



Indian Railways

Lifeline of the nation

(A White Paper)



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Government of India
Ministry of Railways
NEW DELHI

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FOREWORD

“Railways, perhaps along with post offices, are the only two institutions in India with a deep network which if tapped judiciously can create substantial improvements in the hinterland. Railways was always considered only as a mode of transport in our country, we want to see Railways as the backbone of India's economic development.”

*Shri Narendra Modi
Prime Minister of India
December 25, 2014*

Indian Railways is the lifeline of the nation. It traverses the length and breadth of the country providing the required connectivity and integration for balanced regional development. The system never rests; it has been up and working unceasingly for the last several decades. It is an integral part of every Indian's being. It is one of the pillars of the nation.

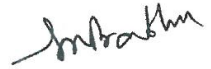
In an earlier era, the Indian Railways have been described as “*imperium in imperio*”, an empire within an empire. The size and scale is gigantic. The United States, China and Russia are the only countries that have longer railway lengths, measured in kilometers.

Indian Railways has suffered from considerable under-investment during the last several years. As a consequence, capacity augmentation has suffered and so has the quality of service delivery. Resources have been insufficient for improving customer satisfaction and introducing technological improvements. Investments in safety have also been insufficient. This is a vicious circle which I desire to convert into a virtuous circle by bringing in greater investments which will generate higher revenues and better service delivery.

Despite its problems, Indian Railways is not down and out; it is the only organization in the Government of India that pays for its wage bill, pensions and working expenses in its entirety. It also accounts for replacements and depreciation like any commercial concern should and pays a dividend on the capital it gets from the Government of India.

The objective of this paper is to show the challenges that the organization is facing today. It also shows that Indian Railways is perched on a precipice but is capable of flying off and attaining great heights. The organization, especially its staff, has inherent strength and I am confident that a clear direction, targeted investments and well- defined priorities can make the organization grow by leaps and bounds.

This status paper is the first in a series of three documents. The second is the budget for the year 2015-16 which lays out five year action plan of the Ministry of Railways in bringing about a turnaround. Finally, during this year Indian Railways will bring out a Vision 2030 document which will contain a blueprint of the long term development of Indian Railways.



(Suresh Prabhakar Prabhu)
Minister for Railways
February 24, 2015

1. Introduction

Background

- 1.1. Indian Railways (IR) is a great national asset. A single transport network connects far flung areas of the country. It is one of the largest transportation and logistics network of the world which runs 19,000 trains. It runs 12,000 trains to carry over 23 million passengers per day connecting about 8,000 stations spread across the sub-continent. It is equivalent to moving the entire population of Australia. It runs more than 7,000 freight trains per day carrying about 3 million tonnes of freight every day. Its network of 65,000 route kilometers is more than one and half times the circumference of the earth. It has joined the select club of countries comprising Chinese, Russian and United States Railways with an originating freight loading of 1008.09 million tonnes (i.e. one billion plus) in 2012-13. During 2013-14, Indian Railways carried 1.05 billion tonnes of revenue earning freight traffic and is expected to carry 1.1 billion tonnes in 2014-15.



- 1.2. The expenditure on Railways as a percentage of total transport expenditure has declined considerably. Railway expenditure as percentage of transport sector expenditure used to be about 56% in 7th Plan (1985-90). It has reduced to 30% in 11th Plan (2007-12). IR in last two decades has remained under-invested whereas the road sector has witnessed a surge in investments. The share of IR in overall GDP has been static at 1% and has, in fact, gone down to 0.9% in 2012-13.

Table 1: Share of Transport Sector in Overall GDP (%)

	2008-09	2009-10	2010-11	2011-12	2012-13 (1 st RE)
Overall Transport	6.6	6.6	6.5	6.6	6.7
<i>of which</i>					
Railways	1.0	1.0	1.0	1.0	0.9
Road Transport	4.7	4.7	4.6	4.8	4.9
Water Transport	0.2	0.2	0.2	0.2	0.2
Air Transport	0.2	0.2	0.3	0.3	0.3
Services incidental to transport	0.4	0.4	0.4	0.4	0.4

- 1.3. In the last 64 years while the freight loading has grown by 1344% and passenger kilometers by 1642%, the Route kilometers have grown by only 23% and Doubling & Multiple route length by only 289%. The growth story of Indian Railways, over the last 64 years, is captured below.

Table 2: Key Parameters

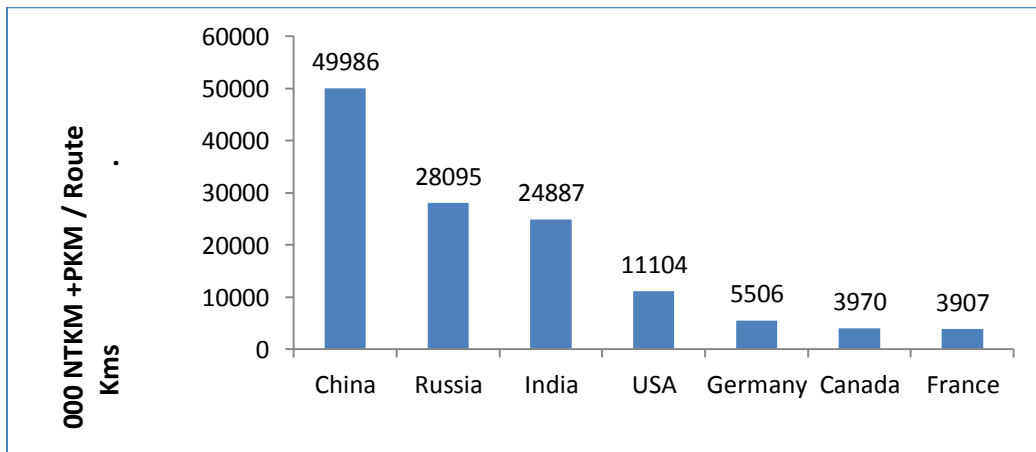
Items	1950-51			2013-14			%Variation		
Route Kms (All Gauges)	53,596			65,806			23%		
	BG	MG	NG	BG	MG	NG	BG	MG	NG
	25258	24185	4153	58175	5334	229	(+)	(-)	(-)
						7			
Running Track Kms (All Gauges)	59,315			89,987			52%		
Total Track (Kms)	90,500 (1964-65)			1,14,907			27%		
Double & Multiple Route Length (Kms)	5,127			19,887			289%		
Freight Carried (Million Tonnes)	73			1,054			1344%		
Wagon Turn Round (Days)	11			5.13			(-)54%		
Wagon Capacity (Million Tonnes)	4.14			13.65			230%		
Passenger Originating (In Millions)	1,284			8,420			556%		
Passenger Kms (In Millions)	66,517			11,58,742			1642%		
No. of Passenger Trains Run Daily (Base Year 1982-83)	6,392			12,874			102%		
Seat/Berth Capacity (Suburban)	87,986			15,28,124			1637%		
Seat/Berth Capacity (Non-Suburban)	8,54,678			36,43,423			327%		

Source: Year Books of IR



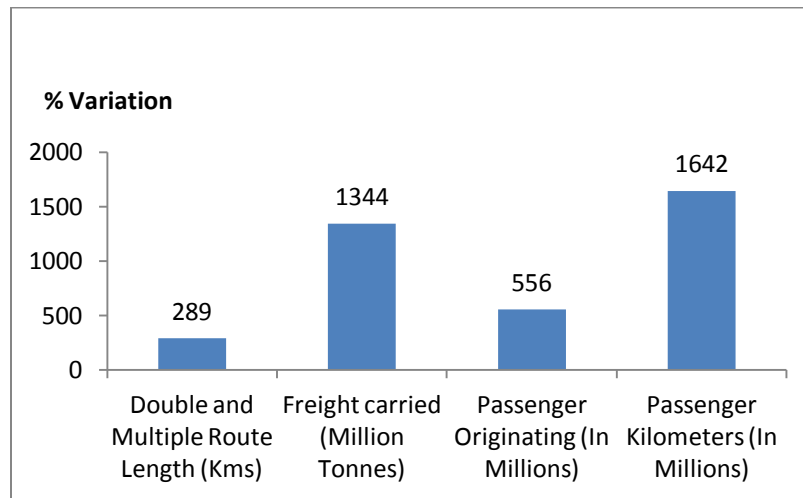
1.4 The above growth pattern has resulted in large scale congestion of the system, affecting the speed of movement, something that impacts passenger satisfaction. Although the Traffic Density on IR is quite high as per world standards, the growth of the network is not commensurate with the growth of the traffic as can be seen from the following graphs:

Figure 1: Traffic Density



Source: UIC Statistics

Figure 2: Growth Pattern since independence



Challenges

- 1.5 The biggest challenge facing Indian Railways today is its inability to meet the demands of its customers, both freight and passenger. Apart from the quantum of investment, quality of delivery is also an issue. Cleanliness, punctuality of services, safety, quality of terminals, capacity of trains, quality of food, security of passengers and ease of booking tickets are issues that need urgent attention.
- 1.6 Indian Railways has suffered from chronic and significant under-investment as a result of which the network expansion and modernization has not happened at the requisite pace leading to an erosion of the share in national freight and passenger traffic. There is a clear recognition of the fact that for serving as the lifeline of the nation and making a contribution to the country's growth, the organization needs to become operationally and financially sound.



- 1.7 Indian Railways is striving to enhance its market share and improve the quality of service so as to ensure that rail travel is an experience beyond other modes of travel. This can be achieved by eliminating capacity bottlenecks which constrain growth, improve productivity of assets and efficiency of operations and optimal employment of its resources including human capital.
- 1.8 The high density networks of the Indian Railways are facing acute capacity constraints coupled with a low passenger fares thereby leading to increases in freight tariffs to cross subsidize passenger revenues. However, that only enables recovery of costs and does not leave enough resources for investment in network expansion and replacement of assets.
- 1.9 Table 3 shows the financing pattern of the Plan investment over the last few years.

Table 3: Financing the Railway Plan

(Rs. in cr)

	2009-10	2010-11	2011-12	% share	2012-13	% share	2013-14	% share	2014-15 (BE)	% share
Budgetary Support	16911	18385	20013	44%	24132	48%	27033	51%	30100	46%
Railway Safety Fund	805	1100	1323	3%	1578	3%	1983	4%	2200	3%
Internal Resources	12196	11528	8935	20%	9531	19%	9681	17%	15350	23%
Extra-budgetary resources	9760	9780	14790	33%	15142	30%	15085	28%	17795	27%
Total	39672	40793	45061		50383		53782		65445	

- 1.10 Investments in safety have also suffered on account of low internal generation of resources. Although the safety record of Indian Railways compares well with other European countries, the fact remains that there is considerable room for improvement. Unmanned level crossings are a major area of concern apart from accidents that arise on other accounts.
- 1.11 The productivity of Indian Railways does not match up with other countries. Select productivity indicators of Indian Railways vis a vis other railway systems are shown in Tables 4, 5 and 6 below.

Table 4: Passenger Service Yields in some Major Economies

Country	Passenger Service Yield US Cents / Passenger-KM at nominal prices	Passenger Service Yield US Cents/Passenger-KM adjusted for PPP* (India=1)
India	0.6	1.0
China	2.4	2.7
Russia	5.2	6.7
Japan	19.0	9.4
Germany	12.6	6.2

Source: World Bank (2012): Railways International Overview: Issues for India (12th Plan document)

Table 5: Freight Yields in some Major Economies

Country	Freight Yield US Cents/ Total Tonne-KM at nominal prices	Freight Yield US Cents/Total Tonne-KM adjusted for PPP (India=1)
India	2.11	1.00
China	1.49	0.58
Russia	2.20	0.75
USA	2.28	0.51

Source: World Bank (2012): Railways International Overview: Issues for India (12th Plan document)

*PPP: Purchasing Power Parity

Table 6: Benchmarking Indian Railways with Chinese and Russian Railways

Railways	Employee Productivity (Annual)		Network Productivity		Wagon Productivity (Annual)
	NTKM (million)/ Employee	PKM (million)/ Employee	NTKM (million)/ Network Length	PKM (million)/ Network Length	NTKM (million)/ Wagon holding
Russia	1.81	0.15	21.87	1.80	5.52
China	1.23	0.38	39.66	12.38	4.31
India	0.44	0.66	9.39	14.12	2.73

Source: UIC Statistics 2009-10 (12th Plan document)

1.12 Due to under-investment, there has been severe congestion on the network and has resulted in the inability of the system to accommodate more trains and increase the speed of trains. Therefore, the need of the hour is to undertake a massive infrastructure expansion and decongestion program coupled with upgradation of technology and judicious electrification of tracks along with enhancement of terminal capacity. It is evident that the real issue today is the lack of physical capacity over IR on key routes due to severe congestion and the incremental traffic is being offered on the saturated routes only. The consequential impact of the above arises in the areas network expansion, customer satisfaction, project planning and implementation and safety.

