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Research Paper

ACOMPARATIVE STUDYOFINDIAN ANDWORLDWIDERAILWAYS

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Railways were the most important development from the point of view of the infrastructure in India from 1850 to 1947. In present scenario Indian Railways has become the prime mover of the Indian Economy. Railways in India in the sense of transportation are the only reliable and feasible source on land. Indian Railways (IR) is one of the largest railway systems in the World. According to Vision 2020 proposed by Indian Railways Ministry, a significant focus would be on Track Enhancement, Environmental Sustainability, Network Expansion of Railway, Capacity Creation, Train Safety, Reducing Carbon Footprint, High Speed Train Introduction and Technological Excellence. There are enormous challenges. It aims to develop a world class rail infrastructure as countries like USA, China etc. This paper presents the recent developments in Railways in developed countries, limitations and problems that are associated with Railways. Also an impression of Indian Railways at the global level will be presented. Solutions and visions that are proposed by Indian Government to meet and to match the technological development with the developed countries will also be discussed in this paper.

Keywords: Capacity Creation, Economy, Network Expansion, Transportation, Indian Railway, High speed trains

INTRODUCTION

Similar to many economic activities that are intensive in infrastructures, the transportation sector is a significant component of the economy impacting on development and the welfare of population. When transport systems are efficient, they provide economic and social opportunities and benefits that result into positive multiplier effects such as better accessibility to markets, employment and additional investments. When transport systems are deficient in terms of capacity or reliability, they can affect economic cost such as reduced or missed opportunities. Efficient transportation reduces costs, while inefficient transportation increases costs. Transport also carries an important social and environmental load, which cannot be neglected. The added

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value and employment effects of transport services usually extend beyond employment and added value generated by that activity; indirect effects are salient. For instance, transportation companies purchase a part of their inputs from local suppliers. The production of these inputs generates additional value-added and employment in the local economy. The suppliers in turn purchase goods and services from other local firms. There are further rounds of local re-spending which generate additional value-added and employment. Similarly, households that receive income from employment in transport activities spend some of their income on local goods and services. These purchases result in additional local jobs and added value. Some of the household income from these additional jobs is in turn spent on local goods and services, thereby creating further jobs and income for local households. As a result of these successive rounds of re-spending in the framework of local purchases, the overall impact on the economy exceeds the initial round of output, income and employment generated by passenger and freight transport activities. Economic impacts of transportation can be direct, indirect and related. A good and reliable transportation system can contribute and improve the economy of a particular country (Rodrigue and Notteboom, 2013).

Railways, which are one of the earliest forms of motorized transportation in the world, play a vital role in facilitating trade. An efficient railway system lowers the cost of transportation, integrates people and markets across the country, links backward regions with the mainstream economy (by opening them up to trade and investment); and thereby increases the overall productivity and global competitiveness of the economy. For a land locked country (for example, some of the European countries), railways are one of the most important modes of international trade and cross-border movement of persons. In developing countries such as India and China, railways are the main form of mass passenger transport at a price accessible to the majority of the population. Railways are also an essential component of the internodal supply chain (Martin, 2010).

Indian Railways operates more than 11,000 trains per day of which 7000 are the passenger trains. The railways have played a critical role in catalyzing the pace of economic development and continue to be an integral part of the growth engine of the country. Ministry of Indian Railways has proposed Vision 2020 for Indian Railways. The advancement in World-wide Railways systems have been gravitating towards heavy-haul in freight, high speed in passenger services and rail-based mass transit in urban transport. All the railways in the table except IR have either high-speed rail networks or are building these. Heavy- haul freight operations are also common in USA, China and Russia with trains carrying in excess of 20,000 tons each compared to 5000 tons in our case. Japan, Germany, France and Russia have very well-developed rail-based urban transit systems. Other countries like China, Japan and USA are putting a lot of efforts in developing High Speed Trains and other remedies of Railways. In order to meet technological developments a number of factors appear that have to be considered in order to propose some great development and enhancement. These factors are Vehicle

Dynamics, Study of vibrations, Fuel Efficiency, Improving Carrying Capacity, Frequency replacement and Upgradation of railway tracks. Developed countries are working on these factors and are using the solution to the above mentioned problems in order to get maximum output and improved efficiency of Railways in their country.

