

인도 철도의 현황 및 특징

Some facts and figures of Indian Railways

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ABSTRACT

Indian Railways runs about 10,000 trains and carries 15 million people daily. Today Indian Railways run efficiently and makes a modest profit in spite of reducing the passenger and freight fares. As Indian Railways has a long history, a brief introduction will be given. Indian Railways has three different gauges (Narrow, Meter and Broad) during British rule and now it is converging to broad gauge in a phased manner. The details will be addressed. As Indian terrain is not that much favorable to Rails.

Evolution of rail engines, coaches / wagons which are all manufactured in India are given in details. As India is attaining self sufficiency in almost all fields of Science and Technology, various production units, research units, Journals etc are also discussed. Statistics pertaining to railways both technical and commercial are addressed.

1. Introduction

Indian Railways (IR) is the largest common man transport system in India. It runs about 10,000 trains and carries 15 million people daily which is more than the populations of Sweden and Norway Combined. Train service was introduced during British Rule in India and the first train on Broad Gauge started on April 16, 1853 in Bombay from Bori Bunder to Thane. India has Broad gauge, Meter gauge and Narrow gauge because of its terrain and efforts are being made to convert them into Broad gauge. IR has attained near 100% self sufficiency in building Rail Road services. The progress and growth of railways are phenomenal, but still long way to go to provide modern bullet train services as well as Metro Rail Services to Indian people. In this paper statistical summary of passenger services, passenger revenue, Freight operation, rolling stock, and personnel are given in brief.

2. Indian Railway

Indian Railways (IR) lifted 581.4 million tonnes of total freight, the bulk comprising revenue-earning traffic of 557.4 millions tonnes. The transport output in terms of Net Tonnes Kilometers (NTKms) was 384 billions, 5,112 million 'originating' passenger kms. Earnings from passengers traffic was Rupees (Rs) 132.98 billion and from freight Rs 276.18 billion. The year ended with an excess of Rs10.91 billion in spite of increased working expenses and payment of Productivity Linked Bonus to employees.

Construction of 162 Kms of new lines was completed and 4,986 Kms of track renovation was also carried out. Also 854 Kms of track was converted from NG/MG to BG and opened to traffic. IR

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made good progress in indigenous manufacture of rolling stock and other vital stores during the financial year 2003–04.

The production of details of locos both electrical and diesel as well as coaches in 2003–04 is given:

Table 2.1. Production details

Production Unit	Product Details		
	Electric locos	Diesel locos	Coaches
	(BG)	(BG)	
Chittaranjan Locomotive Works,Chittaranjan	86		
Diesel Locomotive Works,Varanasi		123	
Integral Coach FactoryChennai			1070
Rail Coach Factory,Kapurthala			1201

IR kept up steady progress in track electrification and the future will be all electrical lines only. In future electrical locos will play a major role.

2.1 Passenger Services

Passenger services measured in terms of train kms, and destiny of train services are shown below:

Table 2.2 Passengers details

Year	Suburban		Non suburban		Trains Kms. per running track	
	(Millions)		(Millions)		km per day	
	Train Km	Vehicle Km	Train Km	Vehicle Km	Suburban	Non suburban
1980–81	35.55	610.5	258	5,582	36.6	9.7
1990–91	48.37	840.7	316	7,739	40.0	11.5
2000–01	56.04	1,029.5	397	11,035	47.1	13.8
2002–03	59.98	1,119.0	438	12,382	15.2	15.2
2003–04	61.57	1,156.2	444	10,880	45.3	15.2

2.2 Passenger Revenue

Passenger revenue has been steadily increasing though it formed only about 31% of the total earnings of the railways during 2003–04.

Table 2.3 Passenger Revenue

Passenger Revenue (Rs in millions)			
Year	Suburban	Non suburban	Total
1980-81	905.2	7,369.5	8,274.7
1990-91	3,569.8	27,877.4	31,447.6
2000-01	10,911.4	93,920.5	104,831.6
2002-03	12,316.0	113,091.9	125,407.9
2003-04	12,555.2	120,043.2	132,598.4#

