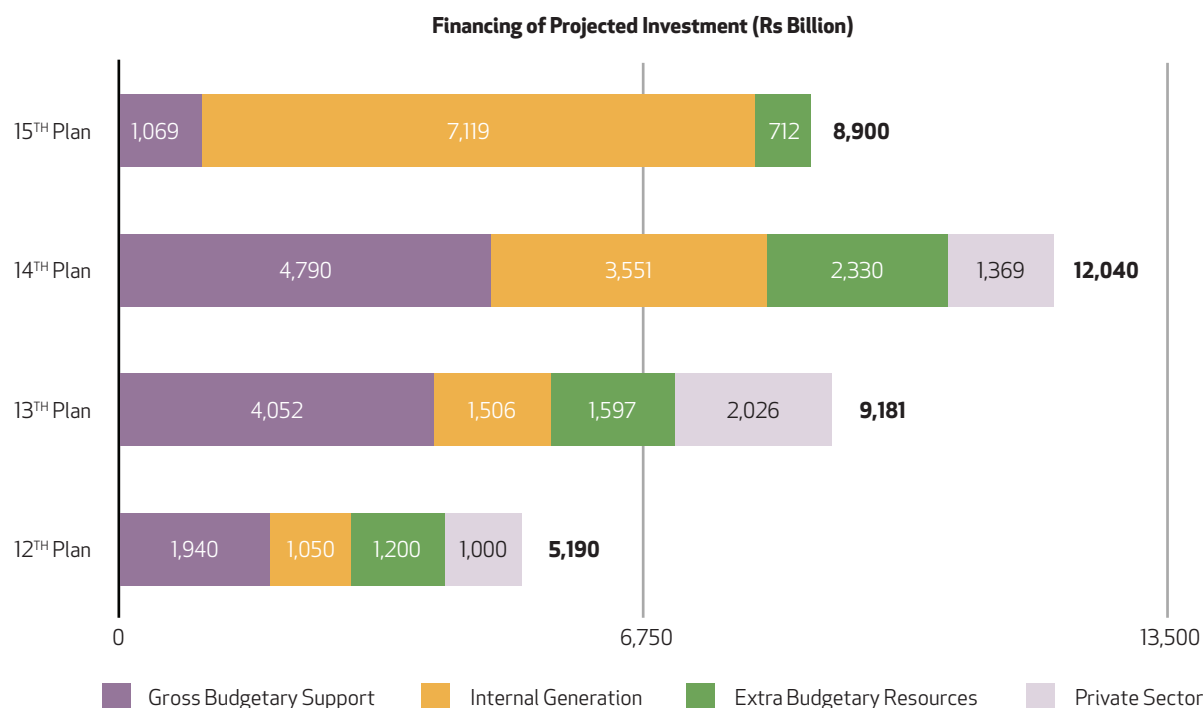
- **Construction of Eastern, East-West and East Coast DFCs must start from the eastern end:** The traffic on these three DFCs will be highest closest to the coal-fields and will decrease as coal is unloaded at successive states on the route to the furthest state. For example, the eastern end of the Eastern DFC is likely to carry coal destined for several states: Bihar, Uttar Pradesh, Delhi, Haryana and Punjab, but by the time it gets to the western part of the country, it will be carrying coal only for Haryana and Punjab, the rest of the coal having been unloaded en-route in Bihar, UP and Delhi.

This importance of the eastern end would also apply to the other DFCs for similar reasons.

Another reason for focusing on the eastern end of the DFCs is that transport of coal within coal-producing states and to neighbouring states is likely to use sections of DFCs that are short but the volume of traffic is likely to be high. Almost all the use of short sections of DFCs will occur in the eastern part of the country.

- **Critical Feeder Routes at Mines (coal, iron ore):** Feeder routes that will carry coal and iron ore from mines to the trunk routes are critical to ensure that power generation and steel production keep up with the economy's requirements. However, eight critical feeder routes for coal with a combined length of about 600 km and several other critical links for the steel industry with a combined length of about 2,340 km are awaiting completion (See Chapter 8 on 'Transportation of Energy Commodities' for a detailed list of these routes). *The total cost of these routes will be about Rs 35 billion for coal routes and Rs 117 billion for steel routes (under 3 per cent of the Railways*

Figure 1.20
Funding Sources
 [Investment in Rs Billion at 2011-12 prices]



Source: Report of the Working Group on Railways, NTDPC (2012).

budget for the 12th Plan); but with large benefits for the economy. These critical routes must be completed on the highest priority within the 12th Plan.

- Feeder routes to Power Plants within Coal Producing States:** In-state consumption of coal for power is likely to increase and much of this new capacity will come up in clusters of about 3,000-4,000 MW each. Accordingly feeder routes from the mines to the power plants will need to be provided. We estimate that such links will be about 70-100 km long and will be required to carry about 20 mtpa each. Consumption of domestic coal within coal-producing states is expected to grow at about 24 mt per year in the country. Therefore, roughly one such feeder route to a cluster of power plants will be required every year in the tri-state region of Odisha, Jharkhand and Chhattisgarh.

These links should be designed for heavy haul technology where a rake per day carries 4 Mtpa. It is likely that some of these feeder routes may overlap to some extent, with each other or the feeder routes that bring coal from the mine to the trunk route. Because each such feeder route will take a minimum of six years to complete, planning for these routes

must be coordinated with investments being planned in the power sector, and decisions for the corresponding transport investment should be taken simultaneously.

RESOURCE MOBILISATION AND SOURCES OF FUNDING

As discussed earlier, railways' Plan expenditure is financed through a combination of internal generation; money from the general exchequer extended as gross budgetary support (GBS), and market borrowings. Although it is difficult to determine the precise mix of funding sources over the next 20 years, the projections for resource mobilisation have been worked out on the basis of investment requirement of Rs 35,000 billion. In order to meet the massive investment requirement, public investment would have to play a significant role in creating the necessary capacity for growth in the initial 10 years, supplemented by borrowings (within prudent limits) and implementation of select projects through PPPs.

Figures 1.20 and 1.21 show the estimated contribution of different sources over the next 20 years. The proposed funding plan relies heavily on budgetary resources in the initial period. Internal generation is expected to pick up and contribute an overwhelmingly large share in later periods. The share of internal generation rises from about 20 per cent in the 12th

Figure 1.21
Funding Sources
 [Per cent share]



Source: Report of the Working Group on Railways (NTDPC).

Plan to 80 per cent by the 15th Plan. The share of GBS is expected to be in the range of 40 per cent till the 14th Plan and falls to about 12 per cent in the 15th Plan. Box 1.12 lists the major assumptions based on which the projections for mobilisation of internal resources have been worked out.

IR aims at mobilising over Rs 5,000 billion through private sector participation (PSP) during the 20-year period. PSP/PPP programmes may start with a few identified projects where quick wins are scored and then scaled up further. PPP mode may be tried for projects such as segments of dedicated freight corridors, elevated rail corridor in Mumbai, last-mile connectivity, high speed rail corridors, rolling stock and other service provisions, etc. PPPs and partnerships with state governments can also play a significant role in implementation of suburban projects. The projections show that if capacity is built, market share goals are achieved and rationalisation of tariff is carried out, IR would be able to finance its investments by 2027-32 mostly through internal generation with little need for reinvestment of dividends payable.

Needless to say, attainment of the ambitious growth is dependent on necessary investment in capacity augmentation and enhancement and modernisation of the network. IR's ability to implement this programme would be a critical determinant in achieving these projections.

MAJOR ISSUES CONFRONTING RAILWAYS

In order to meet the ambitious goals set for 2032, it is essential to identify and address the major issues being faced by the IR. The following paragraphs discuss the major issues confronting the network, classified under the following broad heads:

- Capacity constraints;
- Lack of clarity on social and commercial objectives;
- Safety;
- Inadequate Research & Development;
- Optimisation of land use;

Box 1.12

Assumptions for Internal Generation Projections

The projections for mobilisation of internal resources are based on, inter alia, the following assumptions:

- Rail freight traffic would grow at slightly more than 10 per cent in the first nine years and at close to 13 per cent in the next 10 years to reach around 6,500 billion NTKMs by 2032. Thereafter, rate of growth could slow down and match the rate of GDP growth. This would represent roughly 50 per cent of the country's freight transport task in that year compared to 606 billion NTKMs in 2010-11.
- Passenger traffic (PKM) will grow at close to 9 per cent p.a. to reach around 5,700 billion passenger kms in 2032 compared to 1047 billion passenger kms in the year 2011-12.
- Revenue per NTKM (i.e. the freight tariff) will remain unchanged in real terms but revenue per PKM (passenger tariff) will grow by 4 per cent p.a. in real terms to reach a level of 54.7 paise in 2030 compared to 26 paise at present. If this is done, the freight to fare ratio which is roughly 4 at present will be corrected to 2. The ratio will still not be equal or close to unity as in case of countries like France and China.
- Other coaching earnings and sundry earnings will increase 5 per cent p.a.
- Operating ratio will start at 98 per cent in 2010-11 and will improve by 1 per cent p.a. till 2016-17 and 2 per cent p.a. thereafter for the next four years to reach 84 per cent in the year 2020-21 where it will get stabilised.
- Net dividend to exchequer will grow by 10 per cent p.a. and appropriation to Depreciation Reserve Fund will also grow 10 per cent p.a. from the level of Rs 70 billion budgeted for 2011-12.

Source: Report of the Working Group on Railways (NTDPC).

- Energy conservation;
- Organisational and Human Resource issues.

CAPACITY CONSTRAINTS

A major reason why Indian Railways has suffered a steady decline in its share in freight and passenger transport is that its network is plagued by infrastructural and carrying-capacity constraints. This has forced IR to focus on bulk cargo and forego the immense opportunity for growth in non-bulk and non-train-load segments. In passenger traffic, this has meant that the supply of seats/berths has always lagged demand.

As discussed earlier, traffic flows on IR's network are highly uneven and imbalanced. As of March 2011, the BG network, though forming 85.6 per cent of the route, generated almost 98 per cent of the passenger output (PKMs) and 99.9 per cent of the freight output (NTKMs). The Golden Quadrilateral and the diagonals connecting the four major metros, viz., Delhi, Kolkata, Chennai and Mumbai (along with the east-west diagonal extending to Guwahati) constitute less than 16 per cent of the route, but account for more than 50 per cent of the passenger and freight traffic. These routes have reached over-saturated levels of capacity utilisation and at present are strained to the breaking point (Figure 1.22).

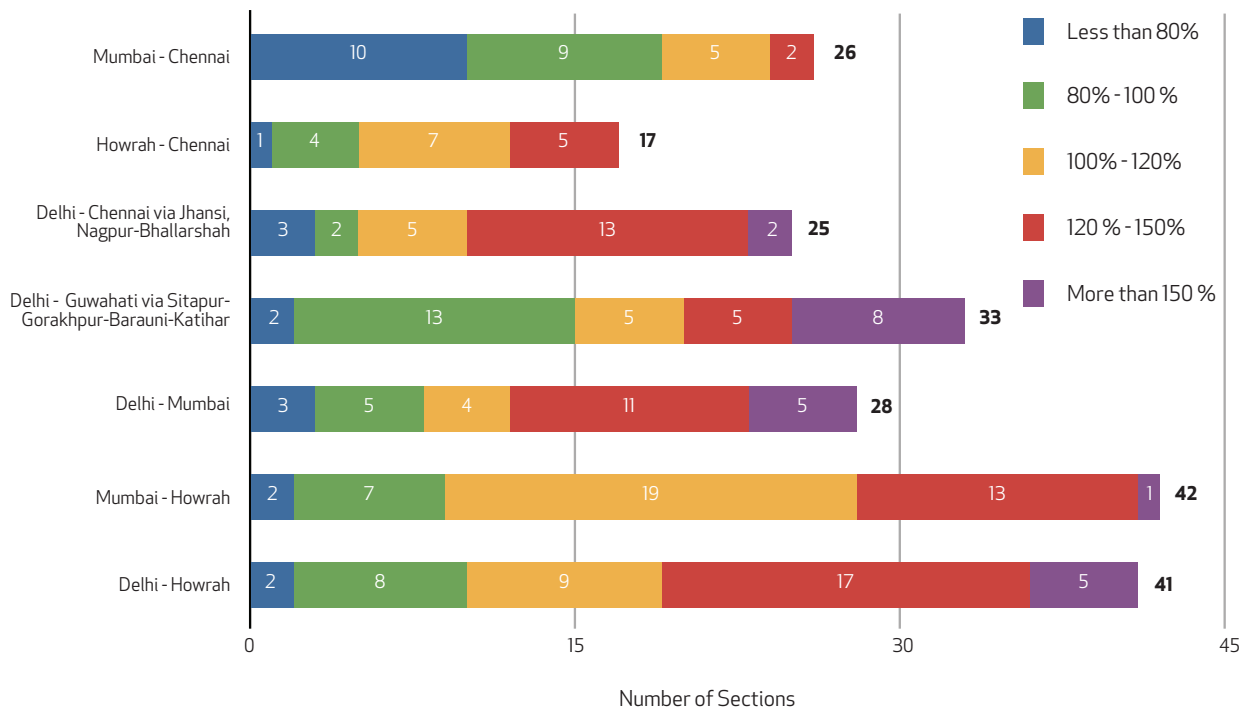
A line-capacity utilisation of 80 per cent is considered optimum as smooth operation of trains requires some slack in the line-capacity to absorb and recover from unforeseen disruptions. Figure 1.22 shows that 189 sections out of the total 212 on the high density network (HDN) have already reached saturation in line capacity utilisation. Moreover, 141 sections have already crossed 100 per cent utilisation. The unsatisfactory state of affairs extends to seven other secondary HDN corridors feeding to or distributing traffic from the primary HDNs.

Further, both passenger and freight trains share the same track capacity. *The passenger trains utilise nearly 65 per cent of network capacity but contribute to less than 30 per cent of the revenue.* While mixed traffic is beneficial for efficient use of capital-intensive railway infrastructure, such operation of mixed traffic in the face of saturation on the network imposes insuperable constraints on running of heavy-haul freight trains and high speed passenger trains, categories that can yield maximum efficiency in transport.

According to the McKinsey Report¹⁵, 'India's current infrastructure is over-stretched and even with a conservative annual growth rate of 7.5 per cent, India's freight traffic is most likely to more than double by 2020. A two-and-a-half times increase in freight traf-

15. McKinsey and Company (2010).

Figure 1.22
Line Capacity Utilisation of Sections on High Density Network (2009-10)



Source: Report of the Working Group on Railways (NTDPC).

fic in the next decade will put further pressure on India’s logistics. Moreover, investments in the current network design will only lead to increased inefficiencies and losses.’

LACK OF CLARITY ON SOCIAL AND COMMERCIAL OBJECTIVES

The report of the Expert Group on Indian Railways headed by Dr Rakesh Mohan in 2001 mentioned that ‘IR has been suffering from a split personality. On the one hand, IR is seen by the government, and by itself as a commercial organisation. It should therefore be financially self-sufficient. On the other hand, as a department of the government it is seen as a social organisation which must be subservient to fulfilling social needs as deemed fit by the government. It is now essential for these roles to be clarified’.

For long-term sustainability, railways have to be run as a business on sound commercial principles. However, the several social/national responsibilities of the IR prevent it from operating on a purely commercial basis. A large section of the population views it as a public utility and expects IR to discharge a number of social obligations ranging from sanction and construction of un-remunerative lines, provisions of suburban and other passenger services below cost, transportation of essential commodities at a loss, etc.

While IR has to fulfil both the roles, it is essential that the commercial and social roles are kept distinct and separate. The commercial part of the business has to be run with a clear set of objectives and judged by commonly accepted financial measures such as revenue, profit, return on capital, productivity of assets, etc. The social part of the business would need to meet different goals and judged by parameters such as improvement in connectivity, service level, patronage and efficiency of delivery/provision of projects/services.

It is imperative for IR that the projects taken up on social considerations must be categorised separately and their funding must come separately either through national /strategic projects or from state governments. The two categories of projects must not be mixed up and must be handled by different project organisations with different project leaders.

The lack of clarity between its public-service obligations and commercial objectives affects several other operational practices/systems of IR, such as, investment planning, project execution, costing & tariff practices, accounting system, etc., making it even more difficult to reconcile these roles. Some of the challenges imposed by these systems are:

INVESTMENT PLANNING

Investment planning on Indian Railways is politically and departmentally directed rather than

Table 1.11
Off Track: Time and Cost Overruns in Railway Projects

PROJECT	DATE OF COMMISSIONING		DELAY IN MONTHS	COST OVERRUN (PER CENT)
	ORIGINAL	ANTICIPATED		
Udhampur-Baramulla (new line)	March-01	Dec-17	201	700
Bankura-Srinagar-Damodar (Gauge conversion)	March-05	June-16	135	1162
Tamluk Digha (Line doubling)	June-05	June-16	132	270
Belapur-Seawood-Uran (Electrified double line)	March-04	March-14	120	276
Howrah-Amta-Champadanga (New line)	March-07	March-15	96	1,489

Source: Project Implementation Overview, December 2012, MOSPI, Gol.

need-driven. The consequence of political control in a departmental set up has been the extension of a number of uneconomic lines with every budget. The project approval process is loaded in favour of uneconomic, un-remunerative and socially desirable projects, rather than focus on projects which remove bottlenecks, ease congestion, and augment IR's capacity to carry traffic, or improve the productivity of operations.

For an organisation struggling with crippling capacity constraints over its most important routes, the purpose and direction of investment planning should be clear and obvious. A complete revamping of the investment planning system is required.

IR needs to shift to a programme approach from the current project-oriented approach. Plan-head wise investment approach has to be dispensed with as it distorts investment priorities and promotes departmentalism. Investment should be focused on total capacity creation including rolling stock, asset renewal, technology induction, information technology and identified investments in modernisation, etc. This should be quantifiable in terms of incremental tonne kms.

Prioritisation of projects is crucial especially since IR is struggling with a large shelf of sanctioned projects in the face of limited resources. Investment in railways has to be focused and directed towards solution of the capacity constraints or improvement of operations. More investment should be directed towards projects and activities that would remove bottlenecks and generate the greatest returns. Operationally urgent and quick pay-off projects that can ease capacity constraints the fastest (such as doubling) need to be prioritised for full funding and time-bound execution. For rolling stock, procurement must be linked to the traffic projections so as to avoid excessive procurement of rolling stock which is less in demand, or under procurement of rolling stock actually required for meeting demand.

Replacement and renewal of assets should be ensured. For this purpose, the ad hoc approach presently followed in respect of appropriation to Depreciation Reserve Fund needs to be overhauled. A rule-based approach that adequately meets the requirement needs to be put in place; and such an approach must satisfactorily provide for the replacement of fixed assets and rolling stock that bring in technological upgrade with increased productivity, efficiency and reduced outgo on maintenance.

PROJECT EXECUTION

IR has a poor track record of project execution. Several projects of IR are suffering from time and cost overruns. For example, as of October 2011, out of the total of 132 projects costing more than Rs 1.5 billion, in 101 projects the anticipated cost is 181 per cent higher than the original estimated cost. Moreover, 26 projects are having time overruns ranging from two to 213 months (Economic Survey 2011-12). Table 1.11 highlights the extent of delays and time overruns in railway projects.

Some of the major reasons for project delays are as follows:

- At present, a large number of projects are started without adequate funding and without a specified date of completion. And more often than not, they are sanctioned without adequate field investigation, followed by a detailed project report. The funds available are spread on numerous projects instead of providing adequate resources for a select few and getting those completed. As a result, every project suffers from time and cost overruns.
- Railway's project organisation is also organised on a zonal or a territorial rather than on a project basis. This further reinforces the ingrained practice and bias towards distribution of funds, rather than rational allocation of funds to projects that need to be completed on priority.
- Incentives for project teams and leaders to deliver projects on time and within budget are also absent.
- Other reasons for project delays include issues

Box 1.13

Building China's Railways

China's railways entered a new phase of development with the Mid and Long-Term Plan (MLTP) adopted in 2004 and revised upwards in 2008. It currently aims to increase the total rail network from 75,000 to 120,000 route-km by 2020. It includes construction of 16,000 km of high-speed routes, three new regional inter-city networks, new dedicated coal lines and substantial double tracking and electrification.

China has successfully managed to deliver project after project much faster than is typical of just about any other country. A project that in China might take about 5-6 years from government approval of project concept to system commissioning would, in the authors' experience, take 7-15 years in almost any other country. For example, the 1,068 km Wuhan-Guangzhou high-speed railway, started construction in 2005 and was commissioned in December 2009.

Following three factors dominate the reasons for this exceptional project delivery:

- **Single-Point Responsibility:** China's Ministry of Railways (MOR) enjoys a potent combination of: (a) the responsibility to plan, design and deliver major projects; (b) the legal and institutional power it needs to do so, and; (c) access to the operating cash flows of one of China's largest single businesses to borrow against, together with a dedicated capital fund from railway construction surcharges on freight. This heady confluence of responsibility, power and resources, has created a goal-driven culture at all stages of project delivery.
- **Strong Technical Capacity and Process:** MOR adopted the 'six in one' principle as the foundation for railway project implementation; which encompasses quality, safety, completion time, investment benefit, environmental protection, and technical innovation. Following are some of the initiatives taken across all stages of the project cycle, from planning to commissioning:
 - **Planning and Design:** The priority and time-frame for project implementation (including the budget, technical parameters, preliminary design and schedule for each project) are frozen at the point of National Development and Reform Commission (NDRC) approval. The detailed and meticulous planning and design facilitate timely implementation as there are minimal changes during construction.
 - **Procurement:** Standardisation of designs and technical specifications, administering procurement through professional tendering companies, emphasis on physical and financial capacity on contractors, tight contract award process etc. are some of the factors that assist expeditious procurement.
 - **Project Management:** MOR establishes a project management team which is delegated the funds, the design and above all the authority to implement the project. The project team remains together until the job is done and is held fully and collectively accountable. This continuity, together with significant financial incentives built into team earnings for timely delivery of the project, acts as a strong motivator of team performance.
- **The Programme Effect:** The articulation of the MLTP and its scale resulted in a programme effect. The programme effect created a whole new industry that was confident in the continued long-term development of China's railways, and led to a huge increase in the capacity of the industry, from technical institutes through to contractors, manufacturers, service suppliers and many others.

Source: China Transport Topics No. 03; Fast and Focused— Building China's Railways; World Bank Office, Beijing.

like land acquisition, clearances, shifting of utilities resettlement & rehabilitation, etc.

IR must review and adopt some of the best practices in project execution from China's railway sector, which has built an astonishing number of large and complex railway projects over the past few years (Boxes 1.13 and 1.14).

RECOMMENDATIONS

Following are some of the recommendations which should be implemented to improve the project execution on Indian Railways:

- Considering the need for massive capacity augmentation over the next 20 years, it is recommended that a separate body/organisation, partially independent of the Ministry of Railways should be set up to expedite the delivery of projects. Such a body should have greater autonomy, for example, the authority to finalise tenders for projects. Box 1.15 provides some recommendations on the institutional arrangement for speeding up capacity enhancement and project execution on IR. Here it may be mentioned that in the Railway Budget 2011-12, a Central Organisa-

Box 1.14

China's Railways' Building Skills and Knowhow to Improve Project Delivery

The short time taken for delivering projects on China Railways follows years of investment in building skills and know-how. Ministry of Railways (MOR) in China undertook years of capacity building leading up to the MLTP. For e.g., in case of high-speed passenger lines, specialised units were set up many years in advance to study and adapt technologies employed internationally such as track systems, rolling stock design, signalling and communications, and electric traction. The technologies selected were absorbed, in some cases by technology transfer agreements with foreign manufacturers, but with considerable adaptation to match China's needs.

There are six major railway design institutes in China. All except one are legally independent of MOR, though they are commercially dependent on MOR contracts, for which they compete (all are state owned enterprises). Their role typically includes route surveys, environmental assessments (sometimes with specialist environmental firms), project feasibility reports and preliminary and detailed designs.

Typically each major design institute employs about 3,000-4,000 people. This capacity together with a singular focus provides the means and the ability to produce a feasibility report within a 6-12 month time frame. In most countries feasibility studies for major railway construction projects take up to two years to specify, procure, complete and report.

Source: China Transport Topics No. 03; Fast and Focused— Building China's Railways; World Bank Office, Beijing.

tion for Project Implementation (COPI)¹⁶ was proposed to be set up with offices in Delhi, Kolkata, Mumbai and Bengaluru, each headed by an officer of GM rank. COPI was to ensure uniformity of systems/methodologies, follow the best practices and optimise on resources. It was expected to monitor and ensure that the funds allocated to different projects are fully utilised and not surrendered or diverted, and that the projects are completed in time. However, no progress has been made on the ground for setting up of the COPI. In any event, the entire issue of setting up agencies for project execution needs a review, considering that as on date, zonal railways, Rail Vikas Nigam Limited (RVNL) and Dedicated Freight Corridor Corporation of India Limited (DFCCIL) are involved in execution; a rationalisation with the objective of 'in time delivery' with massive investments contemplated is the objective.

- DFCCIL, besides handling the Eastern and Western corridors, should also be given the project execution responsibility for the other four proposed high speed corridors. Additionally, it may be given the responsibility for capacity augmentation of the entire high density network. DFCCIL should be given more autonomy - instead of the Chairman Railway Board (CRB) acting as the part time Chairman of DFCCIL, the Managing Director should be made the Chairman.
- Funding should be earmarked for each project before it is taken up for time-bound commis-

sioning. The concept of financial close (as in case of PPP projects) should be introduced for each project.

- The project managers should continue in their positions till successful completion of the project, and they along with the project teams should be held accountable for timely completion of the projects.
- Performance-linked incentives should be provided and penalties for failure should also be imposed. Best practices in contract management should be identified and introduced.

ACCOUNTING SYSTEM

Being a ministry of the GoI, the accounting system of the Indian Railways is organised to cater to government budget and control functions and does not follow accounting standards as prescribed in the Companies Act 1956. The Acworth Committee (1920-21) recommended the separation of railway finances from the general exchequer, because the budget of IR formed a significant portion of the total government finances and there was considerable unease in keeping it as an integral part of the overall budget. The separation of railway finances (effected in 1924) and the creation of an in-house accounting machinery, however, also intended to ensure flexibility in the financial administration of the railways as a commercial undertaking.

The accounting and financial systems of IR have been reviewed by various committees since 1924, and each one of them have found the existing system unsatisfactory and affirmed that the original intention

16. Speech of the Railway Minister, introducing the Railway Budget 2011-12.

Institutional Arrangement for Speeding Up Capacity Enhancement on IR

IR carries out its construction projects through a construction wing which works in every Zone under the General Manager. The budget of this department varies from Rs 2.5 billion to around Rs 10 billion, a bulk of which goes unutilised for tailor made reasons which are endemic on every Zone. The annual budget of IR for such construction works is around Rs 300 billion and for achieving the growth envisaged for the year 2032, we may have to upscale it to Rs 1,000 billion. At present, works on IR are sanctioned at current rates and token allocation of funds is made till the project takes off. After this, the political sagacity compels allocation of funds to as many projects as possible and speedy completion becomes the first victim of the process. There is an urgent need for an organisational restructuring - both functionally as well as administratively.

Following are some recommendations:

- All works having a budget outlay of more than Rs 5 billion (or may be Rs 10 billion) should be entrusted to an 'Authority', which may be called the '**National Railway Construction Authority**' (NRCA).
- The NRCA would be an umbrella organisation having a national level presence, fully autonomous, and having extensive powers for award of works. It will award contracts for construction, supervise quality of construction and would ensure smooth flow of funds for the works to continue unimpeded. Repayment of loans, tax-free bonds etc. would be channelised through it.
- The projects should be taken up as EPC contracts with fixed time-outlay and watertight fund provision. No time over-run and cost over-run may be allowed.
- Sanction of the project should be for the cost as envisaged till its completion so that no further sanctions are necessary.
- The chief of the NRCA should be selected through Public Enterprises Selection Board (PESB). He may be allowed to have his team selected through another well-defined process of selection to scout and attract best talents available in the country.
- The NRCA will have a multi-disciplinary structure to ensure that all decisions relating to every facet of construction are taken under single roof. It may engage Advisors of international and national repute in various fields to assist it in discharging its duties in the best possible manner.
- Various agencies instituted by the Railway Ministry for expediting construction like DFCCIL, RVNL etc. may either be transferred under NRCA's control or allowed to participate in the bidding process for award of contracts for construction to have better competition.

The establishment of NRCA can go a long way in ensuring speedy completion of important Railway capacity enhancement projects.

Source: NTDPC.

of commercialisation has not been achieved. IR has continued to be run like a government department rather than as a commercially oriented enterprise, and its accounts are not in line with normally used commercial conventions recommended by ICAI. The financial results of IR, as presented to Parliament and for public information, include a Statement of Revenue Receipts and Expenditure (Profit and Loss account) and a Balance Sheet, however, the contents of these documents depart substantially from the disclosure standards that are expected of going concern entities. Box 1.16 highlights some of the anomalies and limitations of the present accounting system of IR.

It is imperative that IR's accounting system is revamped for the following reasons:

- *IR requires a substantial infusion of funds from sources other than budgetary support*
- *IR must focus on financial discipline and targeting so as to ensure generation of sufficient*

and internal surplus over the next 20 years, in order to undertake the envisaged capacity augmentation to improve the modal share of IR in freight transport. In order to access capital from external sources, it is essential to recast IR's accounts in a format that is readily interpretable by lenders and investors. The present system of accounting does not give a true and fair financial picture of IR. For example, the balance sheet does not show depreciation provisions and as a result it is impossible to ascertain the net block of IR. Similarly, there is a no clear separation between revenue and capital, or between 'top of the line' and 'below the line', and the data is presented in a way in which one cannot ascertain labour productivity or employee cost.

surplus for investing in capacity enhancement. The present system of accounting gives little information on how to control costs, as accounts are kept on 'heads of account' rather than on the basis of activities. The accounts do not provide a clear segregation on the cost and revenue of various activities and services. As a result, computation of the losses on various activities and the contribution made by various services is difficult. It is critical for any business entity to gain an appreciation of its profit centres to manage them better. *IR's accounting system should be revamped to accurately reflect the cost of various activities and throw light on train-wise and route-wise profitability to aid managerial decision-making.* This would help assess the usage charge of infrastructure and rolling-stock resources and also in accurate allocation of overheads. It would also help in computation of the cost of operation of trains and services and appraisal of profitability of various business lines.

- It is important for IR and the Railway Board to know how the organisation would fare if its accounts were presented as per the Indian GAAP followed by companies incorporated under the Companies Act.

Only with a credible accounting system, IR can manage the commercial and social parts of the business on a rational footing. The commercial part of the business must be managed to yield a surplus for reinvestment in the system.

RECOMMENDATIONS

Following are some of the recommendations which should be implemented in a mission mode approach to ensure timely completion:

- It is important that the accounts of the Railways should be recast into a company account format in line with the Indian GAAP so that the true state of Indian Railways finances become clearer. It would provide activity-based revenue cost data meeting generally accepted accounting standards. Such an accounting reform would facilitate assessment of profitability of different operations, routes and sections and accounting separation of various lines of business and services within the lines of business. The principles for identification and allocation of joint costs and methodology for computation of operation and maintenance cost should be possible. Such recasting is feasible since it has already been done on a pilot basis first by the Railways Capital Restructuring Committee, 1994 and by the 2001 Expert Group.
- Codification of these principles and development of an IT-based system to provide timely compilation of accounting and budget state-

ments should be attempted. This would facilitate determination of cost of infrastructure services and the operational activities with an acceptable degree of exactitude and help decisions on rational pricing on the basis of train-wise, route-wise profitability analysis.

The need for Accounting Reform has been recognised and accepted in the Railway Board. An Accounting Reform project was initiated and sanctioned in 2004-05. However, the work has made a tardy progress and the final results are far off yet. There is a need to hasten and complete the process.

If the railways undertake the kind of accounting reform proposed, it will become much easier to make informed decisions on the areas of investment where budgetary support is to be given. For example, budgetary support could be provided in three parts. First, support could be provided to the commercially justified remunerative projects which are part of a strategic plan. Second, where the government mandates new lines for social considerations, funds could be provided on a grant basis. Third, budgetary support could also be provided for the projects/schemes that result in immediate benefit by way of increased throughput for greater efficiency or cost reduction or on the grounds of safety considerations, that is, implementation of a 'modernisation plan'.

COSTING & TARIFF PRACTICES

Costing and tariff practices have had a long-term impact on the expenses and earnings of IR, and the ability of managers to assess and control the same.

Current costing practices are based on a top-down approach, using total cost at an aggregate level, and are not based on activity-level costing. However, disaggregated information is necessary for pricing. Further, since the costs on railway networks are largely common (or joint) to different services and a substantial part of the costs are fixed, the economies of scale can be fully exploited only with large traffic volumes. This renders a certain degree of cross subsidisation between services and/or between segments of the network unavoidable. This has matched well with the conventional theory of price discrimination which provided the basis for differential pricing (differing price elasticities) and hence cross subsidisation.

Historically, passenger services have been incurring losses at the aggregate level, made good by cross-subsidy from freight services. The cross subsidisation exists at different levels¹⁷:

- a. **Cross subsidisation between freight and passenger services:** here it must be understood that passenger service is a direct consumption item while freight service is an intermediate item. Cross subsidisation here has involved imputing a lower weightage to surplus generation by producers vis-à-vis

17 AITD (2000); Report of the Working Group on Railways (NTDPC).

Limitations of The Present Accounting System of IR

Limitations of the Statement of Revenue and Expenditure (Profit & Loss Account):

- Inadequate disclosure in respect of the in-house manufacturing effort: IR engages in manufacturing operations through its major production units and by virtue of a large number of engineering and repair facilities where substantial production effort is carried out. The P&L Account does not disclose the value of the manufactured goods, the disposal on completion of production or internal capitalisation.
- **Depreciation Reserves:** The amounts allotted to Depreciation Reserve Fund (DRF) tend to be fixed in an ad-hoc manner and are not determined by financial principles that would withstand close scrutiny. Also, the reduction in the value of total assets post-depreciation is not shown.
- **Contribution for Pension Payments:** The procedure adopted by IR with regard to pensions is what is normally termed as 'pay as you go', a system that no commercial enterprise operating in a market environment can sustain for long. For an organisation such as IR that spends over half of its revenues on staff related expenses, the practice precludes reliable long-term financial projections and prudent financial management itself.
- **Utilisation of Net Revenue:** The residual of gross traffic receipts after meeting working expenses and allocation to the two funds (DRF and Pension Fund) is termed 'net traffic receipts'. The sum of this figure and the miscellaneous transactions is called 'net revenue'. In a manner of speaking the 'net revenue' corresponds to IR's gross profit. The 'net revenue' (in IR terminology) is allocated for - (a) Payment of the interest on loan capital to GoI, representing the servicing cost for IR's capital-at-charge (termed 'dividend' in Railway accounts); (b) anything that remains after payment of 'dividend' is transferred to other Railway funds (Capital Fund, Development Fund, Safety Fund) that are used for IR's plan expenditure.

Though the Companies Act lays down that no dividend shall be declared until provision is made for depreciation on fixed assets of the company, IR, being governed by separate provisions, has been paying out dividend to the government on the capital-at-charge without observing this requirement.

Further, the Capital Fund was set up in 1992 with the original objective of financing schemes like gauge conversions, doublings and route electrification which were insufficiently funded by amounts received as 'Budgetary Support'. In practice, much of this investment has gone to finance projects that are not remunerative.

Limitations of the Balance Sheet:

- **Unreliable estimate of capital stock: IR does not maintain a register of assets.** The balance sheet does not separately show gross block, depreciation and net block. All assets are shown at original costs, and further capital expenditure incurred from year to year is capitalised. The leased assets are not shown separately. Fixed assets are not classified in terms of opening balance and additions/deletions for the year.
- **Depreciation Reserve Fund:** The sum of the amounts that are appropriated annually to the DRF are not shown in the balance sheet but only the so called 'improvement element' is reported. Because of this, there is no depreciation provision in the application of funds and, hence, no net block. This has two implications. First, IR overstates its profit by under-provisioning for the amounts earmarked for the DRE. Second, and much more serious, IR has grossly over-capitalised itself.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways.

surplus generated by consumers from a lower passengers tariff.

- b. **Cross subsidisation between different classes of passenger traffic:** part of the problem is that the willingness to pay by common people is often deliberately underestimated. It should be easily possible to segment the market for the passenger services by

appropriately differentiating the product and accordingly attempting to recover the cost of services. This would help delimit size of the market requiring effective subsidy.

- c. **Cross subsidisation across the zones:** This is partly because of the composition of traffic. The passenger component is substantial in many of the zones, and as a result the losses

Figure 1.23
Average Realisation on Freight and Passenger and Fare-to-Freight Ratio



Source: White Paper on Indian Railways 2009, Yearbook 2010-11, Yearbook 2009-10.

cannot be compensated by profit from the freight segment.

However, cross subsidisation has resulted in high tariffs for freight and diversion of traffic to non-rail modes involving higher use of scarce resources of the society. In other words, the market response to the cross-subsidy may also lead to sub-optimal allocation of resources. The extent of effective cross-subsidy needs to be measured to determine an optimal level of cross-subsidisation.

