

Chapter 2

India's Transport Sector System Attributes & Past Performance

2.1 INTRODUCTION

Major Mechanised Modes of Transport

The mechanized modes of transport constituting the transport sector in the country comprise Railways, Highways, Coastal Shipping, Airways, Inland Waterways, Pipelines and, to a minor extent, Ropeways. Railway and Highway networks have more or less an all-India geographic coverage and provide short, medium and long-lead freight and passenger services. Coastal Shipping represents freight movements along the coastline while Airways represent a growing route specific network of linkages. Inland Waterways, which had fallen to disuse over time, are in revival mode. Pipelines catering to transport of liquid fuels, gases and, to some extent, iron ore slurry, have a sizeable and growing network owing to cost effectiveness of operations. Ropeways are in use at a limited number of places for localized short-haul of goods by industries as well as carriage of passengers in cable cars at certain tourist spots.

Other Means of Transport

In the case of Highways, apart from trucks and buses which carry both long-lead and short-lead freight and passenger traffic, there are a number of other means of transport like bullock carts, hand carts, tongas, tempos (light commercial vehicles), etc. which meet local short-lead transport needs of the people in rural and semi-urban areas and, for intra-city movements, even in developed urban settlements. There are even locally contrived mechanical contraptions (commonly called “Jugad”) which are used for ferrying goods and passengers between villages and towns. Even tractor-trolleys are used by farmers for carrying their produce to mandis (wholesale markets). In fact their use is not confined to transport of goods alone; these very often carry whole families to towns and fairs. The number of these varied types of vehicles is fairly large. While this segment of transport may seem rather orthodox, it not only serves the needs of a large part of the population who find it convenient and economical but also provides employment to many.

Institutional Setup

Development and operational management of Indian Railways (IR) is responsibility of the Ministry of Railways of the central government. IR's policy and its implementation rests with the Railway Board consisting of chairman and six members. The Board monitors operations on its sixteen zonal Railways, Kolkata metro line, RVNL (a special purpose vehicle for implementing rail improvement projects) its rolling stock manufacturing units, maintenance workshops, a research and designs organization, apart from two consultancy undertakings, IRCON & RITES, as well as Container Corporation (CONCOR) working under its wings. IRs finances are not part of the general budget and it presents a separate budget for its requirement of funds to the Parliament.

In the road sector, National Highways Authority of India (NHAI) was created by an Act of Parliament in 1988, under the Ministry of Shipping, Road Transport and Highways, for developing, maintaining and managing National Highways network in the country. However, owing to financial and administrative reasons, the Authority came to be formally established only by February

1995, State Highways and other roads are developed and managed by differently named departments, like PWD, Roads and Building Department and Road Development Corporations in different States, using their own resources. However, the Central Road Fund (emerging from tax on fuel) controlled by the Ministry of Finance, also allocates funds for national, state and rural roads. Village roads are managed and maintained by panchayats. National Rural Roads Development Agency provides central government funds for the Pradhan Mantri Gram Sadak Yojna (PMSGY) which is implemented by the state rural roads development agencies. Other associated Ministries include Ministry of Rural Development and Ministry of Urban Development.

Management of Coastal Shipping also falls under the Ministry of Shipping, Road Transport and Highways. Airways are managed by the Ministry of Civil Aviation.

An attempt is made in this chapter to briefly describe, in the backdrop of historical growth, the present infrastructural system attributes and operational status of different modes of transport as a prelude to the future scenario likely to emerge in the wake of anticipated developments fuelled by the continuing high rate of economic growth.

SECTION I: SYSTEM ATTRIBUTES

2.2 INDIAN RAILWAYS

The first small railway line in the country was built near the Chintadripet Bridge in the erstwhile Madras Presidency in the year 1836. On this line, a stone loaded cart used to be moved up a slightly inclined plane from where it would return by the force of its own weight. However, the first locomotive hauled train was run between Bori Bunder (Bombay) and Thane over a distance of 21 miles at a speed of 20 miles per hour, on 16th April, 1853. From these humble beginnings, the IR has seen massive country wide expansions in its network and operations over the past 155 years of its existence, extending over 53596 route-kilometers by 1950-51, the first year of the First Five-Year Plan, after India achieved independence in 1947. By 31st March 2007, the network has further extended to 63327 route-kilometers.