2. Project Planning and Implementation

Trends in Traffic

- 2.1 Railways traffic is a derived demand. It emanates from the requirement of the growing population of the country which has already reached 125 crore. This population generates the demand directly on the passenger side and indirectly on the freight side.
- 2.2 Indian Railways entered the Billion Club in freight loading in 2012-13 by achieving 1,008 million tonnes of originating loading. The loading target fixed for 2014-15 is 1,105 million tonnes which is 4.9% higher than the achievement of 2013-14. The XIIth Plan projections of freight loading in the terminal year of the Plan (2016-17) are 1,405 million tonnes.
- 2.3 Indian Railways carried 8,425.6 million passengers in 2013-14 which is about 1,430 million higher than the population of the world put together. The annual target for passenger traffic in 2014-15 is 8,645 million, which is 2.6% higher than in 2013-14. The XIIth Plan target is 11,710 million passengers in the terminal year of the Plan. The growth of passenger traffic over last 5 years is given in Table 7 below:

Table 7: Trends in Traffic Growth

	2009-10	2010-11	2011-12	2012-13	2013-14	CAGR (2009-2014)
Freight Loading (Million Tonne)	887.79	921.73	969.05	1,008.09	1,053.54	
YoY growth	6.53%	3.82%	5.13%	4.03%	4.51%	3.48%
NTKM (million)	6,00,548	6,25,723	6,67,607	6,91,658	6,74,790	
YoY growth	8.90%	4.19%	6.69%	3.60%	-2.44%	2.36%
Originating Passengers (million)	7,246	7,651	8,224	8,421	8,425.6	
YoY growth	4.71%	5.59%	7.49%	2.40%	0.05%	3.06%
Passenger Kilometers (million)	9,03,465	9,78,508	10,46,522	10,98,103	11,10,000	
YoY growth	7.81%	8.31%	6.95%	4.93%	1.08%	4.20%

The Challenges

- 2.4 As the growth in the economy picks up in the years to come, IR will have a challenging task ahead because of line and terminal capacity constraints in transporting the incremental traffic. Therefore, there is need for significant investment in the network, especially the HDN routes and its feeder and other important routes. This would include prioritised capacity enhancement works such as doubling/tripling/quadrupling and traffic facility works like Intermediate Block Sections, bypasses, longer loops for running long haul trains. The Goods sheds along these routes would also need to be strengthened. The capacity of Workshops needs to be enhanced to cater to larger volume of maintenance of wagons and coaches. Similarly prioritized electrification and signalling & telecom works are also of importance for reasons of safety and efficiency.
- 2.5 There is a large shelf of pending projects which is estimated at Rs. 4,91,510 crore on the basis of originally estimated costs. Of these, fund requirement for the prioritized works such as doubling, new lines, gauge conversion, traffic facilities, signal & telecom works, workshops and electrification is estimated at Rs 2,08,054 crore. Such prioritization of works as per developmental requirements can ensure a sustained flow of funds for such projects and focused attention can be given for early completion and commissioning of these works. These will have a direct bearing on the line capacity which in turn will ensure higher earnings and optimal utilization of assets.
- 2.6 Further, there are constant demands for new lines. From the point of view of remote area connectivity and meeting the demands of all for access to rail travel, construction of new lines also assumes importance. However, all of these demands do not translate into viable projects from the point of view of Railways. Hence, a large number of socially desirable projects have been sanctioned in the past creating huge throw-forward liability and thin spread of funds. In many cases, IR carries the burden of losses from operations in case such projects are undertaken. In order to give impetus to execution of these socially desirable projects, partnership with State Governments would be the way forward.
- 2.7 Projects have been languishing for years on account of absence of assured funding. Delay in execution of projects leads to time overruns and cost overruns. This has an impact on the viability of the projects once they are completed. The available resources are normally spread out thinly over all sanctioned projects. In the current year, projects have been prioritized and funding assured for all the projects that can be taken up for early completion.

Congestion over IR

- 2.8 Across zones, the availability of Line Capacity on High Density Network & other important routes is illustrated below (492 out of total 1219 Sections i.e. 40% of Sections are running at 100% or above Line capacity) in Tables 8 & 9.

Table 8: Line Capacity Utilisation on IR

Railway	< 80%	80-00%	100-120%	120-150%	> 150%	OTOS*	Total
Central	34	9	11	12	7	1	74
East Coast	16	9	9	16	2	4	56
East Central	16	13	19	22	16	5	91
Eastern	22	22	41	1	--	3	89
North Central	11	3	7	22	2	1	46
North Eastern	12	6	12	6	6	--	42
North Frontier	18	10	4	14	3	11	60
Northern	70	26	29	23	10	4	162
North Western	39	7	6	3	1	4	60
South Central	20	32	23	8	9	--	92
South Eastern	24	13	14	17	1	2	71
South East Central	9	6	9	7	2	--	33
Southern	53	38	25	15	--	--	131
South Western	38	12	--	--	--	1	51
West Central	1	4	7	6	3	--	21
Western	32	18	17	21	4	48	140
Total	415	228	233	193	66	84	1219

*OTOS : One Train only System

Table 9: Line Capacity Status of High Density Network on IR

Railway	<80%	80-100%	100-120%	120-150%	>150%	Total
Central	12	4	7	12	5	40
East Coast	5	--	6	8	1	20
East Central	1	5	4	3	3	16
Eastern	--	3	7	--	--	10
North Central	--	1	5	19	1	26
North Eastern	1	3	6	1	3	14
North Frontier	--	3	--	5	1	9
Northern	3	4	5	7	2	21
South Central	--	14	2	2	2	20
South Eastern	2	2	6	6	--	16
South East Central	--	--	3	5	1	9
Southern	5	8	4	--	--	17
West Central	1	--	2	2	2	7
Western	--	9	2	9	2	22
Total	30	56	59	79	23	247

2.9 It would be seen that most of the Zonal Railways are in the range of optimal and higher than optimal utilization of line capacity. Further, 161 out of total 247 Sections i.e. 65% of the sections are running at 100% or above line capacity on High Density Network (HDN) routes. The detailed map of capacity constraints over IR gives a graphic description of the situation (**Annex 1**).

Network Expansion

2.10 During the last four years, whereas new lines have registered a growth of 74%, Doubling and Electrification have grown at 167% & 21% respectively.

Table 10: Network Expansion during last 5 years

Year	2009-10	2010-11	2011-12	2012-13	2013-14	Total
1 New Lines (km)	258	709	725	501	450	2643
2 Gauge Conversion (km)	1516	837	855	605	404	4217
3 Doubling (km)	448	769	750	705	708	3380
4 Railway Electrification (km)	1117	975	1165	1317	1350	5924

2.11 The head-wise break-up of requirement of funds is seen in Table 11.

Table 11: Throw-forward of priority projects

Plan Head	Projects	Length	Cost	Anti. Exp.	Outlay	Balance
	(no.)	(km)	Rs. in crore	(original estimated cost)		
New line	154	17105	173448	42330	9210	121907
Gauge conversion	42	9704	41803	20308	2476	19020
Doubling	166	9272	53134	13414	4931	34789
Traffic facility	560	0	9537	3781	733	5023
Signal & Telecom	517	0	9459	3205	604	5649
Railway electrification	36	10004	10686	4166	1134	5386
Workshop	479	0	26464	7499	2684	16281
Total	1954	46086	324529	94703	21773	208054

Source: IR Pink Book

2.12 The shelf of projects with Indian Railways has been categorised with a view to providing focused attention and assured funding to various categories. With the present levels of funding, the prioritized projects may take anywhere from 3 to 13 years to complete.

Table 12: Categorisation of projects

<u>Category</u>	<u>Nature of Classification</u>
A1	National Projects
A2	Cost Sharing
A3	Critical projects
A4	Sub - critical Project
A5	Important Projects
B	Other Projects
C	Least important projects

Priority projects for Indian Railways



2.13 As of now, there are 362 numbers of sanctioned projects of new lines, doubling and gauge conversion which are included in the table above. It is important that Indian Railways on priority strengthen critical rail corridors to get the benefit of enhanced capacity in a time bound manner. Hence, certain corridors have been identified on the basis of traffic pattern and average speeds. The average speed on most of these corridors is quite low indicating severe congestion on the network. Apart from the aforesaid projects of New Line, Gauge Conversion and Doubling, there are critical sanctioned works of Traffic Facility, Signal & Telecom, Workshops, Electrification, Track Renewals and Bridges that need to be undertaken on priority for strengthening of the corridors.

Challenges in speedy creation of infrastructure

2.14 Absence of assured funding:

Normal completion period of most of the projects is 3-4 years after land acquisition. Availability of assured funding for projects would enable completion in an efficient and time bound manner.

2.15 Land acquisition and clearances:

In the recent past i.e. last 3-4 years, the cost of land in most of the states has increased manifold. In addition to this, the process of acquisition has become much lengthier and for the last about 2 years, land acquisition has practically come to a standstill. Some of the projects are suffering due to delay in clearance from forest, wild life, etc. On many projects the problem of banning of mining and declaration of earth as minor mineral has created severe shortage of quarry products including earth work.



2.16 Law & Order problems

Many projects in North Eastern Region, J&K and Naxal affected areas of Bihar, Madhya Pradesh, Andhra Pradesh, Chhattisgarh, West Bengal, Odisha and Maharashtra are suffering on account of law & order problems.

Special Purpose Vehicles for execution of projects

2.17 With a view to expediting completion of projects, some initiatives have been taken to generate additional resources through non-budgetary measures like funding by state governments and other beneficiaries, execution of projects through Special Purpose Vehicles basis etc. Details regarding number of such projects are in Table 13 below.

Table 13: Details of projects executed through SPVs & Cost-Sharing Basis

Project Details	Number of Projects	Total Length(Km)	Anticipated Cost (Rs Cr)
Cost sharing with State Governments (Andhra Pradesh-8, Chhattisgarh-1, Haryana-3, Himachal -2, Jharkhand-7, Karnataka-13, Maharashtra-3, Rajasthan-1, Uttrakhand-2)	40	5331	44698
SPVs (with RVNL)	5	591	3938
Cost sharing with Industry (Coal India-2, NTPC-1, Cement Industry-3, NMDC-1, Rajasthan State Mines & Minerals-1)	7	708	4300

2.18 The National Transport Development Policy Committee (NTDPC) estimated that Indian Railways should invest Rs. 900 billion in the 12th Plan, Rs. 1.9 trillion in the 13th Plan and Rs. 4.6 trillion in the 15th Plan to regain its lost share in the transport sector. There is need to focus on investments which are remunerative and yield returns to IR. For financing socially desirable projects, a separate mechanism needs to be worked out which insulates the Railways from losses arising on this account.

SUMMARY

- 1. There is congestion on High Density Network, its feeder routes and other important routes. Network decongestion and expansion is required on these routes. Some works related to these areas are already sanctioned, while others are awaiting sanction.*
- 2. Estimated date of completion of all such works will be over 7-10 years at current levels of funding.*
- 3. Many additional tripling/quadrupling line works are to be sanctioned along with Doubling on some sectors.*
- 4. Challenge in speedy creation of infrastructure is being met by IR by requesting funding by state governments and other beneficiaries and execution of projects through Special Purpose Vehicles.*

3. Safety

3.1 Major accidents occur on Indian Railways in the following forms:

- (i) Level Crossing Accidents
- (ii) Derailments
- (iii) Fire
- (iv) Collisions

Global standard in respect of safety performance of Indian Railways

3.2 A comparison of accident statistics of Indian Railways for 2012-13 and 2013-14 with that of the whole of Europe for 2012¹ has been carried out and is available at Annex 2. To normalize the data due to variation in traffic density, Index of ‘Accidents per million Train Kilometre’ has been used. Data on Railway accidents occurring over Indian Railways has been compared with that of European countries based on passenger km, track km, and number of level crossings as shown in Annex 3.

3.3 Comparison of accident statistics of Indian Railways with countries of the European Union in terms of Accidents per million Train Kilometers can be seen in Table 14.

Table 14: Comparison of IR accident statistics with European Rail Systems

Average number of accidents in 2012.				
SN	Country	Total accidents	Total number of million train km	Accidents per million Train Km
1	United Kingdom	26	535.59	0.05
3	Spain	22	188.73	0.12
4	Germany	139	1038.11	0.13
5	Denmark	10	63.06	0.16
6	France	85	511.9	0.17
7	Netherlands	25	149.77	0.17
8	<u>India</u>	<u>194</u>	<u>963.48</u>	<u>0.20</u>
9	Sweden	33	140.43	0.23
10	Belgium	24	99.26	0.24
12	Austria	44	149.8	0.29
13	Finland	16	50.89	0.31
14	Portugal	13	37.5	0.35

3.4 It can be seen that the safety record of Indian Railways compares favourably with that of advanced systems of European Railways. The Accident rate per million Train Kilometres over Indian Railways is 0.201 for 2012-13 and 0.147 for 2013-14 compared to 0.210 over Europe as a whole for 2012. Fatalities per billion Passenger km of IR are 0.240 for 2012-13 and 0.147 for 2013-14, which is also better than that of Europe (1.033). However, there is scope for improvement.

¹ Source: European Railway Agency (ERA)

Causes of Accidents

- 3.5 Although the number of accidents on IR is less compared to those over European Railways in terms of per million Train Kilometers, still there are some causes of concern which need to be addressed, to make our system safer.