Figure 1.23 shows some of the parameters that emphasise the cross-subsidisation on IR. The average realisation for PKM at 26 paise is one of the lowest in the world while average freight revenue per NTKM is one of the highest in the world, second only to Germany (White Paper on Indian Railways, 2009). On the passenger side, the range between the lowest charged and the highest charged classes is wide (from 13 paise per PKM to Rs 1.06 per PKM). Fare to freight ratio that roughly captures the balance between the passenger fares and freight tariffs is also one of the lowest in the world for Indian Railways (0.27) compared to France (1.3) and China (1.2). *The above clearly argues for the need for rational non-distortional prices for freight and passenger services.*

Freight Pricing: The freight rates are commodity specific and yet costs are not available at commodity level. The logic for pricing based on the ability of the commodity to bear is an age-old principle in the Railway industry. In recent times, however, most railways worldwide have moved away from a commodity based pricing mechanism to either a haulage costs based rating or individual contractual agreements based on the shipper's requirements. With the separation of the infrastructure owner and the service

provider, a new market for access to paths and pricing of paths, has developed. Thus at this stage Indian Railways has to make a choice - whether to continue to rely on a regime of commodity based pricing or to move to newer methods of pricing.

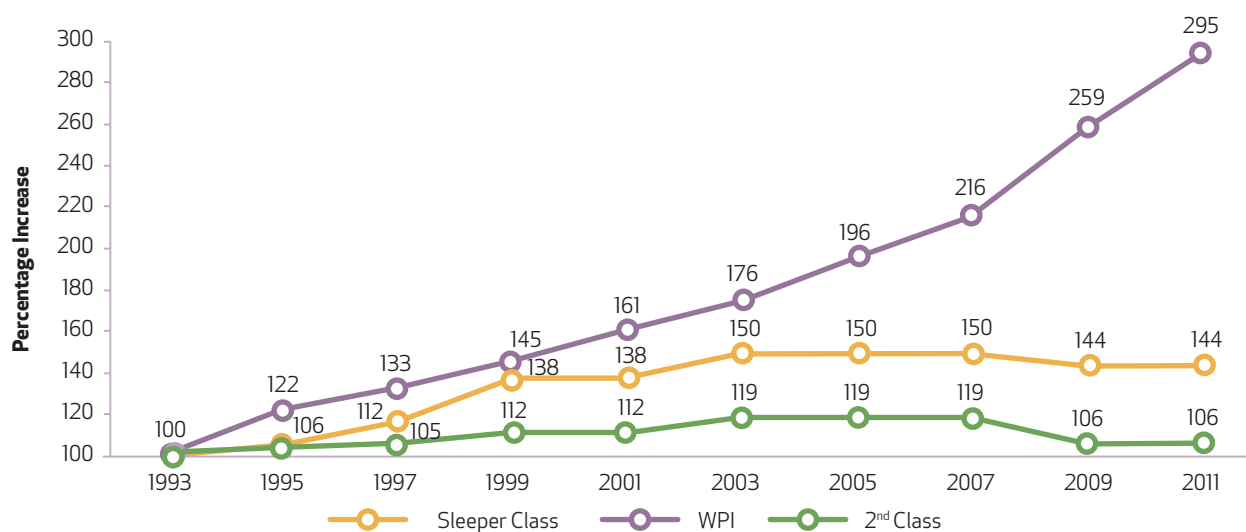
There are two key aspects of commodity based pricing:

- a) **The ability to correctly discern what the commodity can bear:** In recent years, in the case of iron ore for export, the railways were able to informally peg the price to the export price and thus align itself to the market. However, for other commodities there are no such readily available proxies which the IR can use to gauge the market. It would probably not be unfair to state that the IR priced itself out in the case of POL products when pipelines were being considered as an alternative.
- b) **To know the cost of transportation:** As discussed above, in IR costs tend to be aggregated and averaged in a manner that does not clearly indicate the commodity specifics. Greater emphasis on disaggregated costing methodologies is important in a commodity based pricing regime.

The commodity based pricing has undergone a lot of rationalisation over the last decade or so. IR used to have a large number of classes for freight tariff. These have been compressed and the range between the lowest charged and the highest charged classes has narrowed considerably. Following are some of the recommendations for freight pricing:

- For loose bulk commodities, the current regime of pricing is a good approximation and provides the right incentives. Non-price

Figure 1.24
Increase in Wholesale Price Index and Passenger Fares (1993-2011)



Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee).

factors are critical for obtaining a better share and in the case of certain commodities the Railways should consider long-term contracts to bring about greater efficiency in investments.

- For bagged bulk commodities and non bulk commodities, the current regime is too centralised and therefore slow to respond to market changes. Service-based pricing to attract traffic in these industries would help.
- For the growing sector of containerised goods, greater research on the method of calculation of efficient haulage charges is required.

Passenger Pricing: As mentioned earlier, the Indian Railways, in addition to their commercial role as a provider of transport services, is also seen to have social/national responsibility to link people and places and facilitate rapid and low cost movement across the country. To meet this objective the Railways provide several services at prices that are below the cost of provision and this has virtually governed most of the policy decisions often away from the most economically sound ones.

The pricing of passenger services is a highly political issue and not dictated entirely by efficiency considerations. These services are heavily under-priced even though their economic costs are high. International comparison with China, Germany, Japan and Russia shows that the pricing of passenger services is a politically and socially sensitive issue not only in India, but even internationally. However, all these countries impose some statutorily-backed fare regulations on their passenger rail services (Box 1.17). All four countries also receive

some form of Government financial support for passenger services (summarised in Annex 1.3).

India's average passenger yield, adjusted for parity of purchasing power, is about 11 per cent of that of Japan, 15 per cent of that of Germany and Russia and 37 per cent of that of China (Box 1.18). In India, the passenger fares have not been increased in last 10 years and their present level is ridiculously low even as compared to the bus fare (Figure 1.24). However, in the context of limited resources available to the Railways, sustainability of the existing subsidy regime needs to be seriously considered. Further, shift in the relative price of passenger rail travel vis-à-vis other modes of travel affects the modal choice of many passengers, and thus inflates demand and creates pressure to add more services.

For the year 2010-11, losses from passenger services are estimated to be around Rs 165 billion, with a total revenue of Rs 258 billion (Figure 1.25). The suburban segment incurred a loss of Rs 23 billion (roughly 125 per cent of its revenues), whereas the non-suburban segment incurred a loss of more than Rs 141 billion (roughly 60 per cent of its revenues). These losses are due to a combination of factors including non-revision of passenger fares for the last 10 years, running of poorly patronised trains, operations of trains on uneconomic loss-making branch lines and running of slow, stopping passenger trains for short distances. Ticketless travel also contributes to losses to some extent. However, train-wise disaggregated analysis is presently not available.

Looking at the financial situation of IR, with its operating ratio rising to 95 per cent over the last two years, it is imperative that IR designs a realistic

Box 1.17

Tariff Regulation: Government Control in Varying Measures

Germany, Russia, China and Japan all impose some statutorily-backed fare regulations on their passenger rail services. This clearly reflects the high social and political sensitivity of passenger transport fares in all the countries, irrespective of political system.

China lies on one extreme of the fare regulation spectrum, with *highly centralised government control of passenger railway prices.* Under the 1991 Railway Law, passenger fares proposed by the Ministry of Railways must be approved by the State Council via its macro-economic management agency. All China Rail tariffs as well as those of inter-Provincial joint venture and local railways are included in this regulation. Special pricing policies also exist for certain train categories such as high-speed train services.

In Japan, ministerial approval of Japan Rail maximum fares is required and companies are obliged to adopt co-ordinated structures that enable smooth inter-ticketing and travel across Japan. In considering fare proposals the Transport Minister must take into account the level of fares in relation to efficient costs plus ‘appropriate’ profits. The Minister can also order changes if the charges discriminate against certain classes of passenger or if the charges may cause ‘unjust’ competition against another railway. In addition to general co-ordinating mechanisms in setting and administering rail fares, when transfer between companies is required companies are obliged to set fares to take account of the total distance and to taper the fare accordingly.

In *Russia*, the Federal Tariff Service (FTS) has *strong regulatory powers but has granted much greater freedom* and now effectively only regulates non-premium tariffs. FTS is responsible for regulating charges and fees for services which involve transport of passengers by long-distance trains on Russian domestic routes, whether by RDZ or private operators.

Even in *Germany*, where there is substantial commercial freedom to set fares, *the government has formal approving authority for general fare increases* (and changes in conditions of carriage) on long-distance routes. The Bundestag (parliament) also regularly scrutinises rail fare proposals. As this is based on the principle of undistorted competition and commercial operations, in practice fares are generally approved as a commercial decision of the companies involved and the practical regulation is very light. The systems are summarised in the table below.

COUNTRY	PASSENGER FARES REGULATION
China	Heavily Regulated. State Council has complete regulatory powers, but has granted more flexibility in recent years to reflect wider range of service qualities.
Russia	Regulated. Federal Tariff Service regulates domestic long-distance fares but since 2009 has granted independence of pricing for premium travel classes and trains.
Japan	Lightly Regulated. Maximum fares must be approved by Minister of Transport, and companies must coordinate fares and ticketing systems to allow smooth transfer between companies at non discriminatory fares.
Germany	Very lightly Regulated. Federal government must approve conditions of carriage including standard fare but policy is that long-distance markets should be regulated by competition. Suburban/regional fare regulation differs by concession.

Source: Passenger Railway Institutions and Financing, Paul F. Amos, 5 September 2011.

Box 1.18

India's Unyielding Railways: International Comparisons of Passenger Revenue Yield

Within any railway there are *large variations in cost recovery between the different types of passenger service* and different routes. Unlike the transport of rail freight, the costs of a passenger train movement for which the train-consist has been determined is almost independent of the number of passengers using it. Railway management should therefore attempt to match the size of trains to the general level of demand offering. However, fluctuations in traffic by day of week and time of day mean that there is often much unused capacity even with very efficient operations. Highly peaked regional/suburban services tend to have much lower yields/carriage-km compared to costs, relative to less peaked inter-city services.

When other things are equal, *railways in developing countries face an inherently greater challenge in attaining cost recovery* in passenger rail services. The ratio of rail operating costs between efficient railways in high-income countries to those in low-income countries is relatively small, say 2:1 at most (as the cost of many of the inputs, fuel and spare parts are the same in both cases). However the equivalent ratio for income per head may be up to 10:1 and this income disparity affects the affordability of fares. *Railways in developing countries must therefore attract a healthy proportion of higher income earners within the country into their customer mix.* The economics of rail technology depend on delivering the superior travel benefits the technology can offer to those who can afford it, and pricing accordingly. The more successful a company is in providing an attractive travel product at healthy fares the more scope it has for offering cheaper fare options at the margin. As incomes (and costs) increase, positioning the main role of passenger railways as cheap transport for low income groups is a recipe for mounting financial stress.

India's average passenger yield, adjusting for parity of purchasing power, is about 11 per cent of that of Japan, 15 per cent of that of Germany and Russia and 37 per cent of that of China. When adjusted for parity of purchasing power, Japan (which receives no revenue subsidies) has the highest farebox yield, Germany and Russia have lower yields but of a mutually similar order, while China has the lowest yield of the four countries. The table below provides a comparison.

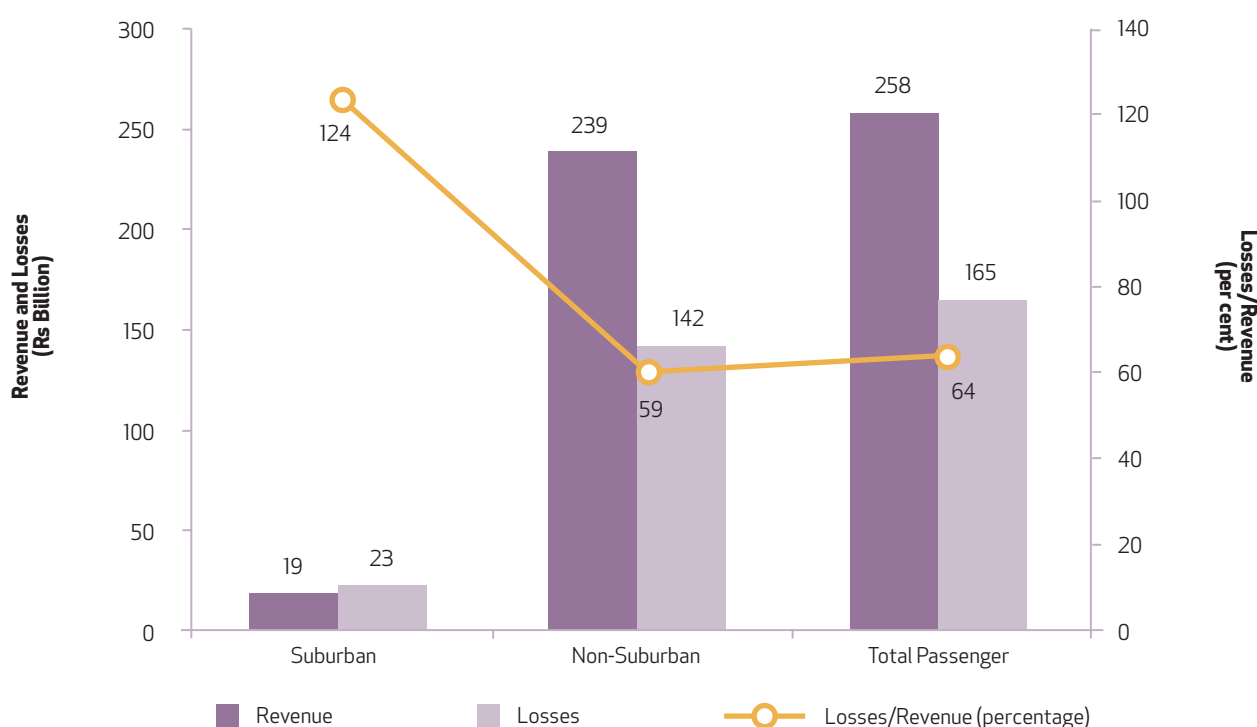
AVERAGE PASSENGER FAREBOX YIELD PER PASSENGER-KM (2010)			
COUNTRY	YIELD/PASS-KM (LOCAL CURRENCY)	YIELD/PASS-KM (USD)	YIELD/PASS-KM (USD PPP)
China	CNY 0.15	0.024	0.038
Germany	EUR 0.09	0.126	0.087
Japan	JNY 14.61	0.190	0.132
Russia	RUR 1.50	0.052	0.094
India	INR 0.26	0.006	0.014

Notes to table:

1. The yields are brought to a common basis of USD rates using currency exchange rates as of 30 August 2010.
2. Because of the disparity in income levels between countries, the results are also shown in USD adjusted for Purchasing Power Parity. Rates used for purchase power parity conversion are as recommended by World Bank for 2010 values.
3. German estimates are for DB long-distance and DB Regional combined but exclude non-fare income from concession contracts.
4. Japanese estimates are for JR companies and private companies combined.
5. Includes both RZD (Russian Railways Corporation) and its subsidiary Federal Passenger Company, plus jointly-owned regional/suburban passenger companies. Excludes revenue shortfall income provided by the Russian Government.

Source: Passenger Railway Institutions and Financing, Paul F. Amos, 5 September 2011.

Figure 1.25
Passenger Business: Revenue and Losses (Rs Billion) and Loss Ratio (Per cent)



Source: Ministry of Railways

programme of fare revision to reduce/eliminate the losses on passenger services. The government may subsidise up to 25 per cent of the costs of suburban railways considering that mobility is an important element in the ability of the people to access better economic opportunities and a large number of people use the suburban network on a daily basis. Box 1.19 gives a simplistic programme for fare revision in order to eliminate the losses on passenger services.

Tariff Setting: Under the provision of the Railway Act, 1989, fixation of freight and fares is the prerogative of Ministry of Railways. Railway Rates Tribunal (RRT) and Railway Claims Tribunal are the two dispute settlement bodies on IR. However, their mandates and powers are limited to complaints against Railways relating to discrimination and excess charging, etc. by the freight customers and disputes arising out of claims settlement respectively. Therefore, in the current scenario, *the Ministry of Railways plays the dual role of the provider and the regulator of these services*. In other sectors like power, telecom, major ports, etc. an independent regulator has been established to regulate tariffs.

Efficient prices or non-distortionary prices are typically the outcome of a highly competitive market or an effective regulator. Indian Railways operates in a highly competitive environment in several freight and passenger segments, but in a few others, it faces little or no competition. Further, the externality effects are not reflected in the prices. In the absence of competition, a

regulator is often instituted to set prices based on true costs revealed by the monopolist or near monopolist. *The need for setting up a Rail Tariff Authority has often been stressed in this context.*

It is recommended that an independent Rail Tariff Authority (RTA) should be constituted at the earliest to fix tariffs for both passenger and freight. The Expert Group for Modernisation of Indian Railways, headed by Dr Sam Pitroda, had also recommended the need for setting up such a Rail Tariff Regulatory Authority in order to provide a level playing field to all stakeholders. Setting up of the RTA could depoliticise the process of setting the passenger fares, which were not raised for close to a decade, until recently, due to populist pressures. It would also help in expansion of the PPP programme of the Railways and could also arbitrate disputes and grievances of freight customers and PPP concessionaires.

Further, an institutional mechanism to gather, analyse and use cost data and market intelligence needs to be established. With computerisation of freight and passenger transactions, Railways now have a huge database. This needs to be used to gain insights on the behavior and preferences of passengers and freight customers. This would need expertise and it is not possible to recruit and retain such expertise within the Railway Board on a sustainable basis. This can perhaps be done through a CRIS project to design and install a decision support system for the rates directorate.

Box 1.19

A Simplistic Programme for Fare Revision

Three alternate scenarios for fare revision have been examined, based on two factors:

(a) Subsidy provided for Suburban railways, and (b) timeframe.

Common Assumptions across the three scenarios:

- Revenue and loss figures for the year 2010-11 have been used as the base to calculate the required revision in fares.
- The proposed fare revision under the three scenarios has not been adjusted for inflation; i.e., it is assumed that in addition to the proposed revision under the three scenarios, the fares will also be adjusted proportionately to change in costs.

	SUBURBAN	NON-SUBURBAN
Revenue (Rs Billion)	18.7	239.2
Loss (Rs Billion)	23.2	141.7
Loss /Revenue (Per cent)	124 Per cent	59 Per cent
SCENARIO I		
Subsidy (on cost)	0 Per cent	0 Per cent
Timeframe for fare revision	10 Years	
Required increase in revenue to incur 'zero loss' ^{**}	124 Per cent	59 Per cent
Fare increase each year (per cent)	8.4 Per cent	4.8 Per cent
SCENARIO II		
Subsidy (on cost)	25 Per cent	0 Per cent
Timeframe for fare revision	10 Years	
Required increase in revenue to incur 'zero loss' ^{**}	68 Per cent	59 Per cent
Fare increase each year (per cent)	5.3 Per cent	4.8 Per cent
SCENARIO III		
Subsidy (on cost)	25 Per cent	0 Per cent
Timeframe for fare revision	15 Years	
Required increase in revenue to incur 'zero loss' ^{**}	68 Per cent	59 Per cent
Fare increase each year (per cent)	3.5 Per cent	3.1 Per cent

* The figure is adjusted based on subsidy provided.

Source: NTDPCC.

With accounting reforms it should be possible for the RTA to determine the costs of operating uneconomic railway lines built on social consideration and losses on passenger services on account of subsidised tariff-setting. The government will have the option of closing operation of such lines or services or raising tariff. Alternatively, the government could decide to provide subsidy as determined by the authority.

SAFETY

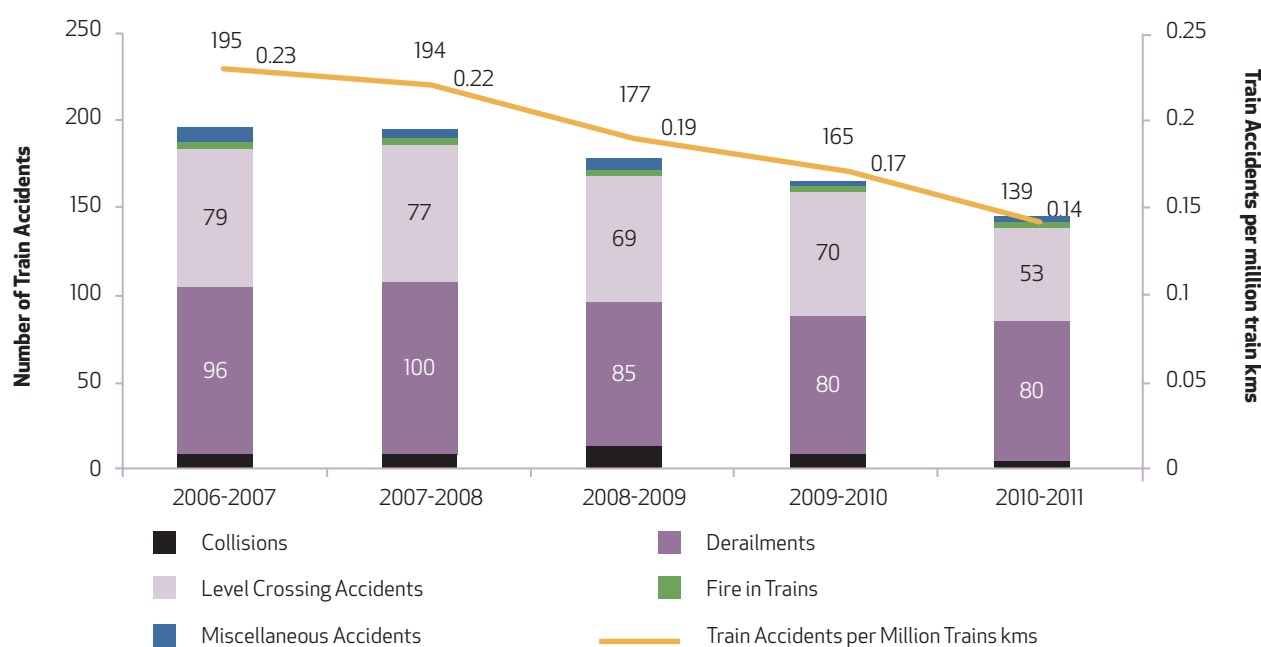
Safety on IR has always remained a pressing issue. Concerned with the high rate of railway accidents in India and to prepare a roadmap for improving safety on IR, the Ministry of Railways appointed a High

Level Safety Review Committee¹⁸ under the Chairmanship of Dr Anil Kakodkar. The Committee examined all technical and technology related aspects in connection with safe running of train services in the country and highlighted many discrepancies in current safety practices caused by poor maintenance of equipment and installations, lack of trained staff, and inability to adapt to new technologies. The Committee submitted its report in February 2012 and noted that:

“There is no practice of independent safety regulation by an independent agency separate from operations. The Railway Board has the unique distinction of being the rule maker, operator and the regulator;

18. HLSRC (2012).

Figure 1.26
Number of Train Accidents and Accidents per Million Train Km



Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee).

all wrapped into one. Commissioners of Railway Safety though considered to be the safety watchdogs have negligible role at the operational level. Compliance of safety standards set by Railways for themselves are often flouted for operational exigencies.’

The Commission of Railway Safety, working under the administrative control of the Ministry of Civil Aviation of the GoI, deals with matters pertaining to safety of rail travel and train operation and is charged with certain statutory functions as laid down in the Railways Act (1989), which are of an inspectorial, investigatory and advisory nature. The most important duty of the Commission is to ensure that any new Railway line to be opened for passenger traffic should conform to the standards and specifications prescribed by the Ministry of Railways and the new line is safe in all respects for carrying of passenger traffic. This is also applicable to other works such as gauge conversion, doubling of lines and electrification of existing lines. Commission also conducts statutory inquiry into serious train accidents occurring on the Indian Railways and makes recommendations for improving safety on the Railways in India¹⁹.

A review of the statistics for safety on Indian Railways shows a sustained reduction in number of consequential train accidents per year despite phenomenal increase in volumes of traffic, both passenger and freight. The total consequential train accidents have come down from 195 in 2006-07 to 141 in 2010-11.

The consequential train accidents per million train kilometre have also shown a steady decline from 0.23 to 0.15 during this five year period (Figure 1.26). Derailments and accidents at level crossings constitute account for roughly 90 per cent of the total accidents. Moreover, roughly 85 per cent of accidents on IR are alleged to be on account of human failure²⁰.

Though the data of consequential train accidents over the years has been showing a declining trend despite phenomenal growth of traffic, safety on IR still remains a matter of great concern as the total casualties have increased from 610 to 844 during the same period. Further, close to 50 per cent of the casualties happen due to accidents at level crossings, while collisions account for about 25 per cent of the casualties (Figure 1.27).

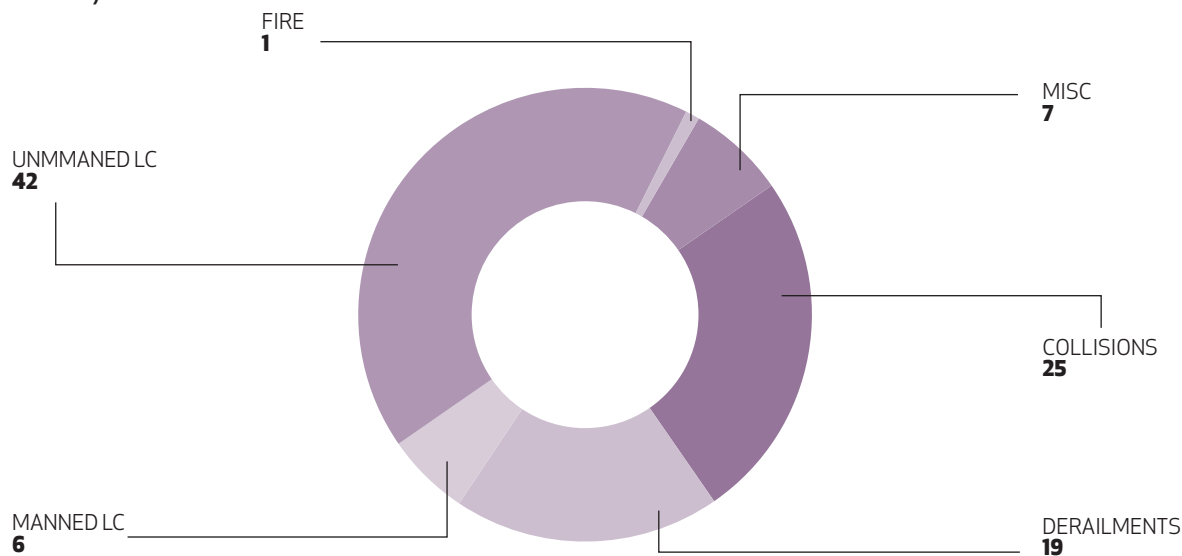
The report of HLSRC also highlighted that the data maintained in the Railway Board office pertains to only those train accidents with apparent consequences. The casualties due to trespassing of railway track, or for other reasons connected with railway infrastructure and casualties of IR’s own staff while on duty, though quite substantial, are not included in the statistics of train accident related casualties. Total deaths and injuries among railway passengers and others on railway property not considered as ‘consequential’, or due to a fault of the Indian Railways, were reported to be around 25,900 for 2011²¹. Further, during the period 2007-08 to October,

19. <http://civilaviation.gov.in/CRSS/Commission%20of%20Railway%20Safety.html> (accessed September 23 2012).

20. HSLRC (2012).

21. National Crimes Record Bureau (2012).

Figure 1.27
Total Casualties in Train Accidents (2006-11)
 (Per cent)



Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee).

2011, about 1,600 railway staff were killed and 8,700 injured while on duty²².

The committee also gave detailed recommendations for enhancing safety on IR, some of which are summarised in Box 1.20.

RECOMMENDATION:

- **Establish a National Board for Rail Safety** which is independent of the operational agencies to avoid conflict of interest. The CEO of the Board should be of a rank of Secretary to the GoI and should report directly to the railway Minister. The Board should be staffed by professionals who have career opportunities and working conditions similar to professionals working in IITs/CSIR laboratories. It should also have an adequate funding mechanism. The Board will also conduct statutory inquiries into train accidents occurring on the Indian Railways, presently being conducted by the Commissioner of Railway Safety. Further, with the setting up of the proposed Board, the institution of Commissioner of Railway Safety may not be necessary and it may be merged with the Board (an amendment to the Railway Act would be necessary in this regard). The terms of reference can incorporate the recommendations similar to those included in the report submitted by the Dr. Kakodkar Committee (2012) on railway safety.
- Establish/strengthen Safety Departments within operating agencies (at different levels Railway Board, Railway Regional

headquarters) for ensuring day to day compliance with safety standards, studying effectiveness of existing policies and standards, conducting safety audits, collecting relevant data, etc. These departments must employ 50-60 per cent professionals with expertise in the relevant area of safety, and 40-50 per cent of the staff could be on deputation from the field.

- A railway safety policy with measurable indicators for evaluation for a five year and ten year period must be announced before the end of 2015. The policy should cover all injuries and fatalities associated with railway property.
- Reform data collection and analysis procedures for traffic accidents in consonance with international practices at different levels: National broad-based data, detailed survey systems for fatal cases, sampling systems for medical data, etc.
- Establish five to 10 multidisciplinary safety research centres at academic institutions.

INADEQUATE RESEARCH & DEVELOPMENT

Research & Development can be a significant source of competitive advantage. However, Indian Railways has not been on the frontier of developing or innovating railway technology. A comparison of the technologies employed on IR with the best that is available or in use on other railway systems shows that IR has lagged behind its peers the world over. There is a gap of a few decades between state-of-the-art technology adopted (in construction, mainte-

22. HSLRC (2012).

Select Recommendations of High Level Safety Review Committee

Following are some of the key measures recommended by the Committee to improve safety:

- **Independent Safety Regulation:** There is no practice of independent safety regulation by an independent agency separate from operations. A **Railway Safety Authority (RSA)** should be set up as a statutory body independent of Indian Railway Board under the Government. The Authority shall have a separate budget fully funded by the Ministry of Railways and shall be backed by a full-fledged Secretariat. The Institution of Commissioner of Railway Safety should be merged with RSA and should be strengthened and empowered. Role of Commissioner of Railway safety should be withdrawn from the routine clearance of proposals from the railways such as changes in Plans, Working Rules, etc. which consume lots of his time.
- Financial health of IR has great bearing on the safety standards. Passenger fares have not been increased in the last decade during which many passenger carrying trains were introduced on the existing overloaded infrastructure. This has strained the infrastructure way beyond its limit and all the safety margins have been eaten up pushing Indian Railways to a regime of adhocism in infrastructure maintenance. **The Committee strongly recommended to stop such practice of introduction of new trains without commensurate inputs to the infrastructure.**
- Line capacity has been severely constrained due to introduction of more and more trains over the years. No technical aid is yet available to run trains during foggy weather which adversely affect train operations during winter season of 2 to 3 months in northern India. **The Committee recommended adopting an advanced signalling system based on continuous track circuiting and cab signalling, similar to European train control system Level-II on the entire trunk routes of about 19,000 route kilometres within 5 years.**
- Casualties in accidents at level crossings are a matter of concern. Moreover, level crossings are also a drag on train operation limiting line capacity. **The Committee, therefore, has recommended total elimination of all level crossings (manned and unmanned) within 5 years.** Construction of limited height sub-ways, Road under Bridges (RUB) and Road over Bridges (ROB) should be taken up in mission mode and traffic blocks should be generously granted.
- With the introduction of long formation of trains running at moderately high speed of 110 to 120 kmph, it is recommended to stop production of ICF design coaches and completely switch over to manufacture of LHB design coaches immediately.
- There is a severe shortage of well trained staff. There are several vacancies in critical safety positions. All the vacancies of supervisors and staff in safety category should be filled up in a time bound manner say within 6 months.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee).

nance and operation, and different kinds of transportation solutions such as high-speed, heavy-haul operations) in the developed railway systems and Indian Railways.

At present, Research, Development and Standards Organisation (RDSO), Lucknow, is the sole R&D organisation of Indian Railways. It functions as the technical advisor to the Railway Board, zonal railways and the production units and is entrusted with:

- Development of new and improved designs;
- Development and adoption of new technologies for use on Indian Railways;
- Development of standards for materials and products specifically needed by Indian Railways;
- Technical investigation, statutory clearance, testing and provision of consulting services;
- Inspection of critical and safety items for rolling stock, locomotives, signals, telecommunications equipment and track.

Infrastructure with RDSO: Presently, RDSO has a number of laboratories equipped with research and testing facilities for development, testing and design evaluation of various railway related equipment and materials. **Although these laboratories have achieved their limited purpose, these are not state-of-the-art.** Moreover, facilities for development of model/prototype research work and workshops equipped to support such research work do not exist at RDSO.

Collaboration with Research and Academic Institutions: RDSO has also forged strategic links with premier technical institutions and organisations, such as the IIT at Kanpur, Roorkee, New Delhi and Chennai, the Defence Research and Development Organisation (DRDO), and the Central Scientific Research Organisation (CSIR). A Memorandum of Understanding (MoU) has also been signed with IIT, Kharagpur to set up a Centre for Railway Research

Table 1.12
Staffing Pattern of RDSO

STAFF	SANCTIONED STRENGTH	ACTUAL ON ROLL	MODE OF RECRUITMENT
Group 'A'	212	192	By deputation of officers from Zonal Railways/promotion from Group 'B'
Group 'B'	166	140	By promotion from Group 'C'
Group 'C'	2,101 (Tech-1,553; Non-Tech.548)	1,612 (Tech.1,141; Non-Tech.471)	RRB/Compassionate Ground
Group 'D'	870	505	RRC/NER & Compassionate Ground

Source: Report of the Working Group on Railways (NTDPC).

at Kharagpur for developing next generation railway technology for Indian Railways.

Despite existing laboratories and strategic alliances, RDSO has not been able to fully achieve its objectives and Indian Railways is mostly dependent on imported technology. RDSO's role has largely remained restricted to facilitating adoption of imported technology by Indian Railways, standardisation of design specifications and development of indigenous sources for import substitution. Some of the main factors that have impeded RDSO's emergence as the R&D spearhead of IR are:

- Bright and talented technical personnel with exposure to global technological trends are required for research. Such technical expertise is not available with RDSO. RDSO is mainly manned by railway officers and their knowledge is limited to railway operations as they exist. Railway officers are undoubtedly required to bring relevant domain knowledge and clearly define research areas but beyond that their skills are of limited use for research, development or innovation. Table 1.12 shows the current staffing pattern of RDSO. It shows that the top-echelon of RDSO is manned by officers on deputation from Zonal Railways and most of the staff of RDSO is recruited at relatively low-level.
- RDSO postings are not considered very attractive by many railway officers. Even the railway officers who are sent on deputation to RDSO stay there for short tenures. The limited expertise or exposure gained by them is also lost and no institutional capacity gets built.
- RDSO lacks research labs with state-of-the-art equipment. It is also hamstrung by the government procedures in procurement of research and testing equipment.
- Workload on account of vendor development has increased manifold in the recent past. As a result, registration and approval of vendors consumes a considerable part of the time and

resources at the disposal of RDSO, adversely affecting its R&D work.

The High Level Safety Review Committee (2012) also examined the present state of functioning of RDSO and noted that:

'Research Design and Standards Organisation, which is the present apex technical wing of Indian Railways, is highly constrained due to several reasons. This has hampered the ability of the system to internalise new emerging technologies and indigenous development has not progressed consistent with today's needs.'

Box 1.21 highlights some of the observations of the HSLRC about the present research eco-system on IR. The major recommendations of the HSLRC on the proposed research eco-system on IR are summarised in Box 1.22.

Recognising the role and importance of research and technology in meeting the goals set out for IR, the **Indian Railways Vision 2020** document of Ministry of Railways noted that:

'We must establish one of the worlds' most advanced research and development capabilities for transfer and indigenisation of technology and breakthrough innovations. For meeting these objectives, the Research, Design and Standards Organisation (RDSO), CRIS and other technical bodies of the Indian Railways would be revamped to enable them to work with clear mandates and deliverables. R&D will be integrated with the core of Railways operations.'