In addition, Konkan Railway Corporation operates a single line rail stretch of 762 kms across the Western Ghats, linking Roha in Maharashtra with Mangalore in Karnataka in the South, passing through important stations like Chiplun, Ratnagiri, Madgaon, Karwar and Udupi. As of now, IR is one of the top five national railway systems in terms of size and scale of operations.



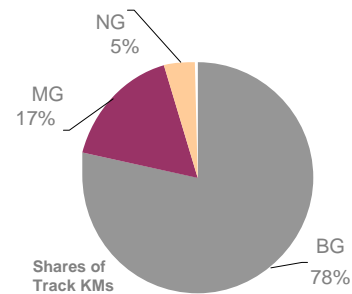
At present, IR, with a fleet of 51255 passenger service vehicles (including other coaching vehicles), 207719 wagons and 8153 locomotives, carries around 17 million passengers and 2 million tonnes of freight traffic per day across the length and breadth of the country, meeting requirements of rail users through 6909 railway stations. Key statistics of IR are placed at **Annexure 2.1** (contained in Annexure Volume-1).

Rail Network

IR has a multi-gauge rail network. The share of different gauge tracks in terms of route-kilometers, running track-kilometers and total track-kilometers is shown in Table 2.1.

TABLE 2.1: IR'S RAIL NETWORK (AS ON 31.03.2007)

Gauge	Route- kms	Running Track-kms	Total Track- kms
Broad Gauge (1676 mm)	49820	71015	93386
Metre Gauge (1000 mm)	10621	11487	13412
Narrow Gauge (762 mm/610 mm)	2886	2888	3198
Total	63327	85390	109996



Broad Gauge (BG) predominates with around 78% share of route-kilometers, 83% of running track-kilometers and 85% of total track-kilometres. The corresponding shares of Metre Gauge (MG) are 17%, 13% and 12%, respectively. The balance is accounted for by Narrow Gauge (NG) network. Though BG constitutes around 78% of the total route-kms, it contributed 99.7% of the freight output (net tonne-kms.) and 96.6% of passenger output (passenger-kms.) during 2006-07.

Of the total 63327 route-kms, a little over 27% (17366 kms) comprise double or multiple track lines. As part of IR's project uni-gauge, MG part of the network is progressively being converted to BG. Railways aim to convert the entire remaining MG network of over 10000 kilometres to BG during the 11th Plan period. A major work in the offing is creation of six dedicated high axle load freight corridors along the golden quadrilateral and its diagonals viz. Delhi-Mumbai, Mumbai-Chennai, Chennai-Kolkata, Delhi-Kolkata, Delhi-Chennai and Mumbai-Kolkata. Of these, process for construction of the Delhi-Mumbai and Delhi-Kolkata corridors has already been initiated.

Zonal Shares of Rail Network

Indian Railways is administratively divided into 16 zones. The extent of route-kilometers of network falling in the jurisdiction of different zones is shown in Table 2.2.

