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Transport Infrastructure in India: Developments, Challenges and Lessons from Japan

Pravakar Sahoo

日本貿易振興機構 アジア経済研究所

INSTITUTE OF DEVELOPING ECONOMIES, JAPAN EXTERNAL TRADE ORGANIZATION

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India is one of the fastest growing countries in the world after China and needs to maintain its growth momentum in a sustainable manner to improve its overall standard of living and reduce poverty. Investment climate surveys like doing business in India repeatedly show that the limited and poor quality of infrastructure facilities act as a major impediment to business growth in India. In this context, the present study analyses the current status and issues related to India's transport infrastructure, mainly roads, railways, airports and ports. Further, the study looks at development of transport infrastructure in Japan and draws useful policy lessons for India.

The study finds that the major issues in infrastructure sector in India include financing of infrastructure, land acquisition and environmental clearances, private sector participation, stable policy framework, institutional set up, tariff policy etc. Given the limited resources of the government to finance the expected infrastructure investment, the environment for infrastructure development through both public and private investments needs to improve. This is possible only through providing a more stable and secure policy framework, protection of property rights and appropriate pricing and subsidy policies. Further, government may give guarantees and other forms of support to ensure confidence and viability for infrastructure projects to attract private investment. Government can also attract foreign investors in infrastructure sector by allowing foreign equity upto 100 % in almost all infrastructure sectors. To tackle the problem of infrastructure financing, the study proposes different ways to provide financing options to meet the huge infrastructure investment.

The laws of Land acquisition need to be revisited to accommodate proper rehabilitation and compensation packages. The decentralized negotiation between the required bodies and land owners is the best option. Proper institutional set up for each transport infrastructure sector is necessary but efforts are needed for a coordinated approach among roads, railways, airports and ports so that interlinking of infrastructure services is effective and efficient. Since most of the infrastructure services are built by private operators through contracts, the design of the projects, estimation of cost and time etc ought to be done in a scientific manner to avoid delays and cost over runs. Overall, the Japanese experience of transport infrastructure development has good lessons for a country like India, particularly in areas of technology and efficiency, tariff policy, land acquisition, public-private coordination etc.. Though both the countries are at different levels of development, learning from Japan and taking appropriate policy measures for developing transport infrastructure in India would be useful.

Introduction

India has become one of the fastest growing countries in the world after China and it needs to maintain the growth momentum in a sustainable manner to improve the overall standard of living and reduce poverty. Sustaining economic growth in India depends on developing quality infrastructure network all over the country. High transaction costs arising from inadequate and inefficient infrastructure can prevent the economy maintaining the high growth rate and realizing its full growth potential in the medium and long-term.

The policy makers[1] in India have reiterated time and again that improving investment climate in the country would drive growth by creating world class business environment. The trade and transaction cost is very crucial for the investors in a competitive and globalised world economy and many studies have found that lack of abundant and quality infrastructure is one of the major reasons for high transaction cost affecting high sustainable growth rates. Infrastructure development, both economic and social, is one of the major determinants of economic growth, particularly in developing countries like India.

The role of infrastructure development in economic growth has been well recognized in literature (Aschauer, 1989; Easterly and Rebelo, 1993; World Bank, 1994; Röller and Waverman, 2001; Calderon and Serven, 2003; Canning and Pedroni, 2004; Sahoo and Dash 2008; Sahoo, and Dash, 2009). Further, investment on physical and social infrastructure positively affects poor directly and indirectly in multiple ways (World Bank, 1994; Jones, 2004 and Estache, 2006). For example, Hall and Jones (1999) argue that international differences in levels of output-per-worker are determined by differences in human capital, physical and social infrastructure. Infrastructure development is one of the major factors contributing to overall economic development in many ways such as (i) direct investment on infrastructure creates production facilities and stimulates economic activities; (ii) it reduces transaction costs and trade costs improving competitiveness and (iii) it provides employment opportunities and physical and social infrastructure to poor. In contrast, lack of infrastructure creates bottlenecks for sustainable growth and poverty reduction. Infrastructure investment generally has two types of effects. First, it has demand creation effect in other economic activities which is flow impact. Second, it has stock impact which makes better availability of services and improves productivity of private sector and the economy as a whole.

In recent years Indian economy has been showing signs of overheating because of basic infrastructure constraints, both physical and human. Clearly, there is a wide gap

[1] Economic surveys and also Budget documents of government of India in recent years have continued to focus on infrastructure development in India.

between the potential demand for infrastructure for high growth and the available supply[2] (IIR, 2006). In this context, government is also planning for huge investment in infrastructure along with private investors.

Investment climate surveys like doing business in India repeatedly show that the limited and poor quality of infrastructure facilities act as a major impediment to business growth in India. In this backdrop, there have been concerted efforts in recent years to improve both physical and social infrastructure facilities in India. The People's Republic of China (PRC) and East/Southeast Asian countries have made rapid improvement in their macroeconomic situations, investment, exports and employment over two and half decades because of huge investment in physical and social infrastructure (Straub, 2008). Indian policy makers realize that any credible efforts for sustainable economic growth in India must involve substantial upgradation of infrastructure investment and provision of quality infrastructure facilities.

In this context, the present study looks at the development of transport infrastructure in India. Transport infrastructure like roads, railways, ports and airports are used as intermediate goods by the private sector and it would be difficult for a market economy led by private sector to grow without it. First, the study analyses the current status and presents a comparative view of India's transport infrastructure compared to other developing countries. Second, the study looks at the problems of transport infrastructure development in India such as financing, private sector cooperation, land acquisition and other policy issues. Finally, the study reports the development of Japan's transport infrastructure development and lessons for India. The concluding section presents the policy measures for infrastructure development in India.

[2] According to the India infrastructure Report (IIR),2006, currently around 5 percent of the GDP is invested in the infrastructure sector which needs to be increased to 7 percent with immediate effect and further to 10 percent by 2010 to meet the infrastructure demand.

1. Macroeconomic Performance and Infrastructure Development in India

Before examining the status of transport infrastructure development in India, it is appropriate to review the macroeconomic performance and infrastructure facilities over a period of time. India has been consistently implementing economic reforms emphasizing on market economy and integrating with the rest of the world. As a result, India has experienced higher economic growth and better macroeconomic performance during the nineties (see Table-1[3]). The higher growth rate in India since 1991 was accompanied by substantial growth in service sector and marginal improvement in industrial sectors. Per capita income growth also improved substantially in India during post reforms period. Other

Table-1: Major Macroeconomic Indicators of India

Major Macro Indicators	80-90	91-00	2002	2003	2004	2005	2006	2007	2008
GDP	5.7	6.2	3.73	8.4	8.33	9.4	9.7	9.1	6.1
GDP per capita	3.49	4.39	2.12	6.78	6.78	7.9	8.2	7.6	4.7
Agriculture	3.12	3.05	-7.22	10.00	-0.04	5.9	4.0	4.9	1.6
Industry	6.89	6.65	7.06	7.4	10.3	10.2	11.0	8.1	3.9
Manufacturing	7.44	7.48	6.81	6.63	8.65	9.09	11.8	8.2	2.4
Services	6.87	8.31	7.37	8.41	9.1	10.6	11.2	10.9	9.7
Exports of goods and services	4.92	11.05	21.89	5.8	28.1	14.8	18.9	7.5	12.8
Imports of goods and services	6.07	12.62	10.30	16.8	16.0	45.6	24.5	8.6	17.9
Gross domestic capital formation	6.21	6.79	12.7	22.4	20.0	16.46	13.9	15.6	10.7
	Ratio to GDP								
	1980	1990	2001	2002	2003	2004	2005	2006	2007	2008
Gross capital formation	18.68	24.06	24.45	25.57	26.8	31.6	34.8	36.4	38.7	39.7
Gross domestic savings	15.51	22.64	23.82	25.19	25.5	29.8	32.0	33.3	35.2	34.3
Current account balance	-0.98	-2.21	0.29	1.39	1.5	0.1	-1.3	-1.0	-1.0	-3.1
FDI	0.04	0.07	1.14	1.10	0.76	0.8	0.9	2.2	2.1	3.6

Source: World Development Indicators 2010 CD-ROM, World Bank.

[3] All the tables mentioned in the Text are given in Appendix at the end.

important macro indicators like gross domestic savings, gross domestic capital formation and indicators on the external sector such as the current account balance, foreign exchange reserves and balance of payments also have improved during the post-reform period[4]. Overall, there has also been a positive movement in most of the macro indicators, except the fiscal deficit, both on the domestic and external sector front. Indeed, India has been the fastest growing country in the world after China in recent years with a average growth of 9 % in between 2003 to 2007. However, the global financial crisis affected India's growth rate marginally and growth rate slowed down little to 6.5% for the year 2008-09. The year 2009-10 witnessed the Indian economy bouncing back to the high growth trajectory of 9%.

However, for India to maintain the growth momentum, it is essential to strengthen transportation infrastructure facilities such as rail, roads, port and airport connecting the domestic economy effectively and improving overall competitiveness, thereby lowering trade and transaction cost. Table-2 reports the overall standing of India in physical infrastructure such as transport, telecommunication, information and energy infrastructure indicators for India *vis-à-vis* other developing countries. India lags behind other developing countries except other South Asian countries such as Pakistan, Sri Lanka and Bangladesh, in

Table-2:Infrastructure Facilities in India *vis-a-vis* Other Developing Countries

	Electric power consum. (kwh per capita)	Energy use (kg of oil equi. per capita)	Paved Roads (% of Total Roads)	Total Rail route _000 sq. k.m.)	Air freight trans.(Milli. for K.M.)	Air pass. transport (_000 Pop.)	Total Telphones (Per' 000 persons)
Countries	2005	2005	2005	2005	2006	2006	2006
India	480.5	490.9	62.6	21.5	842.6	40.3	186
Bangladesh	135.5	157.8	9.5	20.22	190.8	17.2	129
Sri lanka	377.7	476.6	81	14.5	325.4	31.9	366
Pakistan	456.22	490.91	64.7	10.1	426.7	57.14	249
Nepal	69.53	338.45	56.8	0.41	7.21	23.23	592
China	1780.52	1316.3	81.6	6.84	7692	112.41	631.37
Korea	7778.6	4426.5	76.82	33.69	7751	784.4	1385
Singapore	8358.25	6932.5	100.00	----	7981.8	4578.4	1481.4
Indonesia	509.31	813.8	59.00	---	469.2	143.10	352.5
Malayasia	3262.4	2388.72	78.9	5.07	2597.22	713.98	911
Thailand	1988.1	1587.9	99.17	7.89	2106.5	363.82	754

Source: World Development Indicators, Various Years

[4] After 1991

almost all indicators. Most of the East and South East Asian countries, particularly China, Korea, Singapore, Malayasia and Thailand are far ahead of India in almost all the major physical infrastructure indicators. Similarly, infrastructure and business indicators of India *vis-à-vis* other East and South East Asia countries are presented in

Table-3. Singapore has a score of 6.6 out of 7, indicating a high level of infrastructure, followed by Republic of Korea with a score of 5.6. PRC has a score of 3.6, which is higher than most of its counterparts in the region but is not as high as Singapore or Republic of Korea. Though India has managed to receive a score of 3.1, there are huge differences in terms of the crucial infrastructure sectors such as port and airport infrastructure facilities.

Similarly, India lags behind in providing basic infrastructural facilities compared to many other countries in South Asia and East Asia (see Table-4). More importantly, the improvement in all these indicators over time for India is far from satisfactory compared to other countries. Table-5 gives comparative picture of trade and transaction cost and also

Table-3: Infrastructure and Business Indictors of India, South, East and Southeast Asia (2007)

	Overall Infrastructure Quality	Rail Road Infrastructure Development	Port Infrastructure Development	Air Transport Infrastructure Development	Time Required To Start a Business*	Hiring and Firing Practices
India	3.1	4.5	3.5	4.8	35	3.1
Bangladesh	2.2	2.3	2.4	3	37	4.5
Sri Lanka	3.3	2.8	4.1	4.5	50	3.3
Pakistan	3.4	3.2	3.7	4.2	24	4.7
Nepal	1.9	1.3	3	3.4	31	3.1
PRC	3.6	3.9	4	4.1	35	4.3
Republic of Korea	5.6	5.2	5.5	5.7	22	4.7
Singapore	6.6	5.6	6.8	6.9	6	5.8
Malaysia	5.7	5.1	5.7	6	30	4.3
Thailand	5.1	3.5	4.7	5.7	33	4.2
Philippines	2.6	1.7	2.8	4.1	48	3.5

Source: Global Competitiveness Report 2008-09

Note: Overall Infrastructure Quality is (1= poorly developed and inefficient and 7= among the best in the world). The same applies to rail, port and air transport infrastructure.
Hiring and Firing Practices (1= impeded by regulations, 7= flexibility determined by employers)
* No of days required to register a business

Table-4: Summary of Infrastructure Access Indicators in India *vis-à-vis* Other Developing Countries, 2005

	Electricity	Water	Sanitation	Teledensity	Road Density (by population)	Road Density (by area)
Afghanistan	5	13	8	12		32
Bangladesh	25	75	48	16	1.6	1594
Cambodia	10	34	16	38	1	70
PRC	97	77	44	424	1.4	189
India	40	86	30	71	3.2	1115
Indonesia	80	78	52	127	1.7	203
Myanmar	5	80	73	8		
Nepal	15	84	27	18	0.6	107
Pakistan	55	90	54	44	1.8	334
Sri Lanka	75	78	91	122		
Viet Nam	60	73	41	88	1.2	287

Source: Jones 2006.

Note: Electricity (% of population access to network), Water (% of population access to improved sources), Sanitation (% of population access to improved sanitation), Teledensity (fixed line and mobile subscribers per 1,000 people), Roads (% of rural population living within 2 km of an all-season road).

Table-5: Doing Business 2009 Rank

	India	China
The costs imports and exports		
Cost to export (US$ per container)	945	460
Cost to import (US$ per container)	960	545
Difficulty of enforcing commercial contracts		
Procedures (number)	46	34
Duration (days)	1,420	406
Cost (% of claim)	39.6	11.1

Source: Doing Business, World Bank, 2009.

Note:Doing Business 2008 rankings have been recalculated to reflect changes to the methodology and the addition of three new countries.

difficulty of enforcing commercial contracts between two competing economies, India and China. The cost of imports and exports is almost double than China reflecting low quality and quantity of infrastructure availability leading high trade cost in India. Table-6 reflects the differences between India and China in transport infrastructure where China is much ahead of India in almost all indicators in 2008.

Infrastructure demands strong planning, coordination, decentralization, private participation and commercialization of service providers rather than a top-down approach which is generally followed in India. Some of the major issues for infrastructure development in India include public-private partnerships; budgetary allocation; infrastructure financing; land accusation; centre-state coordination and fiscal incentives which are discussed in the later part of the paper.

