

General Management Of Indian Railways

Lesson-2

General Features of Indian Railways

1.0 Introduction

Indian Railways (IR) are the principal mode of transport in the country and is rightly called its life line. In over 165 years of its existence, it has successfully adapted to the changing needs of travel and transport in the country. From a system which essentially served the colonial interest of the British regime since the first train ran from Bombay to Thane on 16th April, 1853, Indian Railways have emerged today as a major vehicle of socio-economic development. It has made great advances in Railways Technology to enable the system to meet the requirements of moving large volume of passenger and freight traffic.

Indian railways with a network of over 66 thousand route Kms. fulfill the country's transport need particularly in respect of long distance passenger and goods traffic and suburban traffic around India's major cities. Indian Railways carry over 1.1 million tonne of originating goods and about 14 million passengers every day, and thus generally meet the aspirations of this country as far as its travel requirements are concerned.

In the first few years after Independence, Railway planners concentrated essentially on filling missing railway links. It was only with the inception of Five Year Plans from 1951 onwards that planned development of Railway system commenced. In 69 years since Independence though the route kilo metres had increased only by 30%, there had been tremendous increase in the passenger and goods traffic; The growth of passenger traffic since Independence is about 400% and that of revenue earning freight traffic is about 675%. This has been possible due to Railways improving the productivity of its assets by modernising the system and technological upgradation in various fields of railway engineering. Indian Railways have attempted modernisation and upgradation of system so as to generate maximum capacity with minimum investment and to provide Railway transport at least possible cost to the rail users.

2.0 Planning Strategy

Indian Railways have drawn a Corporate Plan for 15 year period from 1985 to 2000 providing a basic framework of planning. The objective of the plan and strategies adopted have already been discussed in lesson 1.

The development Plans of the Indian Railway have been drawn up within the framework of the National five Year plans of the country. Plan outlay of the Indian Railways as well as those for the Transport sector as a whole are in the Table below :

Funds Allocation for various five year plans:

Item	Upto Fourth Plan 1950-74	Fifth Plan 1974-78	Sixth Plan 1980-85	Seventh Plan 1985-90	Eighth Plan 1992-97	Ninth Plan 1997-2002	Tenth Plan 2002-2007	Eleventh Plan 2007-2012
Railways	3.200	1,523	6,555	16,549	27.202	45,413	60,600	2332.89
Transport	6.039	4.078	13.841	29.548	53.966	121.324	147,448	448.97
Sector								
Total Plan	30.988	28,991	109,292	218,729	424,100	859,200	893,183	418.531
Outlay								
Transport As %age of total Plan	19.5	14.1	12.7	13.5	12.4	14.1	17.0	10.9
Railways as %age of total Plan	10.3	5.3	6.0	7.6	6.3	5.3	6.8	5.6

* Excludes inter-plan period 1966-69

The 12th five year plan envisages a large investments to achieve its objectives. The estimated resources required are Rs5,19,221 crore including GBS of Rs 1,94,221 crore, IEBR of Rs2,25,000 crore and private sector investment of Rs1,00,000 crore.

3.0 Track Or Permanent Way

Track is the single costliest asset consisting of about 40% of the total capital investment of the Indian Railways. It is also the basic structure which provides the path for the wheels to move on and therefore, carries the main brunt of the moving loads.

Track or Permanent Way is the rail-road on which trains run. It basically consists of two parallel rails having a specified distance in between and fastened to sleepers, which are embedded in a layer of ballast of specified thickness spread over the formation. The rails are joined with each other by fish plates and bolts and these are fastened to the sleepers by various fittings like keys and spikes etc. The sleepers are spaced at a specified distance and are held in position by embedding these in ballast.

Permanent way track, therefore, consists of (i) rails, (ii) sleepers, (iii) fittings and fastenings, (iv) ballast and (v) formation.

3.1 Track Specification on Indian Railways

Most of the railway lines on Indian Railways are single lines having formation generally 6.10 metres (20 feet) wide for broad gauge and 4.8 metres (16 feet) wide for metre gauge. The formation

is generally stable except in areas where clayey soil or other types of shrinkable soils are met with. Most of the track is straight except for 16% of the track on B.G. and M.G. and 20% of track on N.G. which is on curves. The maximum degree of curvature permissible on the Broad Gauge is 10 deg on the metre gauge is 16deg and on the Narrow Gauge is 40 deg.

The ballast used mostly is broken stone ballast but in some areas sand, mooram and coal ashes have also been used. About 20 cm to 35 cm (8" to 14") cushion of ballast is normally given below the bottom of sleepers to transfer the load evenly and to give necessary resilience to track.

Sleepers used are Prestressed Concrete sleepers laid at 1660 nos. per km or 1540 nos per km.