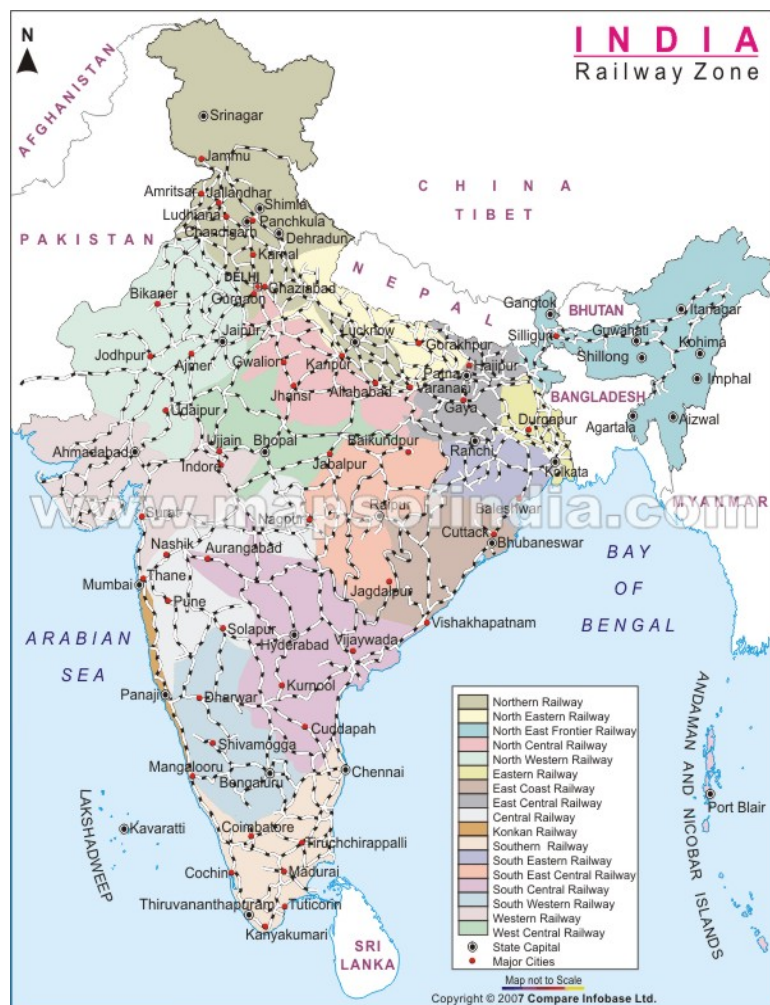
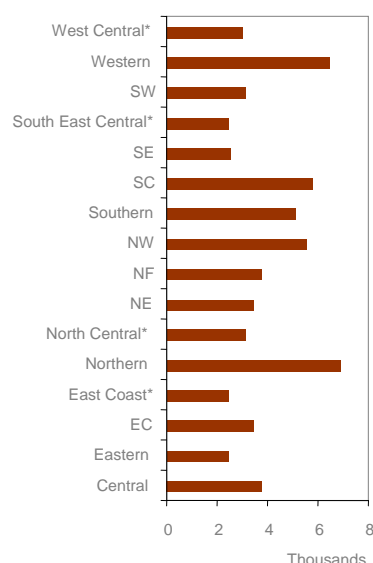


TABLE 2.2: ZONAL SHARES IN ROUTE-KMS ON IR

Zones	Headquarters	Route kms.
Central	Mumbai	3,832
Eastern	Kolkata	2,414
East Central	Hajipur	3,480
East Coast*	Bhubaneshwar	2,430
Northern	New Delhi	6,834
North Central*	Allahabad	3,079
North Eastern	Gorakhpur	3,452
Northeast Frontier	Maligaon (Guwahati)	3,767
North Western	Jaipur	5,576
Southern	Chennai	5,160
South Central	Secunderabad	5,734
South Eastern	Kolkata	2,577
South East Central*	Bilaspur	2,431
South Western	Hubli	3,106
Western	Mumbai	6,490
West Central*	Jabalpur	2,965
Total		63,327

Zonal Shares in Route KMs
(Functional w.e.f. 01.04.03)



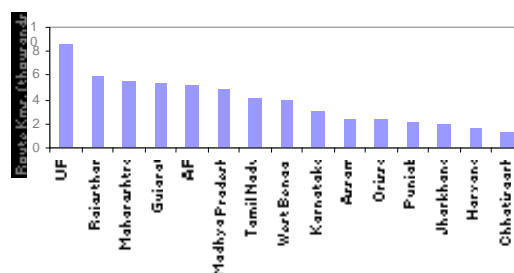
Spread of Railway Lines across States and Union Territories (UTs)

Extent of railway route-kilometers lying in different States and Union Territories (UTs) is given in Table 2.3. The remaining States/UTs viz. Sikkim, Andaman & Nicobar, Dadra & Nagar Haveli and Lakshadweep have no railway line. States like Arunachal Pradesh, Manipur, Mizoram, Nagaland and UT of Pondicherry have negligible expanse of rail network ranging between 1 and 13 kilometres.