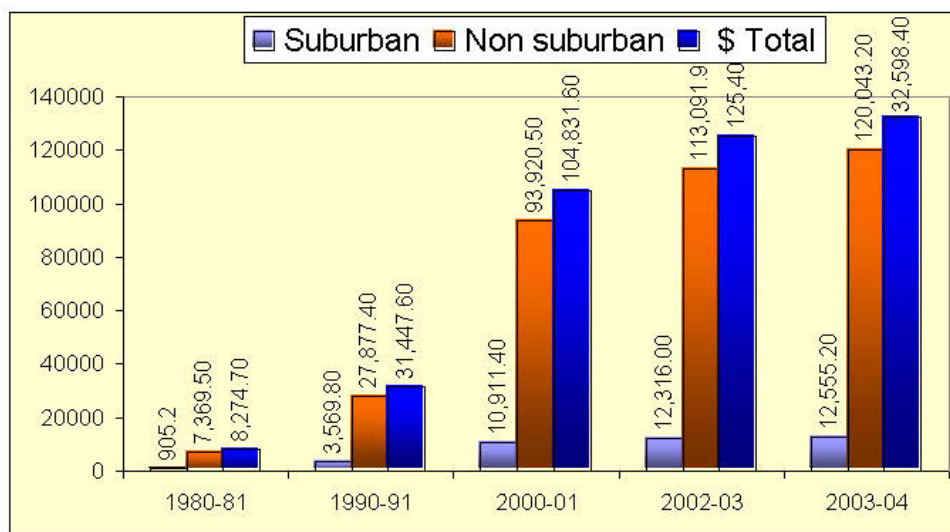


Fig. 2.1 passenger revenue bar chart

3. Freight Operation

3.1 Originating Tonnage

The revenue-earning originating tonnage rose from 19.5 million tonnes in 1980 to 518.7 million tonnes in 2002-03 while the total originating freight rose from 220 million tonnes to 542.7 million tonnes during the same period.

Table 3.1 Freight Earnings

Originating Tonnage (millions tonnes)		
Year	Revenue-Earning	Total
1980-81	195.9	220.0
1990-91	318.4	341.4
2000-01	473.5	504.2
2002-03	518.7	542.7
2003-04	557.4	581.4

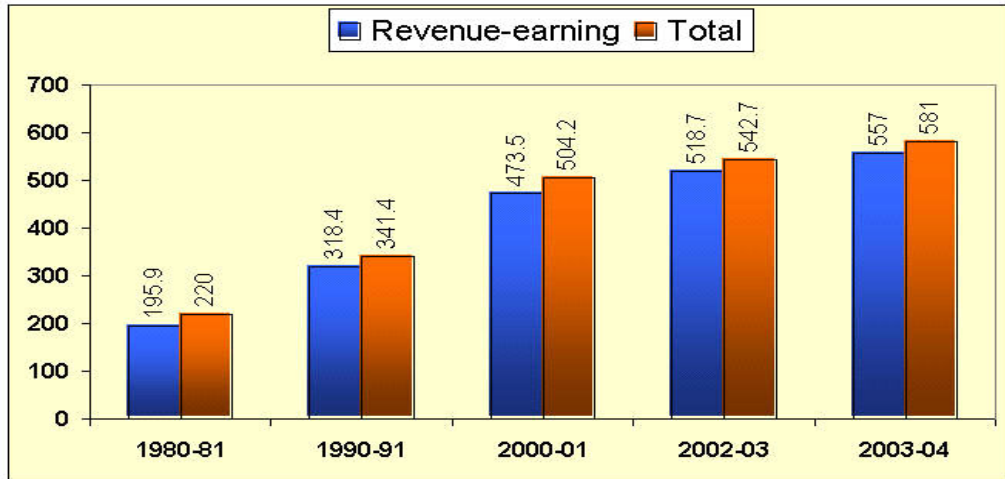


Fig. 3.1 Revenue earnings bar chart

3.2 Locomotives for Rolling Stock

With increasing reliance on dieselization and electrification, IR has been reducing its fleet of steam locomotives. A comparative table and graph is provided for this purpose.

Table 3.2 Locomotives Details

Number of Locomotives									
Year	Broad Gauge (BG)			Metre Gauge (MG)			Total (including NG)		
	Steam	Diesel	Elect.	Steam	Diesel	Elect.	Steam	Diesel	Elect.
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
2002-03	—	3,953	2,912	34	584	18	52	4,699	2,930
2003-04	—	4,031	2,985	31	597	18	45	4,769	3,003