- 3.6 IR's network has 1,14,907 kms of total track length. Of this, 4500 km of track should be renewed annually. However, due to financial constraints, the progress in track renewals is constantly coming down over the last six years. As on 01.07.2014, 5300 km track length is due for renewal. The target for the current year is only 2100 km. Arrears of track renewal are accumulating which will result in disproportionately high maintenance effort. This will also result in reduced reliability of assets.
- 3.7 Highest numbers of fatalities over IR occur due to accidents at unmanned level crossings. They take place mainly due to the negligence of road vehicle users in not observing the precautions laid down in the Motor Vehicles Act while negotiating unmanned level crossings. Still, the number of consequential train incidents at unmanned level crossings has reduced over the years due to various measures taken by IR including intensive publicity campaigns and social awareness programmes undertaken to educate the road users. Railways are also removing the unmanned level crossings by building Road Over Bridges and Low Height Subways. This is happening in conjunction with other stake holders such as State Governments, NHAI, etc.

- 3.8 As on 1st April 2014, 11,563 unmanned Level Crossings were still required to be eliminated. 730 of these crossings shall be removed in the current year. IR needs Rs 39,001 crore to complete all the ongoing works of constructing Road Over Bridges, Low Height Subways and elimination of all the remaining unmanned Level Crossings. This year, initiatives have been undertaken to streamline clearances and procedures to expedite the works.
- 3.9 The aforesaid works are funded almost entirely out of the proceeds of the share of IR from the collections of the Diesel Cess authorised by the Central Road Fund Act. IR gets only 12.5% of the total amount annually credited to the Fund, whereas Roads get 50% of the share, the balance being shared by the States. It therefore becomes a limited amount even though IR can absorb much more. IR has been pursuing a higher share from the allocations to the Central Road Fund. This amount needs to be enhanced for faster elimination of level crossings and saving of precious lives.
- 3.10 The issue of accidents on account of loco drivers' error is being addressed through technological intervention. Automatic Train Protection (ATP) systems mitigate the safety risk due to loco drivers' error or over speeding leading to collisions. On IR network, this safety area could not be given adequate priority/resource allocation and induction of ATP systems has been mostly limited to suburban sections. Train Protection & Warning System (TPWS) has been equipped on suburban section of Southern Railway and also on the Kolkata Metro covering all EMU rakes. TPWS has also been approved for 3300 Route Km Automatic Signaling Sections on IR network. There has been delay in commissioning TPWS for want of funds.

Funds requirement for improving safety

- 3.11 Special Railway Safety Fund (SRSF) Phase-I which was implemented during the period 2003-2008, involved expenditure of Rs.16,318 crore for improving safety on Indian Railways. It involved primarily replacement of worn out assets relating to Bridges, Signalling systems, Track and Rolling Stock.
- 3.12 A High Level Safety Review Committee under the Chairmanship of Shri Anil Kakodkar was set up in September 2011 and the report was submitted in February 2012. The Committee has estimated that for implementation of all its recommendations, primarily pertaining to rail safety, will require an expenditure of Rs.1,03,110 crore in a period of 5 years, i.e. approx. Rs.20, 000 crore per annum for a 5 years period.
- 3.13 IR has requested Ministry of Finance for a grant for a second phase of Special Railway Safety Fund to undertake works recommended by the Kakodkar Committee.

3.14 A list of safety – related works that need to be taken up on priority is presented in Table 15.

Table 15: List of Safety Work

Track renewal, Renewal of over aged distressed bridges, provision of thick web switches and weld able CMS crossings, improved welding technology, vehicle borne ultrasonic flaw detectors and mechanized maintenance of track.
Works for provision of isolation, replacement of over aged signaling gears, mobile train radio communication and train protection system.
Works of up gradation of mainline coaches with smoke and fire detection system, crash worthy buffers, up gradation of wagon and improvement in train examination facility and disaster management facilities.
Works of replacement of over aged traction distribution assets, masts/portals having critical implantation, fire safety in EMUs/locos, replacement of DG sets in power cars and mid-life rehabilitation of mainline coaches/ EMU.
Up gradation of training institutes, running rooms and crew lobbies.

Global Benchmark in Signalling

3.15 State of the art Signalling and Telecommunication systems being used by advanced world railways to realize safety and capacity enhancements compared with signaling and communication systems adopted on IR are shown in **Annex 4**.

3.16 It is proposed to adopt global bench marks in Signaling over next 3 to 4 years depending upon the availability of funds.

SUMMARY:

1. *In terms of global benchmarking, IR's safety record compares favorably with that of advanced systems of European Railways.*
2. *Highest numbers of fatalities over IR occur due to accidents at unmanned level crossings. They take place mainly due to the negligence of road vehicle users in not observing the precautions laid down in the Motor Vehicles Act while negotiating unmanned level crossings. These can be minimized with the construction of ROB/RUB.*
3. *Arrears of track renewal are accumulating which will result into disproportionately high maintenance effort. This will also result in reduced reliability of assets.*
4. *Accidents on account of running staff in terms of Signal Passing at Danger (SPAD) are a major cause of concern.*

4. Customer Engagement

Indian Railway Customers

- 4.1 Indian Railways deals with two types of customers, viz. passenger and freight. The major issues regarding passenger satisfaction are availability of train accommodation, transit time, punctuality, cleanliness at stations and in trains, catering services, reservation facilities etc. Similarly, major issues regarding freight customers are availability of suitable terminals for loading and unloading, availability of rolling stock and speedy and seamless transit times of freight trains.
- 4.2 Apart from the fact that scarcity of resources has been a major factor in network expansion and capacity creation, the quality of service delivery also has been an area of dissatisfaction. A number of surveys have revealed that lack of cleanliness is the main concern followed by safety and quality of food. As was discussed in the previous chapters, the low levels of investment have led to network congestion. This has restricted the movement of a higher number of trains on these routes apart from compromising on the speed of existing trains.
- 4.3 The low recovery of costs on the passenger segment and high freight rates have led to an imbalance in the revenues from these two business segments. This is quite clear from Table 16 below.

Table 16: Recovery of Costs

Unit Cost vis-a-vis Yield per Unit

(Figs. in Paise)

	Coaching Service			Freight Service		
	Cost per PKM	Earnings per PKM	Ratio	Cost per NTKM	Earnings per NTKM	Ratio
1999-2000	35.83	22.21	62.0%	55.91	72.28	129.3%
2008-09	48.86	26.13	53.5%	63.74	96.90	152.0%
2009-10	52.87	25.96	49.1%	65.84	97.41	147.9%
2010-11	52.60	26.32	50.0%	67.63	100.44	148.5%
2011-12	54.38	26.99	49.6%	69.64	104.17	149.6%
2012-13	57.76	28.52	49.4%	75.28	123.27	163.7%

Table 17: Passenger Business

Year	Suburban (EMU)		Non-suburban		Train Kms. Per running track km. per day	
	Train Kms. (Million)	Vehicle Kms. (Million)	Train Kms. + (Million)	Vehicle Kms. @ (Million)	Suburban (EMU)	Non-suburban+
1950-51	9.28	119.8	154	2,678	27.9	7.1
1960-61	14.05	196.8	190	3,594	28.7	8.2
1970-71	23.05	369.4	225	4,636	30.1	8.6
1980-81	35.55	601.5	258	5,582	36.6	9.7
1990-91	48.37	840.7	316	7,739	40.0	11.5
2000-01	56.04	1029.5	397	11,035	47.1	13.8
2009-10	73.25	1342.8	556	17,335	43.8	18.4
2010-11	73.25	1438.5	582	18,207	46.7	19.2
2011-12	76.14	1479.3	605	19,340	46.4	19.4
2012-13	78.53	1651.8	626	20,595	42.7	20.4

@ Includes Mainline EMUs, DEMUs, DHMUs and suburban services other than EMU but excluding Rail Cards/Bus and Departmental.

+ Excludes Departmental but includes Rail Cars/Bus, MEMU, DEMU and DHMU services.

4.4 A few issues related to passenger business are listed below.

4.5 Cleanliness and catering

Cleanliness at stations and trains has suffered, to some extent, on account of poor quality of passenger amenities such as availability of toilets and dustbins. Further, the cleanliness of trains needs to be looked into so as to ensure their cleaning at specified stations en route. Passengers have also expressed concerns regarding cleanliness of bed rolls and the quality of food.

4.5.1 Toilets

With the total commitment of IR to provide hygienic environment to passengers and to keeping station premises/tracks clean, IR have developed environment-friendly Bio-toilets for use in coaches. The technology has been developed jointly by IR and Defence Research & Development Organization (DRDO).



Bio-toilet tank

4.5.2 The bio-toilet tanks are fitted below the coach floor underneath the lavatories and the human waste, discharged into them, is acted upon by a colony of anaerobic bacteria that convert human waste mainly into water and harmless gases (mostly small quantity of Methane and Carbon Dioxide). The gases escape into atmosphere and waste water is discharged after disinfection onto the track. Human waste thus does not fall on the railway tracks.

4.5.3 This environment friendly, low cost and robust technology, jointly owned by IR and DRDO, is the first of its kind in Railway Systems in the world. Significant in-house R&D was done to convert the concept of bio-digestion into a physical prototype in view of the typical passenger usage habits, heavy passenger usage and operating conditions of Indian trains. The progress made since introduction of this technology on IR is given below:

Table 18: Progress of fitment of Bio-toilets

Year	Fitment		Cumulative Fitment	
	Bio-Toilets	Coaches	Bio-Toilets	Coaches
2010-11	57	31	57	31
2011-12	169	67	226	98
2012-13	1337	561	1563	659
2013-14	8024	2988	9587	3647

4.6 IR is striving for elimination of direct discharge toilet system from all newly manufactured coaches by 2016-17 and to eliminate direct discharge toilet system from entire fleet of passenger coaches in the next few years.

Punctuality:

4.7 Punctuality is the one of significant factors determining overall satisfaction of passengers with the service provider. Indian Railways run 2558 Mail/Express train services, including daily and non-daily services (as on 31 December 2014). IT enabled Integrated Coaching Management System (ICMS) helps in online monitoring of the running of trains.

- 4.8 At present, the punctuality of Mail/Express trains over the Indian Railways is about 80 percent. The average punctuality of Mail/Express trains achieved over the IR system on terminating basis in the last five years is depicted in Table 19 below.

Table 19: Punctuality of Trains

Year	Punctuality Percentage	Avg. No. of Mail /Exp Trains Run Per Day
2010-11	69.00%	1266
2011-12	75.00%	1348
2012-13	79.00%	1430
2013-14	83.00%	1505

(Source: Integrated Coaching Management System)

- 4.9 It would be pertinent to mention that on a daily basis, Indian Railways is running about 300 Mail/Express trains more as compared to 2010-11. Punctuality of trains is severely affected on trunk routes due to over saturation of line capacity apart from factors which are beyond the control of the Railways like fog during the December-February period, adverse law and order conditions, running of pilots ahead of Mail/Express trains in Left Wing Extremism (LWE) sensitive areas of East Central Railway etc. Due to over saturation of line capacity on such routes, any disturbance tends to have a cascading impact on punctuality of all trains. During 2013-14, the significant factors accounting for about 54% of punctuality loss of Mail/Express trains were capacity constraints, bad weather, law and order problems, traffic blocks for capacity enhancement /project implementation and up-gradation of existing assets.
- 4.10 For improving the punctuality on IR, developing additional infrastructure by way of signaling intervention, doubling, augmentation of terminals and development of additional terminals needs to be undertaken on priority.

Proposal to Upgrade Passenger Trains Speed:

- 4.11 Inputs for upgrading New Delhi Agra Section to run trains at 160 kmph have been provided. Necessary approvals are being processed for obtaining Safety clearance from Commissioner of Railway Safety.
- 4.12 Speed of a higher number of trains is proposed to be increased from 100/110 to 130 kmph. Following Sections are targeted for speed up gradation:



Table 20: Sections for Speed Upgradation

Railway	Section	Route Classification	Length (km)	Existing Speed (Kmph)	Proposed Speed (Kmph)	Targeted Month	Likely Time saved (Min.)
WR	Virar-Godhra	A	404.75	120	130	June'15	15.57
WR	Virar-Ahmedabad	A&B	435.38	110/120	130	June'15	21.27
NR	New Delhi-Ambala	B	200	110	130	June'15	17
NR	Ambala-Ludhiana	B	110	110	130	June'15	16

Losses in Coaching Operations

Analysis of the profitability of coaching services in 2013-14 revealed an overall loss of Rs 21,391 crore, to which net suburban losses in Chennai, Kolkata and Mumbai provided with EMU and Non-EMU services contributed Rs 2,852.32 crore. Efforts are required to be made to cut down losses. Premium trains have been a good revenue earning option for Railways apart from addressing needs of passengers who have been unable to book tickets in advance.

Coaching operations can be made more efficient with the existing infrastructure mainly by running longer trains through augmentation of coaches in order to reduce the unit cost of operation and increase the earnings and reviewing the maintenance practices. It is also important to review stoppages. It not only results in direct revenue loss but also eats into line capacity. The following measures can be taken to bring down the losses.

1. The concept of premium trains needs to be enhanced as it is a most welcome step for getting the extra revenue and customer satisfaction.
2. Running longer trains through augmentation of coaches in order to reduce the unit cost of operation and increase the earnings.
3. Pattern of examination should undergo a key change in order to release maintenance slots/space at saturated/congested coaching terminals.
4. New Introduction of trains should be avoided until capacity augmentation is firmly in place. If necessary, they should be introduced and run via longer non saturated routes.
5. Running of AC-3 tier coach is most suitable for railways and passengers and it breaks even at approx. 75% occupancy and it is the only coach which has given profits. Therefore, trains should be augmented to run as many AC-3 tier coaches as possible.
6. Parcel business should be separated from passenger operation business.
7. Provision of stoppages without commercial justification should be reviewed.