The rails standardized for Indian Railways are 60 kg and 52 kg (90 UTS) for B.G. and 90R, 75 R and 60R for M.G. The rails are normally rolled in 65metres length and are welded together to form longer rails and are being laid progressively in the track in order to reduce maintenance costs and reduce the noise level, providing more comfortable rail travel. Flash butt welding is done at centralized plants and Thermit welding is done in situ only when required. Elastic fastings consisting of a rubber pad, MS liner and Elastic Rail Clip is used on Indian Railways.

The turnouts used are normally 1 in 8½ for goods trains and 1 in 12 as wells as in 1 in 16 for passenger trains;. Curved switches and thick web tongue rails are being extensively used.

The Indian Railways as such are progressing fast in modernisation of its permanent way in order to cope up with the challenge of heavier loads and faster traffic.

3.2 Length of the track on Indian Railways

The total route kilometres as on 31.3.2016 was 66,687 Kms. Out of this, 31.85% is double/multiple track.

Length of Track on IR over various periods

Total Route Kilometres

Year	BG	MG	NG	Total
1980-81	31,827	25,167	4,246	61,240
1990-91	31,880	23,419	4,068	62,367
2000-01	44,776	14,987	3,265	63,028
2010-11	55,188	6,809	2,463	64,460
2014-15	58,825	4,908	2,297	66,030
2015	60,510	3,880	2,297	66,687

Double / Multiple tracks over the same period is as following

Year	Route Kms.	% of Total Route kms
1980-81	13,040	21.30%
1990-91	14,331	23.00%
2000-01	16,010	25.40%
2010-11	19,223	29.82%
2014-15	20,633	31.25%
2015-16	21,237	31.85%

The length of electrified route Kms. on IR for some selected years is

3.3 State-wise route km :

As on 31.3.2016, the state-wise length of railway lines in terms of Route Kilometers' is as under

Table Showing Route Kms. Statewise

Name Of State	Route Kilometres
ANDHRA PRADESH	3703.25
ARUNACHAL PRADESH	11.67
ASSAM	2442.57
BIHAR	3730.57
CHHATISGARH	1212.91
DELHI	183.23
GOA	69.31
GUJARAT	5258.49
HARYANA	1710.49
HIMACHAL PRADESH	296.26
JAMMU & KASHMIR	298.19
JHARKHAND	2394.46
KARNATAKA	3281.36
KERALA	1045.36
MADHYA PRADESH	5000

MAHARASHTRA	5745.48
MANIPUR	1.35
MEGHALAYA	8.76
MIZORAM	1.5
NAGALAND	11.13
ODISHA	2572.16
PUNJAB	2269.27
RAJASTHAN	5893.1
SIKKIM	0
TAMIL NADU	4027.08
TELANGANA	1736.67
TRIPURA	192.54
UTTARAKHAND	339.8
UTTAR PRADESH	9077.45
WEST BENGAL	4135.19

Union Territories

Name Of Union Territory	Route Kilometres
CHANDIGARH	15.7
PUDUCHERRY	22.16
ANDMAN & NICOBAR	0
TOTAL:ALL INDIA	66687.46

Note : Remaining State/Union Territories have no railway line.

3.4 Railway Bridges

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IR has 1,40,919 bridges, out of which 664 are important, 11,653 are major and 1,28,602 are minor bridges. In 2015-16, 705 bridges were strengthened/rehabilitated/rebuilt. 'Major Bridges with a waterway of more than 18 m or a clear opening of 12 m in any one span.

3.5 Level crossings :

Level crossings are meant to facilitate the smooth running of traffic in regulated manner governed by specific rules & conditions. Status of level crossings on IR as on 01.04.2016 is as under:

Total number of level crossing	:	28,607
Number of manned level crossings	:	19,267 (67%)
Number of unmanned level crossings	:	9,340 (33%)

IR has decided to progressively eliminate the level crossing for the safety of Road - users and train passengers. During the year 2015-16, 1,253 unmanned level crossings and 390 manned level crossings have been eliminated.

3.6 Land management :

As on 31.03.2016 IR owns about 4.73 lakh hectares of land. About 90% of this land is under Railways' operational and allied usages such as laying of new lines, doubling, gauge conversions, track, stations, workshops, staff colonies, etc. The break-up of the land is as under:-

Description	Area (in lakh hectares)
Track and structures including stations, colonies, etc.	3.64
Afforestation	0.40
'Grow More Food' scheme	0.03
Commercial licensing	0.04
Other uses like pisciculture	0.09
Encroachment	0.01
Vacant land	0.52
Total	4.73

Creation of various infrastructure facilities for development of future rail network largely depends on the availability of land. Therefore, preservation and meaningful interim use of railway land is the main objective of IR's land-use policy.

In pursuance of Railways' commitment towards environmental improvement through afforestation and also with a view to safeguard the precious railway land against unauthorized occupation, tree plantation is being undertaken on vacant railway land with active participation of railway employees.

Besides, railway land is also licensed to railway employees belonging to Group 'C' and 'D' category under 'Grow More Food' scheme, for growing vegetables, crops etc.