It further suggested that:

'A conscious strategy to mitigate the risk of obsolescence and continuously stay ahead in technology race would be put in place. This would be achieved by fostering close linkage between RDSO, functional levels of railway administration and intellectual resources at premier technology institutes like IIT and

Present Research Ecosystem (Observations of High Level Safety Review Committee)

- RDSO, in its present form, is largely discharging its role as a support organisation for operational network of Indian Railways in terms of inspection and testing, coordination between vendors / suppliers and operational units, marginal improvement of systems / sub-systems etc. RDSO also carries out the work of development of design and specifications of systems and sub systems, audit of vendors and their approval and inspection of critical items related to operation and safety. *There is, however, no semblance of any original research or technology development initiative and the general style of functioning is around customisation of designs of vendors to suit the requirements of Indian Railways.*
- *Poor empowerment of RDSO in forwarding the sanctioned area of work within the budgeted amount was also brought to the notice of the committee.* It was informed that RDSO was dependent on zonal railways in awarding the contracts for trial projects of RDSO which cause delay.
- *There is hardly any permanent cadre of scientists or officers at RDSO to carry out the R&D work.* The officers at the senior positions such as EDs, Sr EDs and Directors are drawn from the zonal railways on deputation basis. These officers go back to the zonal railways after completion of their term of 3 to 5 years or on promotion. *RDSO-specific recruitment is done only at the subordinate level on permanent basis.* After converting the status of RDSO as a zonal railway, even this recruitment has come to a halt. These subordinate employees are not able to go beyond JAG level.
- The committee had detailed presentations and interactions on Technology Mission on Indian Railways (TMRS). *It is observed that though this was a good effort on the part of RDSO and IIT Kanpur, the role of industry was very limited.* This was perhaps due to the fact that there was no incentive to the industry. Their efforts in association with IIT Kanpur and RDSO were not going to be rewarded in any way as the procurement of the product was through open tender. *IPR policy of Indian Railways was not conducive for promotion of this academia-industry-railway partnership.* This led to the unwillingness of industry partners to participate actively. *Thus, despite the best intentions and reasonable success on the development front up to trial demonstration stage, the process of technology transfer could not be carried out successfully.*
- *It must be mentioned that a certain element of ownership and independence in railway engineering is necessary in India.* If there is a tendency of over independence on suppliers and vendors and if the equipment procured is in the form of a black-box then certainly the organisation is at the mercy of vendors time and again. This is certainly not a safe scenario. The specifications of the equipment as well as the technological know-how should be owned as well as controlled firmly by Indian Railways. Development of technology as well as indigenous vendors is necessary.
- In order to improve the technology of rolling stock, motive power equipment, track system and other assets, it is essential to invest continuously in applied research and technology development. *This perspective is singularly absent in the present scenario.* In case of nuclear and space agencies, the backbone of research and development is as strong as the operational wings of these agencies. It is because of this that the country is able to achieve a level of independence and excellence in these areas.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee).

NITs and research laboratories of CSIR and DRDO along with targeted investments in R&D. *In 10 years' time, IR would be transformed from a net technology importer to technology exporter.'*

RECOMMENDATIONS

Establish Railway Research and Development Council: Presently, functioning of RDSO is reviewed by a Governing Council which is headed by the Min-

ister of Railways; Chairman and Members of the Railway Board are Members of the Council. The Council is required to interact with RDSO at periodic intervals. It has been, by and large, dysfunctional and is not playing the role it was envisaged to. As suggested by the High Level Safety Review Committee, the Governing Council needs to be replaced with an apex body called 'Railway Research and Development Council' (RRDC). RRDC will be chaired by an

Proposed Research Ecosystem (High Level Safety Review Committee)

The High Level Safety Review Committee proposed the establishment of a new architecture of research and development under the overall guidance of an **apex body called Railway Research and Development Council (RRDC)**, which is recommended to be established for this purpose.

Apart from the RRDC, the research eco-system is conceived of the following three wings:

- **Research, Design & Standardisation Organisation (RDSO)**
- **Advanced Railway Research Institute (ARRI)**
- **A set of Railway Research Centres (RRCs)**

Following paragraphs summarise the role of each of these:

- **RRDC:** The RRDC will provide overall guidance as well as resources for the railway research eco-system in India. The council will also provide a perspective plan of research and development in view of the safety considerations on one hand and the technological solutions on the other hand. The RRDC will be chaired by an eminent technologist / scientist of the country reporting to the Railway Minister. It will have three members from the Railway Board and three members, one each from academia, research establishments, and industry associations (CII, FICCI etc). The Director General (DG) of RDSO and the Director General of the proposed ARRI shall also be members of RRDC.
- **RDSO:** Indian Railways should strengthen RDSO and make it more efficient organisation with respect to the work of design standards, inspection, testing and technical support to zonal railways. It should be restructured and empowered to perform the assigned task. It will have linkages with ARRIs and RRCs. Further, the committee recommends enhancing the powers of DG/RDSO to improve its functioning:
 - Full autonomy with financial powers to function within the sanctioned budget.
 - To award consultancy contracts of enhanced value up to Rs 10 million in each case against the present delegation of Rs 3 million in each case. Powers for awarding MOU/Consultancy Contract should also be extended to benchmarked organisations in India and abroad like AAR, TPCI, UIC, etc.
 - Full powers to award Consultancy Contract once sanctioned by the Board for values more than Rs 10 million each and there should not be any further need of sending the proposal to the Board.
 - Full powers for placement of developmental order within lump sum Budget Grant of RDSO irrespective of cost. This will expedite prototype and field validation for which RDSO is presently depending on PUs and Railway Board.
- **ARRI:** This organisation should be a high-end, research organisation focusing on engineering challenges in railway specific areas.
- **RRCs:** Indian Railways should establish a string of five or so RRCs. These centers should be co-located on the campuses of Indian technological academic institutions of national importance. Each center should specialise in specific areas like signalling, rolling stock, motive power, track and bridges, operations management, etc.
- **Financial support** up to 2 per cent of yearly revenue of Indian Railways should be available to support the entire research eco-system of railways in India.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee)

eminent technologist/scientist, with the Chairman and Technical Members of the Railway Board as its members. The Director General of the proposed RRDI, the Director General of RDSO and 2 Directors of the proposed Academic Centres of Excellence shall also be ex-officio members. It will also have one representative each from the academic world and research organisations. The Chairman of RRDC shall have a reasonably long tenure.

RRDC shall provide the perspective plan stretching over a reasonable period of 10 years for research and development needed for the Railways.

The budgetary provision for research and development should be adequate; 2 per cent suggested by the High Level Safety Review Committee can be a benchmark. This is a must to upgrade the research and testing facilities available presently, as also to provide the resources needed for the new RRDI, the

new Academic Centres of Excellence and the modernisation of the RDSO.

Establish Railway Research and Development Institute (RRDI): This will be multidisciplinary research organisation for applied research on current concerns and future technology development for Railways. This is in line with the recommendations of the Dr. Kakodkar committee to establish an ARRI. The proposed institute should formulate a Master Plan roughly every five years to articulate and lay down the major research areas and activities. The institute should look at establishing independent Research Wings for each of the major areas, e.g. Railway Track & Structure; Locomotives; Rolling Stock; Train Controls, Signalling and Communications; Information Technology; Energy Efficiency; Rail Environmental Research; Safety; Railway Transport and Logistics; Railway Economics, Statistics and Data.

The service conditions at RRDI should be similar to those at CSIR and the Director General of the institute should have rank and facilities similar to those at CSIR laboratories/ Secretary to the Government of India. The Director General will report directly to the Minister of Railways or the CRB. Terms of reference would be similar to those at the IITR (as recommended in Chapter 11 on Research and Human Resource Development), but with greater emphasis for applied work as per needs and requirements of Railways. The institute should target recruiting close to 300 researcher professionals (60-70 per cent permanent employees of the institute and 30-40 per cent on deputation) by the end of the 13th Five Year Plan, with a healthy mix of Ph.D. degree holders, engineers, architects, professors from national and international universities, etc. The institute should also look at organising joint researches in collaboration with various international organisations.

The RRDI should be supported by six or seven Regional Railways Institutes, which focus on the research requirements specific to their region. The head of the Regional Railways Institute should report to the General Manager (GM) of a zone. Each regional institute should target recruiting about 100 researchers within five years of their establishment. Apart from the research requirements specific to their region, these Regional Institutes would also compete among themselves for any Request for Proposal (RFP) floated by the RRDI for a research area/project.

Establish Academic Centres of Excellence: The Ministry of Railways and the Ministry of Human Resource Development must set up academic centres of excellence, or the **Railway Research Centres (RRCs)**, in at least 13 technical institutes (IITs, RECs) and at least two IIMs by 2020. It is suggested

that the number of RRCs should be scaled up to 30 by 2030. These should be in the nature of full scale research centres where faculty can interact within a sizeable group. Such centres must be of interdisciplinary nature and be established based on open competition among academic institutions by inviting proposals for the same. Each centre must demonstrate its interdisciplinary nature by ensuring that the participating scientists are drawn from two or more departments and can be established in all academic institutions including medical colleges.

The RRCs should be provided grants in aid for establishment expenses, building, facilities, laboratory, equipment etc. The level of funding would be Rs 30-50 million per year per centre. In addition to equipment, supplies, travel and research funds, the funding must include 5-10 endowed permanent Chairs and 10-20 endowed post-graduate scholarships. Each centre must work in at least 3 research areas. Also each major specialisation/activity of IR should be a focus research area for 2-3 RRCs this will promote interdisciplinary research and minimise academic corruption and monopoly. In order to attract and retain the best of scientists, the RRCs should ensure that their employment and service conditions match the standards of DRDO and CSIR labs. The RRCs should embrace progressive career advancement policies for its staff and provide a platform for the scientists/researchers to rise to the highest level and head the RRCs.

Revamping RDSO: It is recommended that the functions of the RDSO are completely redefined and actions initiated to revitalise and strengthen it. RDSO should involve itself with only technology upgradation, implementation and setting of standards; it should not be responsible for the inspection function. Workload relating to vendor development can be substantially reduced by delegating it to Production Units.

The staffing policies of RDSO need a complete overhaul to induct competent technical personnel required for research. As discussed earlier, currently most of the staff of RDSO is recruited at lower level and the top-echelon of RDSO is manned by officers on deputation from Zonal Railways. In order to build the institutional capacity of RDSO it is important that most of the Group A and B officers should be permanent staff of RDSO. Lateral induction of highly qualified technical personnel at higher levels must be allowed. Further, those from the field who have flair for research should be drawn in and absorbed in RDSO; they shall help bring in domain knowledge too. The target should be to ensure that roughly 50 per cent of the staff of RDSO comprises Group A and B officers. The recruitment of technical officers directly in group 'B' should be started urgently. A well oriented policy for promoting capable and endowed officers to group 'A' on assessing their per-

Box 1.23

Chinese Academy of Railway Sciences (CARS)

CARS is the only comprehensive research institute with multi-disciplines and multi-specialties in China Railway industry. In 2002, it was transformed from a state-owned institute to an enterprise under the direct control of MOR. Grounded in the main field of railway modernization, it has tackled considerable important and critical technological problems and has made a great deal of experimental studies focusing on railway construction and transportation. Therefore, it has gained more than 2300 scientific research achievements and 825 prizes for significant fruits of scientific research. CARS has developed technological innovative ability and core competitiveness in railway transportation over its existence for 60 years, and developed into an industrial group engaging in high and new technologies of rail transport with integration of scientific research, development, production and consultation.

It has 2468 staff and workers, among whom 606 are senior research fellows, and 701 intermediate researchers. As one of the initially approved units granting master's and doctor's degree, it has now developed into a first-level doctorate degree granting institution for Traffic Engineering and Geotechnical Engineering, 2 mobile postdoctoral centers, 6 doctoral degree programmes, and 15 master's degree programmes.

It has built the national railway test center, and has been equipped with over 40 laboratories of all specialties, and 6991 test equipment. Furthermore, it has applied and established in recent years 6 state-level innovation platforms, including

- National Research Centre of System Engineering of Railway Intelligent Transport
- State Key Laboratory for Track Technology of High-Speed Railway
- National Engineering Laboratories for System Test of High-Speed Railway
- Equipment Testing Line of Urban Rail Transit
- State Key Laboratory for Traction and Control System of Locomotive and EMU
- Service Platform for Technological Innovation of High-Speed Train.

CARS is making every effort to build the academy into a first-class research institute and to contribute more to the modernization of China Railways by focusing on research and development, and motivating both experimental tests and commercialization with innovative and enterprising spirits.

Source: <http://www.railway-research.org/Chinese-Academy-of-Railway> accessed on 16th December, 2013.

Box 1.24

Korea Railroad Research Institute (KRRI): Korea's Railway Think Tank

KRRI was established in 1996 as a railway research body in Korea aimed at developing railway transportation and enhancing competitiveness in the industry by unfolding strategic R&D activities along with railway policies. KRRI was launched with commitment to shape the nation's railway transport systems while strengthening its competitiveness in the global railway industry. As the nation's backbone research body for the railway technology, KRRI constantly seeks innovative technologies and policies to better serve the people and nation with improved railway systems.

Over the years, KRRI has expanded its international network by signing MOU with related organisations in and outside country, and has been actively engaged in collaborative research activities with its partners. As of November 2008, KRRI had signed MOU with 25 overseas organisations from 15 countries. It is also a member organisation of International Union of Railways (UIC) and International Association of Public Transport (UITP). KRRI hosts annual seminar with Railway Technical Research Institute (RTRI) of Japan and China Academy for Railway Sciences (CARS) of China where related researchers get together to exchange their research expertise and results to develop the railway technology while forming a strong bond between the countries.

(Contd...)

The organisation of KRRI is composed of 270 regular employees, about 84 per cent out of whom consist of researchers in various technology areas. The budget of KRRI for the year 2011 was around 90 million USD.

As an internationally certified testing centre, KRRI is equipped with some 350 units of advanced railway testing facilities in 6 laboratory buildings to conduct highly sophisticated testing and assessment on railway related gears, rolling stock performance and diagnosis to ensure railway safety.

Source: KRRI website (<http://www.krri.re.kr/>); accessed May 03, 2013.

formance in field as well as in academics after 7-10 years should be created.

Investments should also be made to upgrade and modernise the lab facilities of RDSO.

Presently, no procedure has been specified for taking over of patent rights from the trade. Where there is design/technology the use of which has considerable importance for IR, taking over of patent rights becomes necessary, to avoid monopoly situation and from consideration of security. A procedure for taking over of patent rights from the trade should be clearly spelt. This is not applicable for rolling stock where while importing, transfer of technology with rights is automatically provided for. However, the issue assumes importance for smaller items such as for track.

Ministry of Railways should set up a Science & Technology wing/department which will act as liaison between the field staff and the Research Institutes/RRCs, and will help in transferring knowledge to the field.

Involvement of manufacturers of railway products in R&D: The upgrade and modernisation of technology on IR can be realised by improvement of in-house R&D work and involvement of the manufacturers of railway products in R&D. Major manufacturers of railway products all over the world invest considerable resources in developing more productive, cost-effective products and systems. They need to be involved in R&D for both new technologies as well as for improvement of existing systems and products.

Setting up of new units with participation of private-sector would also be useful in ensuring technological upgrade.

Result-oriented research teams should be set up to work on specified research projects. Such teams may include participants from outside IR, including from

research/academic institutions and OEMs, contracted for the duration of the project. The research projects core team must not be disturbed till the end of the project and should have strong incentives (financial as well as others) to deliver.

R&D projects need to be identified based on operational needs and potential investment returns. These need to be supported through allocation of adequate resources. Clear-cut accountability for outcome and timely completion would need to be established and monitored through annual performance audit.

An Integrated Energy Management System needs to be set up under a separate directorate in the Railway Board. This needs to be assisted by a multi-disciplinary team at RDSO. Electrification on economic justification, induction of energy-efficient rolling-stock and monitoring of non-traction energy consumption should form part of energy management plan.

HUMAN RESOURCES MANAGEMENT

Indian Railways has the second largest workforce under one government controlled institution anywhere in the world, with nearly 1.3 million employees working under 13 departments, organised in 10 different central Group A services. The current structure encourages excessive departmentalism at the management level and often leads to priorities being set not for the organisation as a whole, but on departmental considerations.

With the continuous technological upgrade, the ratio of Group 'C' to 'D' has changed from 25:75 in 1951 to 82:18 in 2010-11, indicating a shift towards induction of larger number of skilled manpower. However, a sizeable number of unskilled group 'D' staff is still being inducted into the railways. Further, IR recruits about 20,000 staff in Group 'C' & 'D' category annually on a compassionate basis. Such staff are not comparable, skill or merit wise, to those recruited by an open competition. No other department of the GoI

Table 1.13
IR Employees (as on March 2011)

CATEGORY	NUMBER (IN THOUSANDS)	PERCENTAGE
Group 'A' & 'B'	17	1
Group 'C'	1,077	81
Group 'D'	235	18
Total	1,328	100

Source: Indian Railways Yearbook 2010-11, Ministry of Railways.

does such massive appointments on compassionate grounds.

HR functions in the Indian Railways have traditionally evolved in the context of its being in the government. HR policies and practices on IR are for the most part attuned to policies of Government of India. There is no flexibility in terms of pay and rewards as these are determined by Pay Commission set up periodically by the government of India.

Recruitment of staff in Groups 'C' & 'D' is done through the Railway Service Commissions located at several centers and to which the zonal railways and production units are attached; the zonal railways and production units too recruit staff such as on compassion grounds and for Group 'D'.

The recruitment to the management cadre (Group A officers) is done through Department of Personnel & Training (DoPT) and Union Public Service Commission (UPSC). The UPSC as of now holds three different examinations for this purpose viz.:

- **Civil Service Examination** for Indian Railway Traffic Service (IRTS), Indian Railway Accounts Service (IRAS), Indian Railway Personnel Service (IRPS), and Security Service;
- **Central Engineering Services Examination** for Indian Railway Service of Engineers (IRSE), Indian Railway Service of Electrical Engineers (IRSEE), Indian Railway Service of Mechanical Engineers (IRSME), Indian Railway Service of Signal Engineers (IRSSE), and Indian Railway Stores Service (IRSS);
- **Special Class Railway Apprentices Examination** for selecting candidates to the undergraduate programme in Mechanical Engineering at the Jamalpur Institute.

The above does not include recruitment of doctors to the Indian Railway Medical Service for which a separate examination is held by the UPSC. Inclusive of this, there are 10 structured services. Ministry of Railways is the nodal ministry for the Central Engi-

neering Services Examination and the Special Class Railway Apprentices Examination.

What are now 10 structured Group A services were originally 3 to start with in 1926; Gopal Krishna Gokhale raised the issue of Indians being given management positions in the Railways in the Imperial Legislative Assembly in 1910 and his effort fructified 14 years later with the Secretary of State giving sanction during the year 1926-27. In course of time, additional services were created for Accounts, Signal & Telecommunication, Electrical, Stores, Medical, Personnel and Security at different times, taking the total to 10.

Rail transport has two characteristics: a severely guided mode, and with controlled access. This, in turn, makes multidisciplinary inputs a must for its output. When the entire organisation is owned and managed by the GoI, proliferation of services is a natural outcome.

This is the root cause of the 'departmentalism' in the IR at the management level.

Presently, the HR function is mostly confined to the traditional role of recruitment, training and establishment matters. Though the Railway Board has the authority and power to attune recruitment and training to job requirements (in terms of skills, performance appraisal, rewards and incentives), there is hardly any effort or interest or institutional mechanism to achieve continuous improvement in HR practices, either at the Ministry's level or at the zonal level. A constant effort to review initial recruitment qualifications and upgrade training modules to reflect the changing needs for Group C staff is totally absent. And, as mentioned above, compassionate appointments done on a large scale make the situation worse. Of the multiple departments and services in IR, some manage these HR activities themselves without involving the Personnel department at Divisional/Zonal or Railway Board level. In an earlier era, Railways could attract talent by

the mere fact that it was one of the few industries in the country and railway jobs offered the security and the prestige of government service. However, to attract, nurture and retain talent in large numbers for growth in future, IR has to take a close look at its HR policies and practices.

This is particularly important in view of the large capacity expansion that is envisaged and the modernisation that is necessary in all aspects of railways' operations.

RECOMMENDATIONS

HR management would be critical to achieving the challenging goals set for IR for 2032. HR reform should proceed hand in hand with the organisational reforms. It is imperative that the 'departmental' character is rectified so as to enable the organisation to deliver on its promises and meet the expectations of the people. The focus should be on building skills and promoting and incentivising excellence at all levels. HR reforms that are carried out will need to be consistent with the proposed future corporate structure envisaged in the organisational reform of Indian Railways.

The NTDPCC has discussed the HR reforms of IR extensively and at different times. There is a consensus on the need to significantly rationalise the existing multiple services and cadres of railways. However, as on some other issues, there were some differences in views with regard to how radical the HR reforms should be. The incremental view suggests that the reorganisation may be into seven cadres rather than two as recommended below. This view in favour of seven cadres is provided in full as Annex 1.4 to this chapter.

Following are the recommendations to reform the HR practices of IR:

- The recruitment to the railway cadres of officers should be totally dissociated from the Civil Services and Central Engineering Services exam. The Special Class Railway Apprentice (SCRA) exam should be upgraded to recruit candidates, who are already graduates, to two streams of Railway Service viz. Indian Railway Technical Service and Indian Railway Logistics Service. This will also facilitate the organisational reforms proposed.
- The age limit for this exam should be 21 to 25 years with three attempts at the competition (at the most).
- On selection, the candidates should be admitted to professional post-graduate level courses of two years duration, on completion of which they should be awarded suitable Masters degree in Railway Engineering, Transport logistics or other relevant disciplines including finance and management. This would help in upgrading the technical capacity of rail-

ways staff. This post-graduate training may be carried out at the proposed Railway Institute/University or other designated reputed academic institutions in India or abroad.

- The Railway Engineering degree will encompass, inter-alia, all aspects of engineering - civil, mechanical, electrical, signalling and telecom, etc. - so that the officers have a holistic approach to the railway related issues.
- The Logistics course will prepare the candidates for railway accounting, railway operations, ratings, human resource development. It could be in the form of an MBA or an MA.
- After successful completion of their course the officers will spend one year as probationers in the field applying their knowledge to actual real-time situations - in a way learning the ropes of managing the day to day working.
- The training institute where the Masters course would be imparted should get converted into a Railway University of international standard, where railway research can be undertaken and PhD degrees awarded. It should become a centre for excellence attracting talent from every nook and corner.
- Once this process of initial recruitment is put in place, we can create a superior managerial cadre of leaders at the time of granting Selection Grade i.e., in the 14th year of service. These officers can be selected by a process of assessment at the UPSC. The leaders so selected will man the posts of Additional Divisional Railway Managers, Divisional Railway Managers, Chief Vigilance Officers, General Managers, etc. In this arrangement the Managers will have long stints unlike today when the DRMs remain in the chair only for two years and the organisation suffers the consequences of frequent changes, lack of direction and cohesion at the divisional level. This will undoubtedly benefit the organisation and a sense of direction, focus will be inculcated. This process will continue for a period of 3 to 5 years, in preparation of the corporatisation and reform of Indian Railways.
- Recruitment of highly qualified PhDs from IIMs/IITs and other science and engineering institutions in India and abroad should be encouraged for specialist functions.
- Lateral recruitment from the market for jobs in R&D, marketing, finance and HR should be considered. IR needs to transform into a smart organisation through a constant process of technological upgrade and stress on customer focused growth. This requires that personnel at all levels are recruited and trained with a view to building skills and attitudes required for attainment of the organisational goals;
- Induction of unskilled staff must be reduced and eventually eliminated altogether.
- The recruitment process has to be supple-

Box 1.25

Human Resource Management

- Install and operationalise immediately modern Computerised Human Resource Management System with data base and inventory/Resume of all present employees and skills required to meet modernisation plan.
- Reduce and gradually eliminate induction of unskilled staff
- Create and impart specialised courses in partnership with academic institutions and others especially for Vocational Education, Supervisors and Management
- Launch a series of in-service training programmes immediately
- Rationalise and consolidate multiple services and cadres without sacrificing the benefit of specialisation and business capabilities
- Offer graduate programmes in Railway technology at IITs and Railway management at IIMs
- Enable lateral recruitment from market for specialist functions
- Upgrade ICT skills of present officers and employees substantially
- Review and Restructure existing training institutions for improving ecosystem and Modernisation
- Review Railway Health System separately to meet aspirations of Railway Families and Modernisation plans
- Create a system of reward for collective performance and variable pay linked to incremental surplus generated by various units

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012.

mented by well researched and meticulously developed induction and in service training to constantly upgrade the skills of employees. The National Academy of Indian Railways (formerly known as the Railway Staff College) should be upgraded the property and its facilities should be expanded to thrice its current size. IR needs to work closely with academic institutions to devise and impart specialised courses, curricula and diplomas. Skilled workers and supervisors, recruited and trained this way would be able to meet the challenges of absorbing new technology and business orientation as IR rapidly modernises and upgrades its systems.

Modernisation of HR practices must happen and some principles regarding necessary changes have been laid down by Expert Group for Modernisation of Indian Railways (Box 1.25).

OPTIMISATION OF LAND USE

Land is a critical and scarce resource and is getting scarcer as demands on the available land mounts due to the pressure of population and development. A proper policy framework is required to preserve the land already available with railways and to minimise the requirement of land in future.

Roughly 10 per cent of the total land under the possession of Indian Railways is vacant (estimated at approximately 4,300 hectares). These are mostly

alongside the track in longitudinal strips but there are some pockets around railway stations and railway colonies also. To keep a proper account of the land resources, an exercise for identification of the vacant land and systematisation of records has been undertaken. Vacant land is primarily meant to meet developmental needs such as doubling, yard modeling, traffic facility works and manufacturing facilities (for various rolling stock and other components required by railways). If the land is not required for operational needs, it can be developed commercially by Railway Land Development Authority (RLDA) created specifically by an Act of Parliament, to generate additional non-tariff revenue for railways.

In future, railways would need to use its existing vacant land scrupulously. It would also need to acquire land for various developmental projects such dedicated freight corridors, high speed passenger corridors, new lines and doubling projects as well as for major manufacturing units and multi-modal logistics hubs. In most cases, the requirement of land would be to connect places in a linear fashion and there would be little flexibility to vary the alignment due to technical constraints like the radius of curvature, gradients, soil characteristics, river crossing etc. It may always not be possible to avoid agricultural land, forest land or tribal land. However, as construction of railway lines requires only small strips of land, the hardship and physical dislocation to the land-losers can be minimised. Wherever possible, a detour could be taken or alignment changed and taken through tunnels. At some places, retaining

As construction of railway lines requires only small strips of land, the hardships and physical dislocation of the land losers can be minimised. Wherever possible, a detour could be taken or alignment changed and taken through tunnels.

walls and breast walls can also minimise the land requirements. This would also help the environment as higher earthwork fillings and deeper cuttings not only use more land, but also disturb the environment through increased earthwork by borrowing or dumping.

Acquisition of the minimum land required for railway projects would be inevitable. In order to speed up the process, Ministry of Railways had enacted Railway (Amendment) Act, 2008 through an Act of Parliament. This Act provides for speedy acquisition of land for 'special railway projects' by nominating a 'Competent Authority' by Railways without resorting to Land Acquisition Act under which acquisition is done through land acquisition officers of State Governments. Provisions of NRRP 2007 for rehabilitation and resettlement of affected persons in a fair and equitable manner have been embodied in the new Act. However, for speedier implementation of infrastructure projects, the land acquisition process has to be based on fair compensation and consent of land-losers to the maximum extent. This, however, lies in the realm of amendment to the Land Acquisition Act for the country as a whole.

RECOMMENDATIONS

Infrastructure Corridors: Several countries have followed the concept of infrastructure corridors to optimise use of land and avoid haphazard development along these corridors. In our country also, no development is permitted within 67 metres on either side of the national highways or 30 metres of the railway alignment. Similar restrictions exist for high-tension lines and petroleum pipelines also. It is suggested that suitable directives be established whereby whenever a new transport infrastructure - rail or highway - is built, the corridor must provide for segments of the infrastructure, i.e., if a new port comes up, the rail connectivity must be in a corridor that also provides for highway, power lines, combined terminals, etc.

Schedule of Dimension (SOD) and Maximum Moving Dimension (MMD) improvement: Appropriate investments in track structure and SOD/MMD improvement (by systematically identifying constraining structures and standards and improving them) can potentially enhance the carrying capacity of existing lines and obviate the need for multiple lines and thereby conserve and economise

the use of land. Adequate research and cost benefit analysis need to be carried out on these aspects.

Redesign and redevelopment of suburban stations: Suburban stations provide an excellent opportunity for management of the precious land resources of Railways in urban areas. A standard template can be developed for redesign and redevelopment of the stations that maximises the comfort for commuters and create space for premium retail in station premises.

It must be ensured that the resources mobilised through commercial exploitation of land should not be utilised for non-remunerative/uneconomical social projects. These resources may be parked in a special fund to be utilised for modernisation initiatives of IR (e.g. modernisation fund as proposed by the Expert Group for Modernisation of Indian Railways, headed by Dr. Sam Pitroda).

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Indian Railways is one of the country's earliest pioneers in leveraging the power of information technology. Passenger Reservation System (PRS) is a highly successful example of use of information technology. Over the years, information technology also has been used for other passenger and customer related services such as Unreserved Ticketing System (UTS) and Freight Operations and Information System (FOIS).

However, system-wide use of IT has remained partial and incomplete. There is a sizeable amount of work needed to enable IT based solutions across business units. The development of compatible interfaces with the regional railway networks and major transport generating entities like ports, mines, etc., and the issues of uniformity of data formats, development of ICT standards and protocols also need attention. Use of information technology (IT) can play an increasingly important role in managing IR's huge network, infrastructure and assets. It will not only help improve efficiency and customer services, thereby contribute towards the goal of enhancing rail's share in the total transport, but also can play a transformative role in railways.

In order to reap the benefits of a single uniform IT solution that runs across Indian Railways, we must look at structural/organisational needs along with business processes and the currently available technology to create a holistic system. Currently, the Computer and Information Systems (C&IS) Directorate in the Railway Board plays the role of a CIO within the Railways. The Directorate is supported by a specialised institution called Centre for Railway Information Systems (CRIS) which is responsible for developing, implementing and maintain-

ing ICT applications under a dynamic operational environment. At the zonal railway level, there is an exclusive organisational arrangement for implementing and maintaining ICT applications in operational and commercial areas. There is a need to strengthen the C&I S Directorate at the Railway Board to prepare an enterprise-wide Master Plan for ICT application.

There is also room for improving the way the IT projects are conceived, prioritised and executed. Most of the IT projects are driven by the respective departments. Different IT solutions developed by different departments or divisions function as islands of information and do not interact with each other because there is no common platform or set of standards for information exchange. This is, therefore, a fragmented process without a single, strategic, and overarching roadmap driven by business objectives. Ideally, IR's business strategy should be the starting-point for identifying the focus areas to be IT-enabled. This approach would ensure that there is built-in synchronisation and cohesions among different respective project teams which function with a clearly defined purpose. Enterprise-wide integration will provide additional benefits because there will be greater uniformity in data formats which will permit greater interoperability and facilitate seamless exchange of information.

RECOMMENDATIONS

Given that there will be large benefits from introducing ICT solutions, we recommend that there be intensive implementation of ICT as soon as possible. A summary of the major recommendations for enablement of ICT in Indian Railways is provided below. These recommendations have been discussed in detail in Chapter 10 (Potential of Information and Communication Technology to Enhance Transport Efficiency).

a. Institutional and Capacity Building

- Computer and Information Systems (C&IS) directorate at the Railway Board be greatly enhanced as to encompass the entire gamut of ICT applications on the network;
- Centre for Railway Information Systems (CRIS) be converted from a society to a non-profit company with much greater freedom;
- Organisation(s) for operationalising ICT applications at field level be converted into autonomous bodies;
- IR Institute of Transport Management (IRITM) be entrusted with the task of human resource development

b. ICT solutions/interventions:

- ICT solutions/interventions should be developed for Demand Forecasting, Scheduling, Procurement and Contract Handling, and

Ideally, IR's business strategy should be the starting point for identifying the focus areas to be IT-enabled to ensure synchronisation and cohesion among project teams.

Office Automation.

- A comprehensive HR management system should be developed to better manage HR processes and costs as well as to allow proper tracking of skills and to gain improved efficiencies by assigning the right people to the right jobs. Such a system should also maintain an updated record of leave and entitlements, making HR management efficient and effective.

c. Long Range Decision Support System (LRDSS) Project:

- LRDSS has become obsolete and the new version has not yet been developed. CRIS has the capability to develop the required software, dovetailing the same with the operational data available with them. This tool can then be gainfully used both for long range decision making as also for operational decision support on a day-to-day basis. As such, the LRDSS project should be housed with CRIS.

d. A Comprehensive IT security framework should be developed.

INTERNATIONAL RAIL LINKAGE

Integrated transport systems at the regional level are considered crucial to facilitate regional integration and sustain the pace of economic growth in the region. Rail connectivity with neighbouring countries will foster increased economic cooperation among them and will yield not only economic but also social, political and diplomatic dividends.

In the Indian context, rail connectivity to the neighbouring countries in the SAARC region and Myanmar is important both from the economic and strategic standpoints. India is the largest member of the SAARC with 51 per cent of the surface area and 71 per cent of population. It accounts for an even bigger share of the rail network. Of the eight SAARC countries, Maldives and Afghanistan have not been considered for direct rail connectivity with India at this stage due to geographical and political reasons.

Present state of rail connectivity with neighbours: Table 1.14 summarises the current country-wise status for SAARC and Myanmar (refer Annex 1.5 for details). Historically, the rail network of the region prior to independence and partition constituted an organic system. However, in the post-inde-

Table 1.14
Summary of Present Status of Rail Connectivity

COUNTRY	STATUS OF RAIL CONNECTIVITY
Bangladesh	<ul style="list-style-type: none"> At present, railway systems of India and Bangladesh are linked to each other at five points. Three BG links are currently open for freight trains. The other two links, though in existence, lie dormant at present. A bi-weekly passenger train also runs between Kolkata and Dhaka.
Pakistan	<ul style="list-style-type: none"> Two BG links (Attari-Wagha and Munabao-Khokhrapar) are operational. Attari-Wagha route is used to run both freight and passenger services. A weekly passenger service runs through Munabao-Khokhrapar.
Nepal	<ul style="list-style-type: none"> In 2004, an ICD which also serves as a rail terminal for bulk traffic was operationalised at Birgunj and connected to Raxaul on the IR network through a new 6-km long BG line. It deals with both inbound and outbound bilateral traffic from and to India and third country traffic through Kolkata and Haldia ports. Survey for five other rail connections between the two countries has been conducted. Ministry of External Affairs has decided to fund two of these (Jaynagar-Bardibas and the Biratnagar-Jogbani lines). These have been sanctioned and taken up by IR for execution.
Bhutan	<ul style="list-style-type: none"> Bhutan does not have a railhead and is dependent on the stations on New Jalpaiguri-Guwahati BG line for its rail transportation. Gol has commissioned studies for five connections to Bhutan. Of the five, Hasimara-Phuentsoling line which will connect Bhutan to the India Railways BG network has been proposed for construction.
Myanmar	<ul style="list-style-type: none"> Myanmar constitutes the crucial missing link or land-bridge between India and South-East Asia. Rail linkages envisaged in the Trans Asian Railway project includes connections to Moreh in Myanmar from Jiribam in Manipur via Imphal. At present, work is progressing on the construction of a new line between Jiribam and Imphal.
Sri Lanka	<ul style="list-style-type: none"> India and Sri Lanka are separated by sea and there is no physical connection between the two railway systems.

Source: Report of the Working Group on Railways (NTDPC).

pendence and post-partition period, rail systems of South Asia have developed in the national context with little consideration for cross-border connectivity and interoperability or compatibility/uniformity of standards in infrastructure and equipment.

Regional and multilateral initiatives for cross border rail connectivity: Present state of rail connectivity with neighbours: Both SAARC and United Nations Economic and Social Commission for Asia and Pacific (UNESCAP) have attempted to draw a roadmap for regional and international rail connectivity in the context of SAARC and Asian region respectively. These are summarised in Annex 1.6.

Trans-continental rail connectivity as a strategic tool is being deployed to great effect by China. It has already developed transport links to the Korean peninsula, South-east Asia, Myanmar, Pakistan and Afghanistan. It is developing extensive multi-modal connectivity in India's neighborhood which is perceived in strategic circles as an act of encirclement. It has established a presence in Pakistan with a new port at Gwadar and strategic linkages through Pakistan, Iran and Central Asia. China's initiatives in expanding its rail connectivity beyond its own geographical borders have been discussed in detail in Annex 1.7 because of its overarching strategic as well as political significance for our country. In order to secure our strategic interests in the region, looking at rail linkages beyond the country's borders is not merely an option but a compulsion. Our long-term transport policy, therefore, has to take note of

and provide for solutions to the challenges posed by the Chinese initiatives in the region.

RECOMMENDATIONS

- It is recommended that Indian Railways should give top-most priority to the projects to be taken up with Nepal and Bangladesh (Table 1.15). Annex 1.8 provides the details of the railway projects that need to be taken up with other neighboring countries. Further, India should take lead in operationalising the southern corridor of the Trans Asian Railway (TAR) project:
 - Connection from Jiribam in Manipur to Tamu in Myanmar via Imphal and Moreh should be expedited.
 - The existing 201-km MG line from Lumding in Assam to Jiribam needs to be converted to Broad Gauge at the earliest (this is a sanctioned work at a cost of Rs 41 billion; work on formation, etc. is in progress and the work is likely to be completed in 2015).
 - The line from Imphal to Jiribam (97.9 km) sanctioned at a cost of Rs 25 billion needs to be completed in a fixed time schedule. Jiribam and Moreh need to be linked to Imphal.
 - Connection from Imphal to Tamu (85 km) also needs to be taken up.
 - Mahishasan (India)-Shahbazpur (Bangladesh) rail link needs to be rehabilitated and restored.