Poor quality of terminals

Globally, most countries have modern passenger terminals with excellent passenger amenities. Station redevelopment is required on priority for improving the quality of stations. This can be carried out through PPP by laying down the desired outcomes. Further, access to platforms by non-passengers also needs to be restricted. The arrival and departure areas need to be segregated.

Ticketing on e-platform for the unreserved traveller

Purchase of tickets through mobiles has been launched on a pilot basis and would be expanded further. However, setting up of vending machines and such other measures can bring down the time spent by passengers on purchasing tickets.

Freight Business

Table 21: Freight business – some parameters

			2009-10	2010-11	2011-12	2012-13
Net tonne kilometres per wagon per day@		BG	9,222	9,247	9,261	9,267
		MG	624	663	632	554
Wagon kilometres per wagon per day@		BG	256	262	266*	265
		MG	30	32	33	29
Net tonne kilometres per engine hour	Diesel	BG	16,465	16,420	15,889	16,199
		MG	2,330	2,421	2,161*	2,390
	Electric	BG	24,672	24,436	24,049*	24,133
Net tonne kilometres per engine day on line	Diesel	BG	2,85,008	3,01,626	300,781*	3,03,200
		MG	26,469	30,552	25,012	240,88
	Electric	BG	4,43,386	4,50,282	4,29,193	4,49,110
@ From 2009-10 onward figure in terms of 8-wheelers						
*revised						

4.13 Railways freight customers are its main stay and contribute over Rs. One lakh crore to its revenues. The main constraint in freight operation is severe congestion on all important routes and terminal congestion. Ensuring the supply of wagons as per their requirement and transporting the goods in time to the destination is the duty of IR. A number of initiatives as detailed below have been taken over the years to make the experience better for the customer:

Computerization of Goods Terminal:

4.14 A customer friendly Terminal Management System (TMS) was introduced in 2005. With TMS installed in sidings, it has become possible for the customer to know the whereabouts of his goods on a real time basis. Issue of railway receipts (RR) has become simpler and faster after the - TMS has been introduced. At present, 99.9% of total loading is captured in TMS.

Mode of Payment:

4.15 76% of the freight customers make payment electronically through the banking system eliminating the need for either bringing cash or demand drafts making the payment secure. Presently, 763 accounts have been activated till April 2014. With some of the banks coming up with a payment gateway whereby freight customers not on e-payment mode can pay directly from their bank accounts, the coverage of customers is likely to go up.

Wagon Registration Fee (WRF):

4.16 Placing a demand for wagons involves payment of wagon registration fee. IR has now exempted payment of WRF by premier customers who pay more than Rs.10 crore per year.

Freight Incentive Schemes:

4.17 IR has a plethora of schemes for its freight customers, where concessions in freight rates are given to garner additional revenue by generating additional volume of traffic. The schemes range from loading bagged consignments in open wagons, loading in empty flow direction, incentives for incremental traffic, incentives for freight forwarders, mini rakes, two point rakes and multi point rakes etc. The schemes have met with partial success.

Terminal Infrastructure:

4.18 The condition of the railway goods-sheds is not very good. A number of works have been sanctioned under works program for improvement to goods sheds. Presently there are 70 works in progress costing Rs. 635.34 crore, which still need another Rs. 325 crore for completion at original costs. In 2007, standards for all amenities at goods/sheds were laid down.

Private Freight Terminal (PFT):

4.19 This policy was launched as a major PPP initiative in 2010, to attract private investment in setting up of freight terminals. As an incentive, 50% of terminal charges were made available to the investors. With the subsequent subsuming of terminal charges in freight, this incentive is no longer available to the PFT investors and on the contrary, a share of the revenue @ Rs.16 per tonne is now realized from the PFT investor. The policy is being reviewed to make it more attractive for investors.

E-Demand module of the Freight Operations Information System

4.20 Registration of wagon demand by the customer can now be done on-line; without the need for visiting goods shed for this purpose.

Freight e-Diversion system:

4.21 The coal rakes among the power houses and corporations of electricity board can now be diverted, if required, through the new “e-diversion system” on real time basis. Diversion orders and notifications can be issued electronically for faster implementation.

Reformulating the Parcel Business

4.22 Non-Core business needs to be strengthened on IR. International experience indicates that this can generate revenues. Of this, Parcel business has a potentially huge market in India. At present, the share of Railways is very limited. In 2013-14, IR earned about Rs.1800 crore. However, the growth rate has been an encouraging at 8% and higher as can be seen from the table below.

Table 22: Parcel Earnings

Year	2011-12	2012-13	2013-14
Actual Earnings (Rs. crore)	1499.46	1635.54	1827.60
Variation over last year	8.8%	9.1%	11.7%

- 4.23 The parcel traffic is presently transported by Assistant Guard's Cabin (AGC), Break Vans (SLRs), Parcel Vans (VPs/VPU/VPs), Special Parcel Trains – Leased or non-leased, BCN rakes for perishables traffic and Special Purpose Vehicles like Rail Milk Tanker, Refrigerated Vans etc. The traffic in AGC, SLR & VPs is carried by mail/ express trains and passenger trains. Parcel traffic is either leased or non-leased. Leased traffic in AGC, SLR & VPs is governed by the 'Comprehensive Parcel Leasing Policy' and leased traffic in parcel train is governed by policy on 'Parcel Cargo Express trains'. Non-leased parcel traffic is booked by the Railways from parcel offices at concerned station.
- 4.24 There are a number of issues that have hampered the growth of non-leased parcel traffic. The booking is done manually. Other issues include: non-availability of space in trains for carriage of parcels; over-carriage of parcels; no prior intimation regarding arrival of parcels; damage during transit; no segregation of space for parcel loading/ unloading for different originating and destination stations. As such handling of parcels in passenger area creates obstructions in free movement.
- 4.25 For development of parcel business, passenger business is being separated from parcel business. Passenger carrying trains should not carry parcels and the released Parcel Vans can be used for formation of full parcel rake(s). These shall run in full parcel trains.
- 4.26 In the Passenger and Parcel segments, there is heavy unmet demand, for which expansion of our network is necessary.

Fixation of tariffs

- 4.27 In order to recover the cost of service and to factor in inflation. A mechanism needs to be put in place to determine fares and freight with specified periodicity.

SUMMARY:

- 1. Major issues regarding the passenger satisfaction are availability of accommodation, transit time, punctuality, cleanliness at stations and trains, catering services and reservation facilities.*
- 2. Similarly, major issues regarding freight customers are availability of suitable terminals for loading and unloading, timely availability of rolling stock and speedy & seamless transit times of freight trains.*
- 3. A number of initiatives have been taken for freight customers, but there is need to a lot more.*
- 4. Non-core business, in particular, Parcel business needs to be strengthened on IR.*

5. Rolling Stock

Background

- 5.1 Indian Railways has a total holding of 10,749 locos, comprising 5,749 diesel locos and 5,000 electric locos. These locos are maintained across 71 sheds. Indian Railways holds 63,511 Broad Gauge coaches of which 9,319 are AC coaches. Gradually all Mail and Express trains are being introduced with LHB coaches which have a higher speed potential of 130 Km/h. While debottlenecking the network is critical, what is also essential is the required focus on Rolling Stock. Following initiatives have been taken/are proposed to be in this direction.

Wagons

- 5.2 New initiatives have been taken for better utilization of the existing wagons resulting in enhanced carrying capacity. Such initiatives are discussed below.

Development of wagons with higher pay to tare ratio

- 5.3 The material of construction of Open BOXN wagons (Pay to tare 2.5) has already been upgraded to Stainless steel in BOXNHL (pay to tare 3.46) to reduce weight and overcome the problem of corrosion. For Covered wagons of BCN type (pay to tare 2.31) Micro-alloyed steels are now being used in BCNHL wagons (Pay to tare 3.40). Both BOXNHL and BCNHL are of 22.9T axle load.





Development of Special types of wagons:

- 5.4 Indian Railways has traditionally targeted carriage of bulk commodities like coal, iron ore etc. There is need to develop special types of wagons for bulk movement of specific commodities. In this direction RDSO has already developed special types of wagons to carry fly ash, food grains, automobiles, salt, parcels, steel coils etc which have much higher capacity than the earlier versions. The new design of Autocar wagon capable of carrying a maximum of 318 cars of all types have been developed with private participation for the first time with M/s Maruti Suzuki India Ltd. (MSIL). It is planned to develop parcel vans and steel coil wagons similarly with private participation in developing of prototype wagons for new designs along with RDSO.

Development of Light weight wagons for salt movement:

- 5.5 Two designs of wagons are being developed:

- (i) Open wagon with Fibre Reinforced Plastic (FRP) interior lining
- (ii) Covered wagons with sliding roof of FRP/synthetic material

- 5.6 A prototype of Open wagon with FRP interior lining has been manufactured and is under field trials. The wagon with sliding roof of FRP/synthetic material is still at design stage. These wagons are being developed primarily for transportation of salt but shall also be capable of carrying other commodities.

Locomotives

Locomotives for Western DFC (Package-7) against STEP Loan

- 5.7 Procurement of 200 locomotives of 9000 HP along with setting up of maintenance infrastructure at Rewari is to be undertaken under Special Terms for Economic Partnership (STEP) loan agreement of Japan International cooperation Agency (JICA) for the Western DFC project. These locomotives are to be energy efficient with regenerative braking features and equipped with IGBT Propulsion technology for use on Western DFC.

High Horse Power Electric Locos at CLW:

- 5.8 IR has a fleet of 4956 electric locomotives with share of 16% of high horse power 3-phase electric locomotives (HHP). Considering the inherent advantages of these HHP locos over old technology Tap changer conventional locomotives like regenerative braking, energy efficient, less maintenance requirement etc. it is planned to completely switch over to production of HHP locos at CLW. Numbers of production capacity work at CLW including setting up of ancillary unit at Dankuni are under progress at CLW.
- 5.9 Similarly, high horse power diesel locos are being manufactured at DLW, Varanasi. Setting up of loco factories (diesel and electric) in Bihar, through PPP, is also under consideration.

SUMMARY:

1. *Focus on Rolling Stock is essential,*
2. *Therefore, IR is also upgrading the Technology of Rolling Stock.*
3. *It is proposed to set up new generation Diesel & Electric Loco Factories in Bihar under JV/PPP Route.*
4. *Development of wagons with higher pay to tare ratio, Light wagons and special purpose wagons for specific commodities are also initiatives for technology upgradation.*

6. Financial Status

Financials of the IR system and outlook for the next three years

- 6.1 In 1923, IR's functioning was separated from that of the General Finance of India and the arrangement formalized by the Separation Convention of 1924 deemed that IR would be responsible for its own financials while contributing to the exchequer a dividend for the capital invested in it. This arrangement has so far worked to the satisfaction of both the parties. IR has earned enough to be able to discharge its working expenses, debt servicing, dividend and all other liabilities including planning for investments and depreciation. Apart from that, IR has also carried a huge social burden which it faithfully discharges by either concessions or subsidized travel.
- 6.2 Recent times, particularly after the Sixth Pay Commission have seen a downslide in the finances of IR and if it has to play a pioneering role in national development including taking care of its own health, some new modeling of generation of finances has to take place so that paucity of resources does not impinge upon the investment planning of IR.

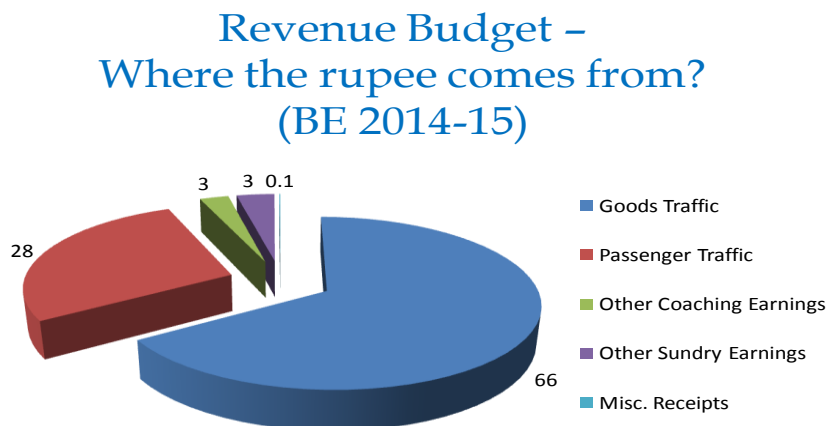
Structure of IR's finances:

- 6.3 The structure of IR's finances is such that they are divided into revenue and capital expenditures. While revenue expenditure takes care of the day to day and operational working expenses, inclusive of debt servicing and dividend payment, capital expenditures take care of IR's investments inclusive of repair and renewals. There are three streams that comprise capital expenditure; these are Gross Budgetary Support from the Ministry of Finance, internal generation of resources and leasing from IRFC.