Table-6: Infrastructure Development in India and China 2008

Sector	Units	China	India
RAILWAYS			
Freight Traffic	Million Tonnes	3142	728
Freight Net Tonne Km	Billion	2380	475
Passengers Traffic	Million	1357	6352
Passenger km	Billion	722	692
SHIPPING			
Cargo Traffic	Million Tonnes	2812	636
CIVIL AVIATION			
Passenger Traffic	Lakhs	1858	1699
Freight Traffic	Thousand Tonnes	4018	2387
ROADS			
Total Road Network	Km	177400	3314000

Source: India- Plan Documents, Planning Commission of India

China Statistical Yearbook 2008, National Bureau of Statistics of China

2. Role of Infrastructure: A Brief Review

Infrastructure development contributes to output growth by stimulating economic activity, productivity and enhancing the quality of life (World Bank, 1994). The empirical research on role of infrastructure in economic growth started after the seminal work by Aschauer (1989; 1993) where he found that the high output elasticity of infrastructure spending which ranges from 0.38 to 0.56. Further, he suggests that lack of infrastructure spending leads to slow down of productivity growth in United States (US). Supporting Aschauer, Munnell (1990a; 1990b; 1992) and Garcia-Mila and McGuire (1992) find high output elasticity, though comparatively lower than Aschauer, of public investment on infrastructure. Further, a series of country level studies support Aschauer's finding, though with lower elasticity, (Gramlich, 1994; Holtz-Eakin and Schwartz, 1995; and Garcia-Milà *et al*. 1996), that infrastructure has positive and significant impact on output growth. Some of the important country studies which found positive impact of infrastructure development on economic growth are Uchimura and Gao (1993) for Korea, China and Taiwan; Bregman and Marom (1993) for Israel; Shah (1992) for Mexico; and Wylie (1996) for Canada, Sahoo and Dash (2009 and 2010) for India and South Asia; and Sahoo *et al* (2010) for China. A summary of output elasticity of infrastructure investment is presented in Table-7.

Pereira (2000), use a multivariate time-series framework for US over the period 1956-97, find that public investment on different types of physical infrastructure is a powerful means of promoting economic growth as it crowds in private investment in different sectors and increases the private output. Fedderke, Perkins and Luiz (2006) use endogenous growth theory and show that investment in infrastructure leads to economic growth in South Africa directly and indirectly (the latter by raising the marginal productivity of capital). Though there is weak evidence of feedback from output to infrastructure; the finding of an infrastructure growth impact is robust. Further, an industry level panel study on South African manufacturing sectors by Fedderke and Bogetic (2009) reveal a significant positive impact of infrastructure on productivity growth even after controlling the endogeneity effect of infrastructure measures.

Table-7: Estimates of Output Elasticity of Infrastructure Indicators

Country/ Region	Author	Output elasticity of Infrastructure	Infrastructure Measure
USA	Aschauer (1989)	0.39	Public Capital
USA	Munnell (1990)	0.34	Public Capital
Mexico	Shah (1992)	0.05	Transport, Power and communication
Taiwan	Uchimura and Gao (1993)	0.24	Transport, Water and communication
Korea	Uchimura and Gao (1993)	0.19	Transport, Water and communication
DCs	Easterly and Rabelo (1993)	0.16	Transport and communication
USA	Gracia Milla *et al.* (1996)	0	Public Capital
LDCs	Devarajan *et al.* (1996)	Negative	Transport and communication
Canada	Wylie (1996)	0.31	Public Capital
Cross Country	Canning (1999)	-0.23 to 0.22	Road, Telephone, and Electricity
USA	Duggall *et al.* (1999)	0.27	Public Capital
Cross country	Calderón & Servén (2003)	0.16	transportation, communication, general purpose
Cross country	Esfahani and Ramíres (2003)	0.12	power and Telephones
OECD countries	Kamps (2004a)	0.22	Public Capital
South Africa	Fedderke, Perkins and Luiz (2006)	-0.06 to 0.20	Physical capital stock
India	Sahoo and Dash (2009)	0.4 to 0.5	Physical capital stock
South Asia	Sahoo and Dash (2010)	0.26 to 0.3	Physical capital stock
China	Sahoo, Dash and Nataraj (2010)	0.27 to 0.35	Physical capital stock

Source: Authors compilation.

Similarly, there have been some cross-country studies on impact of infrastructure on economic growth in developing countries which show positive and significant relationship between them (Canning and Fay, 1993; Easterly and Rebelo, 1993; Roller and Waverman, 2001; Calderón and Servén, 2003; Canning and Pedroni, 2004; Sahoo, 2006; Sahoo and Dash; 2009; 2010). Easterly and Rebelo (1993) find high output elasticity of infrastructure investment, particularly investment on transport and communication for 100 countries. The study by Canning and Fay (1993) suggests normal to high rates of return on infrastructure investment for developed countries and moderate returns for underdeveloped countries. Further, Canning, Fay and Perotti (1994) find a positive effect of telephones on economic growth, while Sanchez-Robles (1998) find a positive impact of road length and electricity generating capacity in explaining subsequent economic growth.

More recent empirical literature, mostly in a cross-country panel data context, has confirmed the significant output contribution of infrastructure development. Taking care of reverse causality problem by using structural model, Roller and Waverman (2001) find that output elasticity of 0.05 for main telephone lines per capita for OECD countries. Esfahani and Ramírez (2003) develop a structural growth and use simultaneous-equations system in their cross country study to distinguish the reciprocal effects of infrastructure and the rest of the economy on economic growth. The results reveal that the contribution of infrastructure services to GDP is substantial and, in general, exceeds the cost of providing these services.

Calderón and Servén (2003), using GMM estimates of a Cobb-Douglas production technology for a panel of 101 countries for the period 1960-97, find positive and significant output contributions of three types of infrastructure assets – telecommunications, transport and power for Latin America Countries. Further, the study suggests that the per-capita output gap between Latin America and East Asia over the 1980s and 1990s can be traced to the slowdown in Latin America's infrastructure accumulation in those years. Canning and Pedroni (2004) investigate the long run consequences of infrastructure provision on per capita income in a panel of countries over the period 1950-1992. Though they find the positive contribution of infrastructure facilities till an equilibrium level, infrastructure provision above growth maximizing level leads to diversion of resources from other productive uses and reduces long run income.

There are also studies examining the relationship between infrastructure development and output growth in the Indian context. Barnes and Binswanger (1986) suggest that electricity and other rural infrastructure have a better more direct impact on agricultural productivity and on private investment in India such as electric pumps and other electrical equipments. Binswanger *et al.* (1989) show major effect of road infrastructure in rural India leading to reduction in transportation costs and increase in productivity. Elhance *et al.* (1988) using both physical and social infrastructure have shown that reductions in production costs in manufacturing mainly result from infrastructure investment in India. Dutt and Ravallion (1998) prove that Indian States starting with better infrastructure and human resources, among others, have witnessed significantly higher growth rates and poverty reduction. Sahoo and Saxena (1999) using production function approach have concluded that transport, electricity, gas and water supply, and communication facilities have a significant positive effect on economic growth with increasing returns to scale. Ghosh and De (2003) using physical infrastructure facilities across the South Asian countries over last two decades have shown that differential endowments in physical infrastructure were responsible for rising regional disparity in South Asia. Sahoo (2006) provides empirical evidence about positive association between infrastructure development and foreign direct investment and also economic growth. Sahoo and Dash (2008) examine

the output elasticity of infrastructure for four South Asian countries viz., India, Pakistan, Bangladesh and Sri Lanka for the period 1980-2005. In this context they develop an index of infrastructure stocks and investigate the impact of infrastructure on output. The study finds a long-run equilibrium relationship between output and infrastructure and infrastructure development contributes significantly to output growth in South Asia. Focusing on physical infrastructure, public and private investment in infrastructure, Sahoo and Dash (2009) find that infrastructure and also development in India has a significant positive contribution towards growth than both private and public investments. More significantly, Haldar (2009) examine the relevance of the three distinct types of the growth models, namely, physical capital accumulation-led growth, export-led growth and Lucas-type human capital accumulation-led growth in India taking a long-time series data from 1950–51 to 2003–04.

However, the exact economic relationship between infrastructure and economic growth and out put elasticity of infrastructure has been debatable. An interesting study by Devarajan *et al*. (1996) finds a negative relationship between infrastructure expenditure and economic growth for a sample of 43 developing countries. They argue that this result may be due to the fact that excessive amounts of transportation and communication expenditures in those countries make such expenditures unproductive. Another cross country study by Sanchez-Robles (1998) using the public investment share of GDP as regressor report a negative growth impact of infrastructure expenditure in a sample of 76 countries. Similarly, Prichett (1996) suggested that public investment in developing countries is often used for unproductive projects. As a consequence, the share of public investment in GDP can be a poor measure of the actual increase in economically productive public capital. Therefore, the impact of infrastructure on growth can vary from negligible to negative (Devarajan *et al*., 1996; Prichett, 1996; Sanchez-Robles, 1998). However, majority of the previous findings suggest that effect of public capital or infrastructure investment is growth-enhancing in general. However, the impact is much lower than found by Aschauer (1989) and Munnell (1990), which is generally considered to be the starting point of this line of research. Further, the effect of public investment differs across countries, regions, and sectors depending upon quantity and quality of the capital stock and infrastructure development.

3. Transport Infrastructure in India: A comparative Picture

In this section, a comparative view of India‘s transport infrastructure *vis-à-vis* other countries has been presented to do an international benchmarking. Transport Infrastructure in India has a share of 6.4 per cent in GDP and its demand has been accelerating over the years.

3.1 Roads

An important component of transport infrastructure is road transport. The Table-8 presents a comparative picture on road Infrastructure in India *vis-à-vis* other countries. The road length per square kilometer of land area is known as density of roads. It is evident from the table that road density has been increasing over the years in India. For instance road density in India stood at 714 per sq km of land area in 1991, increased to 1008 per sq km during 1991 and stood at 1171 per sq. km in 2007. Infact, among the BRIC economies, road density in India is quite high. In Asia, only two countries namely Singapore and Japan have a better road density than India. However, most highways in India are narrow and congested with poor surface quality, and 40 percent of India‘s villages do not have access to all-weather roads.

Another important element of roads is the paved roads as a percentage of total roads. Paved roads are those surfaced with crushed stone (macadam) and hydrocarbon binder or bituminized agents, with concrete, or with cobblestones, as a percentage of all the country's roads, measured in length. Table-8 also shows that paved roads as a percentage of total roads in India have remained almost the same at an average of about 47 per cent. However, in several other countries like Russia, Korea, Malaysia and Japan paved, roads as a percentage of the total roads are quite high as compared to India. In Singapore, paved roads as a percentage of total roads are 100 per cent followed by Malaysia and Russia where the percentage is more than 80 per cent. Further, goods transported by road are the volume of goods transported by road vehicles, measured in millions of metric tons times kilometers traveled. Goods transported are the maximum in China followed by India. But over the years, goods transported using road network is growing much faster in India along with

China. This fast increase in freight traffic in India creates much pressure on the existing roads and thereby there is a demand for new roads. Another important parameter highlighting the importance of road infrastructure is the energy consumption of roadways. Road sector energy consumption is the total energy used in the road sector including petroleum products, natural gas, electricity, and combustible renewable and waste. This percentage is high for countries like Malaysia, Korea and Japan and low for countries like China and India (4.8 per cent and 6.2 per cent) respectively (See Table-8).

Table-8: Roads Transport in India: A Comparative Picture

	Road density (km of road per sq. km road of land area)			Paved Road (% total)			Goods Transported (million ton-km)			Energy Consumption (% total energy consumption*)		
	1991	2001	2007	1991	2001	2007	1991	2001	2008	1991	2001	2008
India	714	1008	1171	47.3	47.7	48.3	267000	615789	978234	7	6.1	6.2
China	123	151	360	34.2	40.2	49.6	321456	620050	1256788	2	4.4	4.8
Brazil	196	203	282	8.6	5.5	5.6	-	-	975420	21.5	22.9	22.7
Russia	54	32.80	35.3	75.8	NA	80.9	-	23300	199000	6.1	5.9	6.1
Malaysia	274	218	278	71.3	77.9	81.3	-	-	-	19.5	21.7	18.5
Korea	599	607	1020	76.4	76.7	77.6	341	565	12545	12.2	12.2	12.6
Singapore	4136	4453	4710	97.1	100	100	-	-	-	12.6	10	9
Japan	3060	3214	3166	70.1	77.1	79.3	283776	313072	346420	15.1	15.5	14.2

Source: WDI, Various Years

Notes :* % total energy used in the road sector to total energy consumption in the country.

There are several other indicators which are used to analyse the importance and development of road infrastructure in the country. These include road length, passengers carried i.e. million passenger kilometers, vehicle per km of road, passenger cars per 1000 people etc. The total road length in India (in 000 kms) is comparable and almost on par with China and infact, better than countries like Japan and Singapore. Though the road length of India is one of the highest in the world, as mentioned before, the quality of roads is really poor compared with other developing and developed countries. But when it comes to

Table-9:Roads Transport in India: A Comparative Picture

	Total Road Length (000'km)			Passenger Carried (million passenger-km)			Vehicle (per km of road)		Passenger Car (per 1000 people)		Per Capita Consumption (kt of Oil equivalent)		
	1991	2000	2007	1991	2001	2008	2002	2007	2002	2007	1991	2001	2008
India	2350	3316	3317	767700	2075700	725100	3	6.8	7.0	15	0	0	0
China	1230	1402	3583	-	720710	1150677	9	11.9	8	22.5	0	0	0
Brazil	1661	1724	-	-	-	78000	18	22	128	158.1	0.2	0.2	0.3
Russia	892	532	-	-	-	-	28.88	104	156	206	0.3	0.3	0.3
Malaysia	56	66	-	-		-	70	73.8	211	-	0.3	0.5	0.5
Korea	58	86	102	-	-	97854	145	160.6	205	248	0.2	0.5	0.6
Singapore	2	3	3.2	-	-	-	178	207	97	113	0.5	0.5	0.5
Japan	1115	1166	1196	869123	954294	905910	63	63.5	428	325	0.5	0.6	0.6

Source: WDI, Various Years

passengers per kilometer, the figure is quite high. Poor quality of road network and high passenger traffic along with high freight traffic shows the conditions of the Indian roads and the need for growing demand for more quality and quantity of road infrastructure. Given the present conditions, the fast growing vehicles (per K.M.) is going to create more congestion in coming years. See Table-9 for details. Overall, in almost all the other indicators, India has a long way to go as compared to China and other East and South East Asian countries.

3.2 Railways

Rail density in India is the third highest in Asia after Japan and South Korea. Railway density in China stood at 6.51 per cent in 2008 as compared to India's 21.20 per cent. The railways have been recording consistent growth rates in the freight and passenger traffic. Goods transported by Indian railways are the second highest in Asia after China. Similarly, number of passengers carried by Indian railways is also on par with China indicating that railways are an important source of transportation to the majority of populations (See Table-10). Overall, the growth of passenger and freight traffic in case of India between 1991 to 2008 is substantial while rail density is at same level. Over the years growing demand has led to introduction of hundreds of new trains on the same tracks with almost same supporting logistics. This has resulted in a compromise on safety, hygiene and also overall efficiency of Indian railways.