Table 1.15

Rail Connectivity Projects to be Taken Up with Nepal and Bangladesh

COUNTRY	STATUS OF RAIL CONNECTIVITY
Bangladesh	<ul style="list-style-type: none"> The old links between the two countries need to be restored for the sake of the development of India's north-eastern states as well as for the sake of better relations with our most populous neighbour. These would include: Haldibari (India) - Chilahati (Bangladesh), Gitaldaha (India)-Mughalhat (Bangladesh), Agartala (India)-Akhaura (Bangladesh) and Shahbazpur (Bangladesh)-Mahishasan (India). Radhikapur (India) - Birol (Bangladesh) line needs to be reopened to facilitate transit trade between Bangladesh and Nepal through India. Haldibari-Chilahati link needs to be restored for trade between Bangladesh and Bhutan through the Indian Territory. Agartala (India)-Akhaura (Bangladesh) connection needs to be re-established to provide the much-needed direct rail link to states like Tripura, Mizoram and Manipur to Chittagong port.
Nepal	<ul style="list-style-type: none"> Jaynagar-Bardibas (69.10 km) and Jogbani-Biratnagar (18.6 km) lines costing Rs 4.7 billion and Rs 2.1 billion respectively and being entirely funded by the government of India should be expedited. Nepalgunj Road-Nepalgunj (12.11 km), Nautanwa-Bhairahwaha (15.30 km) and New Jalpaiguri-Kakrabita (46.30 km), which have also been surveyed, should be taken up by the Government of India. Rail connectivity with Nepal assumes special importance in view of the China factor discussed earlier. China is planning a rail line between Lhasa and Kathmandu. Strategically, it would be in India's interest to construct the Birganj-Kathmandu line (160 km). The cost of this line as estimated by Pipavav Rail Corporation Ltd. (PRCL) is Rs 12.85 billion (2006). This project admittedly will not be financially viable but it will be in India's strategic interest to undertake the project at its cost if it has to preserve its preeminence in Nepal.

Source: Report of the Working Group on Railways (NTDPC).

b) Improvements in rail connectivity with neighbouring countries required on diplomatic and political considerations should be fully funded by the exchequer.

c) Customs and border-crossing: Facilitation Aspects

- In order to reap full benefits of the rail connectivity across countries, in addition to integration of physical infrastructure such as roads, railway lines, and agreed routes, etc., a mutually agreed regulatory framework for harmonisation of documentation and customs procedures and the harmonised use of electronic data interchange (EDI) is also required. Electronic data exchange under a synchronised system needs to be evolved to enable expeditious clearance at the border.
- Inter-country connectivity for trade, transit and trans-shipment should be able to seamlessly use more than one means of transportation: air, water (sea and/or river), rail or road. Simplified procedures like through-bill-of-lading or combined-transport-bill-of-lading can be introduced to facilitate this.
- Inter-change of rail traffic between India Pakistan, Bangladesh, and Nepal is governed under the bilateral agreements. Bilateral agreements need to be reviewed for operationalising all such intra-regional corridors that would carry third country traffic and transit across another country on its rail network. The current bilateral agreements have to be revised

to a trilateral or multilateral agreement for such through intra-regional rail movements.

- Measures like visa-free travel between countries, single-point customs and immigration checks, etc. are also required to usher in a regime that will facilitate seamless transportation across countries.

ENERGY CONSERVATION

Energy constitutes roughly 24 per cent of the working expenses of Indian Railways. IR accounts for close to 2.3 per cent of the country's total electricity consumption (for example, IR utilised more than 16 billion kilowatt-hour (kWhr) electricity in 2010-11 out of the total estimated electricity consumption of 694 billion kWhr²³). Therefore, it is imperative that IR follows a proactive energy management and energy efficiency policy to reduce its energy consumption in both the traction and non-traction systems.

IR's energy consumption has been increasing over the years. During the period 2004-09, electricity consumption for traction and non-traction has increased by 21 per cent and 14 per cent respectively. In the same period, total GTKMs hauled by electric locomotives increased by 29 per cent. Increase in electricity consumption can be attributed to increase in traffic and general services electrical loads. Similarly, diesel consumption for traction and non-traction purposes has increased by 11 per cent and 35 per cent respectively during the same period, while the total GTKMs hauled by diesel locomotives increased by 16 per cent. The high growth rate of diesel consump-

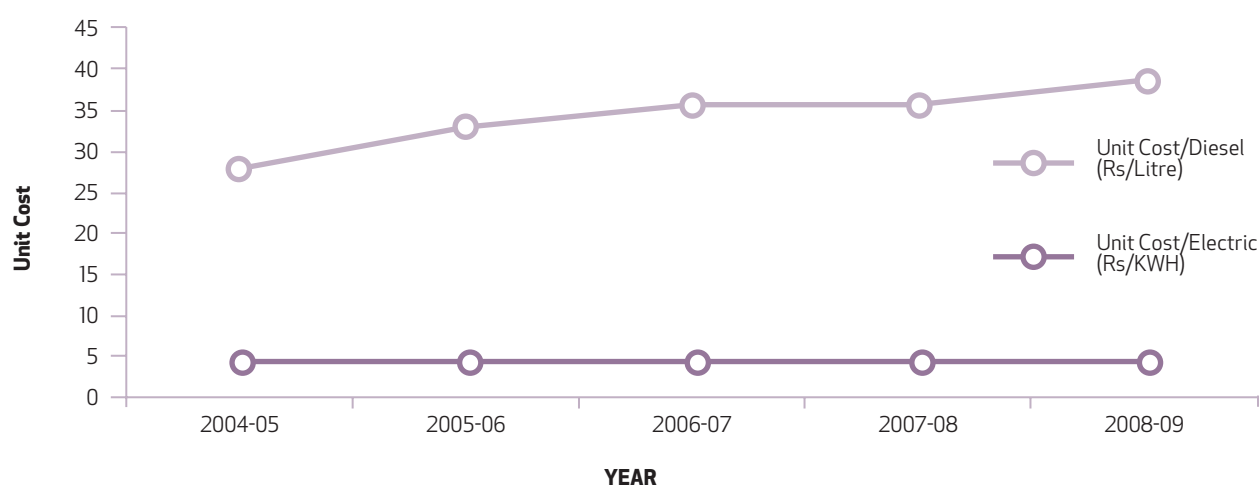
23. Ministry of Statistics and Programme Implementation (2012).

Table 1.16
Quantity of Fuel/Energy Consumed (2010-11)

	FOR TRACTION	FOR OTHER THAN TRACTION PURPOSES (INCLUDING MANUFACTURING UNITS)
Electricity (Million kWhr)	13,621	2,484
HSD Oil (Million litres)	2,523	44
Coal (Million tonnes)	0.001	0.001

Source: Indian Railways Year Book (2010-11), Ministry of Railways.

Figure 1.28
Comparison of Unit Cost for Electricity and Diesel (2004-05 to 2008-09)



Source: Ministry of Railways.

tion for non-traction purposes indicates the scope for substituting diesel generators with renewable energy sources.

Table 1.16 shows the quantity of fuel and energy consumed by IR for traction and non-traction purposes for the year 2010-11. The electricity consumption for traction and non-traction stood at 13.6 billion kWhr and 2.5 billion kWhr respectively at a total estimated cost of Rs 65 billion. The diesel oil consumption for traction and non-traction purposes was 2,523 and 44 million litres respectively.

Figure 1.28 shows the growth in unit cost of electric energy and diesel oil during the period 2004-09. While electricity prices have remained stable, the diesel prices have risen steeply. The unit cost of diesel has increased by 44 per cent and the total diesel oil bill by 61 per cent during the period. Electricity tariff, on the other hand, has remained fairly stable and increased by only 4.4 per cent during the period 2004-09. The steep rise in unit cost of diesel is expected to continue in future.

24. Ministry of Railways (2010-11).

ANALYSIS OF ENERGY CONSUMPTION STATISTICS FOR TRACTION

On the IR, electric traction accounts for a larger share of freight traffic while for passenger traffic the share of diesel traction is slightly higher than electric traction. During the period 2004-09, electric locomotives hauled approximately 63 per cent of the total freight traffic and 46 per cent of the passenger traffic. During the same period, passenger and freight GTKMs carried by electric locomotives increased by 27 per cent and 29 per cent respectively, while the passenger and freight GTKMs carried by diesel locomotives increased by 17 per cent and 15 per cent respectively. The larger share of traffic movement by electric traction is on account of addition of electrified routes and a higher traffic growth rate on the existing electrified sections, which are mostly the dense traffic routes of IR. As of March 2011, more than 30 per cent of total route km and 41 per cent of total running track km, have been electrified²⁴. Diesel traction covers routes with relatively lighter density of traffic.

Table 1.17
Average Energy Consumption (in Kilowatt-hour) per 1,000 GTKM

TYPE OF TRAFFIC	2004-05	2005-06	2006-07	2007-08	2008-09
Passenger	19.2	18.6	19.2	18.9	19.4
Freight	8.5	8.2	7.9	7.7	7.3
Suburban	37.4	37.7	37.9	38.1	36.9
Kolkata Metro	74.1	75.3	74.0	73.5	73.5

Source: ASS (2004-09); Indian Railways Year Book (2004-09)

Table 1.18
Average Diesel Fuel Consumed (in Litres) per 1,000 GTKM

TYPE OF TRAFFIC	2004-05	2005-06	2006-07	2007-08	2008-09
Passenger	4.5	4.3	4.2	4.0	4.0
Freight	2.6	2.6	2.6	2.5	2.4
Suburban	5.4	5.4	5.3	4.9	5.0

Source: Indian Railways Year Book (2004-09).

TRENDS IN TRACTION ENERGY EFFICIENCY

Energy efficiency of electric and diesel traction has been summarised in Tables 1.17 and 1.18. Energy efficiency in traction is expressed as: (a) electric energy consumed per 1,000 GTKM for electric traction, i.e., specific energy consumption (SEC); and (b) quantity of diesel consumed per 1,000 GTKM for diesel traction, i.e. specific fuel consumption (SFC). The noteworthy trends are a 14 per cent cumulative SEC reduction in freight and 11 per cent cumulative SFC reduction in passenger operations during 2004-09. Table 1.16 shows the need for upgrading the coaches of the Kolkata Metro to the technology level obtained elsewhere.

Figure 1.29 shows a comparison of cost of electric energy with fuel cost (per 1,000 freight GTKM), by integrating the energy/fuel tariff data and the SEC/SFC data.

STEPS UNDERTAKEN FOR ENERGY CONSERVATION

IR has constantly endeavoured to improve the energy and environment aspects of rail transport and has undertaken various energy conservation measures over the years which have helped bring down its carbon footprint. Some of the energy saving measures implemented by IR are detailed below:

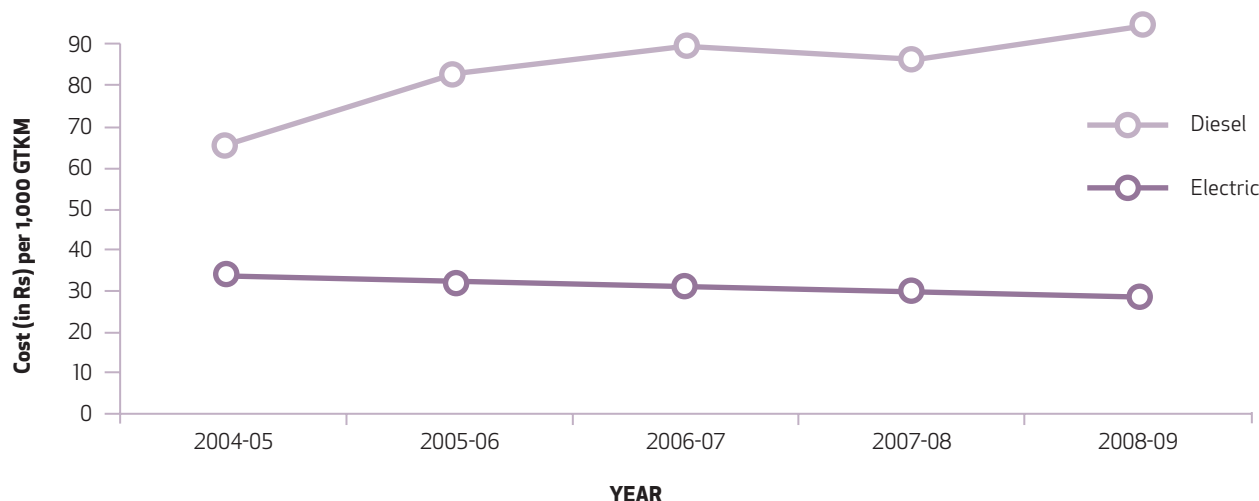
a. Energy saving measures in traction

- **Energy efficient EMUs:** The new three-phase EMUs provided on Mumbai suburban sections are capable of regenerative braking and have an aerodynamic profile. **Regenerative braking has enabled energy savings**

in the range of 35-40 per cent. The project is expected to result in annual reduction of approximately 100,000 tonnes of CO₂ emissions and has been developed in association with World Bank for registration under Clean Development Mechanism (CDM) to claim carbon credits.

- **Energy efficient electric locos:** The production of three-phase electric locomotives is being stepped up progressively and all electric locomotives to be manufactured from 2012-13 onwards will be three-phase. These locomotives operate at near unity power factor and are capable of regenerative braking which enables an energy saving of 15 per cent in freight and 20 per cent in passenger operations. Besides, WAP7 locos are being provided with 2 x 500 KVA hotel load converter to take care of train power supply. This system, referred to as Head On Generation (HOG), offers 92 per cent efficiency and is superior to the 60 per cent efficiency in self-generation and 81 per cent in end-on-generation. The HOG system will eliminate the need for power cars and their replacement by passenger carrying coaches. Further, several improvements have been implemented on conventional electric locomotives for achieving reliability as well as energy conservation.
- **Adoption of 2x25kV system for heavy traffic density routes:** 2x25kV system was implemented on the South Eastern and West Cen-

Figure 1.29
Energy/ Fuel Cost per 1,000 GTKM for Freight Services



Source: Ministry of Railways.

tral Railway as a pilot project. This technology has now been accepted as the only option for hauling heavier trailing loads at higher speeds. It offers several advantages, such as increased Traction Sub Station spacing and reduced EMI. The cost of rail transportation is reduced due to the economy afforded by the system in railway electrification. The reduction in number of TSSs also results in lowering of cumulative maximum demand charges.

- Fuel efficient diesel locos:** In order to reduce the consumption of fuel in diesel traction several new projects have been taken up, e.g. distributed power system to eliminate the need for reversal; HOG; CNG powered DEMUs; and use of B10 blend of bio-diesel on diesel locos. IR has also taken a number of direct measures to reduce the SFC. Through continuous design improvements, SFC of locomotives has been brought down from the initial value of 3.3 to 2.5, i.e., a reduction of 25 per cent (it is expected to be brought down to 2.25 by 2015). Further, new features such as intelligent low idle, automatic engine start-stop (AESS) and auxiliary power unit (APU) are being tried out. Besides, the production of fuel-efficient EMD locomotives has been stepped up with plans for a complete switchover to this class of locomotive in the near future.
- Energy efficient wagons and coaches:** IR has improved the payload-to-tare weight ratio of wagons by using lighter weight materials such as stainless steel and aluminum. Light-weight stainless steel coaches with enhanced passenger carrying capacity have been inducted. Further, the use of the maximum moving dimensions is being studied to permit the introduction of larger-sized wagons and coaches. This involves a study of the kinemat-

ic profile and adoption of best available know-how so that maximum usable dimensions in terms of double-decker coaches or optimally designed wagons can be pressed into service, with minimum investment on infrastructure.

- Energy-efficient practices in operations and maintenance:** Introduction of improved operation and maintenance policies/practices has helped to conserve energy and fuel. Some of the notable steps in this regard include: increased interval of schedule inspections of locos; centralised monitoring of light engine working; enforcement of instructions that locos which are idling or are expected to idle for more than 30 minutes to be shut down; near elimination of movement of dead electric locomotives; loco pilots being provided with detailed guidance on energy/fuel efficient driving as the potential for energy saving in this area is 5-8 per cent; reduction of empty wagon movements; extension of the maintenance interval of freight stock; movement of double stack containers on the western corridor; and popular passenger services with high demand augmented to 24 coaches after upgrading the requisite facilities at platforms and terminals en-route. In addition, there are plans to make feeder routes of DFCs and other identified routes on the network fit for 25-tonne axle load. This would improve the load per train from the existing level of less than 5,000 tonnes to 6,000 tonnes in future.
- Energy saving measures in non-traction**
 - Introduction of energy efficient luminaires such as CFL, T-5, etc.:** IR is about to complete a project which will achieve an annual reduction of 0.14 million tonnes of CO₂ emissions through the free distribution of 26 million CFLs to railway employees (four

CFLs per family), in replacement of energy inefficient incandescent lamps. The project is entirely financed with the carbon credits earned under the CDM framework. Besides, railways are installing T-5 lamps and LED luminaires to save energy.

- **Use of renewable energy in electrical general services:** As per the Vision 2020 document, 10 per cent of IR's energy needs are to be sourced from renewable energy sources. IR is in various stages of implementing projects that aim to harness solar energy. It has also successfully commissioned a 10.5 MW wind power plant at ICF and more are under consideration.

RECOMMENDATIONS

Set up a Special Directorate: It is recommended that IR sets up a separate directorate to deal with all aspects of energy consumption and management. The directorate will be multi-disciplinary and will coordinate with other directorates, apart from monitoring implementation of works/projects that result in reduction in energy consumption or enhancement of efficiency. A concomitant need is for an institutional arrangement to provide adequate funding in the annual budgets by a policy directive - to implement approved projects/works that reduce energy consumption and bring in efficiencies, some of which have been discussed above.

Update system of monitoring and reporting energy consumption: IR should update the present system of monitoring and reporting energy consumption. It is important to note that SEC/SFC data is not maintained on the basis of type of rolling stock, passenger service or class of locomotive. The Annual Statistical Statements (ASS), Annual Report & Accounts (ARA), and the Year Book (YB) provide consumption of electricity and diesel figures in absolute terms and in terms of 1,000 GTKM. This is not a very satisfactory situation.

All electric locomotives/EMUs are now fitted with energy meters, but the consumption data is not yet used for calculation of SEC. It is possible to transmit electric consumption data from the electric locomotives/EMUs to a central server which can then accurately compute the SEC for each passenger/freight train operated and/or for any class of locomotive or service at desired periodicity. It is noted from literature that German Railways has already implemented such a system and Norwegian Railways (NSB) is in the process of implementing a similar system. NSB expects that the web-based energy management system will enable 6 per cent energy savings. IR should also, on a priority basis set up a nation-wide Internet-

based Electric Energy Management System. This will make key electric energy data of IR available on real-time basis and enable approximately 6 per cent energy savings, i.e., nearly Rs 4 billion per annum. Computerisation of diesel sheds can similarly help considerably in the processing, retrieval and monitoring of SFC data (service wise).

Electrification as a means to reduce fuel consumption: Railway electrification should be taken up on a priority basis. Bottlenecks in progress of electrification projects should be tackled systematically. Electrification should be viewed as a means of making rail transport independent of imported fossil energy, while also providing a choice in sourcing energy. Moreover, electric traction allows regeneration of power while braking/coasting and feeding the network, thereby reducing overall consumption of energy and carbon emissions. This is not possible with diesel traction.

Setting up of captive power plants: As mentioned earlier, cost of diesel fuel for transportation is much higher than the corresponding energy cost incurred in electric traction. IR incurs more expenditure on diesel than on electric energy. For 2008-09, the ratio of expenditure on diesel vs. electricity was 55:45. With progressive electrification and increasing traffic on the existing electrified sections, the requirement of electric energy will continue to increase. At present, IR is primarily dependent on SEBs, though at some locations energy is being purchased directly from National Thermal Power Corporation (NTPC).

For availing electric power at lower tariff, IR has set up a 1,000 MW power plant at Nabi Nagar through a JV with NTPC. This plant will supply 90 per cent of generated power to 164 substations of IR located in Eastern and Western regions and will result in a saving of Rs 4-6 billion per year to the Railways due to lower tariff. Another 1,000 MW captive power plant is being set up at Adra through a JV with NTPC (12th Five Year Plan, Volume II, Planning Commission).

In view of the increasing energy requirement for traction, IR will need to set up more such power plants at strategic locations and wheel the power to its distributed network with the help of Power Grid Corporation as a long-term policy.

Greater use of renewable energy sources: As per Vision 2020 document of IR, 10 per cent energy needs are to be met from renewable sources of energy. It is important that IR monitors the consumption of diesel for non-traction purposes, given its upward trend. IR must encourage greater use of renewable energy sources, particularly for production units

Box 1.26

New Generation Locomotives

Ministry of Railways (MoR) is planning to set up a factory with a foreign partner selected through international competitive bidding for supply of 12000 HP Electric Locomotives. This will be a major jump over the current 6000 HP locomotives. During the ten-year period of supply programme, the proposed factory at Madhepura will supply 800 electric locomotives with performance guarantees based on international best practices. **This locomotive will have very high energy efficiency and will constitute a part of India's response towards mitigation of the emission of green-house gases.** Successful execution of this project by the JV route will usher Indian Railways into a new era of reforms and will provide impetus to PPP funding of railway projects.

MoR is also procuring 200 number, 9000 HP electric locomotives under the JICA loan for Western DFC. These locomotives would be mainly used for container train operations on the Western DFC.

A factory is also planned at Marowhra for manufacture of diesel locomotives with a capacity of 5000 HP as against current usage of 4000–4500 HP by the Indian Railways. The Madhepura and Marowhra factories are likely to be awarded during 2012-13.

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012.

and workshops, which are at one location and not spread out and thus well-suited for this changeover. These units must annually report energy consumption per unit of production/performance, as is the case for companies. Further, the government may consider grant of special financial incentives to IR for adopting renewable energy in large measure. It may also initiate a policy for supporting the introduction of CO₂ free passenger and freight transportation in a phased manner.

New generation locomotives: IR must switch to new generation locomotives/EMUs/coaches within an agreed time frame and assured funding. In this regard, the replacement of Kolkata Metro coaches merits attention due to high energy consumption in metro operation and the planned expansion of the network. Development of energy efficient wagons and their introduction should be a priority area. Box 1.26 provides an overview of some of the initiatives planned by Ministry of Railways to introduce higher horsepower and more fuel efficient locomotives.

Linking tariff to the actual energy consumed in transportation: A wagon's payload-to-tare ratio is an important factor in energy consumption. Additionally, the shape of the wagon is also important as it determines the air resistance (this aspect is equally applicable for EMUs and coaches). The results of a simulation to evaluate the energy consumption with different types of wagons show that hauling of BTPN is more energy intensive as compared to BOXN.

And yet, IR levies a higher tariff on coal, than on POL. Therefore, it is important that IR links tariffs to the actual energy consumed in transportation of a commodity. The same principle applies for passenger fares. It must be stated here that rationalising the tariffs for coal and POL would remove the distortion inherent in pricing of electric energy. This would bring down the cost of electric energy to its true level, thereby significantly benefiting IR and other intensive users of electricity.

Diesel traction in electrified sections: After implementation of the Railway Safety Committee's recommendation that in an electrified section, 20 per cent of the total holding of locomotives should be diesel, it is now quite normal to see diesel locomotives hauling trains under OHE. The cases of diesel under wire have further increased in order to avoid traction change and the detention involved in traction change. Since diesel operation under OHE results in higher energy costs, it is worthwhile to review this order and modify/fine tune the instructions, taking into account the experience gained.

Government of India should set up a department in a selected institution to take up strategic studies on environmental, energy and energy security issues related to railway and other modes of transportation.

IR representatives should be included in national energy policy committees.

INTERNATIONAL EXPERIENCE IN RAILWAY REFORM: LESSONS FOR INDIAN RAILWAYS

The reform measures undertaken in major railway systems such as Japan National Railways, Russian Railways, Chinese Railways, British Railways and German Railways have been reviewed to draw lessons for Indian Railways. Though the factors and circumstances leading to reforms in different railway systems vary, however, key drivers for reforms may be summarised as follows:

- Financial crisis and over-indebtedness brought about by rapid expansion of network, operation of non-remunerative lines, and inflexible organisational structure exacerbated by powerful trade unions and erosion of market share;
- Need for rapid expansion and improvement of operational performance;
- Control of public subsidy;
- Need to usher in competition and attract private investment; and
- Ideological inclination of the government.

The railway reforms carried out in Japan, Germany, Russia, China and Britain have been summarised at Annex 1.9.

Key elements of reforms: Broadly, the reforms comprised one or more of the following elements:

- a. Separation of public policy and rail provider roles
- b. Separation of infrastructure and operation: including institutional and regulatory reforms covering rationalisation of tariff determination, investment decisions, freedom of operating companies and establishment of independent regulators.
- c. Labour reforms

Separation of public policy and rail provider roles: Most of the countries reviewed, have implemented the principle that public policy roles should be separate from the role of service provider (for both rail freight and passenger transport). For example, in Germany, Japan and Russia, Ministries of Transport determine national public interest policies in passenger rail transport, supplemented in all three countries by significant roles for the relevant local government transport administrations for specific suburban/regional systems. China has also recently (March 2013) decided to restructure its railway sector by dissolving the Ministry of Railways and separating railway policy and regulation from commercial operations (Box 1.27). Most of the countries have also separated the public policy roles of the Ministry in transport integration and sub-sectoral policy making from either the economic regulation and/or safety regulation roles (Box 1.28).

In view of the increasing energy requirements for traction, IR will need to set up more power plants at strategic locations and wheel the power to its network with the help of Power Grid Corporation as a long-term policy.

SEPARATION OF INFRASTRUCTURE AND OPERATION

The degree of separation between infrastructure and operation has varied across railway systems where reforms have been carried out. Traditionally, railway systems have been **vertically integrated** (single entity controls both infrastructure and services and performs policy and regulatory roles). The objective of reform has been to bring about either **a vertical separation** (ownership of facilities being separate from entities controlling operations: accounting separation or through organisational unbundling) or a system to allow **competitive access** (a single entity may control infrastructure and operation but the usage of infrastructure by other operators is allowed on payment of transparently determined access charges). Some examples of the countries following the three systems are shown below (Figure 1.30).

Once the railway systems moved away from vertical integration to either vertical separation or competitive access, the focus of further reforms has been to reorganise infrastructure and operation. The re-organisation is generally based on the following principles:

- Core and non-core business,
- Geographical separation,
- Line of business separation (freight, urban, long distance, etc),
- Functional separation (creation of profit centres and use of transfer pricing), and
- Traffic density (light density vs. high density to identify to commercial services and social service obligations)

Administrative separation (separate administrative set-up) under an umbrella organisation allows individual accounting, evaluation of units as separate profit or cost centres and charging for usage of assets by another unit on the principle of transfer pricing. Functional division also allows for bidding out of some of the core activities like maintenance of tracks and locomotives on a competitive basis. Alternatively, the reorganisation may take the form of separate geographical organisations (e.g. Japan) or unbundling the current organisation and privatisation of several activities (e.g. U.K.). As summarised in Annex 1.9, extreme unbundling also led to coordination failure and cost of managing the same increased drastically.

Box 1.27

Reform of Railway Sector in China

China has been restructuring and reforming various sectors of the economy for several years now. The objective was to enable them to respond effectively to market economy and rapid economic growth and function effectively in the best national interest. These initiatives included reform of several Ministries of the Government in Beijing.

In March 2013, China decided to restructure its railway sector by dissolving the Ministry of Railways (MoR) and separating railway policy and regulation from commercial operations. As a result, MoR's railway planning and policy making functions have been assigned to the Ministry of Transport (MoT), while its other administrative functions such as establishing and monitoring technical standards, safety standards and service quality have been assigned to a new organisation, the State Railways Administration (SRA). In future, MoT would also establish policy for railways. It would develop a unified policy for all transport modes aiming at modal integration and optimal use of resources. It is expected that only a handful of MoR staff would move to MoT. The responsibility for the enterprise (commercial operations of railways) has been assigned to the newly formed China Railway Corporation (CRC) that is manned virtually by all the staff and managers of MoR except a few that will move to MoT.

CRC is fully owned by Ministry of Finance (MoF) and will have its own Board of Directors. **The Minister of Railways has been appointed as the CEO of CRC. The mandate of CRC is to operate the railway on commercial lines. It is understood that in line with this policy, CRC would be compensated financially if it is required to provide services that are financially not viable.** There is no change, for the present, in the organisation structure and the existing railway administrations will continue to function as before. This ensures that there is no disruption in railway services as a result of restructuring of MoR. However, it is suggested that competition will be introduced and the private sector will be encouraged to invest in commercial railways in the future.

Broad objectives of recent changes include:

- Coordinated development of policy, macro level planning and allocation of resources for the transport sector
- Independent supervision of the performance of CRC
- Independent safety regulation of rail sector
- Regulation of technical standards for railways
- Improving efficiency of railway management and operations i.e. CRC
- Create competition in railway sector
- Encourage non-government investment in rail sector

Source: NTDPC.

Box 1.28

Main Responsibility for Public Interest Roles

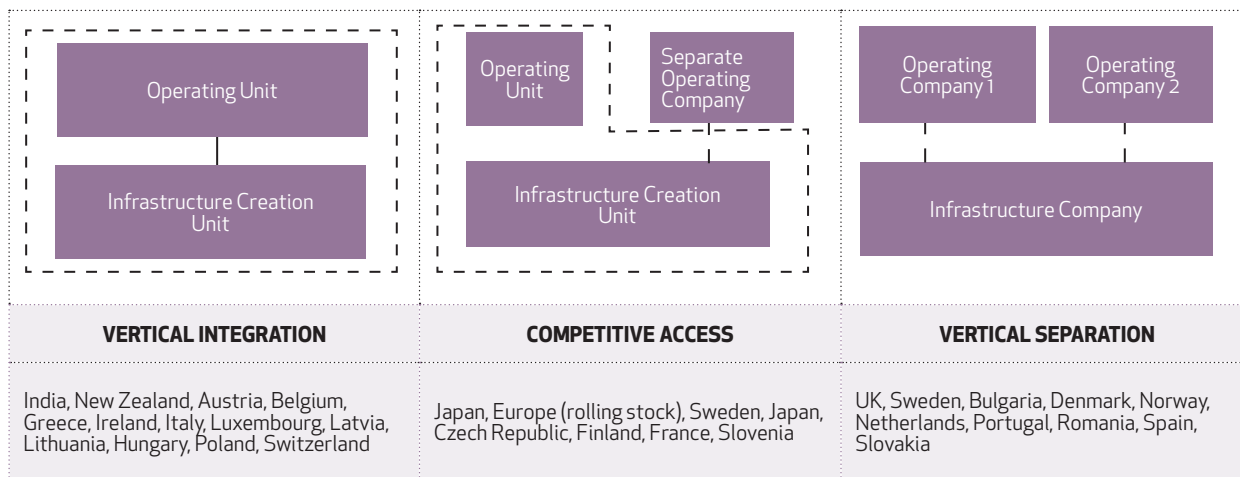
Australia, Brazil, Canada, China, Germany, Japan, Russia and the United States, all have unitary transport ministries at the central government level whose role is to develop and administer policies to protect and promote public interests across the transport sector. This is to establish integrated national transport policies that transcend or augment individual modal interests. China was a partial exception, although it has recently enhanced the role of Ministry of Transport to establish policy for railways along with national highways, ports and waterways, shipping, airports, aviation and transport integration.

(Contd...)

COUNTRIES	MAIN RESPONSIBILITY FOR PUBLIC INTEREST ROLES			
	INTEGRATED TRANSPORT POLICIES	RAILWAY SECTOR STRATEGY/ POLICIES	ECONOMIC REGULATION	SAFETY REGULATION
Australia	Department of Transport		Australian Competition Commission	Departments of Transport or Independent regulators varies by State)
Brazil	Ministry of Transport		National Agency for Land Transport	
Canada	Department of transport		Canadian Transportation Agency	Transportation Safety Board
Germany	Ministry of Transport		Federal Cartel Office	Federal Rail Agency
Japan	Ministry of Transport			Japan Transport Safety Board
Russia	Ministry of Transport		MOT & Ministry of Economic Development and Trade (MEDT)	Ministry of Transport
USA	Department of Transport (DOT)		DOT-Surface Transportation Board	National Transport Safety Board/ DOT-FRA

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 9, Paul Amos, July 2011.

Figure 1.30
Separation of Infrastructure and Operation



Source: Report of the Working Group on Railways (NTDPC).

Once the asset restructuring is completed, the operation of the railway can be governed through haulage agreement, exclusive or multiple access agreements, reciprocal operating agreement, as the case may be. In the case of haulage agreement, track owner may allow any operator to use the track based on fixed haulage charges. American President Line (APL), and CSX Corp are examples for these. In the case of access agreement with one or multiple operators, operator pays for the tonnage it carries e.g. Canadian National (CN) operating over CSX. Annex 1.10 summarises the track access tariff principles and/or formulae used in three countries (Australia, US and Canada).

LABOUR REFORMS

Labour reform is another important dimension of reforms as railways are traditionally one of the largest employers and therefore, the impact of any

structural change on labour needs to be taken into account. For example, in Sweden, high level of unionisation existed among both blue-collar and white-collar employees and management was obliged to share strategic information with the employees and allow employee representation on the company board. Railway reorganisation entailed negotiation with the unions on productivity issues through productivity incentivisation, multi-task assignment, and performance compensation. The restructuring had to work within the existing framework.

Japan grappled with labour issues through reactivation of railway management consultation system. This enabled direct discussion on issues such as work conditions and organisational needs. Japan National Railway (JNR) also had to deal with issues of seniority versus skill-based wages, determination of retirement and social benefits. After restructuring, the labour cost as a percentage of revenue showed a

substantial improvement in Japan and Sweden from 70 per cent and 83 per cent to 33 per cent and 70 per cent respectively.

LESSONS FOR INDIAN RAILWAYS

A review of the reform measures undertaken in major railway systems shows that most of the countries have separated the public policy role from the role of service provider (for both rail freight and passenger transport). The Chinese example is of particular relevance to India, as the railway sector in China until recently was supervised by the Ministry of Railways (MOR), a body which was responsible for strategy, policy and regulatory functions as well as administration of operational entities that delivered the Chinese Railways network and rail transport services (similar to India).

However, as discussed earlier, in March 2013, China also decided to restructure its railway sector by dissolving the Ministry of Railways and separating railway policy and regulation from commercial operations. The big decision to dismantle MOR in China has only started the process of reform of railway sector and it will be fully effective in a few years. The aim is that this major step does not cause any disruption in railway services in the near future and planned expansion of railways materialises. It is expected that several well-considered steps shall be taken over a period of two to three years in order to achieve the long-term benefits of the reform process. Some of the important issues that need to be addressed are discussed in Box 1.29. In the Indian context too, any profound change in the organisational structure may actually distract the railways from the enormous task of building infrastructure and improving services. Some of the key elements of the reform would be accounting reform, reform in investment planning, regulatory structure, reorganisation on business lines, hiving off of activities.

ORGANISATIONAL REFORMS

CURRENT ORGANISATIONAL STRUCTURE AND ISSUES

The highest level of management in the Ministry of Railways, headed by the Hon'ble Minister of Railways and one or two Hon'ble Ministers of State, is the Indian Railway Board. The Railway Board is headed by a Chairman and comprises six other members from specific departmental areas. Indian Railways is divided into 17 zones, each headed by its own General Manager (GM) and assisted by Principal Heads drawn on departmental lines. As a result, the entire organisation gets divided into departmental lines based on different specialisations. This organisational structure of the railways results in over-differentiation and there is a lack of a coherent vision to guide the Indian Railways.

Some of the problems afflicting the IR's organisations at present are:

- a. Centralisation of decision making on many operational issues at the level of members of Railway Board - as the roles of policy making, regulation and operations are today combined in the Railway Board. It leaves little time for strategic thinking and interferes with policy-making role of the Board.
- b. Duality of role— commercial as well social, without any clear demarcation.
- c. Overly differentiated and departmental organisation structure and lack of a coherent vision to guide the organisation.
- d. Production-centric approach to business and lack of commercial and customer-orientation.
- e. Bureaucratic decision-making processes and procedures.
- f. Inadequate empowerment at Zonal Railway level coupled with absence or diffusion of accountability.
- g. Short tenure at the top.
- h. Politicisation of tariff-setting and investment planning.
- i. Poor project management and inadequacies in project delivery system resulting in enormous time and cost overrun.
- j. Lack of capacity and policy for attracting private investment.
- k. Accounting system inconsistent with business accounting, which does not help as a decision making tool for management.
- l. Absence of a system to track trends in technological developments, induct new technology and develop indigenous technology.

NEED FOR REFORMS

This report has emphasised the need to reverse the shift that has been taking place of both freight and passenger transport from the railways to other modes, especially to roads. This is essential to ensure the kind of high growth that is envisaged for the economy as a whole. The kind of investment that is being projected in the Indian Railways over the next 20 years is unprecedented in the history of the railways. For this kind of change to take place, it is essential that the Indian Railways must reinvent itself and expand so that it can play the kind of strategic role envisaged for it to meet the expanding transport requirements of the country. It must rapidly expand its network, augment capacity, modernise and improve services so as to meet the goal of carrying 50 per cent of the freight transport by 2032 and meet the passenger demand in full. By 2032, railways will have to carry close to 6,500 billion tonnes km in freight compared to 626 billion tonnes km in 2011 while it must keep pace with growing passenger demand due to GDP growth.