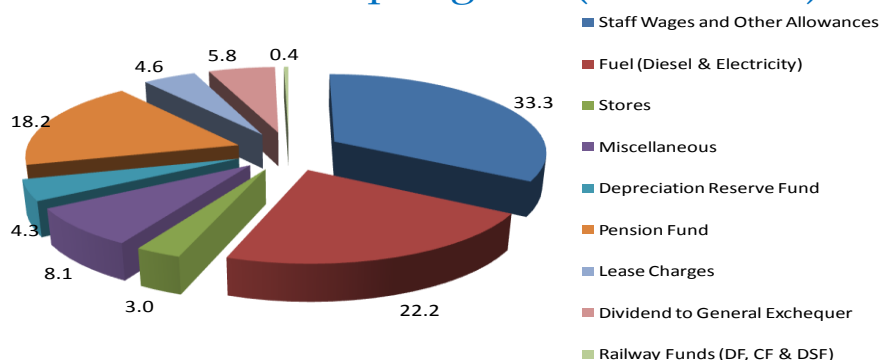
Revenue Expenditure

- 6.4 The charts below indicate the flows into and out of the revenue expenditure:

Figure 3: Revenue Expenditure



Revenue Budget – Where the rupee goes? (BE 2014-15)



6.5 Over the last three years, the inter-se share of the various earnings components has been almost at the levels depicted above. This indicates that there is a certain amount of predictability as to where the revenue streams are originating from and policy makers tend to focus on these for augmentation of revenues.

Table 23: Revenue share

2010-11	2011-12	Year	2012-13	2013-14
67%	67%	Goods	69%	67%
27%	27%	Passenger	25%	26%
94,525	1,04,154	Total Traffic Earnings (Rs. in cr)	1,23,901	1,39,838

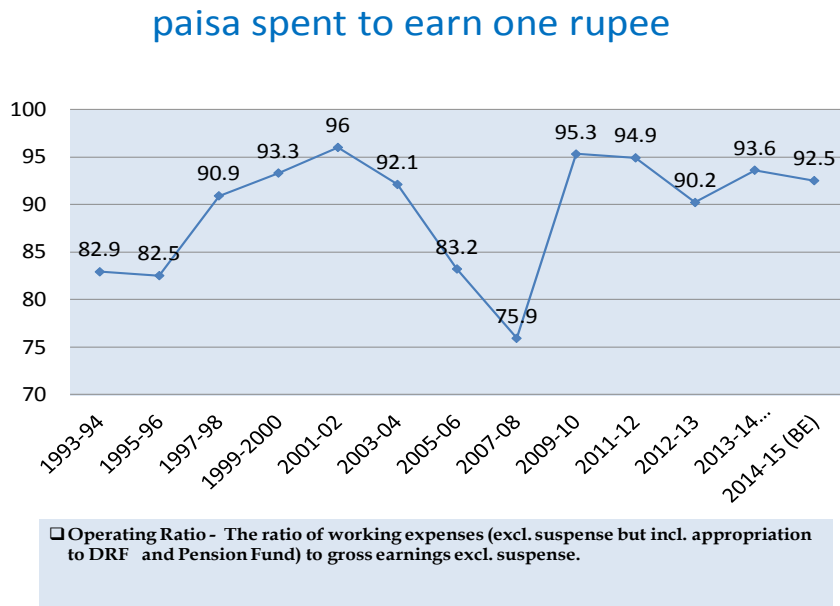
6.6 Similarly, in expenditure, the trend of inter-se share of various components has a pattern over the last three years with the bulk being taken up by staff costs. Year on year variations apart such as the likely impact of benign fuel prices this fiscal, the trend is almost constant.

Table 24: Trends in O.W.E.

2010-11	2011-12	Year	2012-13	2013-14
39.93%	39.32%	Staff	38.09%	35.70%
18.49%	18.86%	Fuel	19.79%	22.26%
17.73%	18.02%	Pensions	18.67%	18.76%
3.96%	4.20%	IRFC	4.47%	4.45%
68,139	74,537	O.W.E.(Rs. in cr)	84,012	97,571
4,941	5,656	Dividend payment.(Rs. in cr)	5,349	8,009

6.7 Only once in the last three years has the Operating Ratio touched 90% and that can be attributed to robust goods earnings. In 2007-08, the dip was significant on account of continuing combined benefit of robust demand in the core sector of economy and Iron-ore export that was compounded by higher axle load and carrying capacity on certain key routes with heavy traffic density. The spike since 2008-09 was due to the 6th Pay Commission; the impact of which was to the tune of Rs one lakh crore up to 2012-13.

Figure 4: Operating Ratio %



6.8 It is also important to re-iterate that IR is the only GOI body which has fully met for the successive pay commissions from out of its internal resources and without seeking GOI support.

Analysis of Working Expenses

Staff Costs:

6.9 IR has 13.07 lakh employees on roll. For 2014-15, the estimated increase in Staff costs over the previous year is 12%.

IRFC Payments

6.10 IRFC raises market borrowings which constitute the Extra Budgetary Resource for Railway Plan Investment to the tune of 25-30% of the IR's Plan size. The funds raised by IRFC are invested mainly in rolling stock assets which are leased for a period of 30 years to IR. IRFC also gives loans to RVNL towards viable and bankable projects being executed by them. The quantum of borrowing in 2013-14 was Rs.15, 181 crore and in

2014-15, it is targeted to be Rs.11, 790 crore. Every Rs. 1000 crore borrowed by IRFC entails repayment of principal and interest which is borne from IR's revenues and which impacts its Operating Ratio. Till the end of 2013-14, the gross value of assets taken on lease stand at Rs. 1,14,327 crore, to which will be added incremental assets of Rs.11,790 cr in 2014-15. This debt stock of IRFC has a maturity life till 2045. IRFC works on a set model: it leases the assets from the month of acquisition to IR based on a standard leasing agreement. Cost of borrowing in 2013-14 is around 8.4% to IR while lease rentals are around 11.4%.

Fuel

- 6.11 This comprises 31% of the OWE at present comprising both diesel (21.4%) and electric (9.7%) tractions. Fuel bill has witnessed a steady increase on account of Tariff, Consumption and increase in Activity. Decisions such as introduction of stoppages also add to the fuel bill and consumption. The major contributor to the increase in fuel outlays has been the steady increase in prices based on global cues and high domestic prices which are illustrated below:

Table 25: Fuel prices

Item	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Rs per kl of HSD	34002	33495	38286	41842	49542	65954
growth over P.Y.	9.2%	-1.5%	14.3%	9.3%	18.4%	33.1%
Rs per kwh of EE	4.43	4.52	4.72	5.20	6.10	6.49
growth over P.Y.	0.3%	2.1%	4.5%	10.1%	17.2%	6.40%

- 6.12 Alternate fuels like Bio-diesel, CNG/ LNG are cheaper than diesel and have potential to replace diesel as a preferred choice for traction fuel globally. Unless there is an aggressive push towards alternate fuels, IR will continue to live with the uncertainties of a higher priced fuel. However, IR is also aggressively working towards reducing cost of fuel. In this regard, action has been initiated for signing long term PPAs and also procuring power from power exchanges.

Pensions:

- 6.13 This segment has witnessed a high growth rate. Over this decade, it is estimated that there will be around 5 lakh incremental retirees. This is a recurring obligatory demand to be catered to from out of IR's internal resources. The number of pensioners on IR is 13.64 lakh as on 31.03.2013 and has exceeded the 13.07 lakh serving staff on roll during the same period. In 2014-15, Pension outgo is estimated to grow over 17% over the previous year.

Table 26: Pension

Year	Likely Number of retirees	Total likely outgo on Pensions (Rs/cr)
2013-14	50476	24850
2014-15	54937	28550
2015-16	57233	33546
2016-17	57682	39417
2017-18	57284	46315

Contribution to Depreciation Reserve Fund:

- 6.14 As per the IR Finance Code Vol. I, “Depreciation provision with respect to an asset will be equal to the annual payment to a Sinking Fund which together with the interest thereon at such rates when compounded annually will provide the amount required for the replacement of the asset at the end of the normal life”. However, the code also provides that budget estimate for DRF is based on the replacement program including arrears of depreciation, if any, to be made good during the following year. This exercise is a part of the overall resource planning of IR. Currently, there is a minimal balance available in the fund due to lack of adequate surplus generated to transfer to the fund to take care of all repair and renewal activities. Allocations for DRF are derived after taking into account the allocations for other committed working expenses, which restricts the capacity to fully provide for this.

Dividend Payment to Ministry of Finance (MoF)

- 6.15 Budgetary support from General Revenues, received for creation of assets, is held as capital-at-charge on the IR. The Railways pay the Ministry of Finance dividend set as a percentage of the capital-at-charge. The capital-at-charge is maintained in the books of Railways at historical value of the assets created. In MoF, the Budgetary Support (i.e. capital-at-charge) is treated as loan extended to the Railways and the dividend being paid as interest. There is no reduction in this capital unless it is amortized or write-back adjustments are affected by debit to internally generated resources of the Railways and hence is a loan in perpetuity. Every time an asset is replaced, the historical value of the asset continues to be reflected under capital-at-charge. Thus, the total capital-at-charge of IR stands at Rs 1, 74,625 cr as on 31.03.2014.
- 6.16 The rate of dividend, modalities of its payment and exemptions are determined by the Railway Convention Committee (RCC) of Parliament in consultation with MoF and MoR. Certain segments of capital-at-charge are exempt from payment of dividend at source. Presently, the dividend is required to be paid to the MoF at 5% of the dividend bearing capital-at-charge except the staff quarters where it is to be paid at 3.5%. Being un-remunerative, the dividend payable on certain items of capital-at-charge investments is paid back to Railways by the MoF.
- 6.17 In 2014-15 (BE), the dividend payable has been estimated at Rs 9,135 cr whereas the subsidy is being claimed at Rs 4,059 cr. Thus, on the net basis Rs 5,076 cr would be the outgo on account of dividend in 2014-15 (BE). Thus, the effective rate of dividend payable to MoF works out to roughly 2.5% of the dividend bearing capital-at-charge. The issue of rationalisation of dividend policy has been raised with the Ministry of Finance.

Social Service Obligations of IR:

- 6.18 Railways also bear social service obligation of around Rs 25,000 crore every year by carrying passenger and goods services below cost. Reimbursement of this cost has been considered by Government and a Committee of Secretaries had recommended that these be reimbursed to the Railways but still remains unresolved. Net Social Service Obligation borne by IR in 2013-14 is assessed at Rs 21,391 crore. This cost impinges upon the viability of IR system.
- 6.19 The main elements of Social Service Obligation of IR are losses relating to:

- (i) Essential commodities carried below cost- essential commodities of mass consumption like fruits and vegetables, organic manures, paper, charcoal, bamboos, cotton raw pressed etc. are carried below cost of operation in order to contain their market prices.
- (ii) Passenger and other coaching services including concessions, low tariff particularly in the second class all contribute to the losses.
- (iii) Operation of uneconomic branch lines: Despite concerted efforts to enhance earnings on branch lines, most of these lines remain commercially unviable. The Railway Reforms Committee recommended closure of 40 such lines but due to stiff public resistance and opposition by State Governments towards withdrawal of such services, only 15 lines have been closed permanently by the Railways. A review of the financial results of existing 88 uneconomic branch lines for the year 2011-12 shows that, on an original investment on these lines of the order of Rs 1,719 crore, loss during the year 2011-12 amounted to Rs 1,366 crore.
- (iv) New lines opened for traffic during the last 15 years.

Low passenger fares, ability to pay and potential of that to Revenue:

6.20 Class-wise breakup of Passengers reflects that 94.64 per cent share is concentrated in the un-reserved segment including suburban. The revenue loss in this segment is around 68%.

Earnings

6.21 Growth in earnings this fiscal is targeted at 14.5%. The trends in earnings segment-wise, are detailed as under:

Table 27: Segment-wise Earnings

(₹ in crore)					
Year	Goods	Passenger	Sundry	Other Coaching	Total
2011-12	69548	28246	3643	2717	104154
2012-13	85263	31323	4261	3054	123901
2013-14	93906	36532	5721	3679	139838
2014-15 (BE)	105770	44645	5500	4200	160115

Goods Earnings

6.22 The Year on Year growth in Originating Tonnage, NTKMs, Freight Lead and earnings is detailed in Table 28 below. Trends indicate that under Tonnage, certain commodities like Raw Material for Steel Plants, Pig Iron and Finished Steel, Iron Ore & Food grains are anticipated to load less than the previous year. Coal, Cement, Containers and Fertilizers is expected to pick up over the previous FY. Average Freight Lead has grown nominally this year after registering negative growth in previous two years.