Licensing of railway land is permitted for the purposes directly connected with railway working. Plots of railway land at stations, goods sheds and sidings are licensed to other parties for stacking/storing of goods either received or to be dispatched by rail.

Through an amendment to Railways Act, 1989, Rail Land Development Authority

(RLDA), under the Ministry of Railways has been constituted on 1st November, 2006 to undertake all tasks related to commercial development on railway land/air-space under the control of Ministry of Railways. Necessary action for development of these sites is under process by RLDA. Besides commercial development of vacant Railway land.

4.0 Locomotives

Indian Railways owns a total fleet of 8592 locomotives as on 31-3-2009 including 43 Steam locomotive, 4963 Diesel-locomotives and 3586 Electric locomotives. Steam loco ownership reached a peak in 1963-64 with 10,810 units. It then declined gradually as production of steam locos was stopped in 1971. Diesel and electric locomotives which are more than twice as powerful as steam locos are progressively replacing steam locos.

Apart from replacing steam locomotives by diesel and electric locomotives in areas of heavy traffic density, a large number of diesel shunting engines are also being introduced in replacement of steam shunting locomotives. This has enabled the Indian Railways to improve operation efficiency in both passenger and freight operations.

5.0 Traction

The traction mix has significantly changed in the last two decades and the railways have been progressively switching over to diesel and electric traction. Steam locomotion, though, it involves the least initial costs, is technologically inferior to diesel and electric traction in many respects. On the other hand, diesel and electric locomotives have much superior performance capabilities, electric locomotives being more powerful of the two. Electric traction is also the most capital intensive and therefore requires a certain minimum level of traffic density for its economic use.

The table below shows changes in the distribution of locomotives for traction.

Number Of Locomotives

Year	Broad Gauge			Metre Gauge			Total (including NG)		
	Steam	Diesel	Elec.	Steam	Diesel	Elec.	Steam	Diesel	Elec.
1980-81	4,361	1,866	1,016	2,763	470	20	7,469	2,403	1,036
1990-91	1,295	2,893	1,723	1,482	731	20	2,915	3,759	1,743
2000-01	-	3,881	2,791	33	657	19	54	4,702	2,810
2010-11	-	4,688	4,033	30	310	-	43	5,137	4,033
2014-15	-	5,375	5,016	30	203	-	43	5,716*	5,016*
2015-16	-	5,585	5,214	26	172	-	39	5,869	5,214

The share of traffic in terms of Train Kms. and GTKMs for passenger and freight services hauled is shown in Table 1.8

Year	Percentage of Train Kms. by types of traction						
	Passenger			Freight			
	Steam	Diesel@	Electric	Steam	Diesel	Electric	
		Loco	EMU				
1950-51	93	-	2	5	99	-	1
1960-61	91	-	2	7	94	5	1
1970-71	77	7	7	9	46	39	15
1980-81	49	25	14	12	18	62	20
1990-91	21.8	42.4	22.6	13.2	3	60.6	34.4
2000-01	-	56.2	31.2	12.7	-	43.5	56.5
2010-11	-	49.4	36.6	13.9	-	37.5	62.7
2013-14	-	48.9	37.0	14.0	-	35.9	64.1
2014-15	-	47.7	38.4	13.9	-	36.6	63.4
2015-16		46.9	39.0	13.9	-	37.13	62.9

@ Includes DHMU & DEMU

Indian Railways run a large number of fast Rajdhani, Shatabadi, GaribRath, Duranto Express trains connecting various metropolitan towns and state capitals. The Rajdhani express trains run between New Delhi & Howrah, New Delhi & Mumbai, H. Nizamuddin & Bangalore, H.Nizamuddin & Trivandrum, New Delhi & Bhubaneshwar, New Delhi & Guwahati, New Delhi-Chennai and between New Delhi & Jammu Tawi etc.

The fast and comfortable intercity Shatabadi express trains operate between New Delhi & Bhopal, New Delhi & Lucknow, New Delhi & Kalka, Chennai & Mysore, Mumbai & Ahmedabad, New Delhi & Chandigarh, New Delhi & Amritsar, New Delhi & Ajmer, New Delhi & Dehradun, Howrah & Bokaro Steel City, Howrah & Rourkela, Chennai & Coimbatore, Chennai and Mysore and between Pune & Mumbai etc. The GaribRath Expresses have more or less the same stoppages as the Shatabadi Expresses but have more of lower classes and the fare is less than that of Shatabadi Expresses. These trains have been introduced to cater to the persons who cannot afford to travel in Shatabadi Express. The Duranto Express trains are long distance trains like Rajdhani Expresses and are unique in the way that these have no scheduled stoppage between the originating station and the terminal station. These trains take considerably less time than even the Rajdhani Express trains.

These trains run at fast speed between 105 kmph to 150 kmph and are fully air conditioned.

Recently IR has started Gatiman Express from New Delhi to Agra which runs at maximum speed of 160 kmph.