Table-10:Comparative Transport Infrastructure Indicators: Railways

	Railway Density (km of road per sq. km road of land area)			Goods Transported (million ton-km)			Passenger Carried (million passenger-km)		
	1991	2001	2008	1991	2001	2008	1991	2001	2008
India	21.01	21.19	21.29	250238	312371	521371	314564	457022	769956
China	5.72	6.33	6.51	1094807	1424980	2511803	282484	463660	772834
Brazil	0.58	1.47	3.48	6346	15647	276700	2521	-	-
Russia	5.24	5.24	5.13	2325881	1433600	2400000	255000	158000	175800
Malaysia	5.07	4.97	5.067	1262	1531	1350	1849	1181	2913
Korea	31.8	32.22	34.88	14369	10492	11566	31454	29288	32025
Japan	55.56	55.36	55.00	26791	21950	23032	247031	241133	255865

Source: WDI, Various Years

3.3 Airways

Aviation Industry in India is one of the fastest growing aviation industries in the world. With the liberalization of the Indian aviation sector, aviation industry in India has undergone a rapid transformation but much more is desired in this important mode of transport infrastructure. Freight traffic of airways in India increased to 1233 million ton kms in 2008 as compared to only 493 million ton kms in 1991. However, countries like China, Brazil, Malaysia, Russia, Japan, Korea and Singapore have a better freight million ton-kms in comparison with India. Similarly, the number of passenger carried by airways in India was 49.9 million in 2008 *vis-à-vis* 191 million in China, 58.8 million in Brazil and 97.02 million in Japan. This also shows that railways and road transport in the country are more popular for a majority of Indian population who belong to poor and lower middle class where as growing middle income population has shifted to using air transport which has created both demand and supply of air services in the country. India is also ranked way below other countries, particularly China, Singapore and Japan in registered carrier departures world wide (See Table-11 for details).

Table-11:Comparative Transport Infrastructure Indicators: Airports

	Freight (million ton-km)			Passenger Carried (million)			Registered Carrier departures world-wide*		
	1991	2001	2008	1991	2001	2008	1991	2001	2008
India	493	515	1233	10.7	16.86	49.9	117500	206690	592292
China	1009	4232	11386	19.52	72.66	191	190300	840911	1853083
Brazil	1143	1467	1807	19.15	34.28	58.8	457700	654106	647753
Russia	890	897	2399	128.8	20.30	38		329925	522577
Malaysia	763	1775	2445	11.83	16.1	22..42	145800	169840	176549
Korea	3323	6827	8726	16.90	33.71	36.1	120100	228442	250260
Singapore	2179	5774	7981	0.8	16.3		35000	72431	823465
Japan	5185	7614	8173	7.8	107.8	97.02	495800	640328	695655

Source: WDI, Various Years.

Note: * denotes domestic takeoffs and takeoffs abroad of air carriers register in the country.

3.4 Ports

India has an extensive coastline of 7517 km, excluding the Andaman & Nicobar Islands. Indian ports handle around 95% of the total volume of country‘s external trade and about 70 per cent in terms of value. India has 12 major ports and 200 non major ports (minor and intermediate ports) spread across nine (coastal) maritime states. Total cargo volume in million tones handled by Indian ports increased from 156 million tones in 1991 to nearly 834 million tones in 2008. Infact, the cargo handled by Indian ports is the second highest in Asia after China. The growth of cargo volume over the years is one of highest among the countries and there is growing pressure on the existing port facilities resulting in high pre-berthing and shipment turnaround time. Similarly container traffic has also increased considerably since 1991 to reach 6623 TEU‘s (twenty foot equivalent units) in 2008. However, port infrastructure in India is not upto international standards and India is ranked at a poor 105 in a set of countries handling port traffic (See Table-12 for details).

The modernization of Indian ports needs huge resources and time bound efficient management.

According to the Global competitiveness Index published by the World Economic Forum, India is ranked 49 on the quality assessment of a range of indicators (see Table-13). Specifically, even with regard to infrastructure, India is ranked 76 with a score of 3.46 indicating that there is immense scope for further development of infrastructure facilities in India including transport infrastructure to catch up with other economies.

Table-12: Comparative Transport Infrastructure Indicators: Ports

	Total Cargo Volume (million ton)			Container Traffic (1000 TEU*)			Quality of port Infrastructure (1 =underdeveloped and 7=developed)			
	1991	2000	2008	1991	2004	2008	2007	Rank	2009	rank
India	156	281	834	367	4332	6623	3.49	80	3.47	105
China	1530	2212	6400	1506	52741	115061	3.98	66	4.28	6.5
Brazil	383	435	735	1345	5057	6879	2.63	116	2.65	144
Russia		180	454		1369	3303	3.69	72	3.55	100
Malaysia	112	324	510	1074	11510	15742	5.73	13	5.52	18
Korea	278	527	786	2571	14363	17774	5.51	20	5.10	39
Singapore	273	313	515	6354	21329	29918	6.83	1	6.78	2
Japan	331	317	378	8782	16436	18795	5.5	17	5.17	37

Source: WDI, Various Years

Note: * Port container traffic measures the flow of containers from land to sea transport modes and vice versa, in twenty-foot equivalent units (TEUs), a standard-size container.

Table-13: Ranking and Score of Global Competitiveness Index and Infrastructure Quality Assessment of Selected Countries in Asia

	GCI		Infrastructure	
	Rank	Score	Rank	Score
Australia	15	5.15	25	5.19
Japan	8	5.37	13	5.83
Korea	19	5.00	17	5.60
Singapore	3	5.55	4	6.35
India	49	4.30	76	3.41
Indonesia	54	4.26	84	3.20
Malaysia	24	4.87	26	5.05
Philippines	87	3.90	98	2.91
PRC	29	4.74	46	4.31
Thailand	36	4.56	40	4.57

Source: World Economic Forum (2010)
Note: Score ranking 1-poorly developed, inefficient; 7-among the best in the world.

4. Transport Infrastructure in India: Development so far

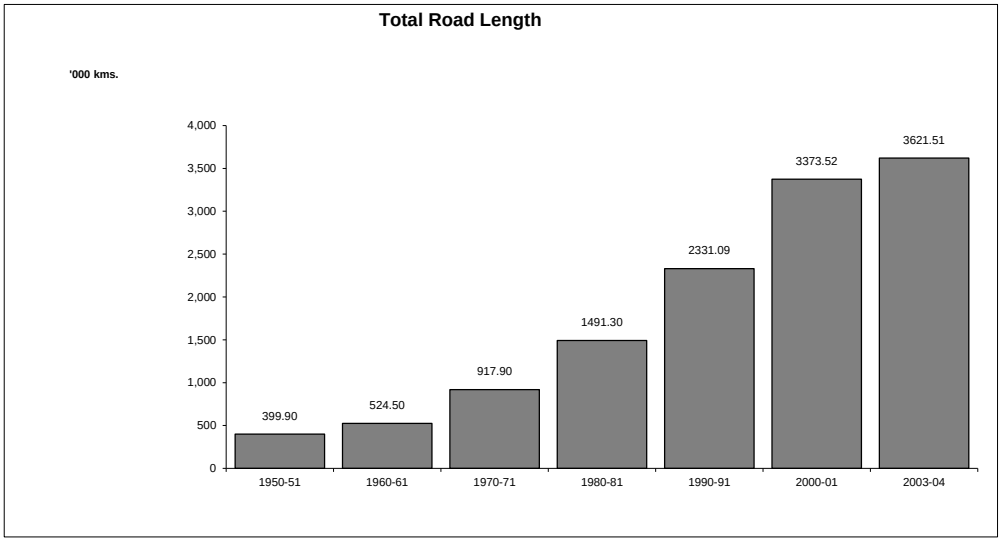
4.1. Roads

An efficient transport system is a pre-requisite for sustained economic development. It is a key infrastructural input for the growth process. The road transport plays an important role in promoting the development of the backward regions and integrating them with the mainstream economy by opening them to trade and investment. Roads are a crucial mode of transportation which connects long distances and also remote villages in country like India. Moreover, the road connection is also essential for other modes of transport such as railways, ports and inland waterways transport and complements the efforts of these modes in meeting the needs of transportation. An efficient and well-established network of roads is desired for promoting trade and commerce in any country and also fulfills the needs of a sound transportation system for sustained economic development. There are already studies which show that roads connecting rural areas and remote villages is helpful to reduce poverty and improve economic growth (Decon and Hoddinott, 2005; Stifel and Minten, 2008). Development of roads contributes to economic growth by promoting marketing of products, flow of goods and services and people. It also promotes human capital by enhancing access to education and health services. There has been a significant growth in road traffic in the past. The average growth of road traffic is stated to be in the order of 8 to 10 percent in recent years. Road sector carries more than 60% of the freight traffic and 85% of passenger traffic. However, the road network has not grown adequately to meet the growing traffic demand. The conditions of entire road network in India are grossly inadequate and poor to meet the growing requirements.

The road transport sector in India has expanded manifold after independence both in terms of spread and capacity. Infact India has one of the largest road networks in the world, aggregating to about 36 lakh kilometers at present. The Country‘s road network consists of national highways, state highways, major/other district roads and village/rural roads. The national highways are the responsibility of the central government and constitute about 71,000 kms length and make up for only 2 per cent of the total road length in the country though they carry over 40 per cent of the total traffic across the length and breadth of the country (see NCAER-Holicim, 2010 for details).

In 1950-51 when India launched its first five year plan programme the road length was about 400 thousand kms but gradually the road length increased over the years and reached 1491 ‗000 kms in 1980-81 , 2331.09 ‗000 kms in 1990-91 and 3373.52 and 3621 ‗000 kms in 2000-01 and 2003-04 respectively (see Figure-1). With the consistent increase in road length in the country, the total number of vehicles has also shown a tremendous increase since independence.

Figure-1: Total Road Length in India: 1950-2004



Source: NCAER- Holcim(2010).

As mentioned earlier, India has one of the largest road networks in the world. The entire network is classified into five distinct categories perhaps from the viewpoint of management and administration. The five categories are National Highways (NH), State highways (SH), Major district roads (MDR), other district roads (ODR) and Village roads (VR), among the different categories of roads, National highways constitute around 2 per cent, state highways 4 per cent, while 94 per cent of the entire network comprises of ODR, MDR and VR. Out of these Public Works Department (PWD) roads are 21 per cent, urban roads 7 per cent and the rest of the road length in India is accounted for by the rural roads. While the development and maintenance of National Highways is under the purview of the Central government , all other categories of roads come under the purview of the respective States/UT governments. The ministry of road transport and highways (MoRTH) is mainly responsible for development of roads and highways. While road wing of MoRTH deals with development and maintenance of national highways, the transport wing is in charge of administrative duties such as motor vehicles act, taxation, road safety etc. The development and maintenance of national highways main depend on state governments and union territories, National Highway Authority of India (NHAI) and Border Road Organisation (BRO)[5].

The National highways have a length of about 67,000 kms in 2006-07 and run across the length and breadth of India facilitating medium and long distance inter-city passenger and

[5] see NCAER-Holicim, 2010 for details

freight traffic. The government has made efforts to increase the total road length in the country with emphasis on all types of highways and other roads. See Table-14 for details. For example state highways and other roads constitute the secondary system of road infrastructure of India. The state highways provide linkages with national highways, district headquarters, important towns etc. The length of the state highways which was 43,000 kms in 1950-51 increased to 127,000 kms in 1990-91 and stood at 137,000 kms in 2006-07. Similarly, the length of the other roads also increased sharply from 338,000 kms in 1950-51 to nearly 7921000 kms in 200-07. Further, another notable feature of the road transport sector has the manifold increase in the total number of motorized vehicles (Table-14). But the expansion in the road network has not been commensurate with this increase. The total number of vehicles has increased from 306,000 vehicles in 1950-51 to a whopping 48,857 thousand in 2000-01 and 89,618 in 2006-07. Of this, the largest increase has been in the case of goods vehicles, cars, jeeps and taxies and two wheelers. Infact, India has the largest number of two wheelers in the world. The number of two wheelers which was just 27,000 in 1950-51 increased to 64743,000 in 2006-07.

For development of roads, the long-term 20-year plans viz Nagpur Plan (1943-61), Bombay Plan (1961-81), Lucknow Plan (1981-2001), Road Development Plan Vision: 2021 were formulated by the Chief Engineers in-charge of roads under the aegis of the Indian Roads Congress and these plans have served as sound reference framework for the central and state governments to formulate their successive Five

Table 14: Plan-wise Development of Roads and Road Transport

Sector	Units	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2006-07
Total Length	000 kms	400	525	918	1491	2331	3374	3709
National Highways	000 kms	20	24	29	32	34	58	67
State Highways	000 kms	43	62	89	94	127	132	137
Other Roads	000 kms	338	439	800	1365	2170	3184	3506
ROAD TRANSPORT								
Total	000 Nos	306	665	1865	5243	19173	48857	89618
Goods Vehicles	000 Nos	82	168	343	590	1289	2715	4436
Buses	000 Nos	34	57	94	154	312	562	992
Cars, Jeeps, Taxis	000 Nos	159	310	682	1122	2733	6143	11526
Two Wheelers	000 Nos	27	88	576	2530	12525	34118	64743
Other Vehicles	000 Nos	4	42	170	847	2314	5319	7921

Source: Plan Documents, Basic Road Statistics, Motor Transport Statistics

Year Plans. As a result, the road network now stands at 3.3 million km. Of this, rural roads comprise around 2.7 million km, i.e. about 85 percent. Overall village accessibility stood at 54 percent in the year 2000, although position in respect of accessibility to large size habitations has been much better. But a major problem with all the three plans is that they have never met their targets. The achievements have always been much less then the targets but the only consolation being that during the course of the plans the total road length in the country increased consistently (see Table-15 for details). Of all the three plans, the achievements with respect to targets has been the maximum in the Lucknow plan. In this plan, the target for total road length was 2700,000 and the achievement was 2,256,00 and this achievement excludes 9,20,00 km of earth tracks constructed under various rural roads programme.

According to the Tenth Five Year Plan, the National Highway network has a total length of 58, 112 km. The total length of National Highways at the beginning of First Five Year Plan was only 22, 255 km and the growth was quite slow over the subsequent decades and till the Ninth Five Year Plan. For example, the total length of National Highways was only 31,710 sq km at the end of Sixth Plan and 34, 298 at the end of Ninth Plan. However, there was a quantum jump in the National Highway network by the end of Ninth Plan to 58,112 k.m.

Thus, while only 12 thousand kilometers were added over thirty year period prior to Ninth Plan, more than 20 thousand kilometers were added in a span of five years during the Ninth Plan. This growth has occurred mainly due to upgradation of state highways to national highways. However, this has put significant burden on the available resources for

Table 15: Targets and Achievements under 20-year Road Plans (length in km)

Road Category	Nagpur Plan (1943-61)		Bombay Plan (1961-81)		Lucknow Plan (1981-2001)	
	Target	Achievement	Target	Achievement	Target	Achievement
National Highways	33,395	22,636	51,500	31,737	66,000	57,700
State Highways	86,825	62,052	112,650	95,491	145,000	124,300
Major District Roads	80,145	113,483	241,400	153,000	300,000	
Rural Roads (other than district roads and village roads)	332,335	500,802	651,780	912,684	2,189,000	2,074,000*
Total	532,700	698,973	1,057,330	1,192,912	2,700,000	2,256,000*

Source: NCAER- Holcim(2010).