Table 28: Traffic Earnings

TRAFFIC PLAN : GOODS												
Commodity	Tonnes Originating (in million)				Net Tonne Kms. (in millions)				Earnings (` in cr.)			
	2010-11	2011-12	2012-13	2013-14 (R.E.)	2010-11	2011-12	2012-13	2013-14 (R.E.)	2010-11	2011-12	2012-13	2013-14 (R.E.)
Total	921.73	969.05	1008.09	1051.55	625,723	667,607	691,658	654,395	62844	69548	85263	94000
TRAFFIC PLAN : GOODS												
Commodity	Tonnes Originating (MT)			Net Tonne Kms. (in millions)			Average Freight Lead			Earnings (` in cr.)		
	Growth in 2012-13 over P.Y.	Growth in 2013-14 RE over P.Y.	Growth in 2014-15 BE over P.Y.	Growth in 2012-13 over P.Y.	Growth in 2013-14 RE over P.Y.	Growth in 2014-15 BE over P.Y.	Growth in 2012-13 over P.Y.	Growth in 2013-14 RE over P.Y.	Growth in 2014-15 BE over P.Y.	Growth in 2012-13 over P.Y.	Growth in 2013-14 RE over P.Y.	Growth in 2014-15 BE over P.Y.
1. Coal	8.9%	2.6%	4.0%	4.1%	-10.1%	4.4%	-4.4%	-12.4%	0.4%	27.4%	10.3%	12.6%
2. Raw Material for Steel Plants	7.5%	7.4%	4.5%	-0.4%	-3.4%	6.2%	-7.4%	-10.0%	1.7%	21.1%	11.8%	12.6%
3. Pig Iron & finished steel	0.5%	8.8%	5.4%	0.4%	1.6%	5.9%	-0.1%	-6.7%	0.5%	23.4%	17.0%	12.6%
4. Iron ore	6.4%	11.6%	8.2%	-5.5%	15.3%	8.4%	-11.2%	3.3%	0.2%	0.4%	19.1%	12.6%
5. Cement	-1.7%	2.0%	4.6%	1.0%	-6.1%	5.6%	2.8%	-8.0%	0.9%	24.8%	3.4%	12.6%
6. Foodgrains	5.7%	12.9%	4.8%	23.1%	-2.4%	5.0%	16.5%	-13.5%	0.2%	42.2%	9.7%	12.6%
7. Fertilisers	-12.3%	-0.7%	4.6%	-10.9%	-3.0%	5.2%	1.6%	-2.4%	0.6%	12.7%	12.3%	12.6%
8. P.O.L.	2.1%	1.7%	0.5%	9.2%	-0.7%	0.1%	6.9%	-2.3%	-0.4%	30.2%	16.5%	12.6%
9. Container Service	7.9%	4.8%	7.0%	10.3%	-3.3%	7.8%	2.2%	-7.7%	0.8%	18.9%	10.2%	12.6%
10. Balance other	-10.4%	3.6%	4.7%	-3.7%	-7.4%	5.7%	7.5%	-10.7%	1.0%	19.0%	-4.1%	12.6%
11. Misc.Earnings										-1.1%	12.1%	10.0%
Total	4.0%	4.3%	4.7%	3.6%	-5.4%	5.2%	-0.4%	-9.3%	0.4%	22.6%	10.2%	12.5%

6.1 The Passenger Traffic Plan over the last four years was as under:

Table 29: Passenger Earnings

TRAFFIC PLAN : PASSENGER												
	Passengers Originating (in millions)				Passenger Kilometres (in million)				Earnings (` in cr.)			
	2010-11	2011-12	2012-13	2013-14 (R.E.)	2010-11	2011-12	2012-13	2013-14 (R.E.)	2010-11	2011-12	2012-13	2013-14 (R.E.)
Total Passenger	7809.09	8224.38	8420.71	8471.97	980,131	1,046,522	1,098,105	1,072,542	25793	28246	31323	37500

- 6.2 After a high growth registered in 2013-14 in Originating Passengers, the growth this year is estimated to be negative relative to last year. Non-PRS segment registered a negative growth last year and on that base the growth this year is expected to be positive. Further, after a long ten year hiatus, where IR had not increased the passenger fares but reduced it by a rupee every year, IR increased the passenger fares in last two years, back-to-back: partly in AC classes after roll-back in B.E. 2012-13, on January 21, 2013 and on June 25, 2014. The impact indicated varying trends. The lead came down as did the number of passengers travelling. An analysis revealed that this was mostly in the segment of the unreserved travel and the impact of loss of passengers in the 0-15 km segment.
- 6.3 Railway finances will be hard-pressed in the near future with the anticipated increase in committed expenditures. Normal growth of Traffic earnings will be able to cater mainly to the revenue expenditures. The likely impact of the next Pay Commission cannot be estimated but undoubtedly, it will further put pressures on the committed expenditures.

Capital Expenditure

- 6.4 Regarding capital expenditure, the inter-se share of various streams of funding as a percentage of the total is detailed as under:

Table 30: Share of Fund Sources

Year	GBS	Internal Resources	Borrowing/Lease
2010-11	47.4%	28.7%	23.9%
2011-12	46.8%	20.4%	32.8%
2012-13	50.0%	20.0%	30.0%
2013-14	52.7%	19.0%	28.3%

- 6.5 The trend is clear, that the declining share of internal resources has meant increasing reliance on borrowings as well as GBS, both of which carry a cost which adversely impacts the expenditures.
- 6.6 Once we look at the trends, it is evident that the generation of internal resources is insufficient to take care of plan expenditure. Hence, other and alternate means of resources are required to be tapped for funding of bankable projects that can be executed in a short time-span. The previous experiment with financing projects from IRFC borrowed resources was not entirely successful. Hence, an alternate model is required to be worked out for mustering resources for project financing.
- 6.7 When the conventional methods of raising resources are inadequate, we must search for Alternate Financing Models of funding. This shall be our focal point in the next chapter.

SUMMARY:

1. *IR's finances are stressed today.*
2. *IR is the only GOI body which has fully met for the successive pay commissions from out of its internal resources and without seeking GOI support.*
3. *The declining share of internal resources has meant increasing reliance on borrowings as well as GBS, both of which carry a cost which adversely impacts the expenditures.*
4. *Railways also bear social service obligation of around Rs 25,000 cr every year by carrying passenger services below cost.*
5. *It is evident that the generation of internal resources is insufficient to take care of plan expenditure. Hence, other and alternate means of resources are required to be tapped for funding of bankable projects that can be executed in a short time-span.*

7. Alternate Financing Options

Background

- 7.1. As detailed in earlier Chapters, in the last few decades there has been considerable under-investment in rail infrastructure thereby reducing the efforts required to expand, strengthen and modernize the Railways. Although, creation of Rail Infrastructure post-Independence has predominantly been done by the government, efforts had been made in the past to involve private sector in creation of infrastructure which has been met with limited success. Absence of an independent regulatory mechanism, no control over operational network & unpredictable tariff, un-certainty of traffic materialization and delays in decision-making processes has generated little confidence among the investors.
- 7.2. Involving customers in building rail lines especially for ports and mines have been a successful experiment on Indian Railways. IR has successfully involved strategic investors in building rail connectivity to ports. Prior to 2012; Rail connectivity to ports of Pipavav, Mundra, Mangalore, Kandla, Dahej, Krishnapatnam and Dhamra has been strengthened bringing private investments in rail sector. Private investments have also been generated through wagon investment/ leasing schemes, private operations of container trains, and development of private freight terminals and private sidings. Efforts are also being made to generate private investments through setting up of locomotive factories and redevelopment of stations.



- 7.3. For successful implementation of PPP projects; appropriate risk allocation between public and private needs to be done. Experience indicates that private sector is averse to taking all construction, financing and traffic risk in rail infrastructure projects.
- 7.4. The projects amenable to alternate means of financing would include construction of New Lines, Doubling, Gauge Conversion, construction of Dedicated Freight Corridors, High Speed Corridors, setting up of manufacturing/maintenance units for rolling stock, development of passenger and freight terminals, projects of electrification and signaling, projects of non-conventional energy sources, setting up of testing facilities, technical training institutes and technological solutions for enhancing safety at level crossing gates. The viability of the individual project could determine the option to be exercised for arranging the necessary finances. In this regard, Railways would be required to lay down certain benchmarks for appraisal which would be acceptable to the market to enable the relevant projects to be financed.

Private Participation in Building Rail Connectivity

- 7.5. MOR policy on rail connectivity and capacity augmentation projects of December 2012 has encouraged participation of the private sector in providing last mile connectivity to ports, large mines, cluster of industries for building rail connectivity and capacity augmentation. The policy had proposed the following five models:
 - i) Non-Government private line model
 - ii) Joint Venture
 - iii) Capacity augmentation through funding by customer
 - iv) BOT
 - v) Capacity augmentation through annuity model.
- 7.6. The first three models involve participation of strategic investors/customers and leverage the requirement of such investors and railways for having last mile connectivity. The other two-models are pure PPP models. All the models provide a clear revenue stream to the investor for making the connectivity projects bankable. Three Model Concession Agreements for private line model, joint venture and BOT have been approved and put in public domain. The agreements for the other two models are under approval process.
- 7.7. These agreements have tried to balance the risk allocations between private and public sector. Under this policy, rail connectivity to Dhamra Port has been commissioned. Projects of rail connectivity to Tuna Port, Jaigarh Port and coal connectivity projects in Chhattisgarh are under implementation apart from four projects under customer funded model. Seven projects have been given “In principle” Approval by MoR.
- 7.8. An Appraisal of the projects being implemented through non Railway investment indicates that projects worth Rs 2800 crore have been commissioned between 2002- 2012 which included port connectivity to Pipavav, Mundra, Kandla, Mangalore, Dahej, Krishnapatnam and Dhamra. Projects worth Rs 15,800 crore are under implementation or have been granted “in principle” approval by MOR. The details are provided in the table below:

Table 31: Details of Projects under PPP

	No. of Projects	Length (kms)	Railway (Rs.Cr.)	Non-Railway (Rs.Cr.)	Total (Rs.Cr.)
Commissioned	7	950	545	2257	2802
Sanctioned/under construction (NGR/JV)	7	793	322	9557	9879
Sanctioned/under construction (customer funded)	5	466	400	1728	2128
In-principle approval granted	7	264	70	3740	3810
Total	26	2473	1,337	17,282	18,619

7.9. The following projects have been sanctioned and are under implementation under the participative policy 2012:

- **17 km Gandhidham-Tuna Port line** to be commissioned by April 2015 (Private Line Model –Rs.142 crore)
- **35 km Jaigarh-Digni New line sanctioned in July’14**, to be commissioned by 2017 (JV Model – Rs 771 crore)
- **Two projects in Chattisgarh (Raigarh-Mand and Gevra Road-Pendra Road)** have been approved under JV with IRCON, State Government and SECL. Separate SPV for both projects have been formed for projects worth Rs 4000 crore.

7.10. Under customer funding model of participative policy 2012, Rs 902 crore have been received from NTPC for the following 4 projects:

- Bhaktiyarpur-Karnauti Flyover and 3rd line from Bhaktiyarpur to Barh- Rs 250 crore (100% funding).
- Manpur-Tilaiya –Bhaktiyarpur (132 km) Electrification – Rs 140 crore (100%).
- Katwa- Balgona GC (30 km) – Rs 112 crore (100%).
- Hutgi- Kudgi- Gadag (284 km) Doubling – Rs. 400 crore (50% funding of 134 km Hotgi-Kudgi portion).

Further NMDC has committed Rs.826 crore for doubling of Jagdalpur-Kirandul (150 km) section.

Foreign Direct Investment (FDI)

7.11. Vide Notification No. S.O.2113(E) dated August 22, 2014, Government of India has opened up the following activities of Indian Railways for FDI- construction, operation, maintenance of :

- (i) Suburban corridor projects through PPP- ;
- (ii) High speed train projects ;
- (iii) Dedicated freight lines,;
- (iv) Rolling stock including train sets, and locomotives or coaches manufacturing and maintenance facilities-;
- (v) Railway Electrification;
- (vi) Signaling systems;
- (vii) Freight terminals;
- (viii) Passenger terminals;
- (ix) Infrastructure in industrial park pertaining to railway lines or sidings including electrified railway lines and connectivity to main railway lines; and
- (x) Mass Rapid Transport Systems.

7.12. Detailed Sectoral Guidelines on FDI have been issued which provide permissible areas and conditions of engagement. As against debt, FDI involves investment in equity which involves greater risk for the investor vis a vis debt and, therefore, also expectation of higher returns. Considering the positive BOT agreement; - investment should flow in these projects as and when they are launched. An Investors meet was organized on 5th December '14, wherein a booklet on "Overview of Framework for Participative Models of rail connectivity and Domestic & Foreign Direct Investment" was released. In this Booklet, Projects have been identified for domestic/foreign direct investments in Railways. These projects are given in **Annex 5**.



Commercial utilization of Surplus Railway land

- 7.13. The total area of land under Railway network is 4,58,589 hectares, out of which approx. 46,409 hectare is vacant (as on 31.03.2014). The vacant land is mostly in the form of narrow strips along tracks, which is required for servicing and maintenance of track and other infrastructure. The vacant railway land is also utilized for execution of various infrastructural projects for meeting future growth needs of Railways and includes projects like Doubling, Traffic Facilities, Rail Coach and Component factories, etc. The vacant land, which is not required by Railways for its immediate operational needs, is utilized for commercial development, wherever feasible, in order to mobilize additional financial resources through Rail Land Development Authority (RLDA).
- 7.14. So far, 102 sites measuring 916 hectare of Railway land has been entrusted to RLDA for commercial development. Out of 102 sites, 62 sites totaling 597 hectares are amenable for commercial development.