6.0 Electrification And Electric Traction

Electric traction is a pollution free and energy efficient mode of transportation and offers an excellent alternative to fossil fuels as a source of energy.

Electric traction on 1500 volts D.C. was first introduced in 1925 on a small section of the Bombay area and till 1957 it was confined to less than 466 kilometres, comprising mainly the suburban sections of Bombay and Madras. Electrification on the main line sections was, however, taken up toward the end of the second Five Year Plan on 25 KV single phase AC system.

The electrification of Howrah-Burdwan suburban section of Calcutta on Eastern Railway was taken up during the First Five Year Plan (1951-56) and was completed in 1958. Thereafter, Electrification on Indian Railways has continued in a planned manner on the trunk routes connecting the four metropolitan cities of Kolkata, Delhi, Mumbai and Chennai and other high density routes.

As on 31.03.2016, Electrified route Kms. on Indian Railways constitute about 35.32% of total route Kms. Out of total 66,687 km of route, electrified route KMs is 23,555 kms.

The length of electrified route Kms. on IR for some selected years is: \

Year	Total Route Kms.	Route Kms. electrified	% age of electrified to total route kms.
1980-81	61,240	5,345	8.73
1990-91	62,367	9,968	15.98
2000-01	63,028	14,856	23.57
2010-11	64,460	19,607	30.41
2014-15	66,030	22,224	33.66
2015-16	66,687	23,555	35.32

Note: Data based on Annual Statistical Statement No. 8

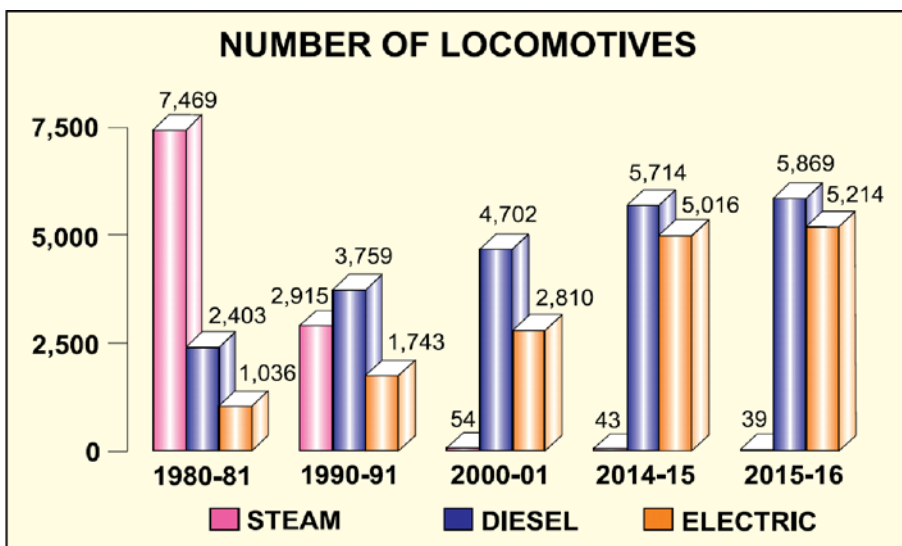
7.0 Dieselisation And Diesel Traction

Diesel and electric locomotives are comparatively more efficient than steam locomotives. They provide greater hauling capacity, have better acceleration and deceleration and are capable of higher speeds. They have less servicing needs, and, therefore, their availability for traffic is comparatively more. Thus electrification and dieselization lead to considerable saving as well as improvement of line capacity.

Diesel traction started off on the ex North-Western Railway prior to the Second World War in a very small way with the introduction of diesel shunting engines. Diesel traction got off to a real

start with the use of diesel locomotives on the newly laid M.G. line to Gandhidham in 1955-56. Diesel locomotion then progressed rapidly after the introduction of B.G. main line locomotives on the heavy density sections of the Eastern region in 1958-59 to ensure speedy and adequate transportation of raw materials to Steel Plants and finished products there from. Diesel traction has subsequently been extended to other high density routes and routes situated away from coalfields. Today, diesel electric traction is significant in the motive power scene of the Indian Railways. Important allied services such as, shunting, branch line feeder service, slower sectional trains are to some extent still operated by diesel locomotives. But those will have to be gradually taken over by diesel locomotives on non-electrified routes as new designs for diesel locomotives suitable for branch line services get evolved. Steam traction has been totally phased out except on some tourist trains and hill/NG. Railways.

The number of locomotives on IR over a period of time is shown in graph below:



8.0 Passenger Coaches

The number of coaches and their capacity has grown over the years keeping in view the increasing passenger demand. Number of coaches over a period of time is as following:

Year	EMU COACHES#		CONVENTIONAL COACHES		OTHER COACHING VEHICLESS
	No.	Capacity+	No.@	Capacity	
1980-81	2,625	5,00,607	27,478	16,95,127	8,230
1990-91	3,142	6,09,042	28,701	18,64,136	6,668
2000-01	4,526	8,59,701	33,258	23,72,729	4,731
2010-11	7,292	13,64,948	45,082	32,54,555	6,500
2014-15	8,571*	15,45,929*	51,838*	37,27,998*	7,000
2015-16	8,805	15,93,268	53,132	37,75,340	6,899

+ Includes standing accommodation.