Table 16: Plan-wise Addition to the Total National Highways Network

Period	Length added in Kms	Total length in Kms
As on 01.04.1947		21,440
Pre First Plan (1947-1951)	815	22,255
First Plan (1951-1956)		22,255
Second Plan (1956-1961)	1,514	23,769
Third Plan (1961-1966)	179	23,948
Interregnum Period (1966-1969)	52	24,000
Fourth Plan (1969-1974)	4,819	28,819
Fifth Plan (1974-1978)	158	28,977
Interregnum Period (1978-1980)	46	29,023
Sixth Plan (1980-85)	2,687	31,710
Seventh Plan (1985-1990)	1,902	33,612
Interregnum Period (1990-1992)	77	33,689
Eight Plan (1992-1997)	609	34,298
Ninth Plan (1997-2002)	23,814	58,112
Tenth Plan (2002-2006)	9,008	66,590*

Source: NCAER- Holcim(2010).

the maintenance of national highways since the resources are spread thinly across the network. It is observed that more than 50 percent of the network is considered to be under pressure and of poor quality. Table-16 below gives plan wise addition to national highway length. It is evident from the table that the maximum addition in road length was achieved in the second five year plan, fourth five year plans, sixth, seventh and the ninth five year plans. But given the increase in road traffic, there is tremendous scope for increasing the road length in India. However, lack of financial resources for this sector is also one the issues affecting the growth of this sector.

With a determined focus to improve the road network in the country, the government of India has allocated funds for the development of roads sector across all plan periods. Every year the outlay for roads has increased and in most plans the total expenditure on roads as exceeded the total outlay in a specific plan period. For example in the Tenth five year plan though the total outlay for roads was only Rs. 110, 835 crores, and the expenditure was Rs. 135,935 crores (EFYP documents, 2008).

Apart from increasing road length through increasing various types of roads connecting rural and urban areas, it is also necessary to maintain the new and existing road network. Infact in many of the developed countries, the cost of the maintenance of existing

infrastructure far exceeds fresh investment in the sector. Given that India has one of the largest road networks in the world, its maintenance is of crucial importance. The present allocation for maintenance of national highways is only 40 per cent of the requirements based on the norms for maintenance. The situation in respect of state roads is still worse. Due to resource constraints private sector also needs to be involved in maintenance of national highways.

Table-17 above shows that since 2002-03, there is a growing gap between the amount of funds required for maintenance of road network and the actual amount provided in the outlays of the Government. The shortfall as a percentage of requirement stood at 67.16 per cent in 2006-07. Therefore, the government should take special care that in the 11th and 12th plans, this shortfall as a percentage of requirement is reduced. In order to augment availability of resources for the sector, the budgetary resources could be used to leverage private investment. Internal generation of resources through rational pricing and user charges is also essential for the successful development of the road transport infrastructure in India.

Gupta *et al*. (2009) report the major limitation in infrastructure development in India, particularly in the road sector. They point out that most of the infrastructure projects face the problem of cost and time runs due to flaws in project design, awards and implementation of projects and quality of planning, engineering and construction procedures used. Basically, the cost and time overruns are due to institutional and contractual failures, faulty design and unrealistic estimation, unstable regulatory policy and inefficient management and technology (Singh, 2010; World Bank 2008). One of major factors leading to delays in construction of roads is land acquisition which is not only time consuming given the present existing land acquisition laws but often gets into disputes. Since construction of roads needs clearance from many agencies including forestry and environment to MoRTH, lack of the coordination among different ministries and department is a cumbersome and time

Table 17: Shortfall in Funds for Road Maintenance in the Tenth FYP (Rs crore)

Year	Requirement as per Norms	Amount Provided	Shortfall	Shortfall as % of requirement
2002-03	2,200	800.00	1,400.00	63.64
2003-04	2,200	731.74	1,468.26	66.74
2004-05	2,480	745.56	1,734.44	69.94
2005-06	2,480	868.10	1,611.90	65.00
2006-07	2,480	814.38	1,665.62	67.16

Source: Planning Commission (2008).

consuming process. Along with these problems, the mobilization of huge resources for new roads and maintenance of old roads is most difficult given the budget constraints of the government and limited participation of private sector so far.

The problem in the road sector is that only little more than 1 percent are four lane and good quality roads while rest are either two lane or single lane. The development of new roads and maintaining existing roads to cater the increasing demand requires huge investment in this sector which is difficult to come by. The 11th five year plan emphasizes on private sector participation by encouraging Built-Operate-Transfer model, allowing toll roads etc and thereby the result so far has been satisfactory. Government does encourage private sector by giving exemptions of custom duties on import of equipments, helping in land acquisition, and providing utilities for construction. In India, private sector generally participates through Public Private Partnership (PP) basically through popular PPP models such as Build-Operate-Transfer (BOT) and Special Purpose Vehicles (SPV). Government is also encouraging foreign investment by allowing 100 per cent foreign equity participation under automatic route and giving tax exemptions.

Further, planning commission has emphasized on integrated road development along with railways and other modes of transportation to make it more effective. With increasing gap between supply and demand due to increase in traffic, usage of roads in a safe and sustainable manner has become an important issue. In this context, maintenance of roads, availability of trained manpower, use of modern technology, performance evaluation of management, availability of trauma care centres etc are priorities in road transport in India.

4.2 Railways

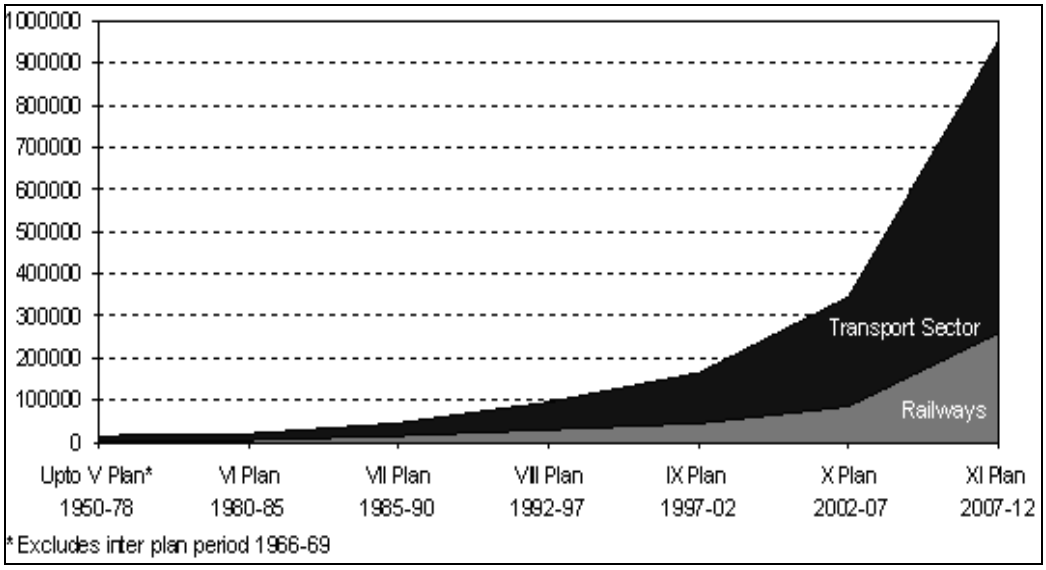
The Indian Railways is one of the pillars of India's infrastructure and has a symbiotic relationship with the country's industry and economy. The Indian Railway is the world‘s largest government railway. The Railway functions as a vertically integrated organization providing Passenger and Freight services. It is a single system which consists of 63,273 route kilometers of track that crisis cross the country, on which more than 17,500 trains ply, carrying nearly 18 million passengers and hauling nearly 2.2 million tones of freight everyday, thereby contributing to the economic growth of the country and at the same time promoting national integration (Railway Budget, 2010-11). The Railways play a crucial role in the transport of coal, iron ore and raw materials for the manufacturing industries such as fertilizers, cement and steel products and food-grain, and in the movement to and from the major ports, as well as the transportation of people. Transport being a derived demand, any growth in the economy fuels the demand for transport. Rail transport demand is thus inter-linked with the growth of GDP, especially of those sectors which generate transport volumes through their forward and backward linkages. The Railways' share in the country's GDP,

however, has been more or less constant at a level of 1.18 per cent from 2003-04 onwards till 2007-08. Indian Railways transports about 40 per cent of India's total freight traffic and 20 per cent of the country's passenger traffic.

Since independence the route network of Indian railways has expanded very slowly. In 1947, Indian Railways inherited 53,996 of route kms of rail network and today the total route length stands at 64,099 kms. Railways have been able to add only 10,000 kms of route over a period of 62 years after independence which is unacceptably slow. Therefore, the vision document of the railways proposed to add 25,000 kms of New Lines by 2020.

Further, the railways also seem to have been affected by the lack of investment in the sector in proportion to its size and importance for the country. Investment in railways as a part of total transport sector investment was less than 10 per cent during the 5th, 6th and 7th Five year plans. It is only from 8th five year plan onwards that the investment in railways as a percent of total transport sector investment has steadily increased and today stands at nearly 22 per cent (See Figure-2). Freight and passenger traffic are the two main components of railways. Freight traffic grew from a level of 557.4 MT in 2003-04 to a level of 833.3 MT in 2008-09, an increase of 276 MT. The main growth was in coal, iron ore and cement traffic. There was a dip in the growth curve in 2008-09 caused by the economic

Figure-2: Railways as a Part of Total Transport Sector Investment (in Rs. Crore)



Source: NCAER- Holcim(2010).

slowdown when the target of 850 MT could not be met and consequently growth was only 4.97% against the 5-year CAGR of 8.38%. In meeting the demands generated by the economic upturn, the main challenges faced by the Railways were the constraints of infrastructure, particularly line capacity on busy routes, and terminal detentions. As capacity augmentation is a long gestation exercise, Railways adopted the strategy of intensive utilization of its existing assets and resources and improvisation of its operational and maintenance practices. Subsequently, there has been an upsurge in freight traffic/passenger since 2002.

In order to augment capacity and enhance the quality of services, Indian Railways has initiated its most ambitious project—the Dedicated Freight Corridors (DFCs). According to the Planning Commission's estimates, investment in Indian Railways in the Eleventh Plan is likely to be about US$ 54.54 billion, as compared to US$ 24.93 billion in the Tenth Plan. Table-18 presents an overall picture of rail infrastructure in the country and reflects the importance of the sector for the overall growth of the economy.

Table 18: Rail Infrastructure (April 2008)

Infrastructure	Quantum
Broad Gauge	51,082
Meter Gauge	9,442
Narrow Gauge	2,749
Route Kilometres Total	**63,273**
Running Track kilometers	
Broad Gauge	72,539
Meter Gauge	9,868
Narrow Gauge	2,751
TOTAL	**85,158**
Electrified Route kilometers	
Electrified Route kilometers	18,274
Rolling Stock units	
Wagons	2,04,034
Locomotives	8,330
Coaches	47,375

Source: Ministry of Railways (2008)

Increasing productivity and efficiency has been one of the important aspects of railways in India. In order to be comparable with the major freight railways like the Chinese Railways, Russian Railways and US Railroads, the Indian Railways need to improve on parameters such as NTKM per wagon day, leads of traffic and productivity indices. But there has been improvement in critical efficiency parameters for freight operations like wagon utilization, NTKM per wagon day and wagon turnround (Table-19). Wagon turn-round (WTR), the single measure that encapsulates the overall operating efficiency of the freight system, improved by a CAGR of over 6% per annum. There were several critical parameters, however, such as average speeds of freight trains, locomotive utilization and terminal detention where substantial scope for improvement remains. Table-19 also shows that there has been an improvement in human resources productivity also since 2001.

Another important aspect of railway infrastructure is the growth in production and railway loading for six bulk commodities. Indian railways strength is in the carriage of bulk cargo over long distances. Coal and iron ore were the major commodities in which there was increased loading and the Railways were able to handle this increase. The increase in growth was witnessed on sectors such as coal, fertilizers, iron and steel and cement accordingly. See Table-20 for details. The fact remains though that IR's poor market share and inadequate total transport output needs to be further addressed.

Table-19: Railways Productivity Performance

Productivity Indicator	Ninth FYP			Tenth FYP	
	2001-02	2002-03	2003-04	2004-05	2005-06
Wagon Utilisation					
NTKM/wagon/day (Broad Gauge (BG)) GGaGaGuageGuage) Gauge [BG])	2223	2468	2574	2617	2872
Wagon km/wagon/day (BG)	191.6	204.6	187.8	204.5	211
Wagon turnaround (in days) (BG)	7.2	7.0	6.7	6.4	6.1
Track utilisation					
NTKM/route km (million)	7.38	7.74	8.14	8.57	9.05
Passenger km/route km (million)	10.1	10.5	10.8	11.5	12.2
NTKM/ Engine day Online (Goods BG)					
Diesel	167163	164713	199958	218045	279066
Electric	311061	326798	352669	415244	465375
Human Resources Productivity					
NTKM/Employee (million)	0.24	0.26	0.28	0.31	0.33
PKM/ Employee (million)	0.35	0.37	0.40	0,45	0.47

Source: NCAER- Holcim(2010).

Table-20 Growth in Production and Railway Loading for Six Bulk Commodities (1991-2004)

Bulk commodity	Production Growth (% per year)	Railway Loading Growth (% per year)
Low-Rated Commodities		
Coal	3.61	4.25
Food Grains	1.22	4.24
Fertilizers	3.78	3.62
High-Rated Commodities		
Cement	7.86	4.37
Petroleum Products	8.02	2.88
Iron and Steel	8.28	1.09

Source: Raghuram and Gangwar (2008).

Freight and passenger traffic are major contributors to Indian railway's revenue. In freight traffic, the bulk traffic, mainly coal, constitutes more than 80% of the total freight revenue. The freight segment of Indian Railways accounts for about 70 per cent of overall revenues of the railway. The Railways have generated US$ 13 billion of revenue earnings from commodity-wise freight traffic during financial year 2009-10 as compared to US$ 12 billion during the corresponding period last year, registering an increase of 8.39 per cent. Railways carried 887.99 MT of freight traffic during April 2009-March 2010 as compared to 833.31 MT carried during the corresponding period last year, registering an increase of 6.56 per cent according to a release by PIB dated 19 April, 2010. According to the railway board, the government plans to double the existing fleet of wagons, coaches, electric and diesel locomotives by 2020. It plans to add 290,000 wagons, over 5,000 diesel locomotives, over 4,000 electric locomotives and 50,000 coaches in the next decade[6].

The financing of railways is generally sourced from internal resource generation, budgetary support and market borrowings. However, Indian railways faced serious financial crisis during nineties mainly due to shifting of freight traffic to road sector, rigid pricing of freight, high cost of internally sourced products and excess staff in railways (NCAER and IDFC, 2001 and Ahluwalia, 2002). Employees cost (salaries and pension) of railways is huge and is more than 25% of total working expenses. However the performance of the Indian railways has been very good over last 6 to 7 years which is mainly due to higher economic growth leading to increase in freight traffic and movement of people across states. Further, government policy of simplifying traffic for freight and creating demand-driven pricing for passengers has helped revenue generation. The recent performance of freight

[6] see NCAER-Holicim, 2010 for details.

traffic was mainly possible due to increase in pay load, round-the-clock operations and overall increase in productivity.