TABLE 2.3: STATE/UT WISE ROUTE-KMS

SN	State/ Union Territory	Route-Kms.	SN	State/ Union Territory	Route-Kms.
1	Andhra Pradesh	5,172	16	Maharashtra	5,520
2	Arunachal Pradesh	1	17	Manipur	1
3	Assam	2,284	18	Mizoram	2
4	Bihar	3,411	19	Nagaland	13
5	Chhattisgarh	1,185	20	Orissa	2,247
6	Delhi	182	21	Punjab	2,134
7	Goa	69	22	Rajasthan	5,911
8	Gujarat	5,309	23	Tamil Nadu	4,121
9	Haryana	1,540	24	Tripura	64
10	Himachal Pradesh	285	25	Uttarakhand	345
11	Jammu & Kashmir	138	26	Uttar Pradesh	8,574
12	Jharkhand	1,941	27	West Bengal	3,911
13	Karnataka	3,006	28	Chandigarh U.T	16
14	Kerala	1,050	29	Pondicherry U.T	11
15	Madhya Pradesh	4,884		Total	63,327

Route-Kilometers
(Top 15 States)



Expansion of Rail Network

Information presented in Table 2.3 reflects inequitable penetration of rail network in different regions of the country. Limited extent of expansion of the rail network between 1950-51, the first year of the First-Five Year Plan and March 31, 2007 can be seen from the status of network in selected years during the period under reference as given below.

Year	Route kms	Increase (kms)
1950-51	53,596	-
1960-61	56,247	2,651
1970-71	59,790	3,543
1980-81	61,240	1,450
1990-91	62,367	1,127
2000-01	63,028	661
2002-03	63,122	94
2003-04	63,221	99
2004-05	63,465	244
2005-06	63,332	-133
2006-07	63,327	-5
Total Increase in Route Kilometers		9,731

Rate of expansion of route kilometres in the first 40 years beginning 1955-51 averaged around 219 kilometres per year. In the next 15 years up to 2006-07, the average annual extensions amounted to a mere 64 kilometres. Total expansion of route kilometres in 55 years was 9,731 kilometres reflecting an average annual increase of around 177 kilometres. This is too low a rate for railway line penetration in a country of India's size particularly when large parts of the country especially the hilly regions lack rail transport facility.

Missing Rail Links

Owing primarily to high cost of construction in hilly terrain and lack of financial viability, most of the hill states, particularly in the northeastern region, with the exception of Assam, have had minimal or no rail connectivity. Of late, however, because of strategic and developmental reasons, there has been renewed emphasis on the need for strengthening the existing links as well as constructing new lines in these states. The works already in progress or proposed include building a new rail link between Harmuti in Assam and Itanagar in Arunachal, a new line between Dudhnoi in Assam and Depa in East Garo Hills region of Meghalaya, conversion of Lunding-Badarpr-Silchar-Katakhal-Bhairabi (Mizoram) metre gauge (MG) sections to broad gauge (BG), a new line between Jiribam and Imphal, capital of Manipur and linkage of Kumarghat with State capital Agartala in Tripura. A survey has also been undertaken by the NF Railway for laying a 52.7 kilometre long new railway line from Sevoke in West Bengal to Rangpo in Sikkim which provides gateway for crucial trade link with China via Nathu La.

A major new line work which has been declared a national project is the linking of Jammu Tawi-Udhampur BG section with Baramula in the State of Jammu and Kashmir. Part of the new line between Baramula and Qazigund has already been constructed for serving the valley and train operations have already started on part of this stretch. Completion of the remaining work on Udhampur-Quazigund Broad Gauge rail link will provide the State with access to all-India BG rail network of IR.

Himachal Pradesh has 285 kilometres of railway lines, major part of which comprises narrow gauge links between Kalka-Shimla and Pathankot-Joginder Nagar. These lines are primarily passenger transport oriented and lack a seamless linkage with the all-India BG network. The Broad Gauge railway line between Sirhind and Una Himachal-Chararu Takrala just touches the fringe of Himachal Pradesh with around 33 kilometres of this line passing through the State. The work of a new 63 km Broad Gauge line between Bhanupali (near Nangal Dam) and Bilaspur in Himachal Pradesh has since been sanctioned which will take the rail network to the heartland of the State with prospect of future extensions. On strategic considerations, proposals are also afoot to further extend the railway line from Bilaspur to Leh via Manali.

Even after completion of the aforementioned sanctioned works, many areas not only in the northeastern region but also other hill states would lack direct rail access. A list of regions/Districts in various States with no direct rail link is given in Table 2.4.