Station Re-development by PPP

- 7.15. It is planned to redevelop at railway stations and important junctions to international standards through PPP or Government to Government co-operation. 5 stations were entrusted to Indian Railway Stations Development Corporation (IRSDC) viz. Habibganj, Chandigarh, Bijwasan, Shivaji Nagar and Anand Vihar for which Draft Master Plans and Feasibility Reports have been prepared and are under statutory approvals with local bodies. Approvals have been obtained for Habibganj. For Shivaji Nagar, heritage clearance has also been obtained.



- 7.16. Surat station has been entrusted to IRSDC for redevelopment for which consultancy contract has been awarded. Gandhinagar station has been entrusted to Rail Land Development Authority (RLDA).
- 7.17. New Bhubaneswar and Baiyyappanahalli (Bengaluru) stations are identified for prefeasibility studies by China Railway Construction Engineering Group at their cost under an MOU between Indian Railways and National Railway Administration, Government of the People's Republic of China.

SUMMARY:

1. *Efforts have been made in the past to involve private sector in creation of Rail infrastructure, but this has been met with limited success. Absence of regulatory mechanism, no control over network & tariff, un-certainty of traffic materialization and delay in processes has not generated confidence among the investors.*
2. *Railways would be required to lay down certain benchmarks for appraisal which would be acceptable to the market to enable the relevant projects to be financed.*
3. *Government of India in August, 2014 has permitted Foreign Direct Investment in construction, maintenance and operation of the identified areas in IR.*
4. *Investments for creating rail infrastructure can be attracted through various models.*
5. *It should be decided to adopt the Engineering, Procurement and Construction (EPC) mode of contracting for construction of Railway projects.*

8. Conclusion

Indian Railways has a glorious past, a turbulent present and a bright future. It is a giant emerging out of a deep slumber. An awake, alive and kicking Indian Railways can lead the country to greater heights of accomplishment. However, today, it is mired in a state of ennui, a state of cynicism that things cannot change.

Its network is congested and finances are not easy to come by. Resources for development and replacement are stressed. It is finding it difficult to even meet its operational expenses. But, the spirit is still alive. To make an attempt at resurrecting itself, Indian Railways has drawn up an ambitious five year action plan. The realization is there that if the vicious cycle of under-investment is to be turned into a virtuous cycle of prosperity; crutches of support will have to be abandoned. Indian Railways will have to generate its own resources for its development.

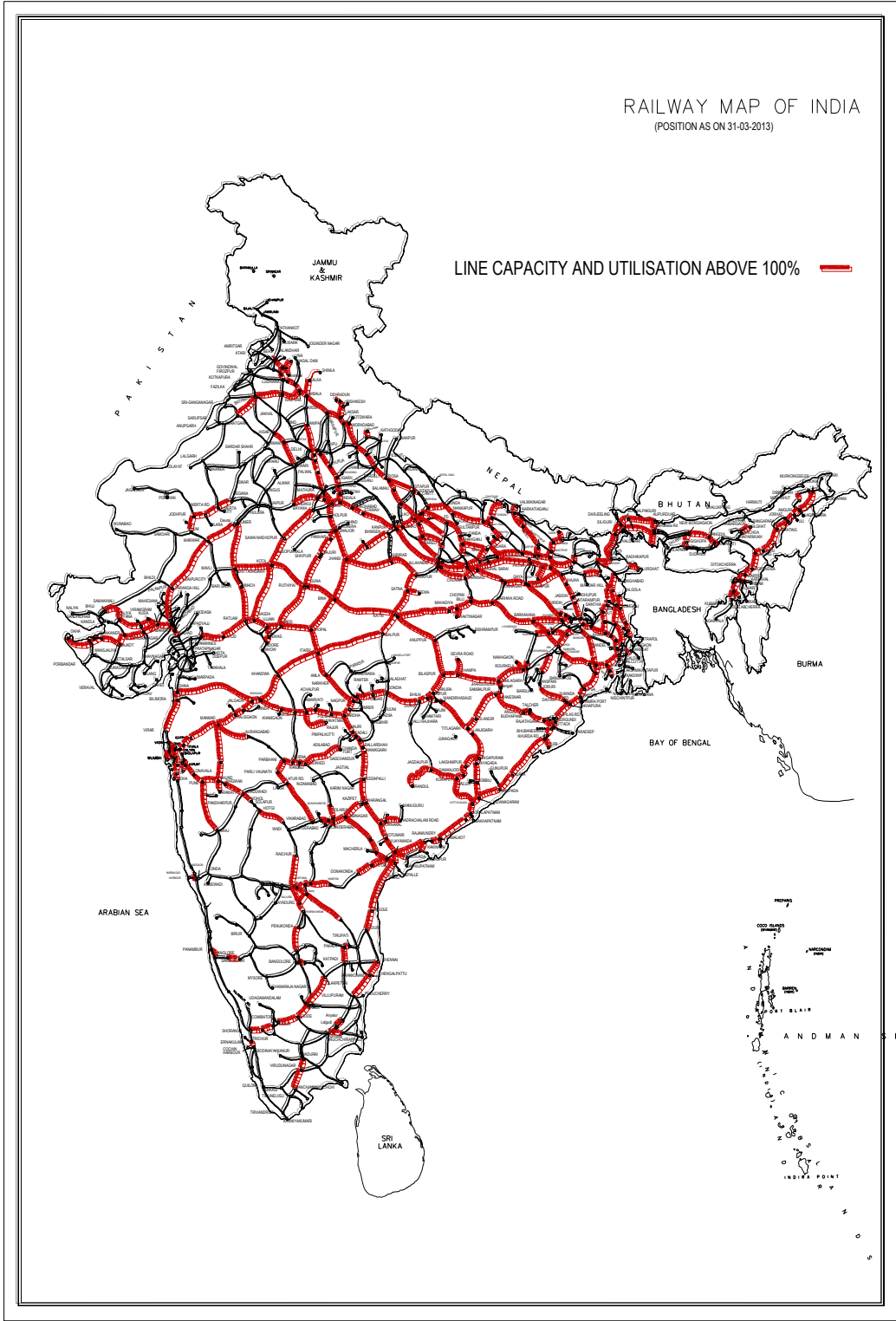
The next five years should change the face of Indian Railways. Faster trains, modern trains, swanky stations, skilled staff, should be the Railways of tomorrow.

IR looks forward to becoming the nation's carrier and a multi-modal integrator; making travel affordable, happy, convenient and reliable – a world class experience! IR also looks forward to becoming self-sustainable!

By 2020, IR would make all efforts towards delivering safe and punctual services, increase average speed by 50% and increase loading to 1.5 billion tonnes.

Indian Railways, like the mythical Phoenix, will rise again to scale new heights.

9. Annexes



Annexure 2

<u>Comparison of Statistics</u>						
	No. of Accidents Indian Railways		No. of Accidents Europe	No. of Fatalities Indian Railways		No. of Fatalities Europe
	2013-14	2012-13	2012	2013-14	2012-13	2012
Collision of Trains	8	8	97	1	27	34
Derailments of trains	80	95	97	6	5	0
Level Crossing Accidents	61	73	573	112	179	372
Fires in Rolling Stock	8	14	14	35	31	0
Other Accidents	4	4	81	7	8	10
TOTAL	161	194	862	161	250	416
	Million Train Kms. (Avg/year)			Billion Passenger Kms(per year)		
	1096	964	4095	1098	1046	402.6
	Accidents per million train Kms			Fatalities per billion pass. Kms.		
	0.147	0.201	0.210	0.147	0.240	1.033

Annexure 3

Comparison of Accidents		
	India	Europe
Track Kilometres	1,14,907	336602
Total Accidents per year (consequential/significant accidents, for 2012)	194	862
Accidents Per thousand KMs of Track	1.70	2.56
Passenger Kilometres (Billion)	1046	402.6
Total Accidents per year (consequential/significant accidents, 2012)	194	862
Accidents Per Billion of Passenger Kilometres	0.186	2.14
Total No. of Level Crossings	32735	121137
Total Accidents per year (consequential/significant accidents 2012)	73	573
Level Crossing Accidents Per Thousand Level Crossings	2.23	4.73

Table 16: Benchmarking in Signaling

Signaling & Telecom Elements	Indian Railways	State- of - art / Railways abroad (Global benchmark)
Interlocking systems	<ul style="list-style-type: none"> Relay based (72%) EI based (12%) Mechanical Lever frames (16%) 	Electronic Interlocking (EI)
Block Working systems	<ul style="list-style-type: none"> Absolute block Automatic block signaling (2623 Rkm) 	<ul style="list-style-type: none"> Track circuit block with Automatic signaling. Communication Based Train Control (CBTC) for Rapid Mass Transit.
Train protection systems	<ul style="list-style-type: none"> AWS (328 Rkm) ETCS L1(250 Rkm) Trials with TCAS 	<p>Automatic Train Protection:-</p> <p><u>USA (PTC)</u>: All main line tracks involving passenger & commuter railroad and lines carrying toxic materials – implement by Dec’15.</p> <p><u>Europe (ETCS)</u>: mandated due to interoperability for conventional & high speed trains.</p>
Signals and Movement Authority	Line side Color Light LED Signals, No cab signaling.	<ul style="list-style-type: none"> Line side Signals Cab signaling (USA: Speed > 80 mph, Japan: Speed > 150 kmph- <p>Europe: ETCS L2; Japan: ATACS; China: CTC; Australia: ATMS; USA: ITCS</p>
Command & Control systems	<ul style="list-style-type: none"> Distributed, voice commands from train controller TMS at Mumbai suburban 	Centralized & Integrated control with automated tools.
Mobile Train Radio Communications (MTRC)	Unsecured, Short range communication system deployed.	Secure, fail-safe and reliable mobile communication system with Save-our-Souls (SoS) features.
Train detection systems	<ul style="list-style-type: none"> DC track circuits Axle counters AFTC 	<ul style="list-style-type: none"> DC track circuits (Relay based Fail Safe) Axle counters AFTC <p>} SIL-4</p>

Signaling & Telecom Elements	Indian Railways	State- of - art / Railways abroad (Global benchmark)
Points operating equipment	<ul style="list-style-type: none"> • High thrust point m/c, • Clamp lock beginning to be used 	<ul style="list-style-type: none"> • In sleeper machines, • Clamp lock on high speed routes
Level crossings control	Mostly manual control, warning is from a fixed distance	Mostly automatic control, warning is from fixed distance

Projects identified for domestic/foreign direct investments in Railways

The list of projects mentioned below is indicative and new projects can be added or listed projects can be deleted depending on the outcome of project specific detailed technical/financial due diligence by Ministry of Railways (MoR) after submission of the techno economic feasibility report and financial/revenue model. Similarly the models of execution indicated are also indicative and can be changed depending on assessment later. The projects will be implemented only when found to be financially viable and bankable with VGF admissible (20% of the cost of the project or as modified from time to time) as per current VGF policy of Ministry of Finance.

1. Suburban Corridor projects through PPP

S.No.	Project	Kms	Cost (Rs Crore)	Probable Mode of Execution	Bidding Parameter
1.	CSTM-Panvel	49	14,000	DBFOT	Premium/Viability Gap Funding(VGF)

2. High speed train projects

S.No.	Project	Kms	Cost (Rs Cr.)	Probable Mode of Execution	Bidding Parameter
1.	Mumbai-Ahmedabad High Speed Corridor	534	63,180	DBFOT/ Government to Government cooperation.	Premium/VGF
2.	Chennai-Banglore-Mysore	-	-	DBFOT/ Government to Government cooperation.	Premium/Viability Gap Funding(VGF)

3. Freight lines

S.No.	Project	Kms	Cost (Rs. In Crore)	Probable Mode of Execution	Bidding Parameter
	New Lines				
1	Dankuni-Gomoh	282	4500	BOT/Annuity	VGF/Annual premium.
2	Whitefield-Kolar (52.9 km)	52.9	353.45	BOT/Annuity	VGF/Annual premium.
3	North- South DFC	-	-	BOT/ Annuity	VGF/ Annual

					premium
	Doubling				
4	Ajmer-Bangurgram (48.43 km)	48.43	144.57	BOT/Annuity	VGF/Annual premium.
5	Durg-Rajnandgaon 3rd line	31	152.99	BOT/Annuity	VGF/Annual premium.
6	Wardha(Sewagram)- Nagpur 3rd line (76.3 km)	76.3	297.85	BOT/Annuity	VGF/Annual premium.
7	Kazipet-Vijaywada 3rd line with electrification (219.64 km)	219.6	1054.35	BOT/Annuity	VGF/Annual premium.
8	Bhadrak-Nergundi 3rd line (80 km)	80	837.33	BOT/Annuity	VGF/Annual premium.
9	Sambalpur-Talcher (174.11 km)	174.1	679.27	BOT/Annuity	VGF/Annual premium.
10	Manoharpur- Bondamanda 3rd line (30 km)	30	258.2	BOT/Annuity	VGF/Annual premium.
11	Rajkharwan- Chakradharpur 3rd line (20 km)	20	174.49	BOT/Annuity	VGF/Annual premium.