Rail projects in India have typically been the domain of the public sector. Government also designed policies for private sector participation through PPPs particularly in procurement of wagons, container sector, creating world class stations in selected places, multi-nodal logistics parks, commercial development land and air spaces. This also created huge demand for new trains and new tracks creating constraints of railway infrastructure. However, several public sector units (PSUs) and private players are involved in allied activities of Indian Railways (track laying and maintenance, maintenance of coaches and wagons, construction of bridges, stations, signaling and telecommunication works). According to the Department of Industrial Policy and Promotion (DIPP), the foreign direct investment (FDI) inflow into railways related components has been US$ 109.56 million between April 2000 and March 2010. Indian Railways has started getting investments from overseas through strategic alliances with various countries across the globe. Metro projects have already been initiated in Delhi, Kolkata, Bengaluru, Chennai, Hyderabad and Mumbai.

Modern technology to improve productivity, rationalizing tariffs, improving the safety and increasing quality of services, and introducing high speed trains has been used to improve the efficiency of the railways to cater the growing markets and in creating dedicated freight corridors. Since creating new infrastructures in railways is time taking, Indian railway can try to improve the operational efficiency by using innovative strategies in operation and maintenance, improving existing terminals for specific commodities, connecting to ports and other modes of transportation to improve efficiency and cater to the growing demand. The problem in providing better services to passengers happens because passenger traffic is increasing much faster than railway network leading to stress on existing infrastructure. Another problem in Indian Railways is passenger safety which is mostly due to human failure. In this context upgrading technology like automatic signaling system etc is the priority now. Railways has to constantly improve its efficiency along with increase in seats, trains etc to meet the demand. In medium to long term, Indian railways needs to meet the growing demands of an modern economy and provide better terminal facilities, high-speed trains, connect major markets with special non-stop trains etc. Planning commission (2008), railway strategy in EFYP includes (1) capacity enhancement through increasing capacity utilization (2) enhancement of capacity by providing terminal capacity and premium service to freight and passenger (3) technology upgradation for higher efficiency and productivity and (5) improving safety and passenger satisfaction.

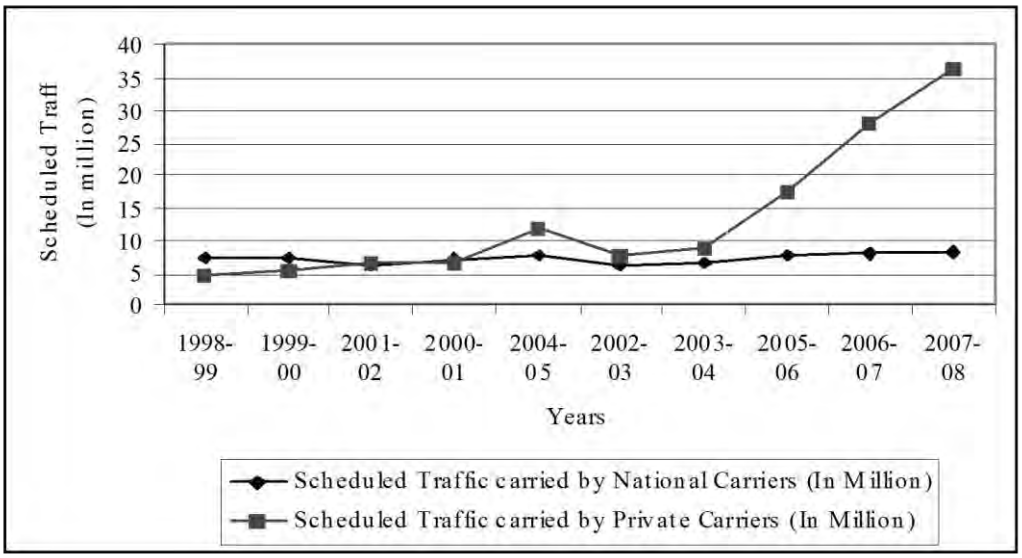
4. 3. Airports

The aviation sector is playing an increasingly pivotal role in the fast-growing needs of this vast country. The Indian aviation industry is one of the fastest growing aviation industries in the world with private airlines accounting for more than 75 per cent of the domestic aviation market (as on 2006). From being primarily a government-owned industry, the Indian aviation industry is now dominated by privately owned full service airlines and low cost carriers. Earlier air travel was a privilege only a few could afford, but today air travel has become much cheaper and can be afforded by a large number of people. The industry is growing at a compound annual growth rate (CAGR) of 18 per cent. The country has 454 airports and airstrips, of which 16 are designated as international airports.

There has been consistent growth in domestic passenger traffic in the last 10 years especially since the entry of several budget airlines and entry by private sector (see Figure-3). Domestic passenger traffic carried by private airlines increased from 5 million passengers in 1989-90 to nearly 37 million passengers in 2007-08. However, the domestic passenger traffic in India's national carriers has hardly increased during this high growth phase

Further, according to the latest statistics by Directorate General of Civil Aviation (DGCA), passengers carried by domestic airlines from January-June 2010 stood at 25.71 million as against 21.1 million in the corresponding period of 2009—a growth of 22 per cent. In terms of market share, private carrier Jet Airways was the market leader with 26.5 per

Figure-3: Scheduled Domestic Passenger Traffic over the Past 10 Years (in million)

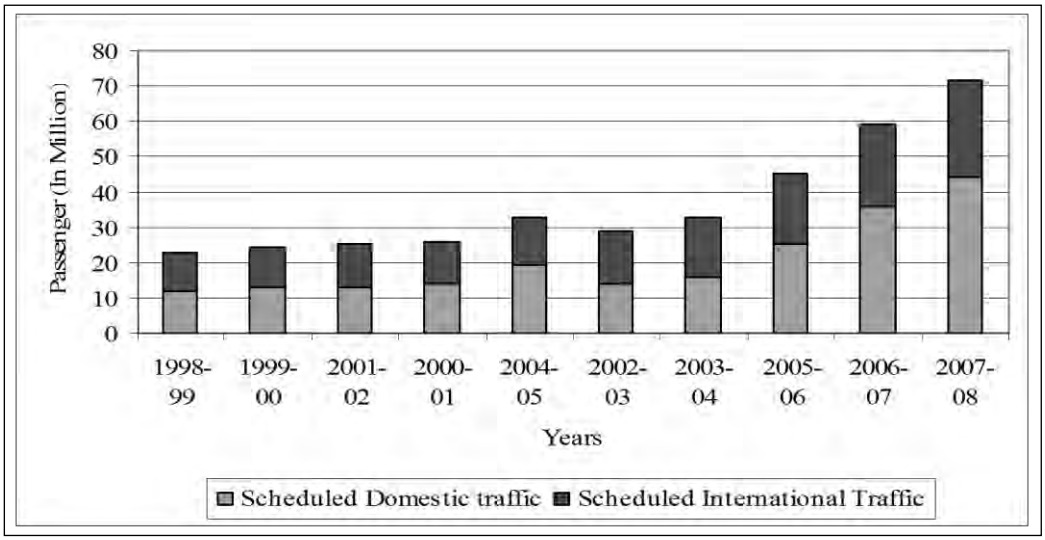


Source:Directorate General of Civil Aviation (DGCA), 2008.

cent share, followed by Kingfisher Airlines with 21 per cent, Air India with 16.9 per cent, Indigo with 16.4 per cent, SpiceJet with 13.3 per cent and GoAir with 5.8 per cent during the month of June 2010. Not only has there been a spurt in domestic passenger traffic, even international travel has become quite common these days with scheduled international traffic going hand in hand with domestic passenger traffic (see Figure-4).

Though there are several small and medium airports across the country, the bulk of the air traffic is handled by the six major airports in the country. Mumbai takes the largest share of traffic, followed by Delhi and Chennai. The top six airports constitute nearly 77 per cent of the total air traffic in the country (See Table-21).

Figure-4:Trends in Scheduled Passenger Traffic (in million)



Source: Directorate General of Civil Aviation (DGCA), (2008)

Table 21: Percentage of Total Traffic at the Top Six Airports

City	Percentage of total traffic	Cumulative total percentage
Mumbai	30.3	30.3
Delhi	21.8	52.1
Chennai	9.2	61.3
Calcutta	7.1	68.4
Bangalore	5.1	73.5
Hyderabad	3.5	77.0

Source: Ministry of Civil Aviation Website (www.moca.gov.in)

A significant feature of the Indian Aviation Industry in the past decade has been the growth and entry of Low cost carriers/airlines in India which resulted in competition and better tariff structure for customers. The success of the Indian aviation industry is largely attributable to the low cost carriers making air traveling much simpler and cheaper. Private players including Kingfisher Red, Spice Jet, Jetlite, Indigo etc. are coming up with attractive rates for their passengers, thereby making civil aviation lucrative. Table-22 shows that the low cost carriers have captured the Indian aviation market. Among the low cost carriers that command the largest share amongst the LCC's itself include Spice jet and Indigo. Air Deccan which had a large share of the market merged with Kingfisher and now is Kingfisher red and commands a share of nearly 35 per cent.

In tandem with the growing demand for airport services and the growth in the aviation Industry, the government has been making efforts to step up investments in airports. To meet the increase in traffic for both passenger & cargo aviation services in India, the government has put in place a program for directing investments in the Airport infrastructure – through both internal resource mobilization, as well as through private sector participation in modernizing specific Airports. The Committee on Infrastructure has initiated several policy measures that would build world-class airport infrastructure in India. A Model Concession Agreement is also being developed for standardizing & simplifying the PPP transactions for airports. In any future projects or for development of existing airports, it has been decided that the length of the runway would be at least 7,500 feet (which is needed for an A 320 or similar aircraft). Table-23 below shows the projected investment in airports in the EFYP.

It is evident that the requirement is huge with projected investment in airports amounting to Rs.408 billion in the EFYP. Emphasis has been laid not only on the development of metro and non-metro airports but also on the development of Greenfield airports in the country. Airport Authority of India (AAI) is planning the city-side

Table-22: Market Share of LCCs in 2007-2008

Airline Name	**Market Share in the Domestic Indian Market**	**Market Share among Low-Cost Carriers (excluding other airlines)**
Jet Lite	7.03	15.11
Indigo	8.76	18.83
Spice Jet	9.23	19.82
Go Air	4.07	8.74
Air Deccan	15.99	34.35
Paramount	1.47	3.15

Source: DGCA (2008).

Table-23: Projected Investment in Airports during the EFYP
(Rs. billion at 2006-2007 prices)

Years	Total	Non-Metro	Metro	Greenfield	NE airport	CNS-ATM and Equipment
2007-08	70.21	10.59	35.95	16.07	1.00	6.60
2008-09	73.79	11.00	35.88	18.10	1.10	7.71
2009-10	78.37	12.10	34.68	21.58	1.21	8.80
2010-11	87.17	13.10	33.15	29.50	1.33	10.09
2011-12	99.26	14.70	31.36	39.14	1.46	12.60
Total XI Plan	408.80	61.49	171.02	124.39	6.10	45.80

Source: NCAER- Holcim(2010).

development of 24 airports, including those at Ahmedabad and Amritsar. Additionally, 11 new Greenfield airports have been identified to reduce passenger load on existing airports.

With the growth in the industry, airport retailing has also gained pace in the recent times (see NCAER-Holicim, 2010 for details). Development of new terminals and airports such as the recently inaugurated T3 in New Delhi has provided added impetus to this segment. The highest margin earners in this segment are food and beverages, beauty product, electronic items, apparel etc. It has been predicted that airports would provide around 300,000-400,000 square feet retail space by 2015. Many companies are also planning to leverage on this growing segment by launching specific products for air travelers.

Even though the government has set aside large percentage of the infrastructure budget for development of airports sector in India, given the fiscal constraints of the Government, the role of the private sector in development of airports in India is crucial. Nearly Rs. 250 billion investment is expected from the private sector in the EFYP. Investment opportunities of US$ 110 billion are being envisaged up to 2020 with US$ 80 billion towards new aircraft and US$ 30 billion towards the development of airport infrastructure, according to the Investment Commission of India. See Table-24 for details of proposed public and private investment in airports during the EFYP. Modernisation of airports like Delhi and Mumbai, Bangalore and Hyderabad have been carried out with private sector participation. Government facilitates and encourages private sector by giving tax exemptions and also providing land for construction. AAI act of 1994 gives concession to private entity for financing, development and operation. The future development of airports across countries heavily depends on private sector participation through PPPs. Apart from AAI, state governments also encourage an airport company by giving concessional land, airport connectivity and other fiscal incentives.

Table-24: Projected Investments by the Public and Private Sector in Airports during the EFYP (Rs. billion at 2006-07 prices)

Years	Total	Public	Private
2007-08	70.21	24.01	46.20
2008-09	73.79	25.96	47.83
2009-10	78.37	32.19	46.18
2010-11	87.17	35.92	51.25
2011-12	99.26	41.81	57.45
Total XI Plan	408.80	159.89	248.91

Source: Planning Commission (2007).

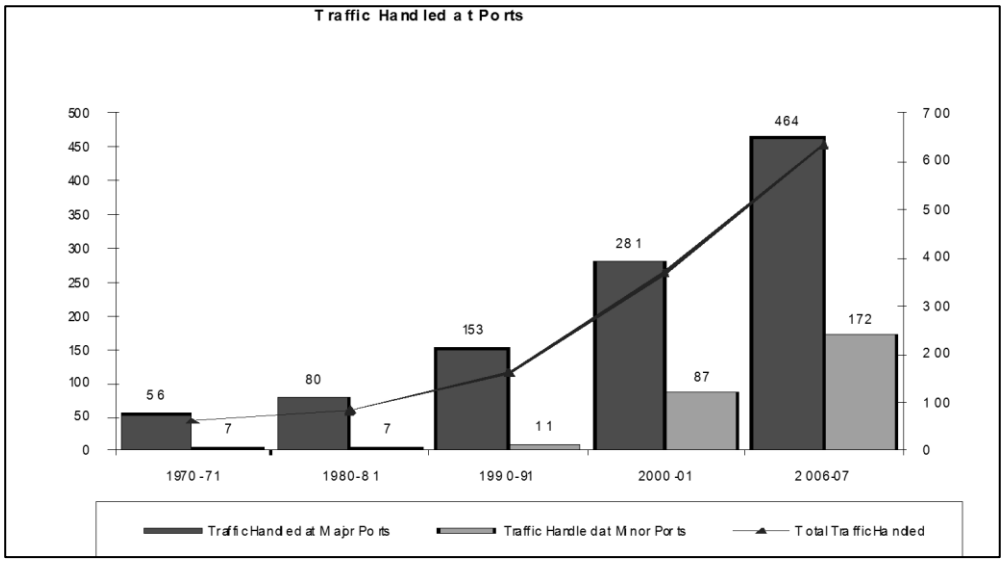
There is tremendous scope for improvement of airports sector in India. The Government must take all possible steps to encourage growth of Civil Aviation, particularly as India has a 300- million strong middle class which is not only a market to boost travel but also an engine for the country's economic growth. Developing civil aviation is necessary not only to meet the domestic demand but also to carry high value cargo (cargo carried by air is around 1 % but it accounts for 35% of total exports) and facilitates tourism which is one of the largest foreign exchange earners.