TABLE 2.4: LIST OF REGIONS/DISTRICTS IN DIFFERENT STATES WITH NO RAIL LINKS

SN	State	Region/District
1	Arunachal Pradesh	Changlang, Dibang Valley, East Kameng, East Siang, Lohit, Lower Subansiri, Papumpare, Tawang, Tirap, Upper Siang, Upper Subansiri, West Siang, West Kameng, Kurungkumey
2	Sikkim	West, South, East
3	Meghalaya	East Garo Hills, East Khasi Hills, Jaintia Hills, Ribhoi, South Garo Hills, West Garo Hills, West Khasi Hills
4	Mizoram	Chimmtuipui, Lunglei, Aijawl, Champhai, Kolasib, Lawngtlai, Mamit, Serchhip,
5	Nagaland	Kohima, Tuensang, Mon, Mokokchung, Wokha, Zunheboto, Phek
6	Manipur	Chandel, Bishnupur, Churachandpur, Imphal East, Senapati, Tamenglong, Thoubal, Ukhrul, Imphal West
7	Tripura	North Tripura, Dhalai, South Tripura, West Tripura
8	Jammu & Kashmir	Leh, Punchh, Rajauri, Kargil, Doda
9	Himachal Pradesh	Chamba, Hamirpur, Kinnaur, Kulu, Manali, Lahul & Spiti
10	Uttarakhand	Almora, Bageshwar, Chamoli, Champawat, Pauri Garhwal, Nainital, Pithoragarh, Rudraprayg, Tehri Garhwal, Udham Singh Nagar, Uttarkashi

Need for Policy Initiative

As already mentioned, the cost of construction of new railway lines in hilly terrain is very high. Even selective rail linkages for the identified areas may not be remunerative. In view of the heavy resources required for the purpose which Railways may not be able to mobilize on their own, it is necessary that a national policy is mooted for the purpose and required funds made available to Railways for prioritized execution of identified rail links in the interest of socio-economic integration of the regions. To start with, the rail network could first be extended to the State capitals, followed by judicious expansion of the network within the respective States.

Traction

Electric and diesel are the main modes of traction on IR. Steam traction is confined to running of heritage/tourist trains and a few narrow gauge hill sections. As on 31st March, 2007, 17811 route-kilometers i.e. about 28% of the total are electrified. The double line Golden Quadrilateral linking the four metros viz Delhi, Mumbai, Kolkata and Chennai has been fully electrified. Even though electrification extends over 28% of route-kilometers, it accounts for 49.7% and 62.8% of gross tonne-kilometers in respect of passenger and freight traffic, respectively. Gauge wise extent of electrification of different types of routes is given Table 2.5.

TABLE 2.5: GAUGE WISE EXTENT OF ELECTRIFICATION OF DIFFERENT ROUTES (AS ON 31.03.07)

Gauge (Route-Kms)	Single Line			Double/Multiple Line			Grand Total
	Electrified	Non-Electrified	Total	Electrified	Non-Electrified	Total	
Broad (1676mm)	4,361	28,107	32,468	13,425	3,926	17,351	49,819
Metre (1000mm)	-	10,607	10,607	-	15	15	10,622
Narrow (762/610mm)	-	2,886	2,886	-	-	-	2,886
Total	4,361	41,600	45961	13,425	3,941	17,366	63,327

Rolling Stock: Locomotives

As on 31st March, 2007, IR had a fleet of 7817 locomotives including 45 steam, 4769 diesel and 3003 electric locomotives. Tractive effort per locomotive (in kgs.) was 29978 in the case of BG and 18603 for MG. Types of diesel locomotives in use on IR include WDP-1, WDP-2 (passenger services) and WDM2, WDM 3A, WDG 3A & WDG4 (goods service). Electric locomotives are WAP/2, WAP/3, WAP/4 (passenger services) and WAG5, WAG7, WAG9 (goods services).



Rolling Stock: Wagons

IR operates its freight services with a fleet of 228,170 wagons in terms of four-wheeler units comprising 69,149 covered, 99,635 open high-sided, 8,889 open low-sided, 39,101 other types and 11,396 brake vans/departmental wagons. Gauge wise wagon holding and carrying capacity is as shown in Table 2.6

TABLE 2.6: IR'S GAUGE WISE WAGON HOLDING AND WAGON CAPACITY (2006-07)

Gauge	Number ('000)	Average Capacity (Tonnes)
BG	190	51.6
MG	7	32.1
All Gauges	198*	10.06T

*Excludes departmental service wagons and brake vans.