@ Includes rail cars.

\$ Includes luggage vans, mail vans etc.

Includes number of DEMU/DHMU coaches and their capacity.

* revised

9.0 Passenger Traffic

Indian Railways is a commonly used mode of public transportation in the country. During 2015-16, it carried 8,107 million passengers as against 8,224 million in 2014-15. Passenger kilometres, which is calculated by multiplying the number of journeys by mean kilometric distance in case of each class was 1,143 billion as against 1,147 billion in the previous year. Passenger earnings increased by ` 2,093.66 crore (4.96%) in comparison with 2014-15.

The trend of passenger traffic since 1950-51 is shown below:

Year	Suburban (All classes)	Non suburban				Total Non-suburban	Grand Total
		Second Class					
		Upper class	Mail/Exp.#	Ordinary	Total		
1950-51	412	25	52	795	847	872	1,284
1960-61	680	15	96	803	899	914	1,594
1970-71	1,219	16	155	1,041	1,196	1,212	2,431
1980-81	2,000	11	260	1,342	1,602	1,613	3,613
1990-91	2,259	19	357	1,223	1,580	1,599	3,858
2000-01	2,861	40	472	1,460	1,932	1,972	4,833
2010-11	4,061	100	1,046	2,444	3,490	3,590	7,651
2013-14	4,552	126	1,306	2,413	3,719	3,845	8,397
2014-15	4,505	138	1,277	2,304	3,580	3,719	8,224
2015-16	4,459	145	1,321	2,182	3,503	3,648	8,107

Also includes Sleeper Class

Average Distance Travelled Per Passenger (Kms.)

Year	Suburban	Non-Suburban	Total
1980-81	20.5	103.9	57.7
1990-91	26.4	147.6	76.6
2000-01	31.1	186.7	94.6
2010-11	33.8	234.4	127.9
2014-15	33.7	267.7	139.5
2015-16	32.6	273.5	141.0

The number of passenger trains run daily compared to previous year is as below:

Type of trains	Broad Gauge		Metre Gauge		Total (incl.NG)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
EMU	5009	5128	0	0	5009	5,128
Mail/Express	3362	3508	25	17	3387	3,525
Ordinary Passenger Trains and Mixed Trains	4298	4366	270	168	4702	4,660
Total	12,669	13,002	295	185	13,098	13,313

Passenger Service improvements

During the year 2015-16, Indian Railways introduced new trains extended the runs and increased the frequency of existing trains, as given below:

	Train introduced	Runs extended	Frequency increased	Total
Non-suburban	133 trains Incl. 39 MEMU/DEMU	109 trains Incl. 28 MEMU/DEMU	18 trains Incl. 2 MEMU/DEMU	260
Suburban	63	44 trains	4 trains	111
Total	196	153	22	371

Ticketless Travel:

During 2015-16, 24.39 lakh checks were conducted against ticketless/irregular travel (including

carriage of unbooked luggage). About 253.37 lakh cases were detected and ` 921.76 crore realized on this account.

Passenger Amenities:

The allocation under the Plan Head "Passenger Amenities" in 2015-16 was Rs1,752.50 crore (Budget Estimate) and Rs1,211.84 crore (Revised Estimate).

During the year 2015-16, 1,252 stations have far been identified for development under the Adarsh Stations Scheme, out of which 988 stations have already been developed.

During the year, 693 stations were provided with water coolers, 468 stations were electrified and 15 passenger lifts and 31 escalators were provided at 11 and 20 stations, respectively.

10.0 Freight Traffic

Revenue earning freight traffic handled during 2015-16 was 1101.51 million tonnes. NTKMs earned during the year were 654 billion. Total loading and freight output, inclusive of non-revenue traffic, were 1108.62 million tonnes and 656 billion NTKMs respectively. Commodity-wise loading of revenue earning traffic was as follows:

	Tonnes carried* (Millions)		Absolute Variation over last year	Percentage to total
	2014-15	2015-16		
Coal				
i) for steel plants	53.91	52.06	-1.85	4.73
ii) for washeries	0.99	1.09	0.1	0.10
iii) for thermal power houses	367.29	371.81	4.52	33.75
iv) for other public users	123.62	126.87	3.25	11.52
Total	545.81	551.83	6.02	50.10
Raw material for steel plants except iron ore	18.28	20.29	2.01	1.84
Pig iron and finished steel				
i) from steel plants	28.25	29.59	1.34	2.69
ii) from other points	14.59	15.20	0.61	1.38
Total	42.84	44.79	1.95	4.07
Iron ore				
i) for export	2.49	2.13	-0.36	0.19
ii) for steel plants	69.43	78.63	9.2	7.14
iii) for other domestic users	40.85	36.18	-4.67	3.28
Total	112.77	116.94	4.17	10.62
Cement	109.80	105.35	-4.45	9.56
Foodgrains	55.47	45.73	-9.74	4.15
Fertilizers	47.41	52.23	4.82	4.74
Mineral Oil (POL)	41.10	43.24	2.14	3.93
Container service				
i) Domestic containers	10.50	9.04	-1.46	0.82
ii) EXIM containers	37.88	36.79	-1.09	3.34
Total	48.38	45.83	-2.55	4.16
Balance other goods	73.40	75.28	1.88	6.83
Total	1095.26	1101.51	6.25	100

* Excludes loading on Konkan Railway.