The increase in air traffic has resulted in congestion in almost all airports in recent years. The ontime arrivals of flights at airports in India is around 50% on an average which is far behind other Asian countries like Singapore, Japan and Korea. The continuous high growth, emerging large middle class and increase in cargo would require not only expanding existing facilities at airports but also increase in operational efficiency. As Ohri (2009) reports AAI is quite inefficient in terms of revenue mobilisation, profits, and input-out ratios, compared with other major international airports. Since existing airports are not able to meet the traffic requirement, there should be proper policy to encourage private sector to construct small airports/airstrips in the growing cities to accommodate the projected growth in traffic. Though there has been great emphasis on the development of airport infrastructure across states, the financing of the airport infrastructure and providing efficient airport services to meet the expected demand is going to be major task in this sector.

4.4. Ports

India has an extensive coastline of 7517 kms, excluding the Andaman & Nicobar Islands. Indian ports handle around 95% of the total volume of country's trade and about 65% in terms of value. India has 12 major ports and 200 non major ports (minor and intermediate ports) spread across nine (coastal) maritime states. Ports are under the

Figure-5: Trends in Scheduled Passenger Traffic (in million)



Source:NCAER-Holcim (2010)

concurrent list of the Indian Constitution. Major ports are under the jurisdiction of the Union Government, managed by the Port Trust of India while minor ports are under the jurisdiction of the respective State Governments. While major ports handle 75% of the total cargo traffic, minor ports account for 25% of the traffic. Figure-5 shows that that the Traffic handled at all ports has increased considerably since 1970-71. Infact, post 2001, the increase in port traffic has been considerable especially in major ports putting a severe stress on ports infrastructure in the country. The following tables show that apart from major ports which handle bulk of the port traffic, there are several non-major states in many states which are also crucial for handling port traffic (see Table-25 for details). Given the vast coast line, the maximum number of non-major ports are located in Maharashtra and Gujarat followed by Andaman and Nicobar islands. However, the bulk of the port traffic is handled by the major ports in the country.

The Indian ports sector is poised for significant growth driven by new manufacturing and power projects and higher cargo traffic at ports. Increase in containerized trade coupled with the Government‘s active initiatives to develop the Indian ports sector, is expected to further boost the growth. Although the ports in India have shown considerable improvement over years, benchmarking them against the ports in Hong Kong, Los Angeles, and Rotterdam reveals that there needs to be marked improvement in many parameters to get Indian ports at par with international standards. Traffic for total ports in India was worth 740.3 million tons (MT) in 2009 and this is expected to rise to 1,373.1 MT in 2015. Traffic at major ports is expected to grow at a compound annual growth rate (CAGR) of 7.6 percent

from 2010 to 2015. Table-26 reports capacity and traffic growth in major ports of the country from 2001-02 to 2007-08.

Indian ports have been the target of much criticism for their poor efficiency. But, according to recent government data, the average operational efficiency in the country‘s 12 major ports has improved considerably in the last seven years. Whether it is turnaround time,

Table-25: Non-Major Ports in India

State	*No. of Non-Major Ports*
Gujarat	42
Maharashtra	48
Goa	5
Karnataka	10
Kerala	17
Tamil Nadu	15
Andhra Pradesh	12
Orissa	13
West Bengal	1
Daman and Diu	2
Lakshadweep	10
Pondicherry	2
Andaman & Nicobar	23
Total	200

Source: NCAER- Holcim(2010).

Table 26: Capacity and Traffic- Major Ports

Year	Aggregate Capacity (in MTPA)	Growth in per cent (Capacity)	Traffic (in MT)	Growth in per cent (Traffic)
2001-02	343.95	18.0	287.59	2.3
2002-03	362.75	5.5	313.45	9.0
2003-04	389.50	7.4	344.80	10.0
2004-05	397.50	2.1	383.75	11.3
2005-06	456.20	14.8	423.57	10.4
2006-07	504.75	10.6	463.78	9.5
2007-08	532.00	5.4	519.31	12.0

Source: Ministry of Shipping (2008). Note: MTPA= million tonnes per annum; MT= million tones. Adopted from NCAER- Holcim(2010).

pre-berthing detention time or output per ship per berth-day — the three basic efficiency parameters at major ports — have all shown improvement since the beginning of the decade.

The average turnaround time — between arrival of a ship and its departure from a port — has nearly ‗plateaued' out as vessels of higher tonnage are increasingly berthing at ports, keeping in line with the international trend of a bigger vessels being employed by the shipping lines. This is reflected by the fact that the average output per ship per berth-day has shown a consistently increasing trend, indicating improved cargo- handling at the ports However, there has been a deterioration in the average pre-berthing time — time that elapses between when the vessel arrives at a port and it is berthed at the terminal — because of capacity constraints in handling specific commodities in certain ports. Further, priority berthing for fertilisers and food-grains in 2006-07 and 2007-08, in consonance with the Government's policy of giving priority to vessel carrying food-grains and fertilisers, has also often led to bunching of vessels, with consequent increase in pre-berthing waiting time, according to the Outcome Budget for 2009-10 of the Shipping Ministry[7]. See Tables-27 and Table-28 for details.

Financing of ports broadly falls under the purview of the Central Government. However, given the resource crunch of the government of India, the government has not only welcomed private participation in ports sector but also announced and set up schemes to finance port infrastructure in the country. The port sector has been thrown open to private sector participation not only to improve efficiency, productivity and enhance quality of services but also to bring in competitiveness in port services. The Major Port Trust Act, 1963 permits private sector participation in major ports. Foreign Direct Investment (FDI) upto 100% under the automatic route is permitted for construction and maintenance of ports and harbours. Private sector participation has been allowed in a variety of ports services which includes construction and operation of terminals/berths, warehousing/storage facility, dry docking and ship repair facilities.

Till date 17 private sector projects involving an investment of Rs.4927 crores has been operationalised which involves capacity addition of 99.30 MTPA. 8 projects are under various stages of evaluation and implementation which involves an investment of Rs.5181 crores and capacity addition of 75.40 MTPA. Further, an investment need of $13.5 billion in the major ports under National Maritime Development Program (NMDP) has been proposed to boost infrastructure at these ports in the next nine years (see Table-29). The total expected investment in ports is slated to be Rs. 575 billion with a large chunk expected to come from the private sector and internal sources.

[7] Performance of Indian ports in 2008-09: Increased efficiency on all major parameters Hindu Business Line, 31st August, 2009,

Table-27: Average Turnaround Time (in days)

Port	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Kolkata	4.47	4.29	4.17	4.12	3.89	4.87	4.60
Haldia	3.02	2.87	3.00	4.00	3.97	4.26	4.21
Mumbai	5.06	4.10	4.21	4.09	4.63	4.44	4.73
Jawaharlal Nehru	2.28	2.04	1.84	1.96	1.67	1.85	1.96
Chennai	3.70	4.60	3.80	3.30	3.40	4.60	4.15
Cochin	2.19	2.22	2.33	2.13	2.19	1.99	2.14
Visakhapatnam	3.72	3.33	3.20	3.80	3.65	3.91	3.93
Kandla	5.94	5.06	4.62	4.39	5.46	5.13	5.20
Murmagao	1.94	4.47	4.35	4.08	4.46	4.03	3.61
Paradip	3.37	3.42	3.41	3.55	3.54	5.54	4.78
New Mangalore	2.37	2.35	2.96	3.00	3.14	3.21	3.00
Tuticorin	3.59	2.59	2.66	2.83	3.67	3.80	3.66
Ennore	2.22	1.94	1.68	2.23	1.89	2.08	2.35
Average	3.37	3.32	3.24	3.50	3.62	3.93	3.85

Source: NCAER- Holcim(2010).

Table 28: Average Pre-Berthing Detention on Port Account (in hours)

Ports	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Kolkata	0.07	0.07	0.00	0.09	0.13	0.24	1.27
Haldia	3.60	3.36	7.42	30.37	26.05	33.44	24.46
Mumbai	3.60	3.60	6.00	4.80	5.22	5.07	7.20
Jawaharlal Nehru	11.76	9.36	8.35	7.40	5.45	10.20	9.84
Chennai	4.30	0.90	0.90	0.90	0.80	1.00	0.93
Cochin	1.67	4.04	4.16	2.94	0.29	1.21	1.31
Visakhapatnam	3.12	1.18	1.11	1.54	4.78	5.10	4.35
Kandla	16.80	10.80	16.56	19.68	35.28	32.64	28.08
Murmagao	19.92	26.64	25.25	17.58	19.34	18.35	11.48
Paradip	10.32	5.14	1.62	1.48	1.41	1.48	1.30
New Mangalore	4.41	3.12	2.64	0.96	1.87	1.92	0.96
Tuticorin	7.20	1.64	1.68	3.06	3.22	4.32	3.36
Ennore	1.56	1.66	0.42	0.36	0.31	0.75	0.73
Average	6.79	5.50	5.85	8.77	10.05	11.40	9.59

Source: Ministry of Finance (2009) and various issues. Adopted from NCAER- Holcim(2010).

Table-29: Source of Finance for Major Ports

Description	Expected Investment	Source of Finance (Rs billion)			
		PPP	EBR	Internal Resources	Govt. Grants
I. Berth development					
Container Terminal	115.02	109.58	0.0	5.44	0.0
POL berths	103.14	92.78	5.40	4.96	0.0
Other cargo berths	110.59	87.15	0.0	23.43	0.0
Total (I)	328.75	289.51	5.40	3,3.83	0.0
II. Capital dredging	58.12	1.03	8.66	22.75	25.68
III. Equipment	36.04	14.44	0.0	20.30	1.30
IV. Connectivity	29.55	0.26	4.02	22.32	2.96
Other	122.07	75.55	3.67	42.55	0.30
Total investment	574.52	380.79	21.74	141.75	30.24

Source: Planning Commission (2007).

Further, Table-30 shows the EFYP projected investments in ports by category. It is evident the government is making tremendous efforts to improve ports infrastructure in the country which is crucial to India‘s trade. The total investment in the EFYP is estimated to be Rs. 869 billion with more than half of it going towards the development of major ports. In sum, though the government has taken several initiatives to improve port infrastructure in the country, the challenge of easing the pressure on India‘s port infrastructure is daunting. Without further delay, India's ports need to significantly ramp up their capacity and efficiency to meet this surging demand.

Table-30: EFYP Projected Investment in Ports by Category (Rs. billion at 2006-2007 prices)

		2007-08	2008-09	2009-10	2010-11	2011-12	Total EFYP
Major Ports	Public	25.65	30.78	36.94	44.32	48.60	186.29
	Private	40.50	52.65	68.45	88.98	115.59	366.16
	Total	66.15	83.43	105.38	133.30	164.19	552.45
Non-major Ports	Public	7.04	7.74	8.52	9.37	10.00	42.67
	Private	40.83	46.95	53.99	62.00	71.00	274.76
	Total	47.87	54.69	62.51	71.37	81.00	317.44
All Ports	Public	32.69	38.52	45.45	53.69	58.60	228.96
	Private	81.33	99.60	122.44	150.98	186.59	640.93
	Total	114.02	138.12	167.89	204.67	245.19	869.89

Source: Planning Commission (2007).

5. Major Issues in Infrastructure in India

Infrastructure forms the backbone of any economy. Physical infrastructure has a direct impact on the growth and overall development of an economy. But the fast growth of the Indian Economy in recent years has placed increasing stress on physical infrastructure. Therefore, the Government has accorded key priority in the 11th Five Year plan (2007-2012) and the 12th Plan period (2012-2017), with projected investment requirement of $500 billion and $ 1.5 trillion respectively for development of Infrastructure in the country. In recent years infrastructure investment has increased and there have been overall improvements. As Raghuraman, Bastain and Sundaram (2009) report that there has been a steady increase in the proportion of projects running on schedule and a sharp decline in the proportion of projects with cost overruns. This has been made possible with better financing and efficient project management. The acceptance of a user fee and development of alternate sources of revenue have helped attract larger investments in these mega infrastructure projects. With increasing private sector participation, delays due to project management have been reduced.

However, the problem in recent times has been the slow implementation of Infrastructure projects. Infrastructure projects face a plethora of constraints leading to long delays in implementation. Quick implementation of infrastructure projects is a rarity. There are several obstacles to speedy rollouts of infrastructure projects. Some of the major constraints to executing projects include delays in financing, decision making, delay in land acquisition and environmental clearances. Non-governmental Organisation (NGO‘) in India add to the delay by holding up projects by filing writ petitions. Some of major issues affecting transport infrastructure projects are mentioned below.

5.1 Public Private Partnerships (PPPs):

Infrastructure development in India faces lot of difficulties. Though there are increasing number of Public-private partnership (PPPs) initiated in recent years in India, the PPPs have been far from satisfactory to meet the supply-demand gap in infrastructure facilities. There are difficult issues for PPPs such as clear-cut and stable legal framework; lack of information dissemination and guidance materials; competent institutional mechanism to priorities investment projects; efficient mechanism for dispute resolution, well developed financial market and land acquisition. Though government is active in supporting PPPs, the position of the government for financial support and undertaking risk limits the success of PPPs in India, particularly capital intensive transport infrastructure.

5.2 Finances

In India, infrastructure projects - roads, railways ports, power - have traditionally been initiated, owned and managed by the state[8]. However, the ability of Governments to exclusively fund infrastructure projects is increasingly being limited by resource constraints faced by governments and the sheer scale of demand for both maintenance of existing infrastructure and provision of additional services (Grimsey & Lewis, 2004, Nataraj, 2007). Indian economy faces budgetary constraints, high cost of debt servicing, increasing revenue expenditure, lower aid flows etc. As a result, government is increasingly looking to the private sector to not only finance but also to build and operate infrastructure assets. Table-31 and Table-32 report the financial needs for the five year plan 2007-2012 which reflects

Table-31: Infrastructure Investment as Percentage of GDP (%)

Sector	Base Year (2006-07) of X Plan (BE/RE)	2007-08	2008-09	2009-10	2010-11	2011-12	Total XI Plan
Public	4.23	4.25	4.62	5.09	5.68	6.45	5.31
Private	1.20	1.73	1.91	2.16	2.51	2.89	2.29
Total	5.43	5.98	6.53	7.25	8.19	9.34	7.60

Source: Projections in the Eleventh Five Year Plan Investment in Infrastructure, Published by Secretariate for the Committee on Infrastructure, Planning Commission, Government of India

Table-32: Projected Shares of the Centre and States in Public Investment (%)

Sector	Centre	States	Total Public Sector
Electricity (incl.NCE)	53	47	100
Roads and Bridges	52	48	100
Telecommunications	100	0	100
Railways (incl. .MRTS)	95	5	100
Irrigation (incl. Watershed)	10	90	100
Water Supply and Sanitation	30	70	100
Ports	89	11	100
Airports	99	1	100
Storage	40	60	100
Gas	100	0	100
Total	53	47	100

Source: Projections in the Eleventh Five Year Plan Investment in Infrastructure, Published by Secretariate for the Committee on Infrastructure, Planning Commission, Government of India. Adopted from Holicim and NCAER report, 2010.

[8] The role of the private sector has been relatively limited, usually restricted to subcontracting in the construction phase.

that government is increasingly relying on private sector for infrastructure financing. Similarly, Table-33 and Table-34 report the huge financial needs for infrastructure development of India *vis-à-vis* other countries in India.