To meet transport requirement of various types of goods, there are different types of wagons e.g. covered, open, flats, well wagons, four-wheeler tank wagons, etc. in use on IR. The fleet includes 144,193 special types of wagons like BOX 'N', BCN/A, BCX, BTPN, etc. (Annexure 2.2 contained in Annexure Volume-1).



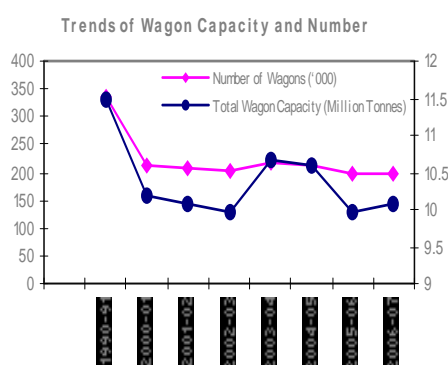
Improvement in Wagon Capacity

Details of variation in wagon fleet size and total wagon capacity as well as no. of BG wagons and associated average wagon capacity for years 1990-91 and 2000-01 to 2006-07 are given in Table 2.7.

It is observed that:

- ◆ While there has been considerable decrease in the size of total wagon fleet on IR over the years, the impact on total wagon capacity has been minimal owing to technological improvements in wagon design and re-rating of carrying capacity of wagons.
- ◆ In the case of BG wagons, despite drop in the fleet size, average capacity of wagons has been going up, for similar reasons.

TABLE 2.7: WAGON FLEET SIZE VIS-À-VIS WAGON CAPACITY



Year	All Gauges		Broad Gauge	
	Number of Wagons @ ('000)	Total Wagon Capacity (MT)	Number of Wagons @ ('000)	Average Capacity (Tonnes)
1990-91	335	11.50	276	36.9
2000-01	214 (-36.12)	10.19 (11.39)	199	48.7
2001-02	207 (-3.27)	10.09 (-0.98)	194	49.7
2002-03	204 (-1.45)	9.98 (-1.09)	192	50.0
2003-04	216 (+5.88)	10.66 (+6.81)	205	50.3
2004-05	211 (-2.31)	10.60 (-0.56)	202	50.9
2005-06	198 (-6.16)	9.97 (-5.94)	189	51.3
2006-07	198 (0.0)	10.06 (+0.90)	190	51.6

@

Excludes departmental service wagons and brake vans.
Parenthesized figures shows % decrease/increase in wagon fleet & associated capacity.

Rolling Stock: Coaches

In view of ever increasing passenger travel demand, there has been substantial increase in number of passenger coaches over the years. Table 2.8 presents growth in number of coaching stock on IR for selected years between 1950-51 and 2006-07.

There are different types of coaches to meet travel needs of different categories of passengers. These include WCRAS (AC Spl twin-car), WGFAC9 (1st class AC), WGACCW (AC 2 tier sleeper), WGACCN (AC 3 tier sleeper), WGFSCWAC (1st AC-cum-AC 2 tier sleeper, WFCZ (1st class chair car), WSCZAC (AC 2nd class chair car), WFC (1st class), WGFCN (91st-cum-2nd class sleeper & coupe), WGS (2nd class), WGSCN (2nd class 3 tier sleeper), WGSCZ (2nd class chair car) SLR (2nd class with brake & luggage van), CT (1st class tourist car), CTS (2nd class tourist car), WCD (dining car), WCB (buffet/pantry car), and LR (luggage & brake van).