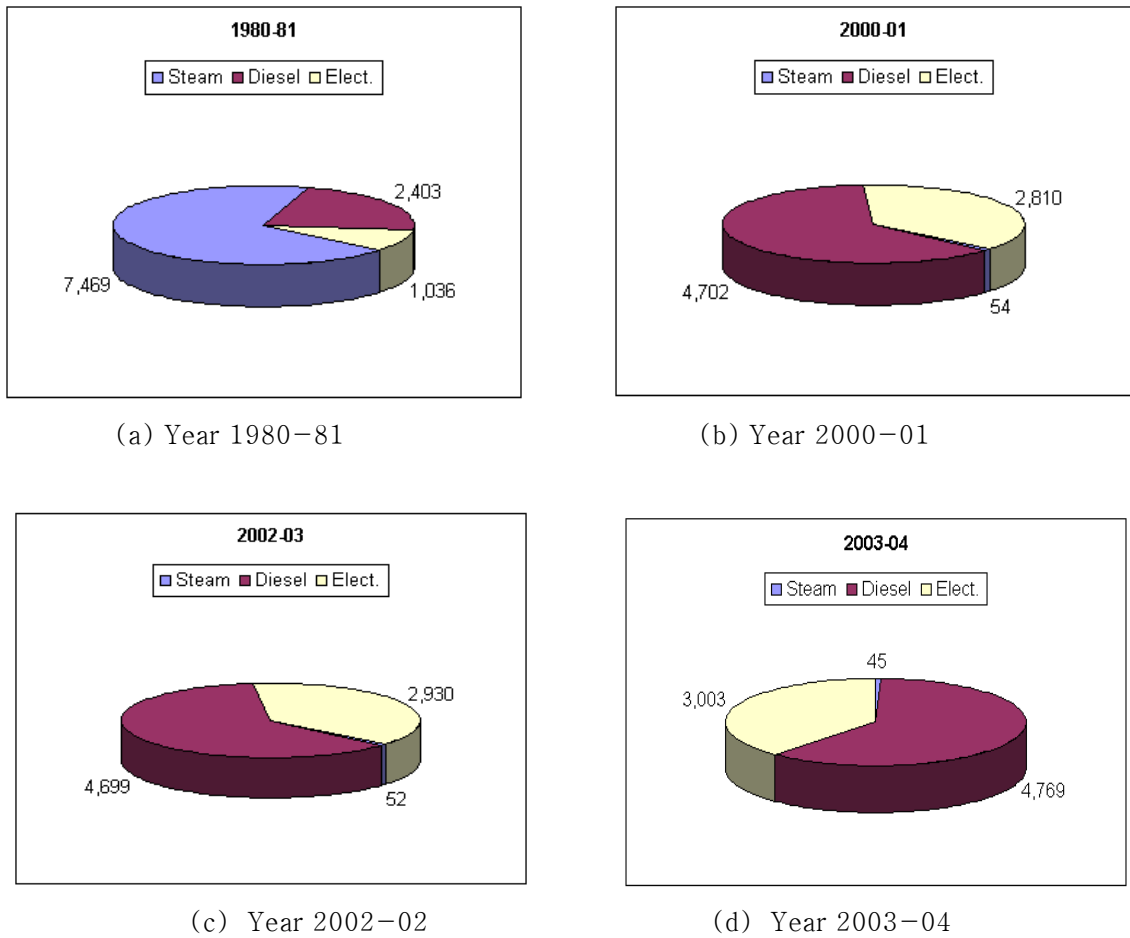


Fig. 3.2 Locomotives Chart–year wise

3.3 Passengers Coaches

The number of coaches and their capacity have grown over the years keeping in view the increasing passengers demand.

Table 3.3 Coach Details

Year	EMU Coaches		Conventional Coaches		Other Coaching Vehicles
	No	Capacity +	No @	Capacity	
1980–81	2,625	500,607	27,478	1,695,127	8,230
1990–91	3,142	609,042	28,701	1,864,729	6,668
2000–01	4,668	873,585	33,258	2,372,729	4,731
2002–03	4,957	930,707	34,895	2,506,699	4,905
2003–04	5,026	945,317	25,772	2,596,216	5,321

3.4 Steam Locomotives

In India Steam Trains were introduced for passenger and goods service on 16th April, 1853 (about 153 years back) during British Rule. There after the steam locomotives were utilized for handling goods and passenger trains for long time.