India needs to invest heavily in infrastructure as rapid economic growth has created increased gap between demand and supply of infrastructure facilities. According to the Global Competitiveness Report 2007-08, infrastructure in India compared unfavourably not only with developed countries but with other developing countries like China. Among the developing countries, China, Malaysia and Thailand have made remarkable progress in rebuilding economic infrastructure. One of the major reasons for China attracting huge amount of FDI is due to its well developed infrastructure, particularly in the developed eastern coastal areas.

Table-33: National Infrastructure Investment Needs in Asia: 2010-2020

Country	Estimated Investment Needs (US$ millions)	Investments as Percentage of Total		Total Investment per Year	Total Investment per Capita (US$)	2008 GDP Per Capita (Constant 2000 US$)
		New Capacity	Maintenance			
PRC	4,367,642	72%	28%	397,058	3,297	1,965
India	2,172,469	64%	36%	197,497	1,906	718
Malaysia	188,084	79%	21%	17,099	6,962	5,151
Thailand	172,907	72%	28%	15,719	2,566	2,640

Source: B Bhattacharya, 2010 (2009)
Note: Estimates obtained using the low case scenario.

Table-34: Infrastructure Investment Needs as a % of Estimated GDP 2010-2020

	Transport	Electricity	ITC	Water and Sanitation	Total
PRC	1.39%	3.42%	0.44%	0.13%	5.39%
India	5.67%	3.23%	1.87%	0.34%	11.12%
Indonesia	3.88%	0.98%	0.97%	0.35%	6.18%
Malaysia	1.94%	4.42%	0.27%	0.04%	6.68%
Philippines	2.30%	1.87%	1.22%	0.65%	6.04%
Thailand	0.58%	3.69%	0.45%	0.19%	4.91%

Source: B Bhattacharya, 2010 (2009)
Note: Estimates obtained using the low case scenario.

The fundamental need for infrastructure development in India is to increase investment, approximately doubling the infrastructure investment than the present level[9]. Financing infrastructure is a complex and difficult matter in India as Infrastructure projects need high initial capital cost and involves complex and varied mixture of financial and contractual arrangements. Some of the major constraints for financing infrastructure are (i) limited exit options for investors and weaknesses in corporate governance (ii) non-availability of well planned and designed number of infrastructure projects to choose (iii) interest cap and lack of deep forward foreign exchange market (iv) lack of depth in government bond market (V) regulatory uncertainty which increases the risk-profile of infrastructure projects (vi) weak fiscal positions of the governments making less bankable business partners for infrastructure projects.

5.3 Fiscal Measures, Governance and coordination between the centre and the states

Government can facilitate infrastructure investment and reduce costs by giving fiscal incentives such as reducing the customs duty on capital goods, tax concessions on long term investment in infrastructures, providing concessional land and other utilities etc. There are other serious constraints coming in the way of infrastructure financing such as time-consuming government approvals, red tape and administrative hurdles. Infrastructure projects generally need clearances from different government ministries at different levels which take long time and the project costs keep over running.

Infrastructure projects require clearances from both the central and state government, which involve many bureaucratic procedures and delay. Though the centre is very proactive in reforming overall policy for infrastructure development from time to time, actual implementation takes place at state level. Bureaucratic hassles, mainly at the state level, is one of the major reasons for the delay in project completions. In this context, there should be an autonomous body in each infrastructure sector to get clearances from both centre and state governments within a stipulated time frame. Other useful steps would be to (i) encourage every state to have a single window nodal agency for approval and clearances for infrastructure projects, (ii) to have coordination between central government institutions and these state level nodal agencies to reduce duplication and the number of clearances.

If there is a complex matter between the centre and the states, the relevant ministries and other related institutions must be available at the problem-solving stage to find solutions and make quick decisions. For this to happen, it is necessary to have an autonomous body with members from the states who would be accountable in the case of delays in project

[9] India is currently investing little less than 5% of GDP on infrastructure which needs to doubled (around 9 to 10 percent) like China to meet infrastructure demand.

implementation. Some of the major causes of delay are state level issues such as land acquisition, land use change, power connection and building plan approval. Therefore, coordination on these issues between the centre and the states before the approval of investment projects is required to avoid unnecessary delays at state level. Reforms at the state level to simplify and modernize policy and rules and to keep up pace with policy changes at the centre are also necessary to reduce cost and time overruns in infrastructure projects.

5.4 Land acquisition

The single biggest constraint to infrastructure development in the Country is "Land Acquisition". With the increasing pressures on land due to urbanization, rapid economic development, industrialization, increasing infrastructure requirements etc., especially in a fast growing economy like India, the acquisition of land by the Government has increased. However, since a large majority of people are dependent on agriculture, acquiring land is a complex process. Moreover, people who forego their land are given poor compensation and an undervalued market price of land and therein lies the recipe for many a dispute by the affected population, thereby impacting land acquisition. Infrastructure projects in India generally also get affected and delayed due to land problems of land acquisition.

In India, there are a rising number of protests against compulsory acquisition of land for construction of manufacturing units such as Tata's Nano car in Singur, in which 997 acres of agricultural land was acquired to set up a factory for one of the cheapest cars in Asia, (the project was subsequently shifted to Gujarat) or for developing Special Economic Zones such as Nandigram or construction of large dams like Sardar Sarovar Dam on the river Narmada, which led to a cancellation of grant by World Bank due to protests under the argument that the tribal population was getting displaced under unfair conditions. The effects of displacement spill over to generations in many ways, such as loss of traditional means of employment, change of environment, disrupted community life and relationships, marginalization, a profound psychological trauma and more. Such consequences lead to the requirement of legislations that address not only the issue of compensation, but also of resettlement, rehabilitation and participation in negotiation[10].

5.5 Land Acquisition Act in India

'Land Acquisition' literally means acquiring of land for some public purpose by government/government agency, as authorized by the law, from the individual landowner(s)

[10] Kelly A. Dhru, "Displacement Due to Land Acquisition for Development Projects in India: The Problems with the Existing Legislation and Policy, Research Foundation for Governance in India.

after paying a government fixed compensation in lieu of losses incurred by land owner(s) due to surrendering of his/their land to the concerned government agency. Land Acquisition Act of 1894 is a law that allows the Indian government to acquire private land in the country. The Land Acquisition Act was passed in the year 1894, and in 2007, a bill was introduced to amend the ancient act. Mostly problem occurs while arriving at proper compensation between land owners and requiring bodies (government agencies in most of the cases). The bill was lost beneath a stack of papers after being passed by the lower house in February 2009. Another bill to set up a regulatory authority for agricultural land acquisition is still pending. With growing pressure from various sides, the government has promised that the Land Acquisition Amendment Bill will be passed soon.

The following steps are involved in Land acquisition (1) Investigation: Revenue officers are appointed to hold enquiry about required land and give notification for land acquisition after the proper papers have been filed for acquisition of land and the government is satisfied about the purpose; (2) Objections and Confirmation: The collector accepts any objection from land owners within 30 days of notification and submit a report to the government to declare for land acquisition and also claims for land owners; (3) Claim and Reward: Then the collector offers a fair price to the owner based on the value of the land (mostly valued at government rate which is much less than the prevailing market rates); (4) Reference to Court: If the landowner who receives the award is not satisfied, he/she can submit a written application to court within six weeks of declaration and (5) Apportionment: Each of the claimants are entitled to the value of his interest, which he has lost by compulsory acquisition. Thus, a variety of interests, rights and claims in the land in terms of money are valued.

There is a plethora of literature on the issue of land acquisition in India. There are several authors who have not only highlighted the problems of land acquisition in India but also have suggested a way forward by amending the act. Some of the studies that have focused on this issue include Ranganathan (2010), Balagopal (2007), Reddy and Reddy (2007), Morris and Pandey (2007) etc. The study by Raghuraman, Bastain and Sundaram (2009) has highlighted issues with respect to environment and land acquisition in the road sector. Mega infrastructure projects receive a sizable investment of about 10% of the gross fixed capital formation in India. These investments are made by government (central and state) and private sector. However, it has been found that pending reforms in environmental clearances and land acquisitions have been the two major reasons for delays in such projects. Modifications in the regulatory framework on environmental and land acquisition issues would be moves in the right direction. Methods used for assessments related to environmental impact and land acquisition are still manual based on field survey, making the whole process time consuming. Therefore the use of technology like satellite images could

be a good instrument in reducing the time required for these assessments as well as in bringing transparency into the system. The satellite images can also be used at the planning level to identify the corridors which will affect the fewest number of people. The use of this technology can also help in identifying environmental and land acquisition issues during the preliminary stages of the project itself and at a much lower cost. Such identification would help in deciding the project with the least conflicts. The study also says that decentralization with capacity building at the state level would also help in the long run in reducing these delays.

Another paper by Asif (1999) proposed an alternative paradigm to the existing Land Acquisition Act. The paper has analyzed whether land acquisitions in India have been smooth and easy. In the process it has claimed that the present paradigm is defective, even though it has helped acquiring land for ‗public purposes' since 1894. The paper also illustrates that the mechanism of land acquisition in India has created enormous problems for the land losers, requiring bodies and the government. The requiring bodies as one of the stakeholders are interested to get the required land in as little a time as possible and at the least possible cost. While the collector-centric decision-making incorporated in the law allows the land losers as well as the requiring body to exert pressure on the collector. Also because of a near absence of transparency in the dealings the acquisitions most of the times has resulted in protest movements marked by a growing militancy. Another important flaw in the law governing acquisitions according to the paper is that it allows requiring bodies to manipulate acquisition before the actual start of the acquisition process. As a result the paper proposes amendments to the Land Acquisition Act of 1894 which can by and large be made acceptable to all the parties involved and keeping the decision making more broad based by involving not only the district collector but also the people who are affected in the acquisition process.

5.6 Issues and Way Forward

According to the Act, the government has the right to acquire private land without the consent of the land owners if the land is acquired for a ―public purpose" project (such as development of towns and village sites, building of schools, hospitals and housing and state run corporations). The land owners get only the current government price of the land as compensation. The key provision that has triggered most of the discontent is the one that allows the government to acquire land for private companies if it is for a ―public purpose" project. This has led to conflict over issues of compensation, rehabilitation of displaced people and the type of land that is being acquired.

The Land Acquisition (Amendment) Bill, 2007 redefined ―public purpose" to allow land acquisition only for defence purposes, infrastructure projects, or any project useful to

the general public where 70% of the land had already been purchased from willing sellers through the free market. It prohibited land acquisition for companies unless they had already purchased 70% of the required land. The Bill also made it mandatory for the government to conduct a social impact assessment if land acquisition resulted in displacement of 400 families in the plains or 200 families in the hills or tribal areas. The compensation was to be extended to tribals and individuals with tenancy rights under state laws. The compensation was based on many factors such as market rates, the intended use of the land, and the value of standing crop. A Land Acquisition Compensation Disputes Settlement Authority was to be established to adjudicate disputes.

The Rehabilitation and Resettlement Bill, 2007 sought to provide for benefits and compensation to people displaced by land acquisition or any other involuntary displacements. The Bill created project-specific authorities to formulate, implement and monitor the rehabilitation process. It also outlined minimum benefits for displaced families such as land, house, monetary compensation, skill training and preference for jobs. A grievance redressal system was also provided for.

Although the Bills were a step in the right direction, many issues still remained unresolved. Since the Land Acquisition Bill barred the civil courts from entertaining any disputes related to land acquisition, it was unclear whether there was a mechanism by which a person could challenge the qualification of a project as ―public purpose". Unlike the Special Economic Zone Act, 2005, the Bill did not specify the type of land that could be acquired (such as waste and barren lands). The Bill made special provision for land taken in the case of ‗urgency'. However, it did not define the term urgency, which could lead to confusion and misuse of the term.

The biggest loop-hole in the Rehabilitation and Resettlement Bill was the use of non-binding language. The government could effectively get away with not providing many of the benefits listed in the Bill. Also, most of the safeguards and benefits were limited to families affected by large-scale displacements (400 or more families in the plains and 200 or more families in the hills and tribal areas). The benefits for affected families in case of smaller scale displacements were not clearly spelt out. Lastly, the Bill stated that compensation to displaced families should be borne by the requiring body (body which needs the land for its projects). However, the serious matter of who would bear the expenditure of rehabilitation in case of natural disasters remained ambiguous[11].

[11] Largely drawn from Kaushiki Sanyal, Sahara Times, September 4, 2010, pg. 36.

Undoubtedly, the issue of land acquisition in India is a complex one. The government needs to balance its development objectives and at the same time learn to respect the sentiments of the people who give away their land. Important stake holders in land acquisition are the companies and it is high time they understood the sentiments of the local community and not look at land acquisition from merely a business perspective. It is important that the farmers not only get adequate compensation but also are rehabilitated and given alternate jobs. It is important for companies to understand the importance of direct dialogue and negotiation with the concerned party. This would help clear any misunderstanding and bring about clarity on the rehabilitation package. Therefore, it is imperative that the Government brings in changes to the Act and simultaneously the companies seek social approval of a project by giving large compensations to the local communities and have direct negotiation with them so that protests and violence of any kind are avoided and the process of land acquisition completed smoothly.

5.7 Environmental Issues

Environmental clearances have added layers of complexity for infrastructure development. Non-governmental Organisation (NGO's) in India add to the delay by holding up projects by filing writ petitions. Environmental clearances, infrastructure shortfalls and land acquisition problems continue to be key concerns for Industry and Corporates wanting to invest in infrastructure development projects. A study conducted by ASSOCHAM surveyed 266 Corporates on issues of "Constraints to Corporate Investments". Sixty seven per cent of those interviewed said that environment clearances, infrastructure shortfall and land acquisition problems still remain the top 3 constraints due to which uncertainties prevail in realizing their investments. Environmental clearances take away a substantial amount of time of the major infrastructure projects. Projects for expansion and modernization including new projects have to pass through over 36 channels at State and Central levels before being finalized.

In view of the above, the Government itself has increasingly found environmental concerns a major roadblock in pushing its growth mantra. Government realizes the need to ease environmental clearances to enable speedy implementation of Infrastructure projects. For instance, it is the environment ministry which gives clearances to proponents to set up industries as well as for using forested areas to develop projects. Off late, the environment ministry has been under tremendous pressure from infrastructure ministries – Power and Coal particularly- and also other industries demanding that the clearance process be made simpler and more industry-friendly. The environment ministry has also has committed to create transparency by putting up the reason for delay in the clearance process online and allowing everyone to track the proposals submitted.

Economic development and environmental management are complementary aspects of the same agenda. Without adequate environment protection, development will be undermined and without development, environmental protection fails. Due to technological advancement multiple choices are available on the development path. One can choose environmental policies and investments which has environment benefits for efficient use of natural resources leading to sustainable development. This is the place where professional approach to the development decision making, political commitment, and administrative ability matters.

Undoubtedly, protecting the environment is necessary and important. But there is certainly a need to re-look at the requirements of environment assessment and thereby the matter of environmental clearances to projects. One way forward could possibly be the scheme of self-certification by Industry when taking up new projects or expanding existing ones and deemed clearances after set time frames to avoid undue delays in the implementation of a project.

Once a project get environmental clearance, the environment ministry could bring in some measures which include strengthening and regulation of industry in the post-clearance stage.