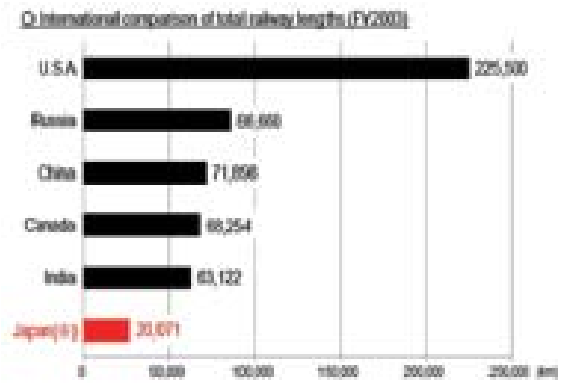
This paper endeavors to make an effective impression of Railways on the economy, productivity and employment. Also a comparison of recent technological developments in various developed countries like USA, China, Japan etc. with Indian Railways has been discussed.

DETAILED COMPARISON

According to a report presented by Christian Walmer (2010), the Railways have turned the World Economy. Railways have been deemed as a momentous domain of any country whether Developed or Developing. Report says that not only Railways have an impact on the economy, development and growth but also on political history (Vision, 2020).

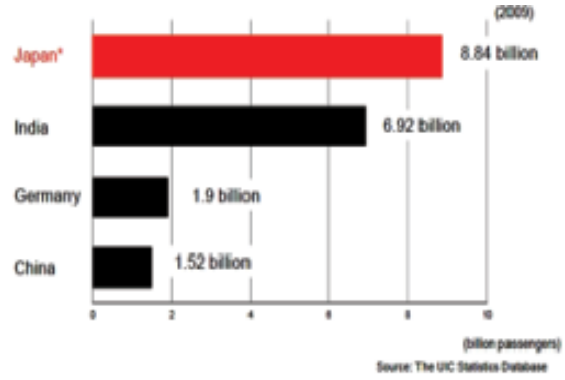
According to Indian Railways: Vision 2020 report (2012), Indian Railways lags behind the developed countries, such as USA, Germany, France and Japan, in terms of route- kms per square kms or route-kms per million population served which are broad indicators of the level of rail connectivity in the country. This can be redressed by expeditious expansion of the network to the unconnected regions. In terms of the productivity (traffic units/employees) also, IR is way behind many of the Railways (Martin B, 2010). Figures 1, 2 and 3 show an effective comparison of various countries including position of India on the basis of

Figure 1: Total Number of Kilometer Sofrailways



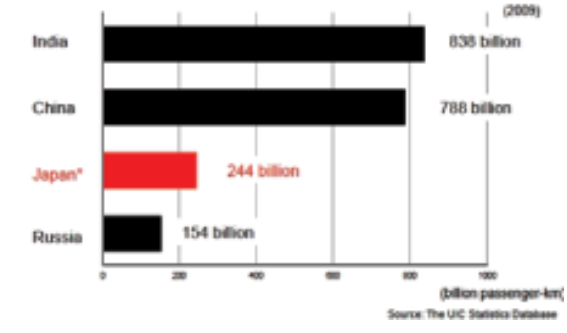
Source: http://railwayslocopilots.blogspot.in/2011/02/chinese-and-indian-railways comparison.html (2013)

Figure 2: Annual Number of Passengers



Source: http://railwayslocopilots.blogspot.in/2011/02/chinese-and-indian-railways comparison.html (2013)

Figure 3: Annual Number of Railway Passengers-Kilometer Carried



Source: http://railwayslocopilots.blogspot.in/2011/02/chinese-and-indian-railways comparison.html (2013)