The following tables show the growth of freight traffic over the years:

Year	Tonnes (Millions)	Index (1950-51 =100)	Net Tonne Kms (Millions)	Index (1950-51 =100)	Lead (Kms)	Index (1950-51 =100)
1950-51	73.2	100.0	37,565	100.0	513	100.0
1960-61	119.8	163.7	72,333	192.6	603	117.6
1970-71	167.9	229.4	110,696	294.7	659	128.5
1980-81	195.9	267.6	147,652	393.1	754	147.0
1990-91	318.40	435.0	235,785	627.7	741	144.4
2000-01	473.50	646.9	312,371	831.5	660	128.7
2012-13	1,008.09	1,377.2	649,645	1,729.4	644	125.5
2013-14	1,051.64	1,436.7	665,810	1,772.4	633	123.4
2014-15	1,095.26	1,496.3	681,696	1,814.7	622	121.2
2015-16	1,101.51	1,504.80	654,481	1,742.26	594	115.79

Movement of bulk commodities in the last four years is as following:

Sl. No.	Commodity group	2012-13		2013-14		2014-15		2015-16	
		Million Tonnes	Percent age	Million Tonnes	Percent age	Million Tonnes	Percent age	Million Tonnes	Percent age
1.	Coal	496.42	49.24	508.06	48.31	545.81	49.83	551.83	50.1
2.	Foodgrains	49.03	4.86	55.10	5.24	55.47	5.06	45.73	4.15
3.	Iron & Steel	35.31	3.50	38.95	3.70	42.84	3.91	44.79	4.07
4.	Iron ore	111.4	11.05	124.27	11.82	112.77	10.30	116.94	10.62
5.	Cement	105.87	10.50	109.80	10.44	109.80	10.03	105.35	9.56
6.	POL (Mineral oils)	40.61	4.03	41.16	3.91	41.10	3.75	43.24	3.93
7.	Fertilizers (Chemical manures)	46.21	4.58	44.70	4.25	47.41	4.33	52.23	4.74
8.	Limestone and Dolomite	19.64	1.95	20.71	1.97	21.20	1.94	23.53	2.14
9.	Stones (including gypsum) other than marble	11.77	1.17	11.61	1.10	14.98	1.37	15.04	1.37
10.	Salt	4.77	0.47	4.65	0.44	4.99	0.46	5.02	0.46
11.	Sugar	2.95	0.29	3.00	0.29	2.69	0.25	3.39	0.31
	Total	923.98	91.66	962.01	91.48	999.06	91.23	1007.09	91.43
12.	Commodities other than above	84.11	8.34	89.63	8.52	96.20	8.77	94.42	8.57
	Grand Total	1008.09	100.00	1051.64	100.00	1,095.26	100.00	1101.51	100.00

11.0 Operating Efficiency Indices of Indian Railways

Operating efficiency indices of Indian Railways are as following

Operating Revenue and Expenditure (` in cr)

Item	2013-14	2014-15	2015-16
Gross revenue receipts (Rs)	1,43,213.87	1,61,017.25	1,68,379.60
Working expenses incl. depreciation, etc. and miscellaneous expenses (Rs)	1,31,464.80	1,44,178.76	1,49,151.13
Net revenue receipts (Rs)	11,749.07	16,838.49	19,228.48
Percentage of net revenue receipts to the Capital-at-charge	5.63	6.95	7.00
Operating ratio (per cent)	93.6	91.3	90.5
Dividend to General Revenues and payment to States in lieu of tax on passenger fares	8,008.67	9,173.55	8,722.51
Excess (+) / Shortfall (-)	(+)3,740.4	(+)7,664.94	(+)10,505.97

12.0 Railway Employees

The strength of railway employees together with the cost is shown below:

Year	No. of staff (000)	Wage bill (` in millions)	Average annual wage (`) per employee#	Traffic unit per employee (000)@
1980-81	1,572.2	13,167	8,435	244
1990-91	1,651.8	51,663	31,864	346
2000-01	1,545.3	188,414	121,281	535
2010-11	1,332.0	517,766	394,112	1,291
2014-15	1,326.3*	847,515*	651,376*	1,473*
2015-16	1,331.4	929,851	718,147	1,442

On the basis of average number of staff employed in the year.