TABLE 2.8: GROWTH IN NUMBER OF COACHING STOCK ON IR

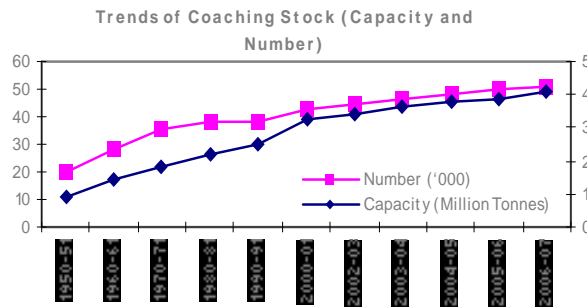
Year	PASSENGER COACHES						Other Coaching Vehicles (Number +)
	EMU Coaches		Conventional Coaches		DMU/DHMU		
	Number	Capacity \$	Number @	Seating Capacity	Number	Seating Capacity	
1950-51	460	87,986	13,109	854,678	-	-	6,059
1960-61	846	150,854	20,178	1,280,797	-	-	7,415
1970-71	1,750	340,541	24,676	1,505,047	-	-	8,719
1980-81	2,625	500,607	27,478	1,695,127	-	-	8,230
1990-91	3,142	609,042	28,701	1,864,136	-	-	6,668
2000-01	4,526	859,701	33,258	2,372,729	142	13,884	4,731
2002-03	4,696	905,771	34,896	2,506,947	261	24,936	4,904
2003-04	4,962	1,060,284	35,691	2,566,917	316	30,232	5,519
2004-05	5,029	1,044,622	37,125	2,668,841	559	52,767	5,600
2005-06	5,316	1,049,867	38,199*	2,756,726*	578	53,859	5,612*
2006-07	5,762	1,120,006	38,896	2,876,174	692	60,132	5,905

\$ Includes standing accommodation.

* Revised.

@ Includes rail cars.

+ Includes luggage vans, mail vans, parcel vans, etc.



The design of passenger coaches has undergone a qualitative change both in terms of physical structure and enhanced passenger carrying capacity. New LHB coaches were first provided on Mumbai-New Delhi Rajdhani Express in December 2003 and subsequently extended to other Rajdhani Express trains. To meet the projected increase in non-suburban passenger traffic by 8-9% per annum, IR interalia proposes to evolve design changes to enhance seating capacity in 3AC & GSCN coaches by 15-20%.

2.3 HIGHWAYS

Road Network

Indian road network is second largest in the world and extends over 36 lakh kilometers (as in 2004), providing connectivity to every nook and corner of the country.



Historical growth of different categories of roads for select years between 1951 and 2004, the latest year for which data in the case of different types of roads are available, is presented in Table 2.9.

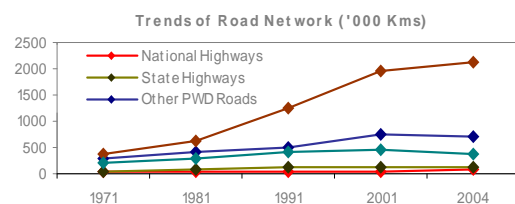
TABLE 2.9: HISTORICAL GROWTH OF ROAD NETWORK (KMS)

Road Category	YEAR WISE ROAD LENGTH						
	1951	1961	1971	1981	1991	2001	2004
National Highways	19811 (5.0)	23798 (4.5)	23838 (2.6)	31671 (2.1)	33650 (1.4)	57737 (1.7)	65569* (1.8)
State Highways			56765 (6.2)	94359 (6.4)	127311 (5.5)	132100 (3.9)	133177 (3.7)
Other PWD Roads			276833 (30.3)	421895 (28.4)	509435 (21.9)	736001 (21.8)	719257 (19.9)
Rural Roads	206408 (51.6)	197194 (37.6)	354530 (38.7)	628865 (42.3)	1264154 (54.2)	1972016 (58.5)	2140569 (59.1)
Project & Urban Roads		46361 (8.8)	203013 (22.2)	308631 (20.8)	396536 (17.0)	475666 (14.1)	362935 (15.5)
Total	399942	524478	914979	1485421	2331086	3373520	3621507

Parentthesized figures indicate percentage share of each road category in total road length.
Source: Basic Road Statistics of India, July 2008, Transport Research Wing, MOSRTH, Govt of India.

Road Length by Category and Type of Surface

Category wise details of surfaced and unsurfaced roads in the country; and state wise shares of surfaced roads in total road length is presented in Appendix-1 and Appendix-2, respectively (at the end of the chapter).



It is seen that, as of 2004, about 42% of the total road length was un-surfaced, which included 29% of motor-able roads and 13% of non-motor-able roads.

Present Status

Table 2.10: Extent of Road Network of Select Categories

SN	Category of Road	Length
1	National Highways	66,590
2	State Highways	1,31,899
3	Major District Roads	4,67,763
4	Rural & Other Roads	26,50,000
Total Length		33,16,252

The extent of network of select categories of roads as on 01.01.2008 is given in Table 2.10.

National Highways extend over 66,590 kilometres as on 01.01.2008. The map below presents the spread of National Highways in the country.