Table 1: World Railway Systems Ranked by Activity

	Total Route km	Percent World Total	Passen-gers (000)	Percent World Total	Passen-ger km (000000)	Percent World Total	Cum % World Total	Freight Tons (000000)	Freight Ton-km (000000)	Staff	Traffic Den-sity (000000)	Lgthof hualFrt	Avg Pax Trip
India	63273	6.9	6524377	22.9	769956	30.9	30.9	727.7	480993	1394520	19.8	661	118
China	62200	6.8	1106510	3.9	583320	23.4	54.2	2309.2	1934612	1665588	40.5	838	527
EU 15	150224	16.4	6361900	22.4	326941	13.1	67.3	860.3	243648	779470	3.8	283	51
Japan	12217	1.3	8987944	31.6	309741	12.4	79.8	36.2	23166	161930	27.2	640	34
Russia	85245	9.3	1338723	4.7	172217	6.9	86.7	1281.3	1858100	1161900	23.8	1450	129
EU 10	61678	6.7	744400	2.6	45188	1.8	88.5	575.7	142816	412200	3	248	61
N.America	224490	24.5	34988	0.1	11910	0.5	88.9	2115.7	2996762	233368	13.4	1416	340
All Other	258311	28.1	3343434	11.8	275889	11.1	100	3454.4	1165056	1389965	5.6	337	83
World Total	917638	100	28442276	100	2495162	100		11360	8845153	7198941			

Freight Traffic Activity Rankings

	Total Route km	Passen-gers (000)	Passen-ger km (000000)	Freight Tons (000000)	Freight Ton-km (000000)	Percent World Total	Cum % World Total	Staff	Traffic Density (000000)	Lgthof hualFrt	Avg Pax Trip
N.America	224490	34988	11910	2115.7	2996762	33.9	33.9	233368	13.4	1416	340
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Source: Rodrigue and Notteboom (2013)

Railways network, number of passengers travelling per year and number of passengers-km carried, respectively. Table 1 presents the latest available data for listing the various countries Railways Details.

According to Figure 1, India lags behind by various countries like USA, Russia, China and even than Canada in the total expansion of Railways in Kms. Hence, India has been placed fifth in the world for total length of the Railways

in kms. It can be noticed from Figures 1 and 2 that Japan is transporting more number of passengers annually even though its railways kilometers are about one third of that of Indian Railways. This shows how the technological developments in Railways increase the number of travellers. Moreover, these data show that if more technology would be introduced in future in India, Railways can improve its ranking among the developed countries.

RECENT TECHNOLOGICAL DEVELOPMENTS IN WORLD WIDE RAILWAYS

Table 2 shows there cent developments in world wide railways. This development has not occurred not only in the area of Railways network extension but also it has covered the targets set to earn total revenue of any country. These developments include HST, Information Technology, Intermodal, Energy Efficiency, Signaling and Infrastructure.

HIGH SPEED TRAINS

Traditionally, a speed of 200 kph was considered as the threshold for 'high speed' which was achieved in Germany in tests as early as 1903. On 1st October 1964, the first high-speed train (HST) passenger service was launched on the Tokaido line between Tokyo and Osaka with trains running at speeds of 210 kph. This date marked the beginning of the modern HST era. Since then, the HST network has expanded, first in Japan, and later in other countries, and speeds have increased. Today, about 40 years later, the HST is in many respects a distinct mode of transport.

In 1955, the French set a new speed record of 331 kph and they also hold the current speed record for a 'steel wheel on steel rail' train of 515 kph achieved in 1990 by a French TGV