Other countries on seeing the benefits of steam trains introduction in Britain made efforts to introduce steam trains in their countries. In France railways was introduced in 1829, Germany in 1835, Russia in 1837, Netherlands and Italy in 1839, Spain in 1848 and America in 1830. On September 27, 1825 world's first steam locomotive hauled passengers and merchandise for the first time. This historic journey was made in England from Stockton to Darlington and was drawn by Stephenson's locomotive named –Locomotion No. 1. Since a very long time efforts have been made by man kind to utilize the power of steam. Thomas Savery utilized steam by making steam engine in 1698 followed by making of fire engine in 1711 by Newcomen. First steam engine was made by Scotsman James Watt with Dr. Robinson in 1759 and improved for commercial use in 1768 along with Mathew Boulton, William Murdock and others. In 1802 a demonstration was made by Richard Trevithick in London and improved version was used to successfully haul a train of 70 passengers and load of iron bars for about 15 Kms. in 1804. George Stephenson (1781–1848) an British national who worked as fireman's assistant in the Killingworth Collieries in England and became the first man to demonstrate successfully the use of steam locomotive for goods haulage and passenger traffic. In 1821 he was appointed as the engineer to the proposed Stockton and Darlington Railway.

3.5 Coaches / Wagons

In 1949 Integral Coach Factory, Chennai was set up in collaboration with M/s Swiss Car and Elevator Manufacturing Company of Switzerland. The new Coaches were world class with all steel, fully welded light weight integral construction. These coaches were also anti telescopic which meant high safety to the passengers in the event of train accidents. Air conditioned coaches were introduced in India in 1936. A modern air-conditioned coach of Indian Railways is dust-proof, has an attached toilet and bathroom & richly and elegantly furnished. Large size windows offer the traveler an excellent view of scenery. The outer-glass prevents ingress of dust and being tinted, eliminate glare. The decor is elegant and artistic.

In 1885, an all steel under frame as developed in Europe was introduced in India. Changes were made in the seating arrangement, ventilation and various mechanical improvements for safer, more comfortable and smoother travel. The design was colorful and intended to look as much like a stage coach and horse carriage as possible. The width of the carriage was taken from the width of the old coach. The lights outside the royal stages were as in stage coaches. The luggage and attendant compartment was also provided. In 1863, the first luxury saloon, a four wheeler carriage was built for **His Excellency the Governor of Bombay, Baroda and Central India (BB&CI)** for Railway Workshops at Amroli. The Coach Height was elevated and within the somewhat cramped confines, sitting-cum-bedroom was arranged in one half of the coach while the opposite half served as a dining room. The lower deck provides accommodation for servants.

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3.6 Locomotives

As India believes in self sufficiency in all fields of science and technology, electric locomotives are built in India at Chittaranjan Locomotive Works (CLW). CLW manufactures electric locomotives— 25 kv ac loco with three phase ac drive, 25kv ac locomotive with dc drive. It is one of the largest Electric Locomotive manufacturers in the world. CLW also manufactures AC & DC Traction motors, Switch gears/Control gears, and Bogies cast & fabricated Wheel sets & Steel casting. Chittaranjan Locomotive Works (CLW) has been named after the great freedom fighter, leader and statesmen Deshbandhu Chittaranjan Das. The production activity started on 26th January, 1950 the day when India became Republic.

Presently, WAP-5 class locomotives employ advanced control and propulsion technology and are capable to deliver 5400 hp on rail. The locomotive has all the hallmarks of a high-speed propulsion unit viz. light weight, fully suspended drive and disc brake. Though presently, it has been certified for 160 kmph operation, the locomotive has been designed to give a service speed of 200 kmph, with test speed potential of 225 kmph. Since IR is currently facing severe competition in Premium Passenger business market from commercial airlines, sooner or later, IR will have to introduce high speed intercity Passenger Services. This emerging market will call for powerful Electric locos to be deployed in the immediate near future.

4. Rail Transport Journal

The Institute publishes a quarterly journal which provides a major forum for sharing of new ideas and thinking on transport technology and other disciplines. It brings our issues devoted to topical themes such as Productivity, Planning, Energy Conservation, Urban Transport, Transport Economics, and Multimodal Transport etc. About 5,000 copies of the journal are distributed all over India. The readership of the journal includes a larger number of railway executives within the country and outside, as also economists, technicians, engineers and industrial managers. Copies are circulated amongst the top management of the Railway in the developing countries of Asia, Africa, Latin America and premier Industrial concerns connected with the manufacture and trade of railway and ancillary equipment in these countries, in addition to members of IRT.

5. Personnel

The strength of railway employees together with cost is shown below in Table 5.1.

Table 5.1 Employees Details

Year	No. of Staff (000)	Wage Bill(Rs in Millions)	Average Annual Wage(Rs) per Employees	Traffic Unit per Employees(000)
1980-81	1,572.2	13,167	8,835	244
1990-91	1,651	51,663	31,864	346
2000-01	1,545	188,414	121,167	535
2002-03	1,471.9	199,148	133,967	630
2003-04	1,441.5	209,287	146,607	686

6. Net Revenue and Excess / Short fall

IR ended the year with an excess of Rs. 10, 914 millions. This speaks about the efficiency and dedication.