Reform of Railway Sector in China: Impact and Issues

Railway sector in China is very large and plays a vital role in supporting its economic performance. The changes that impact railway operations would be implemented over time so that there is no disruption in rail services. Since China's economy shall continue to grow fairly rapidly, it is also imperative that, over the next two decades, railways develop sufficient capacity to service increase in demand for passenger as well as freight railway transport. It also needs to respond to demands for superior services as average incomes increase and more sophisticated commodities are transported.

The important issues that would need to be addressed are discussed below:

- **Debt:** For the present all the debt of MoR (RMB 2.6 trillion-USD 400 billion) has been transferred to CRC. This is likely to increase to about USD 600 billion as all the planned railway projects are implemented over the next few years. It is accepted that investments made in High Speed Railway network are not likely to be profitable for several years. A decision will need to be taken in respect of debt. It is possible that some of it would be transferred to the Central government to enable CRC to operate as a viable financial entity.
- **Planned investments in railways:** It is expected that the recent reform will not slow down the investment programme of railways and CRC would implement all planned projects included in the Medium Term Plan till 2020.
- **Pricing:** A clear policy needs to be articulated in respect of the authority of CRC for pricing of services. It is possible that CRC may not be given total freedom in pricing.
- **Financial Management System for CRC:** CRC will need to develop a financial management system that is aligned to commercial accounting standards. This system should be able to segregate costs by business and service so that informed decisions about pricing and cost control could be taken.
- **Salary structure for CRC staff:** Decision on staff salaries will need to be taken since company salary structure is significantly higher than that for Ministry employees.
- **Criteria for Monitoring Performance of CRC:** Developing criteria for monitoring performance of CRC and defining improvement in productivity of CRC assets and staff and financial performance for the next five years or so.
- **Encouraging PPP:** Long term aim is to encourage investment in railway sector by private sector and non-government entities. Policy initiatives that promote such investment would need to be identified and implemented.

Source: NTDPC.

The technology gap must be bridged and rail speed must be increased to 160-200 kmph along with a zero accident and failure rate. The railways must also change its perception to a more customer-oriented proposition offering best value against competition. The currently existing capacity constraints will require the railways to carry out major capacity augmentation - close to 10,000 km of DFCs, 40,000 km of doubling/quadrupling/multiple lines etc.

It is clear that the task being attempted is stupendous by any measure, especially judged against the pace of capacity augmentation and growth achieved in the past. For example, the doubling/multiple lines being attempted (at the rate of 1,500-2,000 km per annum), is four times as large as the best that has been achieved by railways in the Five Year Plans in the past. Achievement of such targets will not be possible given the current organisation structure and there is need for organisational reforms to address the above lacunae.

RECOMMENDATIONS FOR RAILWAY REFORMS IN PAST STUDIES

A common feature of most railway reforms in countries we have studied is the separation of the policy making apparatus from the operation of the railways themselves. Most countries have now set up their operating railway systems in some kind of corporate form, although in most countries, government ownership of the railway systems remains the norm, except in the United States. Policy making is of course retained in a government Ministry, usually a unified Ministry of Transport, but sometimes a dedicated Ministry of Railways. The organisational structure of Indian Railways is not very different from the kind of structure that existed prior to these reforms in countries such as Russia and China. Unlike Indian Railways, however, these countries have undertaken wide ranging reforms in recent times where they have also separated out policy making functions from operation of their respective railways.

Box 1.30

Recommendations of the Prakash Tandon Committee (1994)

- Restructure the Railway Board with Members responsible for:
 - i. Bulk freight, passenger and inter-modal services;
 - ii. Infrastructure;
 - iii. Moving assets;
 - iv. Finance and Planning;
 - v. HR, R&D, Quality.
- Railway Board to focus on policy, planning, performance evaluation, major projects and appointments and not day-to-day supervision/sanction/control.
- Similar restructuring at Zonal Railways with six AGMs.
- Minimum tenure of 3 years for Board Members and GMs.
- Unified cadre for railways through cross-disciplinary rotation and selection for general management positions.
- Recruitment of qualified finance professionals.
- Shedding of off-line activities-corporatisation of Production Units.
- Induction of specialists as advisers.
- JV with state governments and private entities.
- Decision support system for investment planning.

Source: Report of the Working Group on Railways (NTDPC).

Thus, the key issue to be addressed in reform of Indian Railways is the institutional separation of roles into policy, regulatory and management functions. Currently, these roles are blurred with the Railway Board essentially performing all the three roles put together. This causes confusion about the underlying vision and mission of the Indian Railways.

If such an institutional separation of roles takes place, it would mean that policy makers are limited to setting policies; regulators to fix competition rules in general and pricing in particular; and the railways operations are done by a corporate or corporate like entity or entities.

Within India, many committees have reviewed the organisational structure of the Indian Railways and have recommended the need to undertake reforms. Key recommendations of some of the Committees are summarised below (Figure 1.31 and Boxes 1.30 to 1.32).

This section provides a review of the recommendations made by these various committees over the last 20 years. While the Prakash Tandon Committee of 1994 and the Expert Group for Modernisation of Indian Railways (2012) suggested organisational reforms while keeping the Railways within a government setup, the Expert Group on Indian Railways 2001 visualised the setting up of an Indian Railways Corporation governed by an Indian Railways Executive Board (IREB). In the proposal of the 2001 Expert Group, the Indian Railways Corporation would thus work under the Government of India like any other corporate body with the government laying down vision, objective and policy directives. This is not

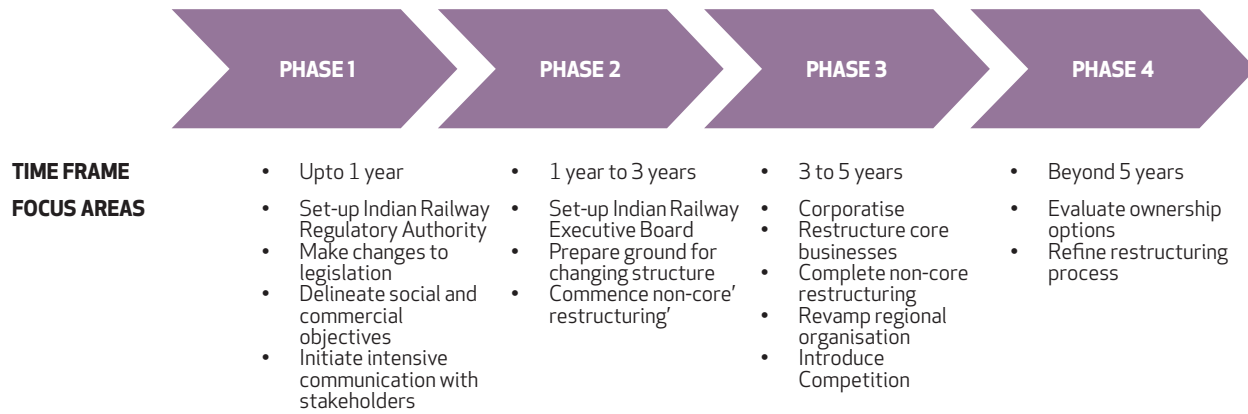
very different from the kind of reforms that have been undertaken in other infrastructure sectors. The 2001 Expert Group also suggested the setting up of a Railways Regulatory Authority whose functions would relate to the setting of freight tariffs and passenger fares as also resolution of disputes. These functions would then be delinked from the Ministry by setting up a Railways Regulatory Authority.

The suggested Railways Regulatory Authority would be guided by the vision and policies laid down by the Government, and not the Railway Ministry alone. It would thus deal with issues relating to subsidies and cross subsidies, as broadly laid down by the government, and help reduce the duality of role syndrome commercial as well as social now afflicting the railways. The Regulator's basic duty would be the protection of consumer interests, providing a level playing field and also ensuring fairness in dealings between Indian Railways and PPP participants in projects. Once such a Railways Regulatory Authority is set up, it would become possible to separate out the commercial operations of the Indian Railways from those operations that are done for socio-objectives at the behest of the government. We note that the Government has already approved the setting up of a Rail Tariff Authority, but which is yet to be implemented.

For this to become possible, the implementation of accounting reforms is an essential feature of the overall reforms that is envisaged. As mentioned in Section 5, the accounting system of the Indian Railways is still organised in a governmental accounting framework and does not follow the accounting standards as prescribed in the Companies Act. Any reform of the railway system, so that it is run

Figure 1.31

Roadmap for Railway Restructuring as Recommended by The Expert Group on Indian Railways (2001)



Source: The Indian Railways Report 2001: Expert Group on Indian Railways.

Box 1.31

The Expert Group on Indian Railways (2001): Key Recommendations

The Report of the Expert Group on Indian Railways (2001), noted that 'Indian Railways is an institution embedded with contradictions. Management knows that the combination of unremunerative investments coupled to massive under pricing of passenger fares is the path to financial catastrophe, yet it is not able to take any effective action to reverse the situation'. The Expert Group recommended that three areas in particular will need to be fundamentally redesigned: Governance, Structure and Portfolio.

(a) Governance: Separate Institutions for Separate Roles: Policy, Regulatory and Management

Governance defines the roles and institutional relationships associated with policy, regulation and management. These roles are currently blurred and need to be clarified and institutionalised. *Indian Railways must aim to be corporatised into the 'Indian Railways Corporation' (IRC) or Bharat Rail Nigam (BRaiN). The Government of India should be in charge of defining the key thrusts of policy direction.* It would also need to set up an **Indian Rail Regulatory Authority (IRRA)**, which would be necessary to regulate IRC's activities as a monopoly supplier of rail services to begin with, particularly related to tariff setting. *The Indian Railways Corporation (IRC) would be governed by a reconstituted Indian Railways Executive Board (IREB).*

(b) Structure: Structure relates to the internal organisational design of IR. *The underlying design principle is to create an outward looking, business oriented, customer driven institution. This will involve reorganising the core transportation network into its key component parts: freight, passenger, suburban, shared infrastructure: fixed, and shared infrastructure: others.* These business units will operate with a large degree of autonomy yet be held accountable for a balanced scorecard of commercial performance measures. Further, adopting commercial systems is an essential pre-requisite for a modern railway. The corporatisation of IR into IRC will **necessitate the recasting of IR's accounts into company format.** The Government will therefore need to initiate the process of restructuring the financial accounts of IR in accordance with the Company's Act 1956.

(c) Portfolio: Portfolio relates to the breadth of business IRC will incorporate under its umbrella of holdings. The view of the Expert Group is that less is more. In other words, IRC should be engaged in only those businesses directly related to its core activity of rail based logistics and passenger transport. Non-core businesses should be spun off on an arms length basis. The eventual ownership of these entities is not an issue that concerned the Expert Group. Difficult though it may be, *the Expert Group anticipates that priority candidates for accelerated spin off would be all the manufacturing units which should be done within a specified time limit.*

Source: The Indian Railways Report 2001: Expert Group on Indian Railways.

Box 1.32

Recommendations of the Expert Group for Modernisation of Indian Railways (2012)

- Re-organise Railway Board along business discipline to reflect Chairman as Chief Executive Officer and Members for the following:
 - Safety
 - Business development/ Commercial
 - Technology/ ICT & Signalling
 - Freight
 - Passenger Services
 - Infrastructure
 - Finance
 - HR and PPP
- Create commodity-wise Key Account Directors under Member Freight for major commodities like coal, iron ore, steel, food grain, fertiliser etc. Coal is 45 per cent for total freight traffic and needs special attention.
- Create Key Account Directors of suburban, long distance passenger etc. under Member Passenger.
- Ensure autonomy, flexibility and accountability at all levels with clear P&L responsibilities
- Make provisions for handling of all parliamentary functions (liaison functions with government, including handling of Parliament questions) by a Joint Secretary level officer in the Ministry, which would set the RB free to focus exclusively on business issues.
- Empower Zonal Railways along with accountability:
 - The present system of seeking sanction for Capital investment to be included in the Works and Rolling Stock Programmes of railways from the Railway Board/ Ministry should give way to a more decentralised decision-making in critical areas like safety, traffic facility, passenger amenity and other areas, by delegation of powers at the zonal level.
 - GMs of Zonal Railways to be empowered to take decisions, within a framework of rules and investment limits. The Zonal Railways should also be made accountable for return on capital, transport output, profitability and safety.
- Review the existing PPP policy framework in the light of hitherto poor response and PPP experience.
- Establish a separate Authority/SPV/Organisation for implementation of Major Projects such as development of high speed corridors, redevelopment of railway stations etc.
- Build capacity for the officers at the Zonal railways to manage PPP projects. A PPP cell should be constituted in each zone to identify, develop, implement and monitor projects at the zonal level.

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012.

on business line in the future, will be difficult to achieve unless accounting reform is undertaken. Adopting commercial systems is an essential prerequisite for a modern railway system. The financial accounts of Indian Railways therefore need to be restructured in accordance with the Companies Act. The objective is to develop financial statements that can be understood by the financial community and the public at large. Unless this is done, it is difficult to comprehend and assess the financial performance of Indian Railways and to separate out its commercial functions from social functions.

PROPOSED ORGANISATIONAL REFORMS

SEPARATION OF POLICY MAKING AND OPERATIONAL RESPONSIBILITIES AT THE RAILWAY BOARD LEVEL

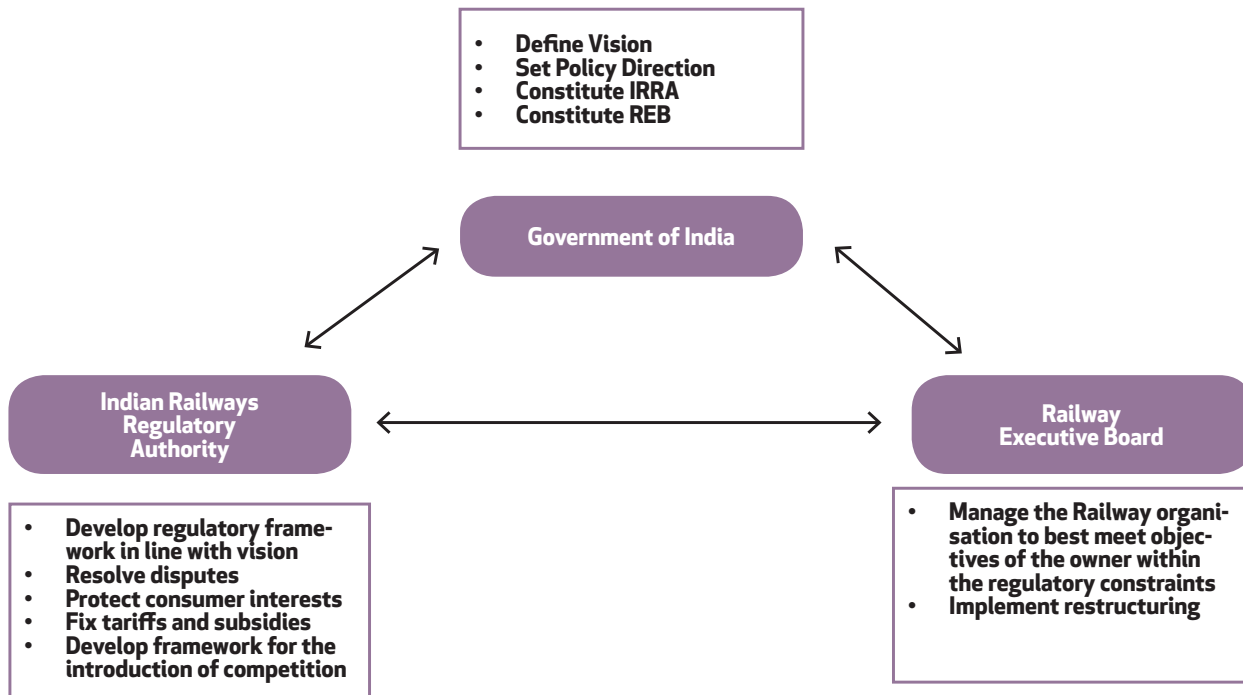
The High Level Safety Review Committee, chaired by Dr. Kakodkar noted in its report that: 'Ever since

Railway Board was first constituted in 1905, its size, functions and responsibilities have gone on widening. Today Railway Board presents itself as all encompassing monolithic structure where it has become all in one - policy framer, operator of train services and regulator'. Similar observations have been made by other committees in the past.

As discussed earlier, the Report of the Expert Group on Indian Railways, recommended a complete separation of roles of policy making, legislation and management of operations with the GoI being responsible for setting the broad parameters in which policy is to be formulated, as well as constituting the Indian Railway Regulatory Authority (IRRA) and the Indian Railways Executive Board (IREB) (Figure 1.32). It recommended that the existing Railway Board should be phased out and the

Figure 1.32

Separate Institutions for Separate Roles: The Expert Group on Indian Railways (2001)



Source: The Indian Railways Report 2001: Expert Group on Indian Railways.

Indian Railways Corporation (IRC) should be governed by the newly constituted IREB.

The Pitroda Committee (the Expert Group for Modernisation of Indian Railways, 2012) also recommended reorganising the Railway Board along business disciplines. Table 1.19 shows the recommendations of the two committees regarding reconstituting the Railway Board.

The reform of the railway sector in China, announced in March 2013 is on the similar lines and proposes to separate railway policy and regulation from commercial operations (Box 1.27).

ORGANISATIONAL REFORMS: KEY RECOMMENDATIONS

Both the 2001 & 2012 Expert Groups have suggested the re-organisation of the Indian Railways into business lines such as freight, passenger services, infrastructure, finance and the like as illustrated in Table 1.19. The difference between the 2001 Expert Group and most of the other committees lies in their recommendation to corporatise the operations of the Indian Railways as has been done with other sectors in India, subsequent to economic reforms. Other committees including the 2012 Expert Group have gone along with the retention of the current framework of railways being run as a Government department, while reorganising the Railway Board along business discipline lines. The objective of making the Railways more commercially oriented

is common to all the Committees. There is also relative unanimity in setting up a Rail Tariff Regulatory Authority.

The NTDP has debated this issue at different times. It is clear that the Indian Railways is now an outlier in being run as government department, and the kind of strategic change needed in its operations and magnitude of investments required over the next 20 years would suggest that a more radical reform be carried out as suggested in the 2001 Expert Group report. While recognising the lack of consensus on this issue in the Government, in the Railways, and in the country at large, the NTDP feels that we have now an opportunity to draw up a vision for the Indian Railways in 2030 and that it is incumbent on us to suggest a structure that would provide for the most efficient and sustainable delivery of rail transport.

We are therefore proposing that it is now time for the government to reconsider the recommendations of the 2001 Expert Group to set up an Indian Railways Corporation in a manner that it is able to meet the challenges for overall transport strategy as it evolves over the next 20 years.

It may be noted that in other infrastructure sectors, such a reform has already been carried out. In the power sector, for example, the Ministry of Power sets overall policies and priorities; the regulation

Table 1.19
Reorganising the Railway Board

THE EXPERT GROUP ON INDIAN RAILWAYS (2001)	THE EXPERT GROUP FOR MODERNISATION OF INDIAN RAILWAYS (2012)
<ul style="list-style-type: none"> • Existing Railway Board to be phased out and the Indian Railway Executive Board to be constituted by the Government. • Executive Board to have 15 members: Operations Office (On-going management) - Permanent position to have a minimum tenure of 5 years <ul style="list-style-type: none"> - Chairperson - COO freight - COO passenger - COO suburban - COO Infrastructure - fixed - COO Infrastructure - other - VP Finance and Planning - VP HR • External office for Strategy (transition management) - Temporary positions - initial tenure of 3 years to be extended if necessary <ul style="list-style-type: none"> - COOs— non-core businesses (2) - Executive Directors (5) (Traffic -3, Infrastructure -2) 	<ul style="list-style-type: none"> • Re-organise Railway Board along business discipline to reflect Chairman as Chief Executive Officer and Members for the following: <ul style="list-style-type: none"> - Safety - Business Development/ Commercial - Technology/ ICT & Signalling - Freight - Passenger Services - Infrastructure - Finance - HR and PPP

Source: The Indian Railways Report 2001: Expert Group on Indian Railways; Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012.

is done by the Central Electricity Regulatory Commission along with a network of State level regulatory commissions; the delivery of power is overseen by the central Ministry of Power, but implemented through large public sector corporations, such as National Thermal Power Corporation (NTPC), the National Hydro-electric Power Corporation (NHPC), Power Grid Corporation, Power Finance Corporation and others at the state level. Within the same framework, there are also now an increasing number of private sector corporations that generate and distribute power. Similarly, in the telecom sector, the Ministry of Communications oversees policies and priorities in the sector, the Telecom Regulatory Authority of India (TRAI) does overall regulation including that of tariff, while both public sector corporations, such as Bharat Sanchar Nigam Ltd (BSNL), and Mahanagar Telecom Nigam Ltd (MTNL), a plethora of private sector corporations deliver the services. Thus, the kind of reform proposed by the 2001 Expert Group for Railways, and implemented by most of the countries, is similar to what has already been done in other infrastructure sectors in India.

Therefore, the NTDPCC recommends that it is time that a similar reform be carried out in the railways. There is a clear need to separate the different roles. Policy should be with the government, regulation including tariff regulation should be with a regulatory authority, and operations should be run by a corporate entity or entities. The Railways already operate a number of corporations, such as the Container Corporation of India Ltd (CONCOR), the new DFCCIL, Konkan Railway Corporation (KRC), the Indian Railways Finance Corporation (IRFC) among others. With the increasing resort to public-

private-partnership, it is likely that there will be a continuing creation of other railways corporations, public or private, to undertake railways operations. It is therefore desirable that the railway system itself as a whole be corporatised in a more organised manner now.

The NTDPCC is not providing detailed recommendations in this regard, since it recognises that this requires further discussion and detailed study on what may be the best form of corporate reorganisation that would be in the interest of the Indian Railways. Furthermore, such a reform will also entail amendment of the Railways Act, 1989, and the Indian Railways Board Act, 1905. Once an in principle decision is taken to undertake such a reform, a more detailed process of transformation will have to be designed. However, there would appear to be near unanimity among various committees that Indian Railways be reorganised into business lines. We can envisage an Indian Railways Corporation (IRC) to be headed by an Indian Railways Executive Board (IREB) with the Chairman as Chief Executive Officer (CEO) and Members in charge of different business lines. Decisions will also have to be taken on the relationship between this apex Indian Railways Corporation and other Railways companies that currently exist and those that may come up in the future. One possibility is that such corporations could all be subsidiaries of the IRC or joint ventures of the IRC with other private or public entities.

It is recommended that the IREB itself would limit its involvement to strategic planning, policy-making and the usual functions of the Board of such an entity. It should function like the board of a com-

pany with clear focus on business, bottom-line and other clearly defined objectives. Day-to-day operations, monitoring and decision making could be delegated to the Zonal Railways and project organisations or companies. The IREB would, however, continue to monitor the performance periodically to ensure that the strategic plans and the policies are implemented.

Governmental functions affecting the Railways would, as is done in other parts of the Government, be carried out by a compact Ministry of Railways in the first instance, and perhaps move later to the unified Ministry of Transport, as is recommended elsewhere in this report. Such a phased reform has also been carried out in similar fashion in other countries that have undertaken similar transformation of their respective Railways. The Railways Regulatory Authority and the IRC would then be responsible to the Ministry as other similar entities are to their respective Ministries. The staffing of the Ministry of Railways should be done by the assignment of Railways officers from the existing set up and from IRC and other Railways entities in the future. Careful consideration would have to be given to the delineation of functions that remain with the Government, and those to be exercised by the IRC.

We may note that the IRC should not be set up under the Companies Act. In fact, it would be advisable to set it up as a statutory Railways Corporation for which a new Act would have to be legislated providing clearly the functions and powers of such an entity. It is important that the IRC be set up as a statutory corporation since the current Railways Act endows Indian Railways with many quasi-governmental powers which will have to be retained by the IRC. However, it would need to be ensured that such a statutory corporation is essentially run on business lines, while exercising other functions of a social and strategic nature which are essential to the functioning of Railways in India.

The NTDPC is fully aware that the kind of transformation proposed above is contentious and does need further discussion among the main stakeholders in the country, including Railways staff and the unions. It is essential that a full understanding is reached that such a transformation would be undertaken in order to empower the Indian Railways system to modernise, to expand, to become more efficient, and serve the needs of the people of the country at large and the country's overall transport strategic needs. As has been made clear in the earlier sections, what is envisaged is an unprecedented significant expansion of the Railways system in India to meet the transport needs of the future in India. It would perhaps be correct to say that if such an expansion in Railways was not needed in the

There is a clear need to separate the different roles involved in running the railways. Policy should be with the government, regulation including tariff regulation should be with a regulatory authority, and operations should be run by a corporate entity or entities

country, there would then, perhaps, be little need for such a transformation as has been proposed.

Corporatisation, as envisaged, will not only allow better use of Railway assets along with higher quality of service and greater emphasis on profitability but also be able to compensate the Railway employees adequately for the increased profits that they are able to bring for the organisation, as noted by the Sixth Central Pay Commission in its report (Box 1.33). Moreover, as a corporate entity IRC would be able to access capital from external sources for funding its significant expansion plan, thereby reducing the stress on government borrowings and facilitating the attainment of fiscal deficit targets set under FRBMA.

The 2001 Expert Group had given a more detailed timeline for Railways reforms; in that timeline, it was suggested that it will take at least five years of preparation for the formation of an Indian Railways Corporation and associated other changes in the system. In the meantime, it would be essential to begin the process of change within the current organisational framework.

There is already in-principle agreement in the Indian Railways that accounting reform be undertaken so that Railways accounting is done in a business oriented fashion. This must be implemented forthwith. Second, the Government has already approved the formation of a new Rail Tariff Authority. Hence, this Authority should be set up as soon as possible in order to provide rationality in the setting of both passenger and freight tariffs. Third, a re-organisation of the Railway Board may be undertaken on the lines of the recommendations of the 2012 Expert Group (Chairman: Sam Pitroda) so that it is organised into the kind of business lines proposed. If these interim reforms are undertaken, it would then become much easier to transform the current system into a corporatised system as proposed. The recommendations in the rest of this section may be seen as the short term reforms that are needed to make the Indian Railways commercially oriented that would ultimately result in the kind of corporate structure as proposed.

SHORT-TO MEDIUM-TERM REFORMS

Reorganisation on business lines: Indian Railways is presently organised in terms of several functional

Box 1.33

Corporatisation of Indian Railways: Sixth Central Pay Commission Report (Excerpts)

Various Railway Federations have demanded a special dispensation for Railway employees keeping in view the profitability of their organisation. The demand is not without substance especially as employees have to be rewarded for efficient performance of the entire organisation that has yielded continuous profits without resorting to any substantial increase in the passenger/freight fares in the recent years. A separate dispensation in terms of pay scales and allowances is not, however, possible, as long as the organisation continues to be a Ministry in the Central Government because it will then need to be governed by the common pay scales and allowances for the entire Central Government. In such a scenario, the optimal solution would be corporatisation of Indian Railways as a Public Sector Enterprise. This would allow the Railways flexibility in determining its own compensation package. While privatization of Railways cannot be an option as Railways is and will continue to be a public utility service providing crucial infrastructure support for balanced economic growth of the country, corporatisation of Railways as a Central Government PSE is a viable option that will not only allow better use of Railway assets along with higher quality of service and greater emphasis on profitability but also be able to compensate the Railway employees adequately for the increased profits that they are able to bring for the organisation.

The only argument that can be used against corporatization is that it may lead the Railways to go for profitability as its primary object without catering to the benefit of the general public. Another negative point of such corporatisation usually projected is that in times of national Emergency like external aggression etc. the Government may no longer be assured of full cooperation from Railways in case it is corporatised. There is not much substance in these arguments because even as a public sector undertaking, the railways would still belong to the public domain with the only difference that the Government then would need to provide upfront compensation to Railways for any social project taken up by Railways in advancement of Governmental policies.

Corporatisation would raise the productivity of services provided by the Railways as it would then be relatively free from governmental control. The Workers, Managers and Executives in Railway organization would then be free to raise the productivity of their organisation and participate in its increased profitability. The Commission, accordingly, recommends that corporatisation of Railways as a Central Public Sector Enterprise should be considered in right earnest by the Government. This will not only benefit the employees in Railways but also the common citizens as increased productivity of Railways will ensure better services to the common citizen.

Source: Report of the Sixth Central Pay Commission.

departments like Civil Engineering, Mechanical Engineering, Electrical Engineering, Signal and Telecom, etc. While in theory, such a structure promotes functional specialisation, each department being manned by separate cadres has led to lack of unity and strategic coherence. From recruitment to retirement, officers spend their service years almost entirely in the department getting deeply steeped in departmental thinking. A great deal of organisational energy is expended in inter-departmental competition for resources.

The Report of the Expert Group on Indian Railways (2001) noted that:

‘Indian Railways remains an integrated, functionally oriented institution that is organised around its cadres instead of around its businesses or customers.’

‘Historically, IR was forced to be an integrator of activities in order to be successful it had both to provide cradle-to-grave care for its employees, and also to produce everything from meals to wheels in order to operate. Indian Railways today is a complex conglomerate. It runs major businesses as diverse as hospitals, schools, catering, manufacturing, real estate and maintenance. To manage these diverse businesses, however, it has created a monolithic organisational structure based on function first and geography second. This makes life more complex than it should be. It makes it hard to answer important questions and it makes unimportant issues very important.’

Table 1.20 summarises the major recommendations of the Expert Group of 2001 (Dr Rakesh Mohan) and Dr Pitroda committee (2012) regarding reorganisation on business lines. Several railways internationally have reorganised their operations in terms of

Table 1.20
Reorganisation on Business Lines

THE EXPERT GROUP ON INDIAN RAILWAYS (2001)	THE EXPERT GROUP FOR MODERNISATION OF INDIAN RAILWAYS (2012)
<ul style="list-style-type: none"> The core transportation business of Indian Railways should be organised into five strategic business units (SBUs) comprising: <ul style="list-style-type: none"> Freight transportation Passenger transportation Suburban transportation Fixed infrastructure Other infrastructure The Freight, Passenger and Suburban divisions will be organised as profit centres. All sub-divisions to be treated as profit centres. The two infrastructure divisions— Fixed and other will be organised as cost centres. All non-core businesses will need to be separated into a sixth division. A Board headed by a Chief Operating Officer (COO) will manage each of the SBUs. The COO will also represent the division on the IREB. 	<ul style="list-style-type: none"> Create commodity wise Key Account Directors under Member Freight for major commodities like coal, iron ore, steel, food grain, fertiliser etc. Coal is 45 per cent for total freight traffic and needs special attention. Create Key Account Directors of suburban, long distance passenger, etc. under Member Passenger. Ensure autonomy, flexibility and accountability at all levels with clear P&L responsibilities. Make provisions for handling of all parliamentary functions (liaison functions with government, including handling of Parliament questions) by a Joint Secretary level officer in the Ministry, which would set the RB free to focus exclusively on business issues.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways; Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012.

business lines (Box 1.34). Annex 1.11 shows several different forms of Line of business management structures.

RECOMMENDATIONS

Infrastructure management, freight transportation, passenger transportation and miscellaneous activities should similarly be organised as separate profit-centres by the new IRC. These businesses could be further subdivided in terms of different activities. For instance, freight transportation could be reorganised in terms of bulk transport and non-bulk transport comprising of parcels and containers; and passenger transport in terms of high-speed, intercity, suburban and regional services. IR should concentrate on providing cost-efficient solutions in each activity by doing its part efficiently and taking the assistance of private partners or special created SPVs for other activities such as for movement of containers and parcels, development and management of terminals, marketing, road bridging, etc. In the suburban passenger transport, the attempt should be to achieve physical separation of the long-distance network and the suburban network, and its organisational separation later. Modern accounting practices would ensure that infrastructure and rolling-stock resources used by these lines of business can be properly charged after appropriate and correct costing.

It is important to mention here that addressing the capacity constraint on IR (discussed in Section 5)

is a concomitant need, in the absence of which the proposed accounting reforms and the reorganisation on business lines will not yield the desired results.

Non-transportation tasks: Production Units: A review of the railway restructuring experience across the globe shows that in order to become more focused, the Railways in most countries decided to spin off their non-core activities and concentrate on the core business (Box 1.35). For example, railways in Europe and Japan have long outsourced activities like rolling stock manufacturing. Even the Chinese Railways has reorganised its rolling stock manufacturing operations into separate companies - China South Locomotive and Rolling Stock (CSR) and China North Locomotive and Rolling Stock (CNR) (established in 2001 from the former China National Railway Locomotive & Rolling Stock Industry Corporation (LORIC)). Considering the serious competition faced by IR in the core transportation business (and the resulting decline in rail modal share of freight), it is imperative that IR critically reviews its presence in all the areas falling outside the core transportation operations. As mentioned earlier, the Expert Group on Indian Railways (2001) had also made a similar recommendation in its report and noted that:

‘To provide adequate focus on the core business as well as improve flexibility and cost competitiveness, the non-core activities of the railways will be fully divested over time, say five years.’

Box 1.34

Freight as a Business Distinct from Passenger Transport

In seven of the eight countries below, rail freight is treated as a separate business from passenger transport. It was not always so; in most countries, the major railway companies once had common business management of passenger and freight business. Because freight trains and passenger trains run on the same tracks, railways historically treated them as different parts of the same business, which they conceived as the business of running trains. Traditional management structures reflected the functional divisions that underpin a 'train' business (e.g. track, signaling, locomotives, traffic operations etc.) and (in larger countries) regional management divisions, similarly organised, as well.

COUNTRY	FREIGHT AS A DISTINCT BUSINESS ACTIVITY	BUSINESS SEPARATION
Australia	Both in federal and all state contexts (other than in Queensland) the operation of rail freight is managed by entities that do not operate passenger services. In Queensland freight is managed as separate division of Queensland Railways.	Mainly 1990s.
Brazil	Freight Concessions predominate (passenger services are mainly in city areas and are run by separate concessions)	1990s
Canada	Freight companies and passenger company (Via Rail) are separately owned. Via Rail is a publicly-owned passenger TOC that pays the freight private freight companies for access	1978
China	Still combined: Regional Railway Administrations deliver both freight and passenger services	N/A
Germany	The main freight rail operator, DB Schenker is a separate company within the State-owned DB holding structure and purchases network access from DB Netz, also in the group.	1991
Japan	The Japanese Freight railway Company is a free-standing freight TOC separate from the 6 passenger companies from whom it hires track access.	1987
Russia	The Russian Railways Corporation has progressively split Intercity Rail away from freight. Passenger Branch established 2006. Currently accounting separation only, but Passenger Branch structured to permit it being split into 5-7 regionally based passenger companies. Within the freight sector several private freight-only companies have been established, mainly with trains hauled by RZD.	2006
United States	Freight companies and passenger company (Amtrak) are separately managed and owned. Amtrak is a publicly-owned passenger TOC and pays the private freight companies for access (at regulated charges).	1970

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011.

The Expert Group further recommended that:
'...that priority candidates for accelerated spin off would be all the manufacturing units which should be done within a specified time limit.'

Given the massive investment requirement for rolling stock, it is imperative that IR should encourage participation of private players (both domestic and international) in setting up manufacturing facilities for rolling stock and components. Despite the recommendations available on this issue for quite some now, IR continues to set up new departmental production units, as also attempt setting them up under the PPP model. Leasing of rolling stock, especially wagons, under the PPP format is another policy enunciated. Joint ventures are also being planned. There is thus no coherent unified approach. Developing the private rail equipment ownership and leasing market can help in bringing substantial private investment to the railway sector (Box 1.37). Private equipment operators in Russia have invested over US\$20 billion in railway freight

equipment²⁰. As a result, the Russian railway no longer has to finance these investments, old rolling stock is replaced promptly, and new equipment technologies have been introduced that reduce maintenance costs and out-of-service time.

Globally, there has been a trend towards consolidation through mergers and acquisitions. Since the 1990s, a series of mergers and restructurings in Europe and North America led to the emergence of three dominant global manufacturers: Bombardier of Canada, Alstom of France, and Siemens of Germany. However, over the last decade, while Bombardier and Alstom have maintained their leading positions, the two Chinese manufacturers, CSR and CNR, have moved into third and fourth place in the list of leading global rail equipment manufacturers (by sales in 2009)²¹.

Recommendations on Production Units: The magnitude of the capacity expansion that is being

20. World Bank (2011).

21. Rennor, Michael and Gardner (2010).

Box 1.35

Focus on Core Business

In all eight countries—Australia, Brazil, Canada, China, Germany, Japan, Russia, and the United States, the major railway operators have withdrawn from most non-core activities. ‘Core’ is generally taken to mean the market focus that differentiates a business from its competitors. For freight railways the core business is delivering competitive transport services through efficient use of railway technology. In all the countries in the group, railways, both public and private, once encompassed a range of activities from which they have now withdrawn.