4. Rolling stock including train sets and locomotives or coach manufacturing and maintenance facilities

S.N.	Project	Quantity	Cost (Rs. in Cr)	Probable Mode of Execution	Bidding Parameter
1	Rail Coach Factory, for manufacture of modern 3 phase MEMU/EMU coaches equipped with IGBT technology at Kachrapara. (Subject to confirmation of requirement)	500 EMU/ MEMU coaches annually	1,200	BOT/BOO/JV/ Annuity	Lowest price per EMU/MEMU
2.	Rail coach factory for manufacturing of Aluminum coaches at Palakkad (Subject to	400 coaches per annum	550	BOT/BOO/JV/ Annuity	Lowest price per coach

	<i>confirmation of requirement)</i>				
3.	Periodic overhauling of wagons at Sonpur	180 wagons per annum	300	BOT/BOO/JV/Annuity	Lowest price of POH per wagon
4.	Midlife rehabilitation of coaches at Anara	250 coaches per annum	185	BOT/BOO/JV/Annuity	Lowest price of rehabilitation per coach.
5.	Locomotive maintenance depots.	Barauni (ECR) Daund (CR) Mughal-sarai (ECR) Bonda-munda (SER)	Rs. 300 crore	BOT/BOO/BOOT/Annuity	Lowest maintenance cost per locomotive.

5. Railway Electrification Projects

S.No	Project	Kms	Cost (Rs Crore)	Probable Mode of Execution	Bidding Parameter
1	Katwa-Azimganj-Nalhati & Azimganj-Tildanga/New Farakka	200	229.26	BOT/Annuity	VGF/Annual premium.

6. Signaling System

S.No	Project	kms	Cost (Rs. in crore)	Probable Mode of Execution	Bidding Parameter
1.	Agra-Gwalior, A route: provision of automatic signaling along with train protection system to enhance line capacity.	118	250 Cr.	BOT/Annuity	VGF/Annual premium.
2.	Gwalior – Burhpura A route: Provision of automatic signaling along with train protection system to	126	280 Cr.	BOT/Annuity	VGF/Annual premium.

	enhance line capacity				
3.	Burpura-Bina, A Route: Provision of automatic signaling along with train protection system to enhance line capacity.	126	270 Cr.	BOT/Annuity	VGF/Annual premium.

7. Passenger Terminals

S.No	Project
1	Habibganj
2	Shivaji Nagar
3	Anand Vihar
4	Bijwasan
5	Chandigarh
6	Surat
7	Gandhinagar
8	Manglore
9	Ernakulam
10	Vijayawada
11	Nagpur
12	Byappanahalli
13	New Bhubneshwar

8. Railway Technical Training Institutes.

S.No	Project	Quantity	Cost (Rs. in crore)	Probable Mode of Execution	Bidding Parameter
1.	Advanced Training Institute (ATI) for training of Technical staff and Loco Pilots	6 Training Centers – with Driving Simulators Mughalsarai (ECR) Kurla (CR) Asansol (ER) Vishakapatnam (ECoR) Kanpur (NCR) Avadi (SR)	120	BOT/BOO/JV/Annuity	Lowest cost for identified quantity.

9. Mechanized Laundry

S.No	Project	Quantity	Cost (Rs. In cr)	Probable Mode of Execution	Bidding Parameter
1.	Mechanized laundries at identified locations of different capacities.	1T/2T/3T/ 5T per day	100	BOT/BOOT/BOO/ JV/Annuity	Lowest Cost for identified quantity.

10. Glossary of common terms in use in Railway Statistics

Authorised stock-locomotives/vehicles/wagons – This is the sanctioned allotment of stock for a railway and includes stock ordered for or under construction but not handed over to traffic. Stock sold or broken up but not replaced or removed from authorised stock is included. Stock replaced but still running is not included.

Average haul or lead of traffic – represents the average distance each passenger or tonne of goods is transported.

Brake van – A vehicle provided with apparatus by means of which the movement of the vehicle can be retarded and stopped and used for the purpose of retarding the movement of other vehicles to which it is coupled, also, in some cases, the vehicle from which the braking apparatus on other vehicles is controlled. A vehicle is not reckoned to be a brake van if it provides accommodation for any traffic.

Capital-at-charge – Book value of the capital assets of the Railways.

Capital outlay – Expenditure of capital nature incurred during the period with the object of increasing concrete assets of a material character.

Cross traffic – All traffic which neither originates nor terminates on the reporting Railway or on the same section of a gauge for which the return is being prepared.

Depreciation reserve fund – This fund provides for the cost of renewals and replacements of assets as and when they become necessary.

Density – The volume of traffic moving between any two points on the railway system. It is expressed in terms of passenger kilometres or net tonne kilometres and train kilometres per running track kilometre or route kilometre.

Development fund – This fund was instituted with effect from 1st April, 1950 and is intended to finance expenditure on:

- (a) amenities for all ‘users of railway transport’;
- (b) labour welfare works costing individually above the new minor works limit;
- (c) expenditure on un-remunerative operating improvement works; and
- (d) cost of construction of quarters for class III staff.

The fund was instituted w.e.f. 01.04.1950. The appropriation to this fund is from the surplus of the Railway but when the amount of surplus is not adequate to meet the expenditure, a temporary loan is obtained from general revenues (which is returned with interest whenever the revenue is surplus) to the finance.

The expenditure to be met out of this fund i.e., expenditure on amenities for the user of the Railway Transport, staff works and re-remunerative operating improvements beyond certain financial limits namely;

Empty running – The running of vehicles empty, i.e., without being loaded.

Engine failures – An engine is considered to have failed when it is unable to work its booked train within the prescribed load from start to destination or causes a delay in arrival at destination of a specified period, namely 30 minutes or more in case of passenger trains hauled by diesel electric and electric engines and 60 minutes or more in all other cases due to defective design or material or bad workmanship in shed/workshop or mismanagement by crew or bad water/fuel.

Engine kilometer – An engine kilometer is the movement of an engine, under its own power, over a distance of 1 kilometre.

Equated track kilometres – Kilometrage of track equated to a standard unit by giving weightage for factors of traffic density, gradient, formation of soil, alignment (curves), rainfall and track connections and layouts.

Fare – Money realized by the railways from transportation of persons.

Full wagon load – Consignment of goods traffic necessitating the use of one or several wagons without the wagon or wagons having necessarily to be loaded to their full capacity.

Gross earnings – The true earnings in an accounting period whether actually realized or not.

Gross receipts – Earnings actually realized during an accounting period.

Gross tonne kilometre (excluding weight of engine) – Unit of measure of work which corresponds to the movement over a distance of one kilometre of one tonne of vehicle/wagon and contents excluding the weight of the motive unit.

Gross tonne kilometer (including weight of engine) – Unit of measure of work which corresponds to the movement, over a distance of one kilometre of one tonne, including the weight of the motive unit vehicle and contents.

Gross weight (of a vehicle or a train) – Total weight of a vehicle or group of vehicles equal to the tare plus the load.

Length of electrified lines – Length of lines provided with an overhead trolley wire or with a conductor rail.

Loading or carrying capacity of a vehicle or wagon – The extent to which the vehicle can normally be loaded as shown by the wagon or van marking. The capacity is expressed for passenger stock in the number of seats/berths available and for parcel and goods stock in tones.

Local traffic – The expression ‘Local traffic’ when used with reference to a railway means traffic originating and terminating at stations within the limits of that railway without passing over any other railway. Existing practices under running power arrangements will, however, continue.

Locomotives – Rail vehicle either with prime-mover and motor or with motor only (electric locomotive) used for hauling other vehicles. A distinction is made between steam locomotives, electric locomotives, diesel locomotives, etc., according to the type of motive power used.

Mean kilometrage – The length of the railway, calculated according to the definition of route kilometrage allowing for changes in the kilometrage during the period covered. Thus, the mean kilometrage worked during a year which has had an addition/closing during the year will be as follows:-

- (a) Route kilometrage at commencement of a year (plus/minus) ;
- (b) (Number of days the new section/section closed was in use during the year) *multiplied* by (the length of the new section/section closed) and *divided* by (the number of days in the year).

Net earnings – The difference between the gross earnings and the working expenses, *excluding* suspense but *including* appropriation to Depreciation Reserve Fund and Pension Fund.

Net load, net tonnage – The weight of passengers, baggage or goods conveyed by a vehicle (coach, wagon, etc.,) or by a group of vehicles (trains).

Net revenue – Difference between the gross earnings and the working expenses after the payment of dividend to General Revenues, payment to worked lines and other net miscellaneous expenditure.

Net tonne kilometer – Unit of measure of goods traffic which represents the transport of one tonne of goods (including the weight of any packing, but excluding the weight of the vehicle used for transport) over a distance of one kilometre.

Net-revenue traffic – Traffic conveyed by rail for the working of the railway and for which commercial tariffs are not charged.

On cost – Expenditure incurred on jobs which cannot be charged direct to the cost of articles manufactured or work done.

Operating ratio – The ratio of working expenses (*excluding* suspense but *including* Appropriation to Depreciation Reserve Fund and Pension Fund) to gross earnings.

Passengers carried – refers to the number of passengers originating on each railway as well as the number of passengers received from other railways and also those crossing the railway.

Passenger kilometre – Unit of measure of passenger traffic corresponding to the conveyance of a passenger over a distance of one kilometre.

Passengers originating – means number of passengers booked from each gauge of the railway.

Pension fund – This fund was created with effect from 1st April, 1964 to even out the charges and to provide not only for the current payments to retired pension opting staff but also to provide from Revenue/Capital each year the accumulated liability for the pension benefits earned by each pension opting staff for each year of service in the same way as provision is made for Depreciation Reserve Fund.

Rate – Price fixed by the tariff for the conveyance of a unit of parcels, luggage and goods.

Revenue earning traffic – Traffic conveyed by rail and for which commercial tariffs are applied i.e., for transportation of which the railway is paid by either the consignor or the consignee.

Revenue tonne-kilometre – Unit of measure of public goods traffic which represents the transport of a quantity of goods charged for as one tonne over a distance counted in the tariff as one kilometre.

Rolling-stock – All railway tractive and transport vehicles, including travelling cranes.

Route kilometer – Distance of each gauge owned by a railway including its worked lines treated as a single line.

Running track kilometer – In addition to the route kilometrage, the extra distance of multiple tracks i.e., double, treble, etc., tracks shall be treated as two or three or more tracks but shall exclude the track in sidings, yards and crossings at stations.

Shunting – Operation of moving a vehicle or rake of vehicles inside a station, marshalling yard or other railway installations (depots, workshops, etc.) which are not considered as a train movement.

Siding - Commercial sidings – are to show assisted sidings build for private individuals local requirements, sidings in the coal fields leading to a particular colliery, etc.

Transportation sidings – are to show crossings, loops at stations, relief sidings, sidings in the coal fields not used solely for a particular colliery, etc.

Staff – All employees paid directly by the railway administration (except casual labour).

Stores – Supplies of materials or parts whether purchased externally or manufactured in railway workshops required for working the railway.

Suburban traffic – Passenger traffic moving in metropolitan areas (at present in Mumbai, Kolkata and Chennai) where special concessional rates for season tickets are applicable is termed as suburban traffic.

Suspense – Difference between true earnings/working expenses in an accounting period whether or not actually realized/disbursed and earnings/working expenses actually realized/disbursed during an accounting period.

Through traffic – This expression refers to transport on interchange traffic beyond the limits of a single railway system.

Tonnes carried – This represents the quantum of goods originating on each railway as well as the quantum of goods received from other railways/gauges and also those crossing the railway.

Tonne kilometer – Unit of measure which represents the movement of one tonne over a distance of one kilometer.

Tonnes terminating – include tones of all traffic terminating on the gauge whether they originated on the home line or on other railways.

Tonnes originating – This includes tones of all traffic originating on each gauge, whether it terminates on the gauge itself or on some other gauge of the home line, or on other railways.

Track kilometer – Distance of each gauge owned by a railway including its worked lines treated as a single line and the extra distance due to double, treble, etc., tracks, as also the length of sidings, etc.

Train engine hours – are to show the hours during which engines are employed on trains, counting in each case from the time the engine starts with the train, until it reaches the station at which the engine terminates its run with the train.

Train kilometer – Unit of measure of distance which corresponds to the movement of a train over one kilometer.

Transshipment – Transfer of goods from one vehicle to another of the same or different gauges.

Turn round of a wagon – Interval of time between two successive loadings of a wagon.

Vehicle, passenger (passenger carriages) – Railway vehicle used for the carriage of persons.

Vehicle/wagon day – Unit of measure of the potential use of vehicles/wagons, which corresponds to one vehicle/wagon being present on the system during one day

Vehicle/wagon effective – A Vehicle/wagon effective, is one in serviceable condition available on a railway and is either in traffic or available for traffic use.

Vehicle/wagon kilometer – Unit of measure of distance which corresponds to movement of a vehicle/wagon over a distance of 1 kilometre.

Wagon – Railway vehicle used for the carriage of goods.

Wagon, covered – Wagon of a watertight nature by virtue of the construction of the vehicle (completely covered on roof and sides), also characterized by the security of transport (possibility of locking and/or sealing the wagon).

Wagon, loaded – refers to a wagon loaded with goods traffic.

Wagon, open – Wagon not fitted with a roof. It may be either high sided, low sided or without side.

Wagons owned – includes total number of wagons owned by a railway whether against authorized stock or stock which has been replaced but still running.

Working expenses – Expenditure incurred in connection with the administration, operation, maintenance and repairs of lines opened for traffic. This also includes appropriation to Pension Fund and the contribution made to the Depreciation Reserve Fund to meet the cost of replacements and renewals. .