Table 6.1 Revenue Details

Year	Gross Traffic Receipts	Total Working Expenses	Net Misc. Receipts	Net Revenue	Dividend	Excess (+)/ Shortfall(-)
1980-81	26,240.2	25,364.6	(+)399.3	1,274.9	3,253.6	(-)1,978.7
1990-91	120,964.9	111,538.6	(+)1,711.5	11,137.8	9,381.1#	(+)1,756.7
2000-01	348,804.8	346,673.4	(+)8,580.9	10,712.3	3,076.4	(+)7,635.9
2002-03	410,682.2	380,257.5	(+)7,877.6	38,302.3	27,148.3	(+)11,154.0
2003-04	429,049.4	394,822.1	10,557.6	44,784.9	33,870.8	(+)10,914.1

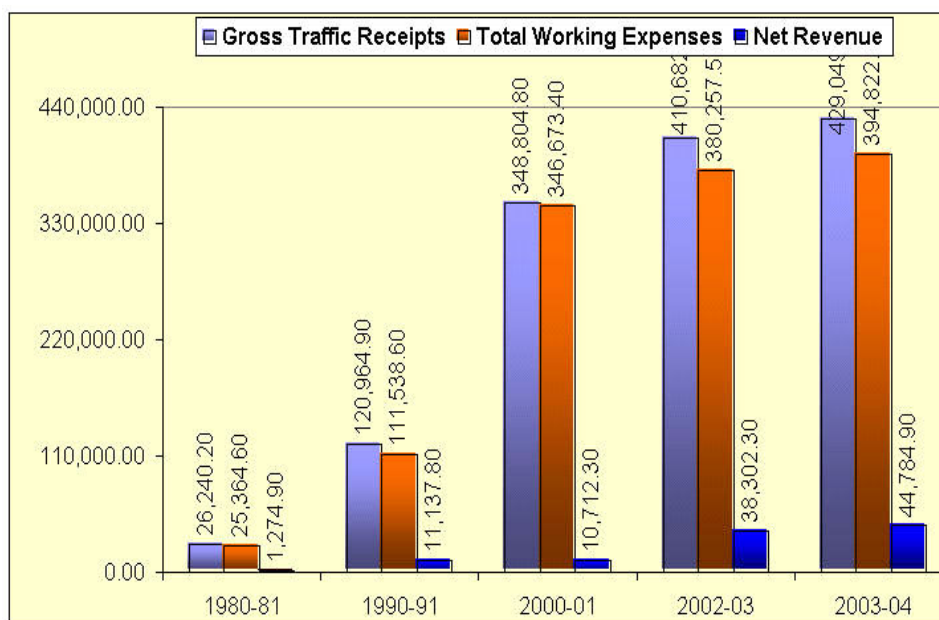


Fig.6.1 Revenue bar chart

7. International Cooperation

Indian Railways is conscious of the need to keep abreast of state of art technologies and best international practices to provide the desired level of customer service. It is therefore in close cooperation with some foreign railways, research institutes and industries world wide .Indian Railways is an active member of International Union of Railways (UIC). and a founder member of ESCAP. As a member of UIC, IR heads the groups on Broad Gauge (BG) and Human Resource Development (HRD). It is also represented in the group of Freight Development. IR is also a full member of International Railway Conference Association (IRCA) and of the international heavy haul association (IHHA). Through these working groups with other Railways, IR is able to constantly able to upgrade technologies.

IRCON International Ltd., a PSU of ministry of Railways, is actively engaged in construction, electrification and signaling projects in various countries such as Malaysia, Bangladesh, Iran, Syria and United Kingdom.

8. Conclusion

Indian Railways is one of the largest transport networks in the world. It has about 1,472,000 dedicated employees who serve for the India people. It covers over a length of 82,492 Km and has about 60906 railway stations. As the major revenue is from the freight IR has taken the step to build exclusive freight tracks so that all the freights delivery can be speeded up. The fare is maintained at the lowest possible level and still running effectively and efficiently with some marginal profit. Still it has to go a long way to serve to serve about 1.2 billion populations. Some of the grey areas are High speed trains as well metro train services. There are large scopes for foreign companies to work in close with IR in the near future as it is likely to under take many prestigious new projects to attract more multinational companies to invest in India.

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