@ Traffic unit represents passenger kilometres and net tonne kilometres (Taking into account open

line staff only).

* revised

13.0 Training of Railway Employees

Indian Railways have developed their own facilities for conducting extensive training programme for their officers and staff to enable them to improve upon their skill/abilities and equip them with the latest technological developments.

Training to railway staff is given in zonal training schools set up on each railway zone. Training for officers is, however, organized in five centralized institutions.

- (i) Railway Staff College, Vadodara,
- (ii) Indian Railways Institute of civil engineering, Pune
- (iii) Indian Railways Institute of signal and Tele communication Engineering, Secunderabad.
- (iv) Indian Railways Institute of Mechanical Engineering, Jamalpur.
- (v) Indian Railways Institute of Electrical Engineering, Nasik.

There are institutional tie ups with prestigious institutes for imparting training in various new fields like management, leadership, innovation. Tie ups are also with prestigious foreign universities and institutes for training.

13.1 Social costs being borne by the Indian railways

Indian Railways are public utility undertaking of Government of India. They do not have the freedom to adjust their freight and fare rates corresponding to increase in the prices of various inputs used by them. They also carry certain essential commodities, as also passenger traffic, at rates which do not even cover their cost of movement. In addition, the traffic bound for flood affected and drought hit areas is carried at concessional rates. Certain unremunerative branch lines are also being operated purely in public interest. Such obligations which Indian Railways have carried all along are not usually borne by purely commercial undertakings.

The losses accruing from such operations, which are justified for meeting wider socio-economic objectives, are termed as 'Social Service Obligation'.

Year	No. of staff (000)	Wage bill (₹ in millions)	Average annual wage (₹) per employee#	Traffic unit per employee (000)@
1980-81	1,572.2	13,167	8,435	244
1990-91	1,651.8	51,663	31,864	346
2000-01	1,545.3	188,414	121,281	535
2010-11	1,332.0	517,766	394,112	1,291
2014-15	1,326.3*	847,515*	651,376*	1,473*
2015-16	1,331.4	929,851	718,147	1,442

14.0 Railway Finances and their Control

Railway finances were separated from the general finances of the country in 1924 by a resolution of the Central Legislature. However, the same has been merged from FY 2017-18. Under the separation convention, the Railways are required to pay a dividend at a fixed rate on their capital, which has been advanced by the central government. Subject to the obligation to pay dividend at the prescribed rates to the general Exchequer and observance of the national economic policies, railways are free to pursue their own financial policies to their best advantage. The rate of dividend as well as other financial arrangements between the Railways and general Finance are determined periodically by 'Convention Committee', which is a Parliament Committee. This system under merged budget with general budget still continues. At present Indian railways are required to pay dividend at 4.5 percent on capital invested upto March 1964 and 6 percent for the fresh investments upto the years 1980-85 and 6.5 percent thereafter, for the 7th plan period i.e. for the years 1985-90. The control over Railway finances and policies is exercised by Parliament through discussions and voting of the annual railway budget, and Parliamentary Committees such as the Railway Convention Committee, the Estimates Committee and the Public Accounts Committee and the Standing Committees on Railways

Railway administration also obtain feel of public opinion and secure rail users as well as people's co-operation through the Railway Users' Consultative Committees at various level and also advisory committees for specific purpose like the Passenger Amenities Committee and Time Table Advisory Committee.

IR's financial results for 2015-16 compared with the previous year are tabulated below:

	(₹ in crore)	
	2014-15	2015-16
Capital-at-Charge	**1,97,991.80	*2,24,685.32
Investment from Capital Fund	44,125.17	50,449.91
Total	2,42,116.97	2,75,135.23
Passenger Earnings	42,189.61	44,283.26
Other Coaching Earnings	3,997.89	4,371.49
Goods Earnings	1,05,791.34	1,09,207.65
Sundry Earnings	5,092.74	5,928.55
Gross Earnings	1,57,071.58	1,63,790.95
Suspense	(-)361.04	542.56
Gross Traffic Receipts	1,56,710.54	1,64,333.51
Ordinary Working Expenses	1,05,995.88	1,07,735.93
Appropriation to Depreciation Reserve Fund	7,775.00	5,600.00
Appropriation to Pension Fund	29,225.00	34,500.00
Total Working Expenses	1,42,995.88	1,47,835.93
Net Traffic Receipts	13,714.66	16,497.58
Miscellaneous Transactions	3,123.83	2,730.90
Net Revenue Receipts	16,838.49	19,228.48
Dividend payable to General Revenues \$	9,173.55	8,722.51
Excess (+)/Shortfall (-)	7,664.94	10,505.97
Percentage of Net Revenue to Capital-at-Charge (including investment from Capital Fund)	6.95	6.99
Operating Ratio (%age)	91.25	90.48
Capital-at-Charge (incl. investment from Capital Fund) per NTKM (in paise)	317	374
* Excludes ₹11,873.47 crore of MTPs, ₹540.80 crore of Circular Railways and ₹13,387.61 crore of Udhampur-Srinagar-Baramulla Project (National Project) and ₹ 11,954.00 crore of appropriation to SRSF and ₹4400.71 crore investment in DFCCIL.		
** Excludes ₹10,535.01 crore of MTPs ₹532.80 crore of Circular Railways and ₹11,954.00 crores of appropriation to SRSF, ₹10,807.47 crore of Udhampur-Srinagar-Baramulla Project (National Project).		
* Includes ₹16,269.11 crore of Production Units.		
** Includes ₹16,078.34 crore of Production Units.		
\$ Includes payment in lieu of Passenger Fare Tax of ₹ 23.12 crore and Contribution to Railway Safety Fund of ₹2.61 crore during 2014-15 and 2015-16 each.		