Three main types were social and recreational services for employees (e.g. housing, schools and hospitals); materials supply and manufacturing (e.g. loco and wagon manufacture, quarries and forests for track materials); and business support services (e.g. vehicle cleaning, printing, building maintenance). The imperatives of transport competition in the motor age have led the railways to devolve social services to specialist organisations and ministries and concentrate on sourcing and procuring railway equipment and support services in the way that will best support the core transport business, that is, by competitive tendering among suppliers. North American railways are ‘leanest’ in this regard. China’s railway still retains ownership of various ancillary companies, though it has divested most of its social services and major construction and manufacturing activities.

China’s refocusing on core business began in 1998 with reorganisation of several engineering and rolling stock manufacturing units to create limited liability companies. This was then followed in 2000 by the establishment of six major non-rail companies as independent enterprises, and their transfer to the supervision of the State Large Enterprises Working Committee. Also in 2000, MOR began transferring the schools, colleges and universities run by Regional Railway Administrations to local governments and to the Ministry of Education, although it still retained railway management institutes and colleges to provide occupational qualifications and training for railway staff. This process was completed in about 2005 when nearly 900 schools, 400 hospitals as well as kindergartens had been transferred. In 2004, the China Railway Communications Co. Ltd. (CRCC) (which had been established in 2000 and is responsible for providing railway telecommunications) and China Rail Materials and Supplies Co. Ltd. (CRMSC) (established in 1988 as the supply and trading agency for the RRAs) were transferred from MOR to the supervision of the State-owned Assets Supervision and Administration Commission (SASAC).

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011.

Box 1.36

Restructuring the Production Units (PUs)

IR’s production units (PUs) were set up at a time when it had become necessary to develop indigenous manufacturing capacity. In order to meet the twin objectives that of developing indigenous capabilities and conserving scarce foreign exchange the IR were entrusted with task of setting up and managing their own production facilities. Five production units (PUs) were set up during the period 1950-90: Chittaranjan Locomotive Works (CLW), Chittaranjan, 1950; Integral Coach Factory (ICF), Perambur, 1955; Diesel Locomotive Works (DLW), Varanasi, 1961; Wheel & Axle Plant, Bangalore, 1984; Rail Coach Factory (RCF), Kapurthala, 1985. These units are managed as departmental undertakings of the Ministry of Railways (MoR), unlike public sector undertakings, which, though owned by the government, are autonomous corporate entities. The MoR provides the funds through the railway budget and the accounts are audited by the Comptroller and Auditor General of India.

The units have to follow the policies laid down by the Railway Board (RB) in the matter of procurement of materials, plant and machinery leaving them with no autonomy in decision making. The RB also decides on the number and types of locomotives, coaches and wheels & axles to be manufactured each year, and the PUs formulate their production programmes accordingly. The products manufactured at

(Contd...)

PUs are supplied to the Indian railways at, what is termed as the 'transfer price'. This price is worked out on actual cost basis. It, however, does not include the cost of capital, the profit element and share of administrative charges.

At present, both IR and its production units are at the crossroads. Because of its weak financial position, IR has not been able to make even essential investments in plant and machinery. No wonder, 49 per cent of the ICF's plant and machinery has outlived its economic life; 16 per cent of the machinery is over 40 years old. Overage and obsolete equipment require frequent maintenance and additional staff. Similarly, at the Wheel & Axle Plant, most of the machines have outlived their economic life, causing heavy down time and low quality output.

Over the years, the production units have also developed their own types of vertical integration. For example, the older plants continue to produce components, which could be easily outsourced and that too at competitive rates. The result is high cost of production and low levels of productivity. **The availability of capital without a price tag has blurred the PUs' cost consciousness and financial accountability.** In addition, the sheltered market for their products and absence of competition do not provide them any motivation for improving quality and upgrading technology, which is way behind international standards. The production units, by and large, have continued with the technology and designs initially procured only with some incremental improvements. **In the bargain, they have suffered from technology stagnation for prolonged periods which affected their export potential.**

The world over, major industries including rail equipment industry have been undergoing structural changes as a result of domestic market developments and globalisation. **The process has been largely driven by three factors: technology, capital and competitive pressure.** The structural changes have resulted in the rationalisation and consolidation of the manufacturing activities. All national railways have hived off their production units into independent enterprises. The initial binds, which were the *raison d'être* for setting up these units, have since lost their validity. The industrial base in the country has acquired the capability for producing high quality equipment. The ancillary industry has significantly developed to produce quality products at competitive prices. The private sector that was earlier reluctant to invest in capital-intensive industries is now willing to do so. It has also developed managerial and entrepreneurial skills. **Time is both ripe and opportune to hive them off into independent enterprises under a corporate structure. Here it may be clarified that corporatisation of PUs would just be an interim phase.** It would subsequently lead to disinvestment and adoption of some suitable model for restructuring in the follow-up phase. Indeed, there are several models that have been adopted in different countries.

Source: Improvement of Railway Finances, Hiving off non-core activities, P.K. Malik for ADB.

recommended by the NTDPCC and the modernisation required in all forms of Railways rolling stock suggests that there needs to be a corresponding enhancement and modernisation of the production units producing such rolling stock in the country. As Indian incomes increase and there is a continuing change in the composition of demand towards more comfortable passenger coaches, there will be need for widespread replacement of the existing passenger coaches in the Indian Railways. In addition, with the kind of passenger shift toward Railways that is envisaged, there will be enhancement in demand for new coaches. On the freight side, as Dedicated Freight Corridors are rolled out, there will be new demand for freight rolling stock on a continuing basis. Furthermore, as freight transport becomes more specialised, greater integration takes place in freight transportation. As suggested in Chapter 4 (Integrated Transport: Strategy and Logistics), there will also be much increased demand for modern and

specialised freight wagons, which make intermodal transfers easier and more efficient. As mentioned above, we are witnessing the emergence of a few dominant global manufacturers in the advanced economies along with the rise of couple of Chinese manufacturers of railways rolling stock. In view of the expansion expected, India should also envisage the emergence of competitive Indian manufacturers for the railways sector.

The first step in this regard should be the corporatisation of the existing public sector railways production units. One possibility could be the setting up of a holding company like the Steel Authority of India Ltd (SAIL) with each of the production units as they currently exist as subsidiaries of this holding company. In order to modernise and expand these production units, an organised programme should be designed through a PPP framework to transform them into possible joint ventures in the

Box 1.37

Equipment Ownership and Leasing

Railway rolling stock comprises a major proportion of most railways' investment portfolio. Reforms that permit or encourage private investors to purchase railway equipment and lease it to users can bring substantial private investment to the railway sector. If the railway has insufficient equipment to meet customer needs, shippers can benefit from purchasing their own freight cars, especially if owning specialised equipment reduces costs or gains a market advantage. Usually, railways offer discounts on tariffs or transport charges for shippers that invest in rolling stock. The discount level is a determining factor in shippers' incentives to invest in rolling stock.

Equipment leasing is a natural extension of private equipment ownership. For railways, equipment leasing is normally a short-term - between one and seven years - exclusive-use agreement between equipment investors and customers. Usually longer-term leases, referred to as 'financial leases,' are a mechanism to finance rolling stock. With financial leases, international accounting standards require that the equipment value is accounted for on the shippers' books rather than the investors' books.

To grow and flourish, leasing requires a market ecosystem. Railway tariffs or transport price discounts must be sufficient to provide investors and shippers with incentives to purchase or lease rolling stock. Private owner-investors must be able to spread equipment ownership risk across multiple potential customers - shippers, rail operators or forwarders, or other railways - not just the state owned railway.

The railway benefits from private investment in equipment since it need not secure financing for rolling stock. This frees scarce railway capital for use in other areas, such as infrastructure improvement, where it may be harder to attract private investors. Privately owned equipment reduces the need for railway rolling stock maintenance facilities, and all the cost and capital they require to operate and renew. Privately owned equipment can yield more transport volume for the railway because it tends to lock shippers to rail transport and private equipment usually has higher utilisation. Moreover, the equipment may be newer, more reliable, and provide a better net: tare ratio and suitability for shipper needs than railway-provided equipment, which is likely more generic.

Shippers benefit from private investment in equipment because the equipment better suits their needs and its supply is more reliable. The equipment may reduce their overall logistics costs - either because it is easier to load and unload, or because it has higher capacity than generic railway equipment. Shippers may also benefit from the ability to assemble enough equipment to ship entire train loads in dedicated service. This not only improves equipment utilisation but also may make the shipper eligible for even more economical pricing.

Investors benefit from owning equipment by earning good returns. In a market of multiple shipper/customers, investors can spread their risks. Moreover, higher equipment productivity permits shippers to move higher volumes, which reduces overall costs for equipment investment - compared to full railway pricing or to equipment-lease payments.

Source: Railway Reform: Toolkit for improving rail sector performance, The World Bank, 2011.

first instance. As expertise is developed in these production units, we can expect a trend of consolidation through mergers and acquisitions of these joint sector units or public sector units along with any other private sector companies that may emerge in this area. Given the size of Indian Railways system and its envisaged expansion, there is no reason why Indian production of railways rolling stock should not be among the most competitive in the world.

In summary, the NTDPDC recommends that all the production units of the Railways be corporatised

within a holding company structure, such as SAIL, and the plans drawn up for their expansion and modernisation to emerge as globally competitive players.

Recommendations on Other Service Activities: All activities falling outside the core transportation and manufacturing operations should be critically reviewed from the perspective of either retention or outsourcing. Outsourcing would be a solution for the activities that are required for transportation service but can be done by another agency more

efficiently and at lesser cost (e.g. cleaning of coaches, provision of linen in trains, etc.).

There are also activities that are amenable and eminently suited to commercialisation and yet suffer from loss of focus being confined to a small part of the railway's operations at present. In the past, railways have benefited from corporatisation of such activities as project/technical consultancy, construction, container transportation, telecom services, etc. Going forward, parcel service management would be an ideal candidate for corporatisation. Other activities of similar nature could also be considered. In several railways, for instance Chinese Railways and Japanese Railways, transportation of special cargo (container, special freight and parcel), construction of railway infrastructure and management of stations have been successfully implemented to facilitate quick upgrade of technology, independent R&D and sharpen focus on upgrade of passenger facilities and revenue generation.

Railways have been experimenting with outsourcing a number of activities. Examples are: onboard cleaning, supply of linen in trains, station cleaning, etc. The results have not always been satisfactory. In fact, some of the outsourcing activities have given rise to a large number of complaints from customers. This, however, does not make a case against outsourcing. However, it demonstrates the need for seeking professional help and guidance in designing outsourcing modules and monitoring performance post-outsourcing.

Chapter 4, Volume II (Integrated Transport: Strategy and Logistics) details the kind of logistics systems that we can expect in the transport sector. The outsourcing activities mentioned above need to take cognizance of the emergence of these integrated logistics companies and take advantage of the kind of services that they provide.

Empowerment of Zonal Railways: It is essential that the organisational reforms be extended to the Regional/Zonal level. The recommendations of the Expert Group on Railways (2001) and the HLSRC (2012), with respect to empowerment at working level have been summarised below (Boxes 1.38 and 1.39).

Recommendations for Zonal Railways: GMs of Zonal Railways could be empowered to take decisions that enhance the revenue, reduce costs or build platforms for higher growth in future. For example, if a freight bye-pass or traffic facility work or a signalling change can increase capacity or remove a bottleneck, GMs could have the power to take such decisions without reference to Railway Board within a framework of rules and investment limits. The present system of seeking sanction for

investment to be included in the Works and Rolling Stock Programmes irrespective of the size of investment should give way to a more decentralised decision making at the zonal level. Simultaneously, the Zonal Railways would be made accountable for return on capital, transport output, profitability and safety. An enabling framework can be created to stimulate internal competition among Zonal Railways with incentives and bonuses for high performers. Box 1.40 shows the improvement in financial performance achieved as a result of managerial decentralisation undertaken in China.

The proposals above on the empowerment of Zonal Railways should be implemented as preparation for their functioning within an overall corporate framework is carried out as proposed above for Railways re-organisation.

Public Private Partnership (PPP): Investment in infrastructure in India is increasingly being done through public private partnerships (PPP). The concept is now also being extended to railways infrastructural investments. As noted earlier, most railways in the world are run as government owned corporations, with the exception of the United States. Thus, extension of the PPP concept to the railways while desirable, has to be done carefully.

A thorough review of the experience of PPP projects so far needs to be undertaken. Organisational and institutional deficiencies inhibiting PPP need to be identified and addressed. Clear-cut empowerment and accountability for PPP projects need to be established. Decision-making for PPP projects needs to be streamlined. Capacity building for officers handling PPP projects both at the ministry and the field level needs to be taken up with help of professional bodies. Standardised documents balancing risks and interests of private partners must be prepared in advance to avoid delay in decision making in the course of the bidding/award process. The existing PPP policy framework should be reviewed in the light of hitherto poor response and PPP experience.

The recommendations of the Dr. Pitroda Committee with regard to improving the environment for PPPs should be implemented (Box 1.41).

SUMMARY OF RECOMMENDATIONS

The Indian Railways, with its network of about 65,000 route km, plays a crucial role in integrating the social, political and economic life of the country. IR forms the backbone of India's transport infrastructure; facilitating industrial and economic development by transporting about 33 per cent of the total freight traffic (NTKMs), while simultaneously meeting the transportation

Box 1.38

Revamp Regions/Zones: The Expert Group on Indian Railways (2001)

The restructuring process will be extended to the Regional/Zonal level. A Zonal Management Committee comprising 4 General Managers (GMs) one each from the Freight, Passenger and Infrastructure Fixed and Infrastructure other Strategic Business Units (SBUs), will have the responsibility of managing the zone. The Zonal GM will report directly to the COO of their respective SBUs. Greater powers will be given to the Zonal GMs to allow them to take independent decisions regarding their own SBUs. Decisions regarding sharing of common facilities, infrastructure will be taken jointly by the Zonal Management Committee. Guidelines to facilitate decision making by the Zonal Management Committee will be laid down in line with the principles established by the Railway Executive Board.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways

Box 1.39

Recommendations of HLSRC Regarding Empowerment at Working Level

Enhanced powers should be delegated to GMs and DRMs in regard to safety matters as under:

- Powers of General Managers to be enhanced to 3 times for sanction of works under all Plan Heads except New Lines and M & P items. These should also be applicable under out-of-turn basis, depending on the urgency. Powers of DRMs also to be accordingly enhanced to 3 times.
- General Managers to be given full powers for re-appropriation of funds from one work to another under the same Plan Head and source of funds under all the Plan Heads, except New Lines.
- General Managers to have full powers to re-appropriate funds under Revenue under the same Demand from one PU to another within the overall budget allotment.
- DRMs to be fully empowered to decide the process/procedure such as Spot Purchase Committee, Single/Limited Tenders, etc.
- DRMs to have full powers:
 - To accept tenders floated by the division
 - To enter into repair or Annual Maintenance Contracts through OEM or otherwise
 - To purchase stock items in case of shortages and non-stock items upto Rs 0.3 million per case but without any monthly ceiling
- DRMs to be empowered to award works of essential nature related to operation and maintenance assets on quotation basis for 3 months as a stop gap arrangement.
- DRMs to have full powers for hiring of resources including utility vehicles.
- DRMs to have full powers to sanction construction of RUBs, limited height subways and ROB under Road Safety works.
- Powers those vested with DRMs of the Division to be enjoyed by the Chief Workshop Managers in respect of their workshops.
- Powers to sanction cash awards for good performance in safety related matters should be enhanced to three times.
- Enhanced delegation of powers to the divisions should be directly mandated by the Railway Board as a onetime measure.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee).

needs of the people across the length and breadth of the country.

However, Indian Railways has suffered from the absence of a comprehensive framework for capacity expansion over the last 60 years. Consequently, only incremental changes have taken place through gauge conversion, doubling of lines, some modernisation of signalling, etc.; along with continuous

addition of new lines on uneconomic routes. Presently, the network of IR is plagued by infrastructure and carrying capacity constraints and most of the routes on the high density network (HDN) have already reached saturation in line capacity utilisation. *The expenditure on railways as a percentage of total transport sector expenditure has declined considerably over the last two decades.* Moreover, while IR has been suffering from severe capacity con-

Box 1.40

Managerial Decentralisation in China

China has increasingly tried to commercialise its Regional Railway Authorities but without establishing them as corporations. The introduction of Assets Operation Liability System (AOLS) in 1999 was a key step in managerial decentralisation by making Regional Railway Administration managements responsible for managing and increasing the value of the assets assigned to them. AOLS sets bonuses in relation to three targets and two commitments. The three targets are: to increase the net worth of the RRA; to make profits, expressed as a percentage of the RRA's gross operating assets; and to return dividends to MOR, expressed as a percentage of MOR's capital investment. The two commitments made by RRAs are: to operate safely; and to achieve a specified minimum increase in RRA profits or reduction in RRA losses. Under AOLS, each member of RRA management (as far down as stationmaster) puts up an incentive deposit, the size of which depends on rank. The deposit is forfeited if the targets and commitments are not met. For target-beating performance, the manager gets the deposit back, plus a bonus equal to up to twice the deposit. During the eight years that ALOS has been in place, there has been a steady improvement in the financial performance of the RRAs (and of CR as a whole) as well as a significant improvement in safety, with the number of accidents reducing. Most RRAs now achieve the higher levels of bonus.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 13, Paul Amos, July 2011.

Box 1.41

Organisation for PPP: Recommendations of the Expert Group for Modernisation of Indian Railways (2012)

- Create a post of Member (PPP) responsible for project development and processing of all PPP projects to facilitate their speedy sanction by the Government and award of concession. The Member should have a multi disciplinary team of officers, including finance, to deal with various railway projects.
- Establish a Committee for approval of PPP projects to be headed by Chairman Railway Board with Financial Commissioner, Member (PPP) and the concerned member to whose area of responsibility the project belongs. The process and procedure followed should be similar to that of PPPAC followed in Government of India. The Board should decide and approve the projects and they should not be examined or referred back by the members to their respective directorates. The projects thereafter should follow the normal procedure of approval by PPPAC and CCI.
- Appoint a 'PPP Ombudsman' to resolve any disputes that may arise between the private sector and the government in interpretation and enforcement of provisions of the agreements. The Ombudsman should be a quasi judicial authority and should have the authority to give directions which are binding on all parties.
- Constitute a Railways Tariff Regulatory Authority in order to provide a level playing field to all stakeholders.
- Build capacity for the officers at the Zonal railways to manage PPP projects. A PPP cell should be constituted in each zone to identify, develop, implement and monitor projects at the zonal level.

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012.

straints and remains underinvested, the road sector has witnessed a surge in investments (both public and private). The launch of the ambitious National Highways Development Project (NHDP) brought about a phenomenal improvement in the national highways.

As a result of the severe capacity constraints and distortions in relative allocation of resources, IR has seen a fall in the share of both passengers and

goods transported over the last 60 years. *The non-optimal intermodal distribution is estimated to cause a loss of about 4.5 per cent of GDP to the nation's economy. It is essential that an attempt is made to reverse this declining trend in railway's share or, at a minimum, to arrest it.* If this is not done, the progressive achievements of the NHDP will only accelerate the loss in the railways' transport share leading to greater pollution and environmental degradation.

Thus, the key issue facing the country relates to the desired strategy for capacity expansion of the railways over the next 20 years. All projections for the growth in demand for both freight and long distance passenger services suggest that overall economic growth could be stymied if appropriate strategic choices are not made now to facilitate significant capacity expansion of the railways. If consistent economic growth of 7-10 per cent per annum is to be achieved over the next 20 years, there is a pressing need for unprecedented capacity expansion of the railways for both freight and passenger traffic in a manner that has not taken place since independence.

The massive capacity expansion, as envisaged, will not take place in a business as usual scenario. Hence it is of the utmost importance that a vision similar to that of NHDP is laid down for railways so that we may expect a transformed railway network by 2032. This will have to be supported by (a) the required organisational changes, and (b) certain strategic decisions in terms of the relative allocation of resources between rail and road.

Choices will need to be made on the priorities to be placed on different investments. This implies some judgment on the normative modal shares that are desired for rail, road, air, shipping, and inland waterway traffic. At present, this prioritisation and decision-making are disjointed. A coordinated approach needs to be taken focusing on significant augmentation of technical capacity, investments in capacity building and R&D, executing the required organisational reforms and accounting reforms, setting up of the rail tariff authority, among other things. The important recommendations for each of these areas are summarised below:

ORGANISATIONAL REFORMS

The key issue to be addressed in the reform of Indian Railways is the institutional separation of roles into policy, regulatory and management functions. Currently, these roles are blurred with the Railway Board essentially performing all the three roles put together. This causes confusion about the underlying vision and mission of the Indian Railways. Consistent with Railways reforms in other major countries and with those in other infrastructure sectors in India, the NTDPDC recommends the separation of Railways management and operations from the Government. The Ministry of Railways (or the unified Ministry of Transport) in the future should be limited to setting policies; a new Railways Regulatory Authority would be responsible for overall regulation, including the setting of tariffs; and the management and operations should be carried out by a corporatised entity, the Indian Railways Corporation (IRC) to be set up as a statutory corporation, which would retain many of the quasi governmental

powers endowed to the Railways under the current Act. Existing railways corporations such as CONCOR, DFCCIL, and the like will become subsidiaries or joint ventures of the IRC.

For these reforms to be implemented, the Railways Act, 1989, and the Indian Railway Board Act, 1905, will have to be amended accordingly.

These reforms will be very complex and the NTDPDC recommends widespread consultation with major stakeholders including the staff and unions of the railways system. This process may take upto 5 years. During this period, the Railway Board should be reorganised along business lines consistent with the recommendations of the 2001 Expert Group on Indian Railways and those of the 2012 Expert Group for Modernisation of Indian Railways.

The NTDPDC also recommends the corporatisation of the existing public sector Railways Production Units. Each of the production units could be set up as a corporate subsidiary of a holding company that oversees all the production units. Plan should be drawn for their expansion and modernisation to emerge as globally competitive players.

To facilitate these reforms, the NTDPDC recommends that the Railways should undertake recasting of its accounts in a company account format consistent with accounting norms under the Indian GAAP. This is feasible to do since it has already been on a pilot basis twice: first by the Railways Capital Restructuring Committee of 1994 and the Expert Group of 2001.

Furthermore, in preparation of the overall corporatisation of the railways system, the existing organisation of the Railways needs to be reorganised on business lines. Indian Railways is presently organised in terms of several functional departments like Civil Engineering, Mechanical Engineering, Electrical Engineering, Signal and Telecom. It should be reorganised in terms of business lines such as infrastructure management, freight transportation, passenger transportation, parcel and miscellaneous activities should similarly be organised as separate profit-centres by IR.

All activities falling outside the core transportation operations should be critically reviewed from the perspective of either retention or outsourcing.

GMs of Zonal Railways to be empowered to take decisions that enhance revenue, reduce costs or build platform for higher growth in future. GMs should have the power to take such decisions without reference to Railway Board within a framework of rules and investment limits. Simultaneously, the Zonal

The existing Railways Production Units should be corporatised. Each could be set up as a corporate subsidiary of a holding company that oversees all the units.

Railways would be made accountable for return on capital, transport output, profitability and safety.

Organisational and institutional deficiencies inhibiting PPP need to be identified and addressed. Decision-making for PPP projects needs to be streamlined. Capacity building for officers handling PPP projects both at the ministry and the field level needs to be taken up with help of professional bodies. The existing PPP policy framework should be reviewed in the light of hitherto poor response and PPP experience

GOALS FOR 2032, STRATEGIC PLAN AND BUSINESS STRATEGY

Optimal market share in freight: Aim to attain 50 per cent market share in inter-regional freight traffic by 2032, up from the current level of about 33 per cent.

Indian Railways to satisfy passenger service demand in full.

A shift of long-distance (500 km and above) transport of parcels - essentially non-bulk packaged items - to rail is a must.

Indian Railways to institutionalise a strategic planning process taking a forward view over the next 20 years. The strategic plan has to be necessarily prepared involving the Zonal Railways and key stakeholders and will clearly lay down the goals to be aimed at and attained and the path to be traversed. A multi-year investment plan fully supported by a credible funding plan will form the bedrock of the strategic plan.

FREIGHT AND PARCEL BUSINESS STRATEGY

- Indian Railways to capture a significant share of the fast-growing FMCG, Consumer Durable and Information Technology (CDIT), containerised cargo and other segments like automobiles, etc., where its presence is negligible. In this regard an organised intermodal transport system which will combine the advantages of rail with that of road is needed.
- Setting up of a focused business organisation for multimodal transport of non-bulk commodities (e.g. parcels) under the PPP mode, combining the efficiency and advantages of rail and road.
- Development of a few selected corridors for heavy-haul operations.

- Development of last mile connectivity on PPP in a time-bound manner
- Running of freight trains at 100 km per hour.
- Running of premium freight services with differential pricing and assured deliveries.
- Supply of rakes on demand with differential pricing for different demand lead times.
- Running of trains on schedule with guaranteed transit time.
- Running of automobile, hazardous material trains, movement of bulk cement, etc by private train operators.
- Reduction in cargo parcel size to 1,000 tonnes and aggregation mechanism for even smaller parcel-sizes.
- Indian Railways to work closely with state and city authorities to set up rail-based multi-modal logistics parks to attract increasing volumes of miscellaneous cargo to rail.

PASSENGER BUSINESS STRATEGY

- Upgrade speed to 160-200 kmph on select corridors.
- Shift of focus to long-distance and inter-city transport and suburban corridors involving dense passenger movements.
- Redevelopment of stations for smooth flow and comfortable experience of passengers as also to ensure clean and hygienic environment.
- Redesign of coaches to enhance travel comfort.
- Conversion of all stopping passenger trains to EMUs/DMUs or railcars; invitation to state governments to manage uneconomic and unpatronised services.
- Augmentation of supply (more trains and longer trains) to ensure full satisfaction of demand.

CAPACITY CREATION

Construction of 6 Dedicated Freight Corridors on top priority. The Eastern DFC must be given the highest priority among the DFCs, and should be completed within the 12th Five Year Plan. Further, construction of Eastern, East-West and East Coast DFCs must start from the eastern end. Private sector participation should be encouraged for development and operations of the DFCs.

Eight critical feeder routes for coal with a combined length of about 600 km and several other critical links for the steel industry with a combined length of about 2,340 km must be completed on the highest priority within the 12th FYP.

Improved connectivity to industry clusters as well as significant ports (major and non-major), based on

their current and projected traffic volumes. Development of last-mile connectivity should be encouraged through PPPs.

Development of 15 to 20 logistics parks as the main network hubs viz. Mumbai Bangalore, Cochin, Hyderabad, Kolkata, Delhi NCR, Ahmedabad, Nagpur, Vishakhapatnam, Siliguri, etc.

Given the massive investment requirement for rolling stock, the capacity for manufacturing rolling stock and components must be increased substantially.

Upgrade wagons and track to 25-tonne axle load.

Upgrade rail wagons (higher axle load, better tare-to-payload by shifting away from carbon steel to stainless steel and aluminium/ other light-weight bodies, increased payload of covered wagons (BCN) through use of well wagons, better maintenance cycles, etc).

Expand partnership with private sector to facilitate development of private freight terminals, operation of container, automobile and special freight trains and third-party leasing of wagons.

IR should achieve physical separation of the long distance network and the suburban network. The segregation of suburban and long distance passenger/freight traffic is necessary for efficient provision of commuter service. A separate organisation should be created for suburban services with freedom to coordinate with state governments for connectivity/integration.

Development of select High Speed Corridors (speed potential 350 Km/h) on a pilot basis, if and when deemed to be economically viable.

INVESTMENT PLANNING

IR needs to shift to a programme approach from the current project-oriented approach.

Quick pay-off projects that can ease the capacity constraint the fastest should be prioritised.

Investment should be focused on total capacity creation including rolling stock, asset renewal, technology induction, information technology, identified investments in modernisation, etc.

A more integrated approach is required to be taken of transport as a whole and choices will need to be made on the priorities to be placed on different investments. Priority should be given to projects such as DFCs which are self financing and critical to achieve the target of 50 per cent share of railways in freight

IR should physically separate the long-distance and suburban networks. A separate organisation should be created for suburban services with freedom to coordinate with state governments for connectivity/integration.

transport, as compared to projects such as HSR network which require continuous fiscal support.

A programme for raising speed to 160-200 km/h on selected existing routes should be undertaken, till the time the HSR projects are found commercially justified or operationally required to cater to the country's growth and mobility needs.

IR should encourage participation of private players (both domestic and international) in setting up manufacturing facilities for rolling stock and components. This would facilitate induction of world-class technology, besides being a source of capital for the resource constrained IR.

Replacement and renewal of assets should be ensured. The ad hoc approach presently followed in respect of appropriation to Depreciation Reserve Fund needs to be overhauled and a rule-based approach needs to be put in place.

PROJECT EXECUTION

Considering the need for massive capacity augmentation over the next 20 years, a separate body/organisation, partially independent of the Ministry of Railways should be set up to expedite the delivery of projects. All works having a budget outlay of more than Rs 5 billion (or may be Rs 10 billion) should be entrusted to an 'Authority', which may be called the 'National Railway Construction Authority' (NRCA). The NRCA would be an umbrella organisation having a national level presence, fully autonomous, and having extensive powers for award of works. It will award contracts for construction, supervise quality of construction and would ensure smooth flow of funds for the works to continue unimpeded. Repayment of loans, tax-free bonds, etc. would be channelised through it.

All capacity enhancement projects should be taken up after ensuring that funding is earmarked for each project. The concept of financial close may be introduced for each project.

Project teams to be held accountable for timely completion of the projects. Project managers to continue in their positions till project completion. Performance-linked incentives should be provided and penalties for failure should also be imposed.

A comprehensive railway safety policy with measurable indicators for evaluation for a five-year and 10-year period must be announced before the end of 2015

TARIFF

As has already been approved by the Government, independent Rail Tariff Authority should be set up with the mandate of fixation of rates and fares.

As the overall railways reform proceeds, this Authority can be changed into an overall Railways Regulatory Authority which would encompass tariff setting, along with other regulatory functions. Service-based pricing to attract traffic for bagged bulk commodities and non-bulk commodities.

A realistic programme of fare revision should be designed to reduce/eliminate the losses on passenger services. The government may subsidise up to 25 per cent of the costs of Suburban railways and no subsidy should be provided for non-suburban railways.

SAFETY

Establish a National Board for Rail Safety which is independent of the operational agencies to avoid conflict of interest. The CEO of the Board should be of a rank of Secretary to the government of India and should report directly to the Railway Minister. The Board will also conduct statutory inquiries into train accidents occurring on the Indian Railways, presently being conducted by the Commissioner of Railway Safety.

Establish/strengthen Safety Department within operating agencies (at different levels—Railway Board, Railway Regional headquarters) for ensuring day-to-day compliance with safety standards, studying effectiveness of existing policies and standards, conducting safety audits, collecting relevant data, etc.

A railway safety policy with measurable indicators for evaluation for a five-year and 10-year period must be announced before the end of 2015.

Reform data collection and analysis procedures for traffic accidents in consonance with international practices at different levels: National broad-based data, detailed survey systems for fatal cases, sampling systems for medical data, etc.

RESEARCH AND DEVELOPMENT (R&D)

Establish **Railway Research and Development Council (RRDC)**, an apex body that will replace the

Governing Council and will be chaired by an eminent technologist/scientist, with the Chairman and Technical Members of the Railway Board as its members. RRDC shall provide the perspective plan stretching over a reasonable period of 10 years for research and development needed for the Railways. The Director General of the proposed RRDI, the Director General of RDSO and 2 Directors of the proposed Academic Centres of Excellence shall also be ex-officio members. It will also have one representative each from the academic world and research organisations.

Establish **Railway Research and Development Institute (RRDI)**, a multidisciplinary research organisation for applied research on current concerns and future technology development for Railways. The RRDI should be supported by six or seven Regional Railways Institutes, which focus on the research requirements specific to their region. The head of the RRDI should report directly to the Minister of Railways or the CRB. It should target recruiting close to 300 researcher professionals by the end of the 13th Plan, with a healthy mix of Ph.D. degree holders, engineers, architects, professors from national and international universities etc.

Establish **Academic Centres of Excellence or Railway Research Centres (RRCs)** in at least 13 technical institutes and at least two IIMs by 2020. These should be in the nature of full scale research centres where faculty can interact within a sizeable group. The RRCs should be provided grants in aid for establishment expenses, building, facilities, laboratory, equipment etc. In addition to equipment, supplies, travel and research funds, the funding must include 5-10 endowed permanent Chairs and 10-20 endowed post-graduate scholarships.

The functions of the RDSO should be completely redefined and actions should be initiated to revitalise and strengthen it. RDSO should involve itself with only technology upgradation, implementation and setting of standards; it should not be responsible for inspection.

Manufacturers of railway products to be involved in R&D for both new technologies as well as for improvement of existing systems and products. Setting up of new units with participation of private sector would also be useful in ensuring technological upgradation.

Result-oriented research teams should be set up to work on specified research projects. Such teams may include participants from outside IR, including from research/academic institutions and OEMs, contracted for the duration of the project.

An Integrated Energy Management System (IEMS) need to be set up under a separate directorate in the Railway Board.

INTERNATIONAL RAIL LINKAGE

IR should exhibit greater urgency and expedite the execution and operationalisation of identified inter-country connectivity projects as well as the execution of bilateral agreements, for smooth and seamless movement of intra-regional traffic among neighbouring countries. It is recommended that IR should give top-most priority to the projects to be taken up with Nepal and Bangladesh

Improvements in rail connectivity with neighbouring countries required on diplomatic and political considerations should be fully funded by the exchequer.

OPTIMISATION OF LAND USE

Infrastructure Corridors: Suitable directives to be established whereby whenever a new transport infrastructure—rail or highway—is built, the corridor must provide for segments of the infrastructure, i.e. if a new port comes up, the rail connectivity must be in a corridor that also provides for highway, power lines, combined terminals, etc.

Schedule of Dimension (SOD) and Maximum Moving Dimension (MMD) improvement should be undertaken.

A standard template can be developed for redesign and redevelopment of the stations that maximises comfort for commuters and create space for premium retail in station premises.

INFORMATION TECHNOLOGY

Computer and Information Systems (C&IS) directorate at the Railway Board should be greatly enhanced as to encompass the entire gamut of ICT applications on the network.

Centre for Railway Information Systems (CRIS) should be converted from a society to a non-profit company with much greater freedom.

Organisation(s) for operationalising ICT applications at field level should be converted into autonomous bodies.

IR Institute of Transport Management (IRITM) should be entrusted with the task of human resource development.

HUMAN RESOURCES

Multiple services and cadres of Railways at the management level need to be rationalised and coalesced into fewer services in preparation of and to be consistent with the overall railways reform being proposed. The recruitment to the railway cadres of officers should be totally dissociated from the Civil Services and Central Engineering Services exams. The SCRA exam should be upgraded to recruit candidates, who are already graduates, to two streams of Railway Service viz. Indian Railway Technical Service and Indian Railway Logistics Service, while overall reform is undertaken.

Induction of unskilled staff to be reduced and gradually done away with.

The recruitment processes to be supplemented by well researched and meticulously developed induction and in service training to constantly upgrade the skills of employees.

Recruitment of highly qualified PhDs from IIMs/IITs and lateral recruitment from market would be considered for specialist functions with suitable compensation.

A system of reward for collective performance and variable pay linked to incremental surplus generated by various units to be implemented.

Annex 1.1

International Comparison of Modal Share of Domestic Freight

The modal share of rail freight ranges from only 3 per cent in Japan to around 65 per cent in Russia. Although the range of traffic types carried by railways in each country is similar, the overall contribution to the domestic freight task differs in each country. The proportion is influenced by management performance and also by (a) the actual freight markets offering and whether they are suited to railways; and (b) the existence and extent of domestic waterborne transport (coastal shipping and/or inland waterways). Since railways and these waterway services target many of the same market segments a large commercial waterway sector will significantly constrain railway modal share. The table below summarises some of the country specific factors involved:

COUNTRY	MODAL SHARE* OF DOMESTIC FREIGHT (EXCLUDING PIPELINES)
Australia	Railways carry about 44 per cent of domestic freight. Because of concentration of population and industry around the coast, the coastal shipping industry carries a substantial 20 per cent.
Canada	Railways carry about 66 per cent of domestic freight. The high market share is influenced by Canada's long east-west distances, but water transport (coastal shipping and St Lawrence/ Lakes transport) is significant with about 12 per cent modal share.
China	Railways carry about 51 per cent of domestic freight. Waterways (including both coastal shipping and over 24,000km of commercially significant inland waterways) perform a very large role in China carrying about 27 per cent of traffic.
Germany	Railways carry about 19 per cent of domestic freight. Germany has little bulk traffic and faces rather short rail distances; it also has an extensive inland waterway network consisting of the Rhine River and its tributaries, and a solid canal network, which together carry about 18 per cent of freight.
Japan	Railways carry about 3 per cent of domestic freight; because of its island geography, coastal shipping is the overwhelmingly dominant carrier with 58 per cent modal share.
Russia	Railways carry about 65 per cent of total freight. Russia's main waterways are south-north (which is contrary to main traffic flows); also the long east-west distances and relatively poor east-west road system contribute to the very high railway modal share.
United States	Railways carry about 44 per cent of total domestic freight. The USA has important coastal shipping links and about 12,000 km of commercially significant inland waterways (dominated by the Mississippi-Missouri river systems), which together carry about 25 per cent of freight.