Table 2: Effect of Technology Advancement

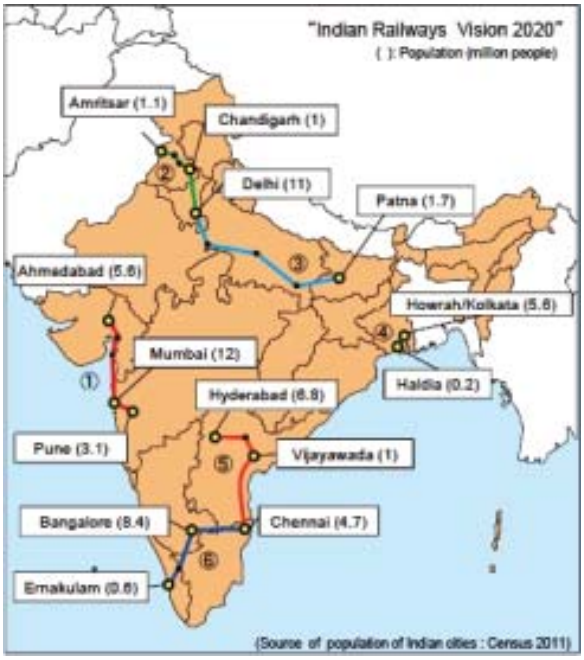
Technical Innovation	Freight	Passenger
High Speed Rail	Reduces freight/passenger congestion when new HSR tracks are built	Reduced weight, better aerodynamics: speed increase from 200 to 350 km/h.
Information Technology	Cargo management vastly improved. Costing systems permit better pricing. Digital Communication. Automatic equipment identification (AEI).	Efficient ticketing and reservations. Digital communications. Permits revenue maximization.
Inter modal	Rails fully participate in containerization trends.	Better connections to air and bus.
Energy Efficiency	US energy intensity reduced by half. AC traction on diesel locomotives.	AC traction, solid state controls. Shinhansen energy intensity cut by half.
Heavy Haul/ Better Infrast.	Higher axel loads, longer trains, larger locomotives, rail metallurgy. US operating cost/ tone-km reduced by 59$ 1978 to 2007	Continuous welded rail reduces maintenance and energy.
Signaling	Higher traffic density and improved safety accident rates down by 2/3.	Improved capacity and safety, especially with mixed freight and passenger traffic.

HST. However, the commercial speed that can be achieved is of greater importance. The maximum operating speed on the Tokaido line now stands at 270 kph, while on the TGV Atlantique line trains operate at a maximum speed of 300 kph. The following is the list of High Speed Trains Models (http://railwayslocopilots.blogspot.in/2011/02/chinese- and-indian-railways comparison. html (2013):

- The Shinkansen
- The TGV
- The Tilting HST
- The MAGLEVHST

In contrast to Japan, China Railways, which is planning to input $106 billion in railway infrastructure this year, allowing it to expand a high-speed railway network that with a combined length of 7,531 kilometers, is longer than the rest of the world's high-speed networks put together. China has begun to earn billions of dollars exporting high-speed bullet train technology to the United States and Europe. China latest fast train, the CRH380A, set a new record on December 3, 2010 by clocking 486.1 kilometers an hour in its Beijing to Shanghai trial. Whereas India's fastest train Rajdhani and Shatabdi are far behind this speed. China's Railways Ministry plans to nearly double the high-speed rail network for its sleek bullet trains to 13,000 kilometers by 2013. In the same year, India hopes only to start basic work on its first high-speed rail track between New Delhi and Mumbai. Figure 4 shows high Speed Railway Corridor in India. India might

Figure 4: High Speed Railways Corridors in India [3] Vision 2020



benefit from consulting China Railways for high-speed corridors, but this lack of a neighborly railway partner ship only high lights how China and India, both expected to dominate global economy by 2050, have divergent strategies for their vast rail networks, a key to economic growth (Louis, 2010)

As shown in the Figure 4, track represented by green color shows that the work of HST (High Speed Train) has been done and is ready to be implemented in near future. The extended sky blue color shows that after the successful implementation this track would be extended to Patna. The dark blue color shows that the work is in progress between Chennai and Ernakulam and red color track shows that planning for HST track (High Speed Train) from Chennai to Hyderabad and Ahmedabad to Mumbai has been done.

KEY CHALLENGES IN AMBITIOUS GROWTH IN INDIAN RAILWAYS

In order to achieve ambitious growth and to meet the competitive factors, Indian Railways has faced several challenges. The first requisite challenge is Capacity Creation. Other challenges are Safety, Reliability, Project Execution, Improving Carrying Capacity, Technology Upgradation, Connectivity Issues etc. Apart from these challenges Supply Constraints, Upgradation of Quality of Services, Slow Moving Passenger Services and most important challenge is Speed. Because in order to stand in competition with other countries High Speed Trains evolution and their proper execution is the key challenge for Indian Railways.

CONCLUSION

A detailed comparison of World wide Railways has been presented in this paper. India has gained first position as far as travelled passengers per km is concerned but is far behind in the field of latest technology used by other countries. Vision 2020 proposed by Ministry of Railways, India focuses only on the adoption of technology and HST, but we still lack behind in the Research and Development in Infrastructure. Thus we are dealing with other countries and importing their products. Vision 2020 has proposed a good methodology for implementing and expanding the Railways Network.

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