Social and environmental clearances are best obtained by the government and not the private partner. Numerous projects have been stalled with huge time and cost overruns due to delay in land acquisition and failing to obtain environmental clearances. Expediting the environmental clearances will go a long way in improving the infrastructure development in the country.

6. Transport Infrastructure Development in Japan and Lessons for India

6.1 Transport Infrastructure Development in Japan

Japan has gone through phases of development starting from the eighteenth century. During the pre-war period, Japan had both phases of import-substitution and export promotion but the overall growth momentum between 1880 to 1940 required increased amounts of infrastructure services. The increased traffic, both cargo and passengers, and demand for energy, necessitated Japan to frame policy for development of infrastructure services, particularly transport infrastructure. The cargo traffic increased on an average of 8% for 50 years before the war compared to 10 % for the next 30 years after the war (Yoshida, 2000). The increase in cargo demand also witnessed the shifting of transport mode from shipping to railways before the war and from railways to roads after the war. The change in preference for mode of transportation could be attributed to changing unit pricing of transport services because of technological innovation and needs.

The foundation of infrastructure development in Japan actually started 50 years before the World War II. The period 1980 to 1940 witnessed huge investment in infrastructure and thereby increase in infrastructure stock. Infact, the total cargo traffic was highest during the pre-war period, particularly between 1987-1904 and 1919-1938. The volume of traffic per unit of transport infrastructure stock was very high in these two periods, particularly between 1919-1938. This reflects that investment in infrastructure investment was demand induced and there was better utililisation of infrastructure investment. The period between end of the world war-II and 1955, both traffic and investment slowed down resulting in slow down of infrastructure stock. However, the post war period between 1955 to 1985 was the best period for transportation sector as it received the highest investment compared to other infrastructure sectors. The investment in infrastructure sector used to be between 1 to 2.5 of GDP for three main infrastructure sectors such as transportation, electricity and telecommunication before the war which increased to 5 to 6 % of GDP between the period 1955 to 1985. The transport infrastructure received the major portion (3 to 4% GDP) catering to increasing demand due to revolution in automobile sector and increased movement in both traffic and passengers across prefectures. The continuous high investment on infrastructure during post war period resulted in substantial improvement in infrastructure services. However, the demand for infrastructure sector slowed down after 1980 due to slow down in the overall economy and shifting of manufacturing bases out of Japan. Overall infrastructure development in Japan was not uniform in the initial phases of development. The scarce resources were productively utilized which created unequal development of infrastructure. However, increased unequal development was a major

political issue in early 1960 which led to the formulation of National Comprehensive Development Plan in 1962 which emphasized on balanced development by providing infrastructure facilities in rural areas.

6.1.1 Development of Railways

Railways was increasingly the preferred way of transportation during the pre-war period. The development of railways started from Meiji government which emphasized on the modernization and higher efficiency in transportation sector through railways. The first railway started in 1972 with the bonds issued in London market through Oriental Bank of London. Though Meiji government wanted to build transport infrastructure, the difficult financial position during 1977 due to south western rebellion forced them to create Japan Railways Company in 1881 with private capital. Thereafter, private sector was the main driving force for railways development but government supported the private sector in many ways such as (i) government subsidy on interest payment and guaranteed net profit for first ten years; (ii) free sales of government lands and buying lands on behalf of railway companies (iii) fiscal incentives like exemption taxes etc. With all these incentives and facilitation by the government, private sector financing to railways and railways development under private sector was flourishing starting from 1980. Since these services are directly used by private sector, it was possible to levy user charges and toll fees depending upon the usages. This was an indication for the private sector to get involved in the infrastructure projects which would be helpful to them as well as they can cover their cost of providing infrastructure services.

The railway development was done very strategically to manage the increase in cargo and also linking production to market. There was clear emphasis on making routes connecting industrial areas to ports for exports. However, private railways, 17 biggest out of 38 existing, were purchased by the government in 1906 and the lines were nationalized. This was done after Sino-Japan and Russia-Japan wars which made the government realize that development of railways of equal standards and management across regions was a necessity. During post-war period, National railways were not doing well and were running in high deficit and suffered from frequent political intervention and labour unrest. Finally, National railways was split into seven companies and privatized in 1987, 81 years after nationalization. However, railways had some remarkable achievements during government controlled period such as the technological innovation of Shinkansen train, which was first in Asia.

6.1.2 Road Sector

Roads sector in Japan was mainly managed by the public sector though the government allowed toll roads in 1871. This made way for private sector investment in toll

roads and bridges. The toll expressways are mainly under the jurisdiction of Japan Highways (JH) Corporation, which was established in 1956. The JH took the role of government to construct national toll highways and collect tolls. JH enjoyed strong support from national government in forms of tax exemptions, toll collections power, power of compulsory land acquisition and financial help in the form of government bonds and guarantee to bonds. However, JH's conduct of business was properly supervised by national government, particularly by ministry of Land, Infrastructure and Transport. Earmarked funds for road improvement were introduced in the middle of fifties which acted as a major fund raising channel for road construction. Till very recently, the road sector, mostly tolls roads, are managed by the public sector such JH, Metropolitan Expressway Public corporation, Hanshin Express way Public Corporation etc. Unlike other developed countries Japan does not have a unified roads system by which private sector handles everything from construction to operation. However, government has created an environment where in efforts have been given for universal access to transport infrastructure across regions either by public sector or through giving incentives to private sector.

Similar to railways and roads, airports and ports have had different phases of development. As mentioned before Japan is highly developed in these crucial infrastructure compared to other countries and India is far behind. Though public sector/government played very important role in development of airports and ports, private sector has participated actively and that is mainly due to government sector specific policies for infrastructure development.

6.2. Lessons for India

Japan's development of infrastructure offers good lessons for India particularly in technology development and self reliance, allocation of investment to different infrastructure and overall policy for efficient management. One of the success stories of road sector development is toll pooling system which was introduced in 1972. This was useful as the total toll collected was used for development of all toll roads instead of collecting tolls for each project on the basis of separate estimations of profitability. The remarkable success of highway networks in Japan was possible primarily because of toll and user charges. Under the pool system, toll rates are equal across different expressways. Though it has been criticized on the basis of cross subsidization, it helped Japan to develop road sector across regions using the pool system. This pool system, resulted in development of expressways which are integrated to nationwide network which are of same quality. Government did not have to subsidize the road network heavily as the operating revenues were good enough as percentages of operating cost.

Railways, mainly the trunk network, was primarily created by private sector with strong government support. These are useful lessons for developing countries like India which are struggling with finances. After privatization, the quality, management and efficiency has improved substantially. Further, the role of private sector in raising the efficiency of personnel without any labour friction and introducing innovative technology is good lesson for India. The deregulation of transportation sector in recent years has helped mobilize private resources and implement competitive principle that resulted in improved services, lower prices and improve over all competitiveness. The private sector participation in Japan has serious implications for India like the clear cut and flexible division of roles and responsibilities, ownership and management, between private and public sector. Like India, public sector also owned and operated transport infrastructure facilities but frequent government intervention and restrictions resulted in unhealthy developments in terms of finance, sustainability and quality of services. Whenever one infrastructure sector, for example railways, under public sector witnessed inefficiency and detoriation in quality of services, then private sector was allowed to operate. Private sector participation not only improved the efficiency and but also got the most upgraded technology into the infrastructure sector. But in the initial years of private sector participation, government of Japan gave huge subsidies to privatization in construction and operating cost. However, like Japan in the past, public sector in India needs to have a major role in development of infrastructure for masses and all across different regions as private sector only concentrates on profit maximization.

Generally cost recovery in Japan is based on marginal cost pricing which is based on theory of efficient allocation of resources. The operating cost, which is close to the marginal cost is borne by the users in the forms of fees and fares where as the fixed cost portion is partially borne by the private sector supported by the public sector. However, annual expenditure is generally financed through fares and fees which also includes repayments for loans including interest. Fares/user charges are calculated in such a way that it covers the construction cost and operational expenses over a long period of time, (say 40 to 50) years. The approach is not based on annual accounts but for whole period (redemption period) where total revenues are equal to total expenditure minus subsidies. Therefore, the cost recovery mechanism in Japan is one of the lessons for India to sustain infrastructure development.

Another lesson for India is provision of infrastructure services across all regions. Infrastructure development leads to increase in overall economic activities, increased productivity and higher incomes. Therefore, regional disparities in infrastructure development also lead to regional disparities in per capita income. In India, there are wide disparities in infrastructure development and also per capita income. Therefore, India should

follow the policy like universal access to infrastructure of Japan where government supported backward regions for infrastructure development and gave huge incentives for the private sector to participate in backward regions.

Another lesson for developing countries like India is to improve technology on continuous basis. One of the remarkable features of Japanese infrastructure development is the use of most sophisticated technology which provides safe and quality services. Though the development of technology was not equal across infrastructure services and across regions initially, the quality of services in recent years is almost same across all regions.

Another success story of Japan in infrastructure development is integrated development model, particularly in major cities. Under this model, integrated land use and transport planning process uses land in best possible manner and interlinks all types of transport infrastructure. This reduces cost, time and encourages private sector to participate. Further, Japan also had a strategic location of urban materials to provide the space and right-of-way to construct an underground railways. The meticulous planning of land use and development of residential areas along the railway corridors to create traffic for new railways and other inter-linking transport infrastructure is a successful model. Development of railway corridors also benefits private operators or private railway companies as they own most of the land around rail line which are either sold at high prices or given for big retaining. The high level of coordination among different railway networks (such long route and short routes/intracity networks) for efficient and better service is highly commendable.

Japan is successful in creating world class transport infrastructure not only due to good planning and financing model but also due to creation of special bodies such as Japan High Corporation for road network and Japan Railways corporation. These bodies though part of the government, are quite independent when it comes to management and operation. Since these bodies are accountable to the government as well as to public, the focus has always been on efficiency and sustainability.

Japan is very successful when it comes to completion of projects on time. That is possible mainly due to smooth acquisition of land for construction. The rights of the land in Japan are strongly protected. Like India, though the land acquisition law entitles the government to forcibly acquire land for public purposes, it has been hardly used. Usually the public corporation and private infrastructure companies visit the land owners much before the project design is prepared and hold negotiations. The efforts are given to convince the land owners about the economic and social benefits of the project. More importantly, the compensation package is very generous and the money offered to land owners are higher, sometimes multiple times, than the prevailing market prices. This reduces the delay cost due to land acquisition process.

Along with all these factors, high public investment on infrastructure over a long period of time starting from mid fifties resulted in ever expanding transport infrastructure. Infact, government of Japan invested heavily even during the long recession starting from early nineties. India‘s infrastructure investment today is almost equal to the investment of Japan 50 years back. Therefore 50 years of continuous high spending investment in infrastructure resulted in quality infrastructure stock in Japan. Government at different levels such as national government, local government and public corporations have directly and indirectly financed most of the infrastructure in Japan. Along with this, the active participation of private sector helped improve infrastructure sector. Public corporation used to finance infrastructure development through users fees and borrowing from public and private institutions through public bonds. Further, use of postal savings and social security funds through Fiscal Investment and Loan Program (FILP) has been helpful in mobilizing resources for infrastructure development. Overall configuration of various sources of financing such as public corporations, special accounts for each transport sector, public borrowing through bond issues, FILP and user fee based revenue generation has helped Japan to develop massive transport infrastructure development.

Concluding Remarks and Policy Suggestions

Today infrastructure development in India is most crucial to continue high and sustainable growth. The major issues in infrastructure sector are financing, land acquisition, private sector participation, stable policy framework, institutional set up, tariff policy etc. Given the position of the government to finance the expected infrastructure investment, the environment for infrastructure development through both public and private investments needs to improve through providing more stable and secure policy framework, protection of property rights and pricing and subsidy policies. One of the major problems in infrastructure development is the lack of proper dispute resolution mechanism. Moreover, it is desired that independent regulatory authorities clear different kinds of infrastructure projects. Further, governments may give guarantees and other forms of support to ensure confidence and viability for infrastructure projects to attract private investment. The politically acceptable cost-recovery based pricing is very important for financial sustainability of infrastructure projects and for attracting private investment into infrastructure sector[12]. Government can also attract foreign investors in infrastructure sector by allowing foreign equity upto 100 % (at least to be increased from the present level) in almost all infrastructure sectors. Infrastructure projects are capital intensive and the ability of foreign investors to finance and mobilize resources and global expertise can expedite infrastructure investment if the policy framework and regulatory structures are appropriate in this sector. Therefore, formulating special investment law with clarity covering infrastructure investment at state level would attract huge investment[13].

Another major problem in Infrastructure development is infrastructure financing. Therefore, Indian government needs to look into the following aspects (i) removing interest rate caps on External commercial Borrowings (ECBs) (ii) improve the health of the bond market (iii) relaxation on bank‘s investments in corporate bonds (investment and regulatory guidelines for financial intermediaries which will encourage them to participate in infrastructure projects (iv) allowing financial intermediaries to invest in reasonably rated infrastructure projects. (v) government needs to guarantee the use of pension funds, insurance and FII‘s to invest in infrastructure projects where risk is quite high. (vi) creating special infrastructure financial institutions which would get involved in the design and

[12] Policy and regulatory reforms relating to user charges, reduction of theft and private entry into distribution are a pre-requisite for increased private investment in power.

[13] Andhra Pradesh Infrastructure Act and success of Gujarat government in attracting private investment/FDI in ports and other infrastructure could be taken as reference cases.

planning of the projects and also create a debt recovery tribunal to to bring in confidence for large investment.

The laws of Land acquisition needs to be revisisted to accommodate proper rehabilation and compensation packages. The decentralized negotiation between the required bodies and land owners is the best option. Proper institutional set up for each transport infrastructure sector is necessary but there should be efforts for coordinated approach among road, railways, airports and ports so that interlinking of infrastructure services is effective and efficient. Since most of the infrastructure services are built by private operators through contracts, the design of the projects, estimation of cost and time etc has to be done in scientific manner to avoid delays and cost over runs. Overall, the Japanese experience of infrastructure development have good lessons for a country like India. Though both the countries are at different levels of development, learning from Japan and taking appropriate policy measures for developing transport infrastructure in India would be useful.

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The Author

Dr. Pravakar Sahoo obtained his Ph.D from Institute for Social and Economic Change, Bangalore, India. He is currently working as an Associate professor with the Institute of Economic Growth (IEG), New Delhi. Prior to this, he was working as Senior Fellow in Indian Council for Research on International Economic Relations (ICRIER). He has carried out projects and acted as a Consultant to various national and international agencies such as the Government of India; Asian Development Bank Institute (ADBI), Japan; Indo-Shastri Canadian Institute, Canada; International Labour Organisation (ILO); Korea Institute for International Economic Relations (KIEP), Asian Development Bank (ADB) etc. He has published more than 30 research papers in National and International refereed journals. Further, he teaches macroeconomics to high-level government officials and policy makers like Indian economic services and Indian statistical services.

Dr. Sahoo‘s research interests focus on macroeconomics, international trade & finance and development economics. He has worked on India, South Asia and many developing countries across the globe. This paper is the result of his six months stay at Institute of Developing Economies, Japan, from June 2010 to December 2010 as a Visiting Research Fellow.

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