China, Germany, Japan and Russia are, like India, mixed-use railways with significant freight volume but also heavy passenger train use of the network. By contrast, Australia, Brazil, Canada and the USA have only marginal passenger train activity outside the cities. Not having to share the network with a substantial passenger rail service affords both institutional and operational freedom on rail freight service. Nevertheless, the freight railways in those countries contain some of the most efficient land-based freight operations in the world and much of this experience is equally valid for mixed-use rail systems.

Note: Modal share does not equate to market share. Different modes can only 'share' markets where they exist as viable alternatives in those markets. The market reach of road networks is much greater than of railway systems, and that of rail systems exceeds that of waterway networks.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011.

Annex 1.2

Routes Suggested for Increasing Maximum Permissible Speed to 160-200 kmph



Source: Report of the Working Group on Railways (NTDPC).

Annex 1.3

Forms of Government Financial Support of Railway Passenger Services

TYPE	CHINA	GERMANY	JAPAN	RUSSIA
Compensation for carriage of specific user groups	No	Minor (less than 2 per cent of second class revenue on long-distance services)	No	Yes
Specific operating subsidies	No	Contract payments from regional administrations for public service contracts	No	Contributions towards regional companies from corresponding regional administrations
General operating subsidies	No	No	No	Deficit support of passenger revenue shortfalls during reform process.
Specific capital support	Grants for building new lines to remote areas	Replacement infrastructure investments, set out in a performance agreement with govt. Interest free loans and grants towards projects included in the federal transport infrastructure plan	The fees for rail company use of many high speed lines are set at less than full commercial rates on some lines.	For projects contained in the federal target programme. For 'special' projects (currently dominated by Olympic projects)
General capital support	No	No	No	Equity injections for maintenance repair and rehab.
Support from freight services	Freight services pay disproportionate share network costs	No	No	Freight services pay disproportionate share of network costs

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011.

Japan's Funding System

Japan's passenger railway sector is operated by private companies according to commercial principles. The three major, privately-owned, JR companies must fully cover the train operating and network infrastructure costs of their operations with commercial revenues, and finance their own capital programmes. They receive no revenue subsidies from the Japanese Government and must finance their own infrastructure development programmes, though special provisions apply to the development of the Shinkansen Network.

Most of the companies have diversified into a wider range of non-railway (and non-transport) businesses. These include businesses based on use of railway property and air-rights. The many non-JR companies generally earn an even greater share of revenue from non-transport businesses. The financial performance of the largest JR passenger company, the East Japan Railway Company (EJRC), is illustrative of the financial structure of the passenger railway industry in Japan. Of its operating income around two-thirds is earned from transport (mainly railways but including bus services and the Tokyo monorail), 9 percent from commercial exploitation of its own stations, 18 percent from other shopping and office centres, and 9 percent from various ancillary businesses. The company has 75 subsidiaries in all (each of its 25 shopping malls is managed by a separate subsidiary).

Although commercially independent, the Japanese Government imposes a number of general obligations on the JR passenger railway companies, including appropriate setting of passenger fares and rates structure; facilitation of smooth inter-company transfers by passengers; maintenance of the currently operated railway routes with due notification and process if line closure is envisaged or stations and other railway facilities are to be developed; and consideration of the impact of company diversification plans on small and medium-sized enterprises engaged in similar business in the same areas to avoid unfair impact.

The government is involved in financing the Shinkansen (bullet train) network. The Tokaido Shinkansen, a 515 km high-speed passenger-dedicated line opened in 1964. **This first route was a financial success** and by 1967 revenue exceeded operating costs, including interest and depreciation. The succeeding Shinkansen lines, while generally earning sufficient to cover operating and maintenance

(Contd...)

nance costs, were less heavily used and able to contribute little towards capital recovery. Shinkansen-related debt was JPY 5.7 trillion by 1987 and Japanese National Railways were wound up with a significant portion of this debt relieved.

The capital cost of new Shinkansen railway construction projects is now shared by the national government (two-thirds) and local governments (one-third) along the railway lines. The railways are constructed and owned by a government corporation but managed and operated by the companies. Passenger railway companies pay a levy for the use of this infrastructure. The maximum charge is equal to the profits from the new Shinkansen operations. Therefore decisions to build new lines involve a detailed appraisal of the impact on the profitability of the railway company. A little more than half of the national government funding comes from the payments received from companies for use of existing Shinkansen lines while the remainder comes from Japan's General Account.

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011.

Russia's Funding Structures

The Russian passenger railway sector has undergone reforms over a period of 10 years from 2001 to convert the railway sector from the wholly vertically and horizontally integrated structure inherited from the Soviet Union to one based on commercial, corporatised structures focused on specific business activities and private sector participation in train operations. Prior to the 2010 reforms, passenger services were run directly by Joint Stock Company Russian Railways (RZD – a defined 'strategic' company whose shares were owned by the Russian Federation). As part of reforms RZD transferred staff and assets to the newly formed Federal Passenger Company, which manages long-distance rail passenger services. Their aim is **transparency of financial performance, eventual elimination of cross-subsidies, and the ability to set locally economically justified tariffs.**

RZD passenger services receive several forms of financial support from the Russian Federal Government and modest contributions from regional administrations. Revenue support of various kinds appears to have been about RUR 41 billion (US\$1.3 billion as of November 2012) or just over 15 percent of the total income of the RZD companies and subsidiaries. There is also capital support of passenger railway links in preparation for the 2014 Sochi Winter Olympics and for a new airport link in Vladivostok (these categories of support are clearly of a special and short-term nature). Passenger services have also benefited from federal support of around RUR 39 billion to rail network infrastructure in 2010, although rail freight, which constitutes around 90 percent of traffic-kms in Russia, is likely to have been the main beneficiary.

RZD raises debt for its own funded investments through loans and bonds. As at the end of 2010 total debt is reported as RUR 297.6 billion consisting of RUR denominated bonds (63 percent), Euro-denominated bonds (15 percent), project finance (11 percent), syndicated loans (8 percent) and bilateral loans (3 percent).

Russian passenger services earned accounting losses in 2011, but long-distance services as a whole probably contributed positively to network infrastructure costs. Long-distance services cover about 80 percent of their fully allocated expenses and suburban/regional services about 56 percent of fully allocated expenses. This implies that long-distance services cover their train operating costs (which are expected to be less than 80 percent of the total costs) and make a modest positive contribution to infrastructure network costs, while suburban services as a group do not even cover train operating costs.

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011.

Germany's Funding System

Germany's two main state-owned rail passenger service providers, **DB Long-distance and DB Regional, both benefit significantly from government financial support** from two main sources. DB and its subsidiary passenger and infrastructure companies are responsible for financing their operations, management and maintenance expenses entirely from revenues.

However, a major portion of the revenue earned from regional passenger services (whether run by DB Regional or private contractors) is from government funded **passenger public service contracts between the regional company and the administrations** on whose behalf specific services are run at agreed fare schedules and structures. This support represents about 56 percent of DB Regional's total revenue.

Moreover, while track access charges paid by operators to DB Netz are sufficient to cover the expenses of track operation and maintenance, access income only finances a small part of the capital costs of renewal, upgrading or of new rail infrastructure. **Most of the capital cost is funded by government grants and non-interest bearing loans**, which partly come from petroleum taxes and the EU. DB contributes funds of its own towards such projects insofar as they are in its own business interests (it has contributed around 15-20 per cent of the total). Over the last few years, the Federal government has contributed an average of EUR 1.2 billion/year to new-build and upgrading projects.

A third, source of federal government funding is **payment to providers for trips made by certain community groups** such as severely disabled passengers, and military (or alternative) national service travellers. This constitutes a minor portion of passenger revenue (less than 2 percent of second class revenue on long-distance services).

The German model of concessioning of suburban/regional networks through competitive tender has provided good value for money. According to DB, the Federal Länder (states) now have to spend less public funds to obtain a far higher level of traffic performance in regional rail service than at the start of the rail reform (According to the DB Annual Competition Report 2011, after adjustment for inflation, the Länder received 37 percent more performance for each euro in 2009 than they did in 1996).

Additional government support to DB companies is also given through borrowing guarantees. This includes explicit sovereign guarantees for loans from Eurofima, a company set up by a number of European railways to finance purchase of railway rolling stock. Because DB is 100 percent owned by the German Federal Government, the raising of capital by the DB Group is also assisted by market perception of an implicit government guarantee on bonds issued by the DB Group's financing company, DB Finance.

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011.

ANNEX 1.4 REORGANISATION INTO 7 CADRES

[ALTERNATIVE VIEW ON HUMAN RESOURCE MANAGEMENT]

- While the recruitment to the Indian Railway Medical Service, the Security Service and the Indian Railway Stores Service can continue as hitherto, the balance 7 railway cadres may be reduced to 4 as under:
 - i. Indian Railway Traffic Service, recruitment done through the Civil Services Examination as now.
 - ii. Indian Railway Service of Engineers, recruitment done through the Combined Engineering Services. This service will be responsible for the maintenance of fixed infrastructure (track, formation including bridges, buildings, signaling, over head electrical traction system etc). The initial qualification may be prescribed as a graduate in Civil or Electrical Engineering and no other branch. It may be mentioned that till the 1950s, Signaling Cadre was a part of the Indian Railway Service of Engineers.
 - iii. Indian Railway Service of Mechanical & Electrical Engineers, recruitment done

through the Combined Engineering Services. This service shall be responsible for the 'rolling' infrastructure, that is, locomotives, coaches, wagons etc. The initial qualification will be a graduate in mechanical or electrical engineering.

The SCRA exam would be done away with; it is a historical legacy of 1926; and when graduate engineers are available, the need for SCRA does not exist. In fact, the Ministry had stopped recruitment for two years due to the reluctance of UPSC to conduct such a recruitment and it was restarted more for sentimental reasons. Qualifications as now prescribed by UPSC do not prohibit an electrical engineer joining the IRSE cadre or a mechanical engineer joining the IRSEE cadre. And, the Railways have had such examples.

- iv. Indian Railway Accounts Service, recruitment done through the Civil Services Examination as now.
- Recruitment to the Indian Railway Personnel Service, now done through the Civil Services Examination, may be discontinued. This service was the last to be added in the 1970s. While it is not anybody's argument that a specialised service dealing with human resources is not required- all corporate organisations have this distinctive group to assist- the situation in IR is different. Being a part of the GoI, the role a HR manager plays is limited. All establishment policies and emoluments are uniform for the civil services. The posts of 'personnel officers' can be filled by officers from the four services mentioned above, as was the case earlier, if necessary after a short course on HR and establishment at Vadodra.
- On selection to the Indian Railway Service of Engineers, the candidates should be admitted to a preselected Institute of Technology such as an IIT or NIT for professional training of one year's duration. This training will enable a graduate in one discipline of engineering to learn basic aspects of engineering in other disciplines; thus one with civil engineering qualification will have adequate coverage of basic electrical engineering subjects and vice versa so that the officers have a holistic approach to the railway related issues. The training modules will thus be specific for graduates of any one specific discipline. Similarly, candidates selected for the Indian Railway Mechanical & Electrical Service will undergo a year's course in each other's discipline for a good grounding of the basics of the discipline. After successful completion of their course, the officers of these two services will spend their further probationary period as now, except that they will also be trained in the Institutes at Nasik, Secunderabd and

Jamalapur as the case may be. The impact of combining the existing services is a prolongation of the probationary period by one year. However, we would have initiated a process of reducing the number of services and thereby limit the problem of departmentalism in the organisation and attuned with the organisational reforms proposed.

- Officers of the two cadres— Indian Railway Service of Engineers and the Indian Railway Service of Mechanical & Electrical Service should be put through cross-disciplinary rotation; one concomitant requirement would be to increase the proportion of Group B officers in the cadre and reduce Group A cadre correspondingly. A better qualified and trained Group C cadre— the supervisory cadre - is a *sin qua non* for this proposal as it is this cadre that deals with day to day operations and management. Cross disciplinary rotation was a recommendation of the Prakash Tandon Committee too.
- The candidates selected for the Indian Railway Accounts Service and Indian Railway Stores Service will undergo training as hitherto and of the same duration. Similar will be the case with the Indian Railway Traffic Service. The Prakash Tandon Committee had recommended that those joining the Indian Railway Accounts Service should have a financial background; this can be achieved either by prescribing an initial qualification while applying to the UPSC or suitably including the subject in the training modules.
- Once this process of change in the initial recruitment is put in place, we can create a superior managerial cadre of leaders after 14 to 16 years of service from out of three services IRTS, IRSE and IRSM&E. These officers can be selected by a process of assessment by a Committee of Members of the Board and with participation by UPSC. The present practice of basing the selection only on annual confidential reports would be given up. The process of selection will have well developed criteria such as leadership quality, decision making capacity, proven performance, ability to work with a diverse group, analytical ability etc. A batch so chosen will be relatively small in number and with their inter-se seniority fixed. The batch will receive training in a management institute which will include logistics, supply chain management, multimodal transport, PPP, finance as relevant for a corporate body including issues related to investment and its appraisal, etc. They will man the posts of Additional Divisional Railway Managers, Divisional Railway Managers, Chief Vigilance Officers, Chief Personnel Officers, General Managers etc. In this arrangement, the Managers will have long stints unlike today

when the DRMs remain in the chair only for 2 years and the organisation suffers the consequences of frequent changes, lack of direction and cohesion at the divisional level. This will undoubtedly benefit the organisation and a sense of direction, focus will be inculcated.

- Further, recruitment of highly qualified PhDs from IIMs/IITs and other science and engineering institutions in India and abroad should be encouraged for specialist technical functions such as for structures, signaling and telecommunication, etc. Such recruits

can either be on a contract basis or on regular employment with attractive compensation packages.

- Lateral recruitment from the market for jobs in R&D and marketing should also be considered. IR needs to transform into a smart organisation through a constant process of technological upgrade and stress on customer focused growth. This requires that personnel at all levels are recruited and trained with a view to building skills and attitudes required for attainment of the organisational goals.

ANNEX 1.5 RAIL CONNECTIVITY WITH NEIGHBOURS: THE PRESENT STATE²²

Historically, the rail network of the region prior to independence and partition constituted an organic system. However, in the post- independence and post-partition period, rail systems of South Asia have developed in the national context with little consideration for cross-border connectivity and interoperability or compatibility/uniformity of standards in infrastructure and equipment. The current country-wise status is presented below.

Bangladesh: A number of connections existed between India and East Pakistan (now Bangladesh) at the time of independence. These include: Haldibari (India) - Chilahati (Bangladesh), Gitaldaha (India) -Mughalhat (Bangladesh), Agartala (India) - Akhaura (Bangladesh) and Shahbazpur (Bangladesh) -Mahishasan (India). Many of these, however, fell into disuse over the years. At present, railway systems of India and Bangladesh are linked to each other at five points. Of these, three BG links, namely, Gede (India)-Darshana (Bangladesh), Singhabad (India) - Rohanpur (Bangladesh) and Petrapole (India)-Benapole (Bangladesh) are currently open for freight trains. A bi-weekly passenger train, 'Maitree Express' introduced on 14 April 2008 also runs between Kolkata and Dhaka Cantt. via Gede-Darsana route. The other two links, though in existence, lie dormant at present. These are:

1.	Radhikapur(IR)-Biroi (BR)	BG on Indian side, MG on Bangladesh side. Inoperative since 1 April 2005
2.	Mahishasan(IR)-Shahbazpur (BR)	MG. Extensive damage by floods. Not functional since December 1996. Track on BR side needs strengthening

Over the years, the gap between BR and IR in regard to the loading capacities of rolling stock, length of passing loops, size of trains, braking systems, etc

has widened. Difference in ground infrastructure and technology platforms has adversely affected interoperability. On the positive side, construction of a rail-cum-road bridge over the Ganga (Jamuna) with provision of dual -gauge rail tracks suitable for both MG and BG operation has connected the previously isolated east and west rail networks.

Akhaura, which was the rail-head for Agartala during the British colonial rule in undivided India, served as a major link between Chittagong port and Tripura. IR have now extended the MG rail network up to Agartala and are extending it further south to Sabroom located on Tripura's border with Bangladesh. India has offered assistance to construct the MG Akhaura-Agartala rail link.

Pakistan: As with Bangladesh, there used to be several rail connections between India and Pakistan at the time of independence. Many of these connections fell into disuse over time. At present Attari-Wagha and Munabao-Khokhrapar links (both on BG) are operational. Attari-Wagha route is used to run both freight and passenger services, while a weekly passenger service runs through Munabao-Khokhrapar. Other links which are no longer in use are: Sialkot (Pakistan) - Jammu (India), Dera Baba Nanak (India) - Jassar (Pakistan), Hindumalkote (India) - Mandi Sadiq Ganj Jn.(Pakistan), Fazilka (India) - Mandi Sadiq Ganj Jn. (Pakistan), Hussainiwala (India) - Ganda Singhwala (Pakistan) and Khemkaran (India) - Kasur Tehsil (Pakistan). Uneasy relations between the two countries have prevented any serious efforts to re-establish these connections.

Nepal: Nepal had a small narrow-gauge network. In 2004, an ICD which also serves as a rail terminal for bulk traffic was operationalised at Birgunj and connected to Raxaul on the Indian Railway network through a new 6-km long broad- gauge line. It deals with both inbound and outbound bilateral traffic from and to India and third country traffic through Kolkata

22. Report of the Working Group on Railways (NTDPC).

Rail Routes Surveyed for Nepal

PROJECT	LENGTH (KM)	ESTIMATED COST (RS BILLION)	RATE OF RETURN: PER CENT
Jaynagar-Bijalpura-Bardibas	69	4.7	-5.7
Nepalganj Road-Nepalganj	12	1.5	Negative
Nautanwa-Bhairahawa	15	1.8	-4.14
Jogbani-Biratnagar	18.6	2.1	-3.6
New Jalpaiguri-Kakarbitta	70	3.4	-3.6

Rail Routes Surveyed for Bhutan

PROJECT	LENGTH (KM)	ESTIMATED COST (RS BILLION)	RATE OF RETURN: PER CENT
Banarhat-Samtse	23	2.05	-4.6
Hasimara-Phuentsholing	18	1.68	6
Kokrajhar-Gelephu	58	2.94	-9.7
Pathsala-Nanglam	51	6.69	4.7
Rangia-Sandrupjongkhar via Darranga	41	6.07	-8.2

and Haldia ports. Survey for five other rail connections between the two countries has been conducted:

Of the above, Ministry of External Affairs has decided to fund the Jaynagar- Bardibas and the Biratnagar-Jogbani lines. These have been sanctioned and taken up by Indian Railways for execution. In addition, Ministry of Physical Planning and Works, Nepal got a techno-economic survey carried out in 2006 for a rail line to connect Birgunj with Kathmandu. The survey estimated the cost of the 160 km long BG electrified rail line along Kathmandu-Thingari-Kaveri-Hetuada-Pyramidi-Amlekgunj-Pathlauja-Birgunj alignment at Rs 30 billion.

Bhutan: Bhutan does not have a railhead and is dependent on the stations on New Jalpaiguri-Guwahati Broad Gauge line in North East Frontier Railway for its rail transportation. Government of India commissioned studies for the following five connections to Bhutan:

Of the above, the Hasimara-Phuentsholing line which will connect Bhutan to the Indian Railway BG network has been proposed for construction.

Myanmar: Myanmar constitutes the crucial missing link or land-bridge between India and South-east Asia. Adequate connectivity with Myanmar would be an essential first step towards the integration of India's North-east region with South-east Asian economies.

Rail linkages envisaged in the Trans Asian Railway project includes connections to Moreh in Myanmar from Jiribam in Manipur via Imphal. At present, work is progressing on the construction of a new line between Jiribam and Imphal.

In 2008, India signed the Indo-Myanmar cooperation agreement on the Kaladan multi-modal transport project. Although this project envisages use of riverine and road transport to connect Sittwe with Mizoram and Manipur, a railway line from Silchar longitudinally through Mizoram connecting Sittwe port will provide access to the land -locked regions of North Eastern India, in particular, states of Mizoram, Manipur, South Assam and Nagaland .

Sri Lanka: India and Sri Lanka are separated by sea and there is no physical connection between the two railway systems of Sri Lanka and India. In the past, railway line existed upto Dhanushkoti near Rameshwaram in Tamil Nadu from where there was a ferry service to Talaimannar in northern Sri Lanka. This link was destroyed in a cyclone in December, 1964. Since then railway link to Rameshwaram has been restored and upgraded to BG, but the link to Dhanushkoti remains disrupted. A ferry service remained operational between Rameshwaram rail-head to Talaimannar till 1984 when it was discontinued owing to the militancy plaguing North and East Sri Lanka in the subsequent years.

ANNEX 1.6 REGIONAL AND MULTILATERAL INITIATIVES FOR CROSS-BORDER RAIL CONNECTIVITY²³

Both SAARC and United Nations Economic and Social Commission for Asia and Pacific (UN-ESCAP) have attempted to draw a roadmap for regional and international rail connectivity in the context of SAARC and Asian region respectively.

A multi-modal transport study carried out at the instance of SAARC Secretariat suggested the following potential rail corridors:-

Corridor 1: The SAARC Rail Corridor 1 (2,800 kms) is on BG from Lahore in Pakistan to Dhaka in Bangladesh and thereafter on MG on its eastern side. It is an almost continuous rail link and has the potential of moving intra-regional cargo via the shortest and the fastest mode. Lahore–Dhaka containerised cargo currently moving by a much longer rail-sea-road network (Lahore–Karachi–Chittagong–Dhaka) could move on this shorter and faster corridor, saving transportation cost and transit time significantly. This route would also facilitate traffic moving from destinations in India to its North-Eastern states, drastically reducing transportation costs and transit time (Kolkata–Badarpur via Guwahati is 1,356 km on the existing rail route against 682 km via Gede–Akhaura–Shahbazpur on this identified corridor).

The port at Karachi could provide a shorter route for international inward and outward cargo especially from North India, compared to the distance it has to travel to and from JNPT. **In fact, this corridor commands immense potential of carrying inter-continental containerised cargo, say, between Dhaka in the east and Europe in the west via a BG rail network through India and Pakistan onwards to Zahedan in Iran with only one transshipment at Zahedan to SG for further movement through Iran and Turkey on standard-gauge Network.**

Corridor 2: This 707 km rail corridor, re-commissioned on 15 February 2006, connects Karachi (Pakistan) and Jodhpur (India) and thus provides connectivity to the entire IR network. Currently, a passenger train ‘Thar Express’/‘Link Express’ operates between Mirpur Khas (Pakistan) and Munabao.

Corridor 3: This 700 km BG rail corridor provides the shortest and the fastest access for traffic to and from land-locked Nepal. The 704 km Birgunj-Kolkata port via Naihati and 832 km Birgunj-Haldia via Howrah corridor has been extended by a 30 km BG line link along Sugauli-Raxaul-Birgunj with a 6 km extension inside Nepal connected directly to ICD at Birgunj.

Corridor 4: The 1,146 km Birgunj-Katihar-Chittagong port corridor also starts at Birgunj in Nepal and con-

nects the Indian rail network at Raxaul and runs South-east through Barauni-Katihar-Malda Town-Singhabad to the Bangladesh, border-crossing at Rohanpur. In Bangladesh the corridor then extends to the port of Chittagong via Rohanpur, Abdulpur, Ishurdi, Tungi and Akhaura. The existing rail link from Jogbani to Katihar has been identified as part of this corridor. Proposed connectivity to Biratnagar in Nepal with Jogbani (last station on IR) would provide a second rail route connecting Nepal with India and Bangladesh.

This corridor can potentially connect Akhaura in Bangladesh with Agartala in India and shorten the link between Kolkata and Agartala. Howrah-Agartala via Guwahati is 1,561 kms against 502 kms from Howrah to Agartala via Joydebpur and Akhaura.

Corridor 5: This 1,025 km Colombo-Chennai corridor has the potential of further connectivity with other SAARC member states through the IR network. It could also be utilised for the movement of containerised traffic with transshipment to sea vessels for movement across the channel connecting to the Indian mainland. The 35 km ferry link from Talaimannar Pier in Sri Lanka to Rameshwaram in India would provide connectivity with Chennai, 653 km away, through the IR network.

TRANS ASIAN RAILWAY

UN-ESCAP under its Asian Land Transportation Infrastructure Development (ALTID) project identified three Trans-Asian Railway (TAR) routes. These are: (i) Northern Corridor which passes through Russian Federation, Kazakhstan, Mongolia, China and Korean Peninsula, (ii) TAR in the Indo-China and ASIAN sub-region starting from the Chinese border through Lao People's Democratic Republic and Thailand up to Malaysia (with linkages connecting Myanmar, Cambodia and Vietnam) and (iii) The Southern Corridor comprising Turkey, Iran, Pakistan, India, Nepal, Sri Lanka and Bangladesh. Inter-governmental agreement on TAR has been negotiated under UN-ESCAP.

The Southern Corridor commences from Kunming in China and Bangkok in Thailand and ends in Kapikule in Bulgaria. The total length of this route between Bangkok and Kapikule is 11,460 kms and it provides Trans Continental rail connectivity to the countries of China, Thailand, Myanmar, Bangladesh, Pakistan, India, Iran and Turkey. The route, as proposed, would enter India at Tamu, bordering Myanmar, pass into Bangladesh at Mahisasan/Shabajpur and re-enter India from Bangladesh at Gede. On the West side, this route was proposed to enter Pakistan at Attari-Wagah. This route has a missing link of 180 kms between Jiribam and Tamu in India.

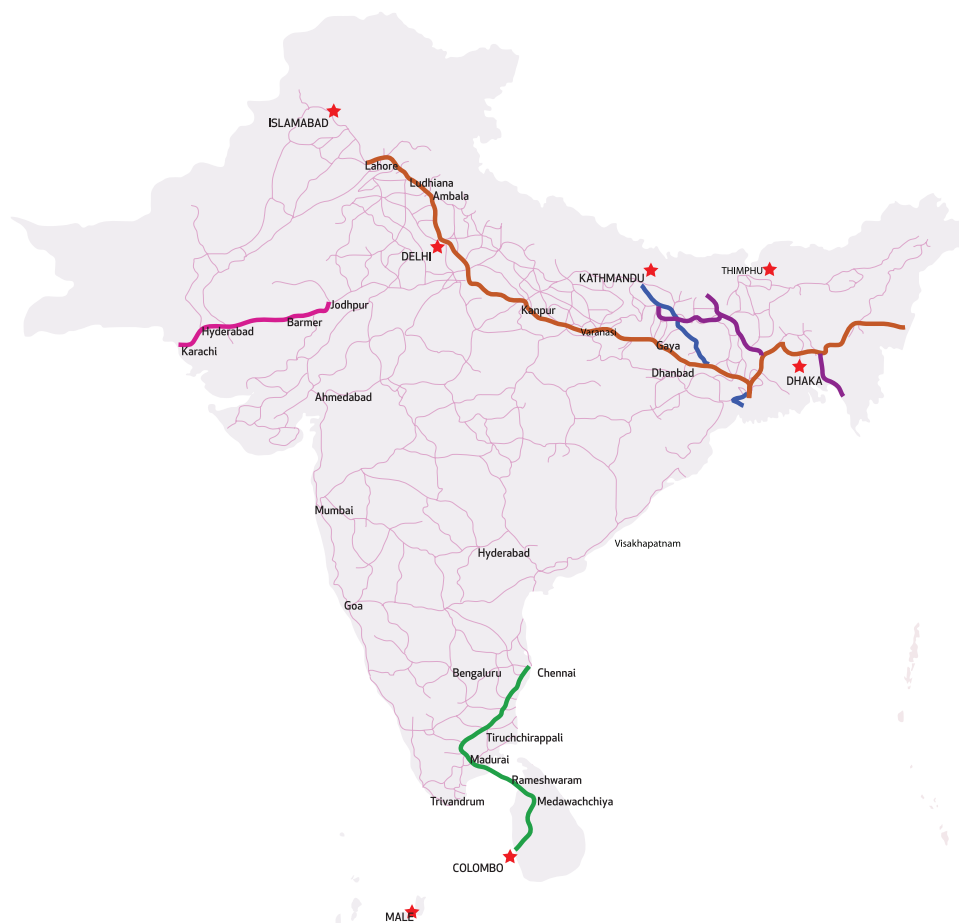
The Trans Asian Railway network is intended to provide connectivity between (i) capitals of member countries, (ii) main industrial and agricultural centers, (iii) major sea and river ports, (iv) major container terminals and depots, and (v) places of major tourist attractions.

23. Report of the Working Group on Railways (NTDPC).

SAARC Corridors

	CORRIDOR	COUNTRIES SERVED	BASIS FOR SELECTION
SRC 1.	Lahore (Pakistan)-Delhi/ Kolkata (India)-Dhaka (Bangladesh)-Mahishasan-Imphal (India)	Pakistan, India & Bangladesh	Potential growth of intraregional traffic. Reduced distance and shorter transit time.
SRC 2.	Karachi (Pakistan)-Hyderabad-Khokrapar-Munabao-Barmer-Jodhpur (India).	Pakistan & India	Shorter route for intra-regional traffic. Access to Karachi port and potential third country traffic.
SRC 3.	Birgunj (Nepal)-Raxaul-Haldia/Kolkata (India)	Nepal & India	Access to the landlocked Nepal. Potential corridor for third country and bilateral traffic (Already functional).
SRC 4.	Birgunj (Nepal)-Raxaul-Katihar (India)-Rohanpur-Chittagong (Bangladesh) with links to Joghani (Nepal) and Agartala (India)	Nepal, India & Bangladesh	Access to Chittagong port for Indian and Nepalese traffic. Shorter route for North Eastern States of India through Bangladesh
SRC 5.	Colombo (Sri Lanka)-Chennai (India)	Sri Lanka & India	Restoration of old rail ferry link to provide passenger and goods access from Sri Lanka to mainland South Asia

SAARC RAIL CORRIDORS



LEGEND

- SR1: Lahore - Delhi - Kolkata - Dhaka - Imphal
- SR2: Karachi - Hyderabad - Barmer - Jodhpur
- SR3: Birganj - Haldia
- SR4: Birganj - Raxaul - Katihar - Chittagong
- SR5: Colombo - Chennai
- National Railway Lines

Source: Report of the Working Group on Railways (NTDPC).

ANNEX 1.7 THE CHINA FACTOR²⁴

Trans-continental rail connectivity as a strategic tool is being deployed to great effect by China. It has already developed transport links to the Korean peninsula, South-east Asia, Myanmar, Pakistan and Afghanistan. It is busy developing extensive multi-modal connectivity in India's neighbourhood which is perceived in strategic circles as an act of encirclement. It has established a presence in Pakistan with a new port at Gwadar and strategic linkages through Pakistan, Iran and Central Asia.

China Metallurgical Group Corporation, involved in the development of the Aynak copper mines, has signed an MoU with Afghan government on 22 September 2010 to undertake a feasibility study for a 700 km rail-line connecting the Aynak copper mines in northern Afghanistan with Kabul and the two neighbouring countries, with connectivity to ports in Iran and Pakistan (estimated cost- \$5 billion). China is also actively working to incorporate the Gilgit-Baltistan tract into Xinjiang's logistics grid by widening the highway and laying a Pakistan-China rail link, through an MoU between Beijing and Islamabad for a trans-Karakoram rail line through the Gilgit-Baltistan region. Pakistan plans, with active Chinese involvement, a 900 km rail line from Gwadar port in Balochistan on Pakistan's south-west coast close to the Straits of Hormuz to join the Quetta-Zahedan line and via Dalbandin along Koh-i-Taftan (on Iranian border)- Spezand-Quetta-Chaman (on Afghan border) onwards through Khunjerab Pass in the Karakoram to Kashgar (Kashi) connected to Xigaze in China. It has planned a railway and pipeline from Gwadar port to western China along the Karakoram Highway route.

China has also plans to build a new rail corridor to link it to the Mediterranean Sea through Central Asia, Afghanistan, Pakistan and Iran. It has proposed 580 km rail-line from Tehran through Hamadan, Malayer and Kermanshah to Khosravi on the border with Iraq, which will also provide a link between Arak and Malayer. The line will offer onward linkages via Iraq to the Mediterranean port of Latakia in Syria, thereby facilitating a southern route from China to Europe. Yet another transit route being considered is through Afghanistan and Pakistan along Askabad-Torghundi-Herat-Kandahar-Chaman-Quetta.

In the east, China has long-term plans to link up with the Bay of Bengal port of Sittwe (Akyab) through Mandalay and the Irrawady River. China is also planning to build a 232-km Lashio-Muse/Ruili rail line that would provide a strategic link through an extensive rail network across Myanmar. From Kunming in its Yunnan province, a network of road, rail and river links fork out to Sittwe in western

Myanmar and Thilawa near Yangon on the Bay of Bengal. Myanmar would thus emerge as a possible land-bridge connecting South Asia and South-west China.

Besides the Irrawady corridor through Myanmar into the Bay of Bengal, China extends significant development assistance to Bangladesh by way of grant, credit, and interest-free or concessional loans for important bridge works, natural gas, etc. Plans are on the anvil, among other projects, for constructing the second Padma Bridge and a 130 km rail line from Chittagong to Gundum on Myanmar-Bangladesh border. A Myanmar-Bangladesh rail link will help connect Kunming to Chittagong as well.

In the north, China is busy extending the world's highest 1,142 km Golmud-Lhasa rail line, that was opened in July 2006, to Xigaze, Tibet's second largest city, 253 km apart from its capital city, with plans to take it further towards Nepal, first to Nyalam, 400 km from Xigaze, on the China-Nepal border and finally a 120-km extension to Kathmandu.

In the south, a part of its 'string of pearls' strategy of links with regional maritime nations, China is now Sri Lanka's biggest investor as well as aid donor. The Economist (10 July 2010) reported that China is financing nearly all of Sri Lanka's biggest infrastructure projects, e.g., a new sea port at Hambantota, an oil storage facility, a new airport, a thermal power plant, an expressway, besides a special economic zone at Mirigama near Colombo. China is also rebuilding the main roads in the war-shattered north and east, and also a performance arts centre.

Chinese road and rail connectivity projects to speedily knit the South-east Asian land mass include the ambitious 5,380 km ASEAN flagship Kunming-Singapore rail line venture, a crucial corridor critical to the Trans Asian Railway project. China has been keen on connectivity of its rail network across those of the ASEAN region, even though there is no rail linkage between China and Myanmar, China and Laos, Myanmar and Thailand, Thailand and Cambodia, Cambodia and Vietnam, and Vietnam and Laos.

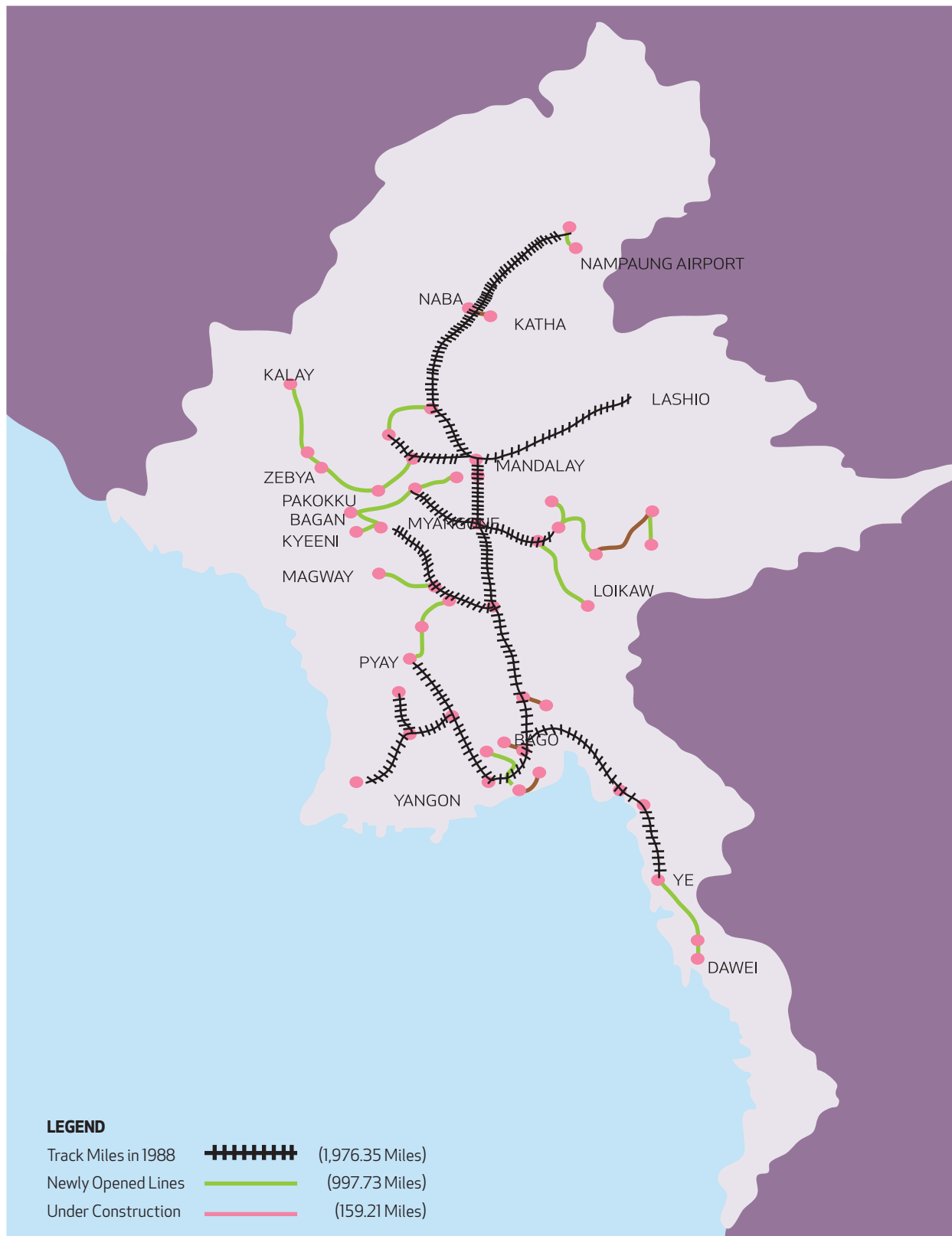
China's initiatives in expanding its rail connectivities beyond its own geographical borders has been dealt with in some detail because of its overarching strategic as well as political significance for our country. There are very important implications of Chinese advances in the neighbouring countries. In order to secure our strategic interests in the region, looking at rail linkages beyond the country's borders is not an option but a compulsion. Our long-term transport policy, therefore, has to take note of and provide for solutions to the challenges posed by the Chinese initiatives in the region.