15.0 Achievement of Indian Railways

Indian Railways have made considerable achievements particularly in last 50 years since independence. This has been possible by modernizing its system and upgradation of technology in various fields.

Some of the major achievements made are indicated below:

- (i) **Introduction of Rajdhani & Shatabdi trains:** Rajdhani express trains have been introduced since 1969 at upto 130 kmph breaking the decades old barrier of 100 kmph. A number of Shatabdi trains and Inter city express trains have been introduced to connect metropolitan towns and state capitals. This has provided much needed relief to passengers
- (ii) **Kolkata Metro Railways:** Underground Metro Railway has been built & commissioned in Kolkata. This has brought Indian Railways on the map of world Railways with regard to metro trains. This has provided considerable relief to commuters in densely populated city of Kolkata.
- (iii) **Konkan-Railway:** 760 Km B.G. Railway line of the Konkan Railways were built from Roha to Mangalore. The construction of this line has been a big technical achievement. This section has 169 major bridges, 1630 minor bridges & 88 tunnels with longest tunnel being 6.5 Kms.

This line has substantially reduced journey time between Mumbai –Mangalore, Mumbai-Cochin & Mumbai-Goa. This line is accelerating Socio-economic development of the Konkan region.
- (iv) **Electrification of Railways :** About 35.32% of total route Kms (23,555 Kms) has been electrified. This has considerably increased the output of the railways system.
- (v) **Uni Gauge project :** Adoption of one uniform gauge has been undertaken in big way to develop alternative routes, to connect important places with B.G. net work, to develop backward regions and to avoid the problem of transshipment. During VIII plan, about 6897 kms of M.G.& N.G. track had been converted in B.G. and in IX plan, another 1892 kms. have been converted and work is in progress on 8074 km.

The unification of gauge will be highly beneficial to railways, the railway administration & the country at large. It will also help in socio-economical development of backward regions.
- (vi) **Computerised reservation facility:** The computerized railways reservation facility has been provided in last few years at a large number of places (including at stations) on Indian Railways. On 31-3-2016 this facility is available at about 4000 terminals covering about 100 % of Total work load. The computerized reservation facility has been a land mark in passenger amenity works and has been greatly appreciated by rail users.
- (vii) **Technology upgradation:** Indian Railways have updated the technology in various fields of railways working like manufacture of Electric & Diesel Locos, manufacture of Coaches & wagons, signalling & telecommunication techniques & in various fields of civil Engineering.

As far as civil engineering in concerned, some of the major trust areas are introduction of long welded rails, manufacture of concrete sleepers, mechanized track maintenance & use of sophisticated track recording cars.
- (viii) Development of indigenous capacity for rolling stock manufacture.

- (ix) Construction of bridges, which are Engineering marvels across major river like the Ganges, Godavari, and Brahamputra.
- (x) Linking North-Eastern region with the rest of the country.
- (xi) The upgradation of technology has helped considerably in improving the output of Indian Railways.
- (xii) Running of Gatiman (150 kmph) and Tejas (Super Luxury) trains. Running of special trains as per peak traffic.
- (xiii) Development of 400 Railways station as World Class on PPP (Public Private Partnership) model.

Key statistics of Indian Railway

Some of the important key statistics of Indian Railways are given below as on 31.3-2001

Key Statistics of Indian Railway

Item	Quantity in 2015-16
1. Total Track Kilometres	: 66,687
2. Route Kilometres	: 92,081
3. Electrified Route Kms.	: 23,555
4. Locomotives	
Diesel	: 5,869
Electric	: 5,214
Steam	: 39
Total	: 11,122
5. Wagons (Units)	: 2,51,256
6. Passenger Coaches	: 53,101
7. No. of Stations	: 7,216
8. No. of Staff	: 13.31 lacs
9. No. of Trains	: 13313 trains daily including EMU and Passenger/Mail Express Trains
10. Traffic carried (originating)	: 1108.62 million tones of freight traffic and 8107 million passengers in the year.
11. Revenue earned	: Revenues : Rs. 1,68,379.60 crores Next excess :Rs19,228.48crores.

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