24. Report of the Working Group on Railways (NTDPC).

Annex 1.8

Railway Projects That Need to be Taken Up with Neighbouring Countries²⁵

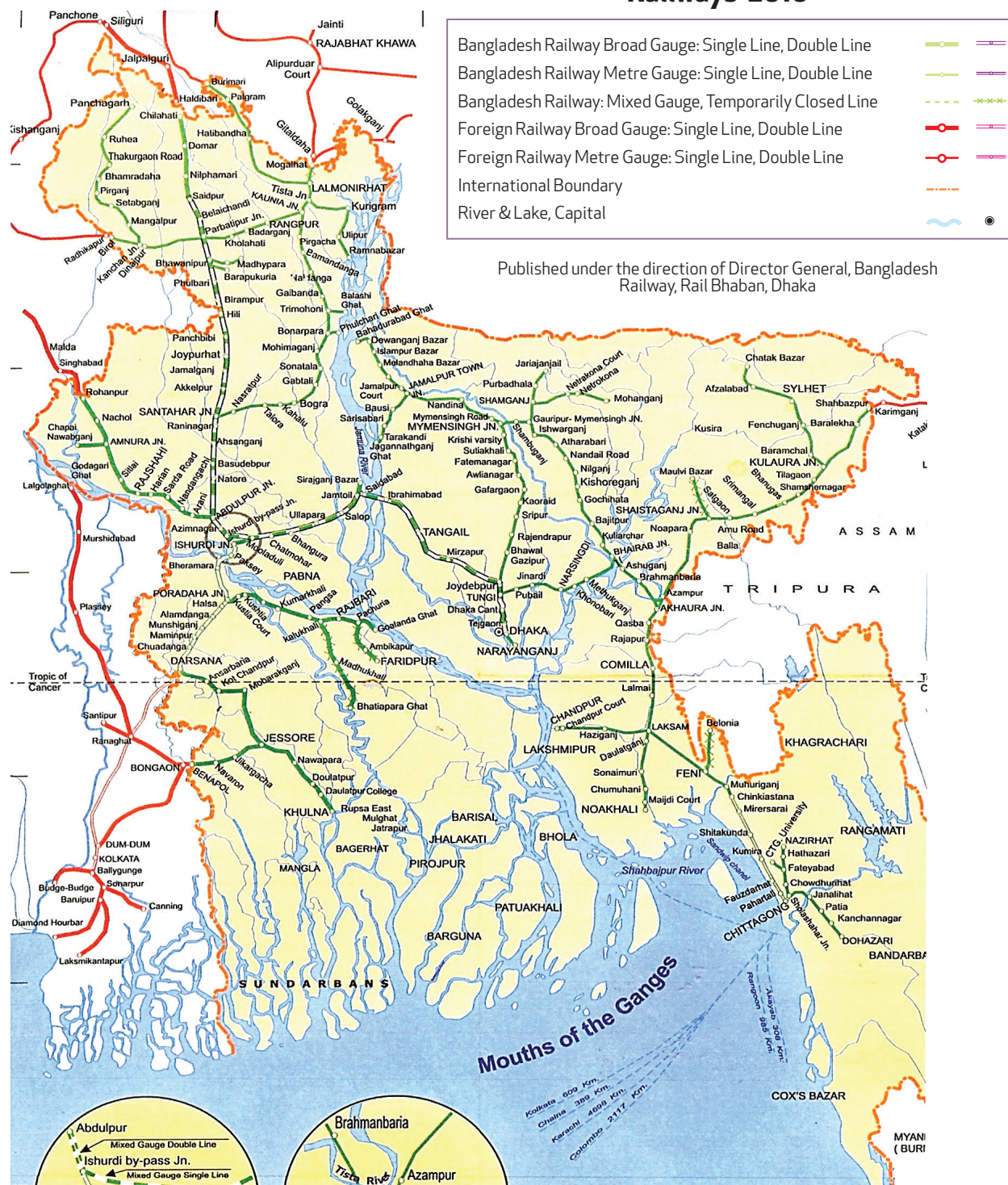
[A] MYANMAR



- i. A study should be commissioned to work out the costs and other details of the Kaladan project.
- ii. Jiribam-More and Seggi-Chaungh-Myohaunes lines should be constructed.
- iii. Yangore Mandalay rail-link needs to be upgraded.

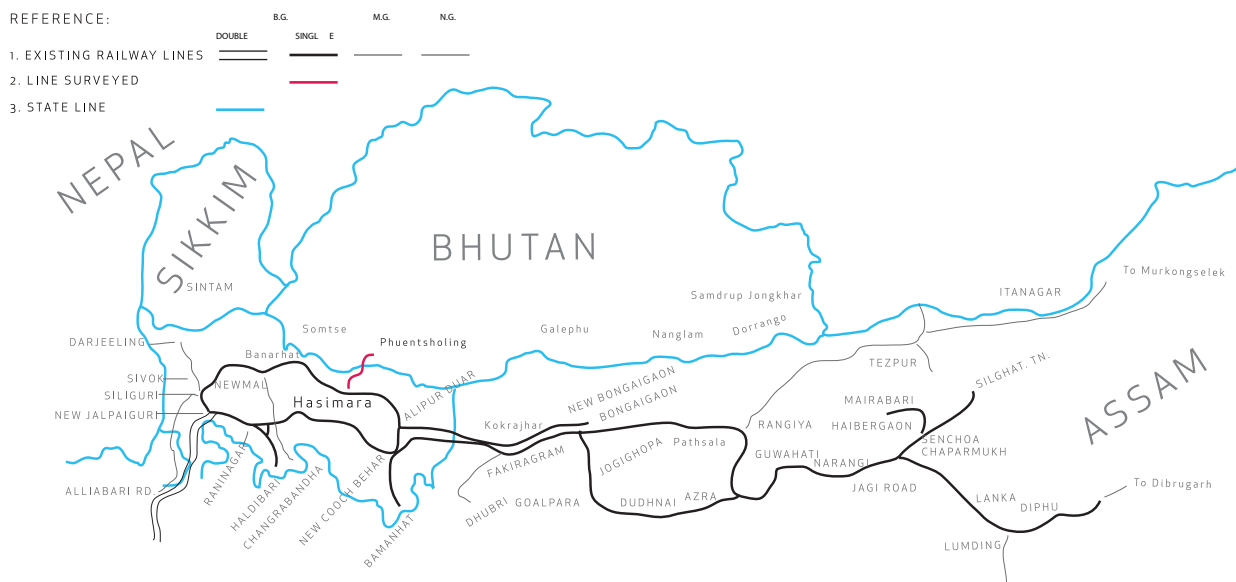
25. Report of the Working Group on Railways (NTDPC).

BANGLADESH Railways-2010



- i. The old links between the two countries need to be restored for the sake of the development of India's North Eastern states as well as for the sake of better relations with our most populous neighbour. These would include: Haldibari (India)-Chilahati (Bangladesh), Gitaldaha (India)-Mughalhat (Bangladesh), Agartala (India)-Akhaura (Bangladesh) and Shahbazpur (Bangladesh)-Mahishasan (India).
- ii. Radhikapur (India)-Birol (Bangladesh) line needs to be reopened to facilitate transit trade between Bangladesh and Nepal through India.
- iii. Haldibari-Chilahati link needs to be restored for trade between Bangladesh and Bhutan through the Indian Territory.
- iv. Agartala (India)-Akhaura (Bangladesh) connection needs to be re-established to provide the much-needed direct rail link to states like Tripura, Mizoram and Manipur to Chittagong port.

[C] BHUTAN



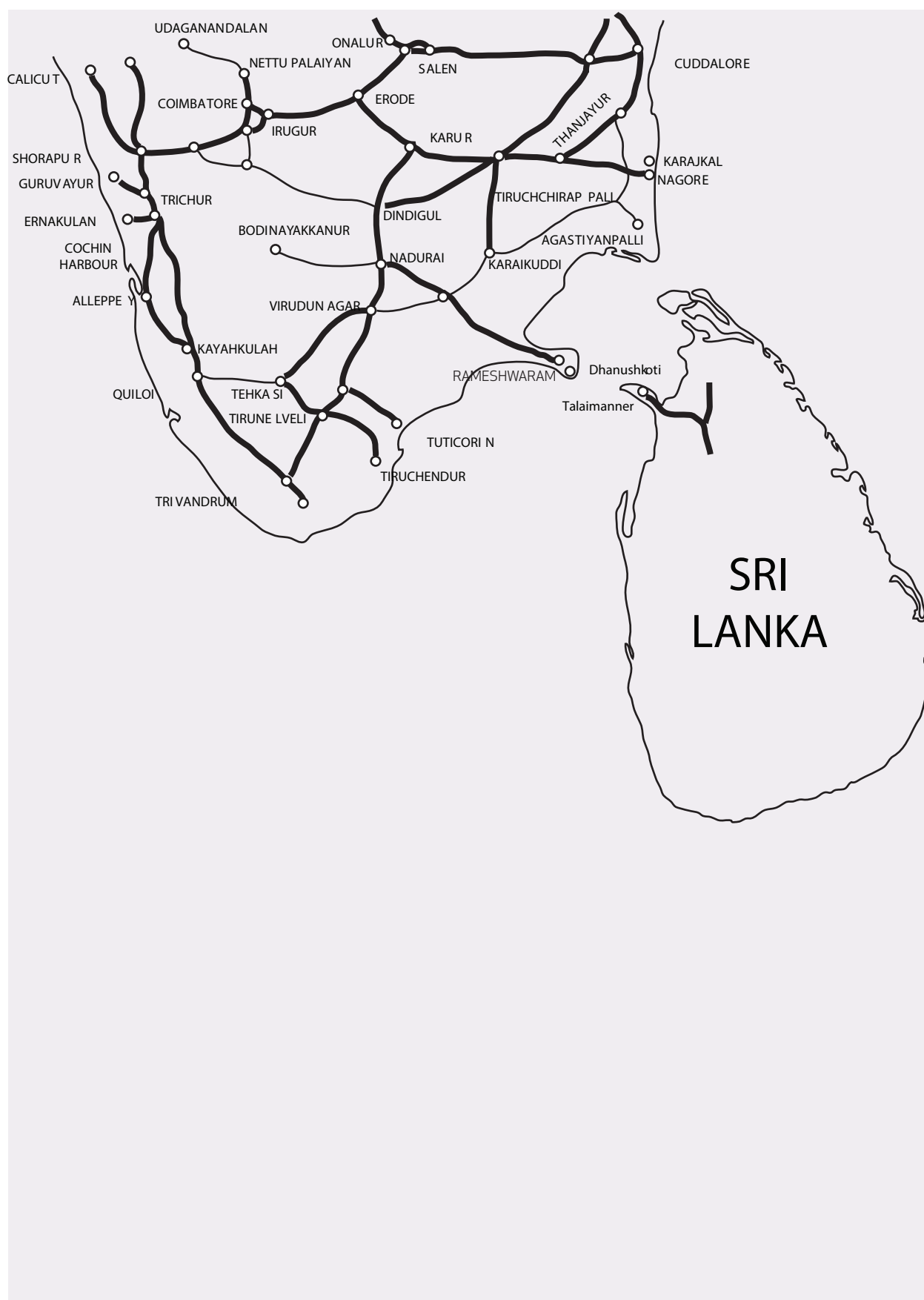
- i. The 17.5 km long Hasimara (India)-Phuentsholing (Bhutan) which has been identified for execution should be constructed. Issues relating to land acquisition need to be addressed by the State and the Union Government.

[D] NEPAL



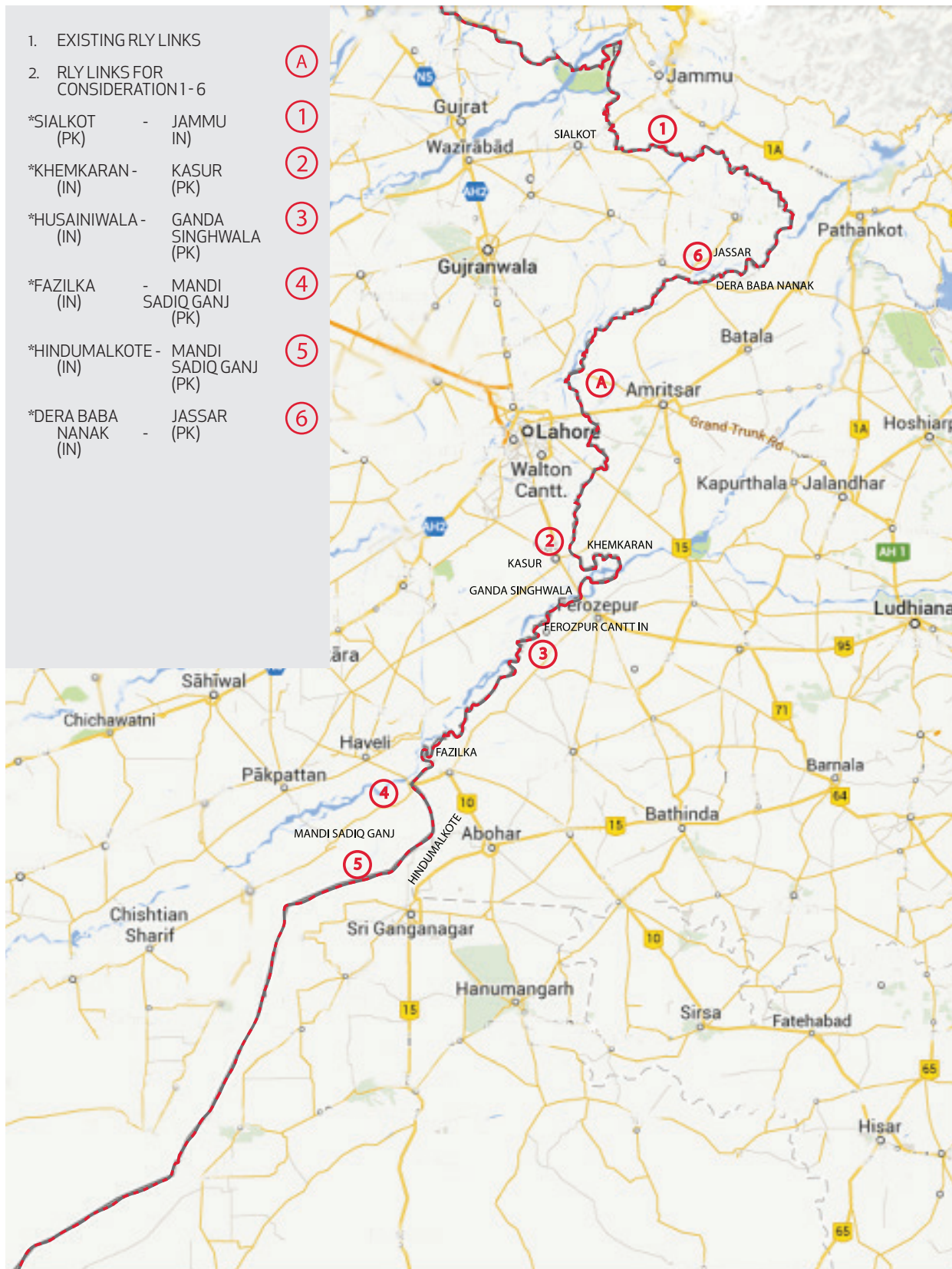
- i. Jaynagar-Bardibas (69.10 kms) and Jogbani-Biratnagar(18.60 km) lines costing Rs 4.7 billion and Rs 2.1 billion respectively and being entirely funded by the Government of India should be expedited.
- ii. Nepalganj Road-Nepalganj (12.11 km), Nautanwa-Bhairahwaha (15.30 km) and New Jalpaiguri-Kakra-bitta (46.30 km), which have also been surveyed, should be taken up by the Government of India.
- iii. Rail connectivity with Nepal assumes special importance in view of the China factor discussed earlier. China is planning a rail line between Lhasa and Kathmandu. Strategically, it would be in India's interest to construct the Birganj-Kathmandu line (160 km). The cost of this line as estimated by Pipavav Rail Corporation Ltd. (PRCL) is Rs 12.85 billion (2006). This project admittedly will not be financially viable but it will be in India's strategic interest to undertake the project at its cost if it has to preserve its preeminence in Nepal.

[E] SRI LANKA



- i. Rameshwaram-Dhanushkoti (17km) railway link and Dhanushkoti-Talaimanner ferry service should be revived for faster, easier and convenient communication between India and Sri Lanka.

'INDIA - PAKISTAN RAIL LINKS'



- i. The following links should be revived and rebuilt: Sialkot (Pakistan)-Jammu(India), Dera Baba Nanak (India)- Jassar (Pakistan), Hindumalkote (India)- Mandi Sadiq Ganj Jn.(Pakistan), Fazilka (India)- Mandi Sadiq Ganj Jn. (Pakistan), Hussainiwala (India)-Ganda Singhwala(Pakistan) and Khemkaran(India)- Kasur Tehsil(Pakistan).

Annex 1.9

International Experience in Railway Reforms

	JAPAN NATIONAL RAILWAY	RUSSIAN RAILWAYS	GERMAN RAILWAY REFORM	BRITISH RAILWAY	CHINESE RAILWAYS
Problems of Railway and Aims of Reform	Erosion of market share Heavy debt burden	Rapid fall in traffic Efficiency of the system Inadequate investments	Poor performance Loss of market share High amount of government subsidy/debt EU directive to open up infrastructure	Shrinking market share Poor financial health	Requirements of transport capacity and quality of service Separating state control from economic activities Orienting railway institutions towards transport market
Institutional and Regulatory Framework prior to reform	JNR's management reported to a board of directors. The governor of the board was appointed by the Cabinet and s/he in turn appointed other directors with the approval of the Minister of Transportation. As public corporation JNR was not subject to same civil and commercial laws of private companies. Its employees and officers were public servants, they had right to organise into unions and negotiate labour contracts, but did not have right to strike. It had obligations beyond profit making objective. It also had to operate in low density lines that were not economically viable under the political directions.	Russian federation has a monopoly and carries half of the freight ton as compared to 8 percent in the European union. The road network is comparatively weaker and is not able to provide competition. Under the federal rail transport law, railways were unified under the direct management of Russian federation. The infrastructure and operations were not accounted for separately. There was no open access for other operators either for freight or passenger transport.	The West German system was referred to as Deutsche Bundesbahn (DB). The Governance of Deutsche Bundesbahn was heavily centralised and had several public service obligations. The workforce enjoyed the status of being civil servants. It was speculated that it under reported deficit. The state owned railway carrier of East Germany, i.e. 'Deutsche Reichsbahn' (DR). The infrastructure of DR was in poor state. It was state owned monopolist undertaking and the socialist nature of political system meant that there was no objective of earning profit from the business. In 1975 an attempt to focus on high ridership routes was made, however it was stalled by the federal states, town halls, and unions due to the fear of closing of various routes. The railway had to compete with a well developed road network and a population with high car ownership rate.	British railways was operating as a single integrated entity including track maintenance, train operations, and supporting activities. It functioned under British railways board. Around 1980, ancillary activities (hotels, ferry service, rail vehicle manufacturing business) were sold to private player. The service was organised on business service lines including intercity operations, network south east, regional railways, euro passenger service, train load freight and rail freight distribution.	Chinese railways functions under the ministry of railways and has 14 regional administrations. The government is involved in planning, operation, and regulation of Chinese railways. There are no separate suburban railway operations. New operators do not have access to infrastructure.
Reform	Restructuring of JNR involved the reorganisation and reassignment of core businesses, assets and operations, organisational structure, work force, management, liabilities, and commercial orientation among the successor companies. JNR operation was divided into six separate passenger and a freight companies. The passenger rail companies were organised into three contiguous regions on the main island and one region on each of the three islands of Hokkaido, Shikoku, and Kyushu. The main reason for this division was the fact that 95 percent of all the trips originated and terminated within one of these services territories.	The first stage was corporatisation of Russian Railways Limited (RAO RR) and creation of subdivisions for Freight Infrastructure maintenance and development Locomotive traction Long-distance passenger service 17 regional suburban railways Maintenance of carriage and locomotives Construction Research and development	In 1980, the accounting method of Deutsche Bundesbahn was changed to introduce higher degree of detail, in order to identify the origins of the deficit, particularly in local and regional passenger transport. Three cost centres were identified: Public service obligations, i.e. local and regional passenger transport The remainder of the transport infrastructure as a public obligation However, the accounting did not separate the profits between infrastructure and operation and ended up as becoming a means to justify public subsidy.	The reform process was an extreme case which involved fragmented structure in order to introduce competition. Infrastructure was separated and privatised in 1995. By 2001, it was considered as failed move due to poor maintenance. The renewal contracts were found to be badly designed. It was bought back.	Asset Operation Liability System, which was started in 1999, has made managers of regional railways administrations (RRA) accountable for returns on capital, output, profitability and safety. RRAs are accountable for capital expenditure. Individual managers also receive financial incentives for better performance. It has focused on improving its employ productivity and reducing staff costs. Chinese railway has also done away with below cost provision of passenger services. It has separated non-core activities such as enterprises dealing with construction, manufacture, telecom, design, education and social activities. Many of these enterprises

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	JAPAN NATIONAL RAILWAY	RUSSIAN RAILWAYS	GERMAN RAILWAY REFORM	BRITISH RAILWAY	CHINESE RAILWAYS
<p>Reform</p> <p>Freight operations were organised into a separate company with a nationwide service territory. This freight operation company had no ownership of tracks but would get the access to the rail network through track usage contract with other newly formed regional rail companies.</p> <p>All non-core assets and liabilities of the former JNR in excess of those assigned to the individual companies were conveyed to a new entity i.e. JNR Settlement Corporation, a government agency. The Settlement Corporation, which held the shares of each of the seven operating companies that emerged from the restructuring, was intended to liquidate the assets it held, including the most important i.e. excess real estate, to pay back as much as possible of its outstanding liabilities with the proceeds of this liquidation.</p> <p>The new regional companies were transformed as joint stock companies, each with its own board of directors and management. The organisational structure was similar in JNR and the regional companies, except that in the regional companies departments related to railway operation were put together within the new Railway Administration unit, so that operation-related decisions can be taken in a more coordinated way. Since the regional departments of regional companies were smaller than that of JNR, meeting local needs was manageable because of smaller size.</p> <p>The Supervisory Committee estimated that JNR had approximately 93,000 excess employees. The restructuring plan made specific provisions for surplus employees:</p> <ol style="list-style-type: none"> 1. A special fund was set up for early voluntary retirement of 20,000 employees 2. Provisions were made to transfer 32,000 employees of the newly formed regional passenger companies to other parts of JNR 3. Remaining 41,000 excess employees were assigned to the Settlement Corporation <p>In spite of these, JNR restructuring faced union oppositions from the employees and were dragged to the court of law. JNR Settlement Tribunal failed to manage the debt was later dissolved. Its assets and liabilities were inherited by Japan National Railways Construction Cooperation, a government entity.</p>	<p>In the second stage, private sector was encouraged to involve into freight traffic movement and maintenance activities. Increasing passenger and suburban operation competition is also on the anvil.</p>	<p>Another round of reform started with merger of DB and DR in January 1994. It also attempted to separate commercial activities from liabilities. DB AG, the commercial division, was formed as a joint stock company under private law. BEV, the public division, administered by the Federal Transport Ministry and the Federal Finance Ministry, was created to take the liabilities. Infrastructure was separated from operations. Subsequently, the rail was also opened up of the rail network for third parties against the payment of track charges. The federal railway agency was founded as a regulatory agency, while the financial and contract responsibilities for regional services were transferred to states.</p> <p>In 1999, five joint stock companies were created:</p> <ul style="list-style-type: none"> DB Reise und Touristik AG (long distance passenger transport); DB Regio AG (local and regional passenger transport); DB Cargo AG (freight transport); DB Netz AG (infrastructure); DB Station and Service AG (passenger stations) <p>DB Reise & Touristik AG and DB Regio AG, the companies responsible for long-distance and regional passenger transport respectively were merged for better control on passenger transport.</p> <p>In December 2007, DB AG reorganised again bringing all passenger services under DB Bahn, freight and logistics services under DB Schenker, infrastructure and operations under DB Netz. In June 2008, passenger and logistic services were brought under a new company DB ML AG. In 2008, Federal Government and the parliament agreed to the partial privatisation (24.9 per cent) of the DB ML AG. IPO of DB Mobility Logistics AG was planned in October 2008 but was deferred due to economic recession in the market.</p>	<p>The passenger operation was split into 25 companies later consolidated into 19. Three passenger rolling stock leasing companies were established for leasing rolling stock and were ultimately sold. Freight operation was sold with open access.</p> <p>Network Rail was named as the infrastructure company. The government sets the expectations for Network Rail and specifies the passenger service requirement. The regulator determines the efficiency targets and decides on the competition issues.</p>	<p>now provide services to China Railways on a competitively tendered basis. In the area of rolling stock, this has resulted in very rapid modernisation of products as a result of several joint ventures with foreign firms that became possible due to separation of production units.</p> <p>Chinese railways also removed a whole layer of management by eliminating the 44 sub-regional administrations.</p> <p>Management was consolidated at the level of the 18 regional administrations and some 60,000 staff positions were removed. All stations and depots now report directly to RRAs and train control centers were also consolidated at RRA level. This was made possible by advances in communication and information technologies. This change brought together management responsibility and accountability at the regional level. It also facilitated and encouraged higher utilisation of locomotives and crews, which had normally been changed at sub-regional boundaries.</p> <p>Recently, in March 2013, China has decided to dissolve the Ministry of Railways (MoR) and separate railway policy and regulation from commercial operations. As a result the functions of railway sector policy and regulation, particularly in respect of safety in construction and operation of railways, were assigned to the Ministry of Transport (MOT).</p> <p>In future, MoT would also establish policy for railways. It would develop a unified policy for all transport modes aiming at modal integration and optimal use of resources.</p> <p>The responsibility for the enterprise (commercial operations of railways) has been assigned to the newly formed China Railway Corporation (CRC) that is manned virtually by all the staff and managers of MOR except a few that will move to MoT.</p>	

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Improvement in finances of railways	JAPAN NATIONAL RAILWAY	RUSSIAN RAILWAYS	GERMAN RAILWAY REFORM	BRITISH RAILWAY	CHINESE RAILWAYS
	<p>The market share of railways both in passenger and freight transport increased substantially after the reform process. The financial health of the privatised firms improved. The market share of the high speed railway was as high as 65 percent to 80 percent on various routes.</p>	<p>The performance has improved and better accountability has been achieved.</p>	<p>The reforms were able to arrest decline in modal share. Major traffic growth in overall passenger and freight market was observed. The freight share also increased. The open access operations, primarily run by private sector also grew over the years.</p>	<p>Some aspects of reform have been successful: Privatisation of freight operators Privatisation of passenger rolling stock leasing companies After privatisation, both passenger and freight traffic have increased. Along with the traffic, costs have also increased. One aspect of reform which has not been very successful is managing the interface between infrastructure and operations, both for investment decision making and operations.</p>	<p>The Chinese railway has performed well with these changes. It adopts a market culture and tries to match its services with customer requirements. It has been able to progress on creating one of the largest networks in a very short span.</p>

Source: NTDFC Research.

International Experience in Setting Track Access Charges

[A] Australia: Interstate Freight

The Australian Rail Track Corporation (ARTC) publishes a list of Reference Tariffs for track access on each of its routes. The Reference Tariffs are based on a fixed component (referred to as a 'flagfall') per train for each route, plus a variable element that depends on the gross tonne-km of the train. The fixed element itself is actually fixed for different routes reflecting the length of route, so is basically distance-related rather than a true 'flagfall'. This distance-based component is affected by the speed of train and whether the train path is peak or off-peak.

The different train types are listed in Table below. The current Reference Tariffs for the different train types on different routes is publicly available and can be reviewed on line. The pricing formula is the same for each route and the tariffs are shown separately by route for convenience of customers.

FLAGFALL	TRAIN TYPE AND DESCRIPTION	TRAINS
Super Premium	Max train speed 130 km/h Max axle-load up to 20 tonnes	XPT (fast passenger train)
Premium	Max train speed 115km Max axle-load up to 20 tonnes	Passenger, Bi-modal
High	Max train speed 110km/h Max axle-load up to 21 tonnes Length up to corridor standard max	Superfreighters
Standard	Max train speed 80km/h Max axle load up to 23T Length up to corridor standard max	Express goods
Low	Off -peak train paths	Metro shunts/work trains

The Reference Tariffs relate to a particular (standard) service performance specification. There can be negotiation with individual customers for specific needs or service characteristics that vary from the reference assumptions; for example, with respect to axle loads, speed, train length, origin and destination, stops and operating timetable. However, ARTC has undertaken to the Australian Competition and Consumer Commission that it will not charge different prices to different clients where the characteristics of the service are alike; and where the applicants are operating within the same end market. ARTC also specifically undertakes not to discriminate pricing on the basis of whether the Train Operating Company is privately owned or owned by a state or federal government. All negotiated tariffs are also published.

The fixed component is paid for the right to reserve a train path and is payable by the customer whether they use the train path or not. The ARTC has also undertaken to the Australian Competition and Consumer Commission to limit the increase in the Reference Tariffs to a rate below the inflation rate, as its own efficiency incentive.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 38-39, Paul Amos, July 2011.

[B] Canada: Interswitching

Canada has many examples of what are referred to as 'voluntary running rights' which are commercial agreements between two railway companies (usually between Canadian National and Canadian Pacific companies) to allow one to run its trains on the track of the other. There are also some broader access provisions administered by the Canadian Transportation Agency (CTA) which administers interswitching rights (a form of limited- distance track access rights) and sets the access tariffs. CTA can also impose more general running rights, where one railway seeks to operate on the lines of another. Interswitching rights allow freight customers with access to a federal (inter-province) railway (basically Canadian National or

(Contd...)

Canadian Pacific) to have cars transferred (interswitched) onto another federal railway if the point of origin or destination is within 30km of the interchange point. This provision basically avoids the need to transfer wagons from one train to another for short distances at the beginning and/or end of journeys. The tariffs for this form of track access are set by the CTA because it is not convinced that market forces could otherwise protect shippers from the market dominance of one railway service provider. The CTA's Regulations establish four distance zones within the 30-kilometre radius and prescribe rates per car for interswitching traffic to or from each zone. The rates are based on the estimated costs of interswitching traffic borne by the Canadian National Railway Company and the Canadian Pacific Railway Company.

Lower per-car rates are prescribed for the interswitching of blocks of 60 or more cars as a unit. The Canadian Transportation Act requires that the Canadian Transportation Agency examine railway costs in its determination of the rates and stipulates that the resulting rates shall not be less than the average variable cost of moving the traffic. The interswitching rates are also subject to section 112 of the Act, which requires that rates established by the Agency be 'commercially fair and reasonable to all parties'.

As noted, imposed running rights can also be mandated by the CTA on a federal railway, if it decides this in the public interest. In practice, the CTA's power to approve such applications (and so confer wider track access rights) has rarely been used and most examples of running rights in Canada have been by private agreement (voluntary running rights). If the CTA does grant an application for running rights, the two railways have the opportunity to negotiate the tariff for track access. If the negotiations fail, the Agency may determine the financial compensation to be paid.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 39-40, Paul Amos, July 2011.

[C] United States of America: Track Access Agreements

Privately negotiated track access agreements have a history as long as railways themselves. Early railway companies in most continents were regionally rather than nationally based. In the boundary areas in particular they had a strong incentive to come to agreement to use each other's tracks to reach major business origins and destinations that lay over their own company's boundaries.

Access by private contract is the predominant form in the World's biggest single freight railway market, the USA. In 2010 for example there were over 550 common carrier freight railways operating in the USA. They include seven major (Class 1) railways, 31 regional railways 314 local railways, 204 switching (shunting) and terminal railways, plus 2 Canadian railways operating in the USA. All the Class 1 railways and around 90 percent of the rest are privately-owned. United States Law does not give any legal rights of access of one freight railway company over the tracks of another freight railway company.

However, under US Competition Law, railways have 'common carrier' obligations to freight customers. They must provide to customers routes and tariffs to move traffic from any origin to any destination on the railway network. If it is necessary for more than one railway to participate to complete the traffic movement the railways must interchange the traffic and establish a tariff for the total movement. However, as an alternative to interchanging the traffic, a railway can complete the movement with its own trains by entering into track access agreement with one or more other railway(s). Around 37,000 km of route operated by US railways is on track owned by another railway. That is equivalent to around a quarter of the total route-length of the network.

Agreements that set out the conditions and prices for use of another railway's infrastructure are known generically as 'trackage agreements.' They exist in many different forms. They can include agreements to use specifically defined sections of track, to use terminals, to use shunting yards, or to use 'haulage' (i.e. the locomotives and crews) of another railway entity. The agreements vary but will typically set out the services to be performed and the performance level agreed, (which will generally be an undertaking to provide the same level of service as the host railway provides to its own trains of the same type or volume - i.e. without discrimination). Any additional expenses borne by the host railway such as fueling costs, rolling stock repairs etc. are charged back to the guest train operator at agreed rates.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 39-40, Paul Amos, July 2011.

Line-of-Business Management Structures

The managements of most major freight railways in the countries reviewed have adopted lines-of-business (LOB) structures. This has been partly to better tailor products and customer care to the target markets, because each market has different customers with different needs. Equally importantly (and like the split of freight and passenger services) it has also been to devolve management of specific segments to line managers, thereby making a complex freight business more manageable. Most freight is consigned by relatively few corporate customers who employ a small number of logistics decision makers. It is both desirable and feasible for LOB managers and marketing staff to get close to these customers, understand their businesses, assess their needs, determine whether railways can meet these needs economically, and try to match product to commodity or customer.

LOB structures are applied in several different forms. LOB structures can be implemented through Product Managers responsible for client relationships for defined markets or products and who 'transact' internally in the railway to plan and monitor delivery of the services sought; with agreed internal 'cost rates' or 'prices' for those services, management accounting systems can also segment financial performance according to LOB and so devolve 'bottom-line' accountability to product managers. LOB for larger traffic segments (say, coal or intermodal business) can be divisions of the company with management responsibility for dedicated rollingstock, terminals and other assets. Ultimately, LOB may be established as separate or subsidiary companies, particularly if services are so specialised that the required market profile and/or skill-set needs to be differentiated from that of the railway itself. Freight railways in the countries reviewed display elements of all these LOB models, sometimes within the same railway. There is no best approach. It all depends what the management thinks will work best in the context of its corporate aims and the nature of markets on offer.

It is not possible to create an effective LOB organisation simply by creating segmented accounting systems or appointing segment marketing managers. Accounting and Marketing structures are tools of LOB, not the other way around. Finance departments need to adapt their accounting procedures to an authentic and agreed LOB structure, otherwise there will be no constituency of support for the accounting structures required and no market for the information they can provide. Similarly, marketing managers can discern client needs but if they have little influence and no control over product design and delivery, the implementation of LOB will probably fail. LOB management must be structured to suit the business and be holistically applied in the sense of linking market need, service response, and accountability for outcome.

Nevertheless, LOB management has led to the transformation of railway freight marketing. Those railways organised by LOB tend to have individual marketing teams specialising in the industry or customer group concerned. When railways still had monopoly power in freight, the main function of the Marketing Department (if there was one) was taking wagon orders, completing waybills and handling complaints; they employed clerical skills appropriate to clerical tasks. Rail freight providers today need marketing groups who can manage client relationships and not just client paperwork.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 19, Paul Amos, July 2011.

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