National Highways Development Plans

Around 32% of National Highways are single lane, about 56% double lane and only around 12% have four or more lanes. Even though National Highways constitute around 2% of the total road network in the country, they carry 40% of the total road traffic. With ever increasing motor vehicle population in the country, most of the roads are congested and unable to handle increasing traffic. NHA is carrying out an ambitious National Highways Development Programme for up-gradation and expansion of roads for better connectivity to ports, etc. More specifically, the development programmes include:

NHDP Phase I: Approved in December 2000, it envisages:

- ◆ Four-laning of the Golden Quadrilateral, linking the 4 metropolitan cities of Chennai, Delhi, Kolkata and Mumbai, having an aggregate length of 5846 kms. ;
- ◆ Four-laning of the North-South corridor connecting Srinagar in Jammu and Kashmir with Kanyakumari in Tamil Nadu in the South, and East-West Corridor connecting Silchar in Assam with Porbandar, a coastal town in Saurashtra region of Gujarat, covering 981 kms. ;
- ◆ Port connectivity by upgrading 315 kms of NHs linking major ports in the country; and up-gradation of 315 kms of other National Highways.
- ◆ The aggregate length of NHs for up-gradation envisaged under Phase I is placed at 7498 km. out of which 6994 kms. have been four-laned as on 01.01.2008.

NHDP Phase II: Its main thrust is 4-laning of North-South and East-West Corridors covering a distance of 6240 kms and up-gradation of 496 km stretch of other National Highways. Out of the total length of 6736 kms, 778 km has been four-laned as on 01.01.2008.

NHDP Phase III: Four-laning of 12,109 km of high density National Highways connecting State capitals, important tourist places and places of economic importance on Public Private Partnership basis.

NHDP Phase IV: Two-laning of 20,000 kilometres of Highways with paved shoulders.

NHDP Phase V: Six-laning of 6,500 kilometres of existing four-lane Highways including the Golden Quadrilateral (about 5,700 km) and other selected stretches.

NHDP Phase VI: Development of 1,000 km of access-controlled four/six lane divided carriageway expressways on BOT basis

NHDP Phase VII: Other highway projects like ring roads, flyovers and bypasses on selected stretches of roads.

Status of Development of Golden Quadrilateral

Progress of works on the major corridors constituting the golden quadrilateral as on 31st December 2007 is given in Table 2.11.

TABLE 2.11: PROGRESS OF WORK ON GOLDEN QUADRILATERAL (AS ON 31.12.2007)

Corridor	Length (km)	Works completed	
		Km	%
Delhi-Mumbai	1419	1419	100
Mumbai-Chennai	1290	1247	78.82
Kolkata-Chennai	1684	1571	51.66
Delhi-Kolkata	1543	1397	83.70
Total	5936	5634	76.76

Major Expressways

A number of heavily loaded road routes have been developed as Expressways during the past decade for achieving speedier and smoother movement of traffic. These include the following:

- (i) **National Expressway 1 – Ahmedabad-Vadodara Expressway:** India's first 92.85 km, 4-lane, dual carriageway expressway mooted during 1970s got under way in 1990s and was opened in 2001.
- (ii) **Delhi-Gurgaon Expressway:** This tolled expressway is a part of the Golden Quadrilateral Highway project which was opened to public on 23rd January, 2008, significantly reducing the travel time between Delhi and Gurgaon and ensuring smoother flow of trucks beyond Gurgaon.
- (iii) **Mumbai-Pune Expressway:** This is the country's first 6-lane concrete access-controlled high-speed expressway. The expressway is completely fenced to check humans or animals to cross the path. Plying of two wheelers, three wheelers or tractors is prohibited. Other features include provision of petrol pumps, motels, workshops, toilets, emergency phones, first aid, breakdown vans, etc. The expressway has cut travel time between India's commercial capital of Mumbai and the major educational centre of Pune from 4-5 hours on old NH-4 to 2-3 hours.
- (iv) **Noida-Greater Noida Expressway:** This expressway connects Noida, an industrial suburb of Delhi to Greater Noida.

- (v) **Delhi-Noida Expressway:** This 8-lane access-controlled toll expressway connecting Delhi with Noida was developed under BOOT model by NOIDA Toll Bridge Company Ltd.
- (vi) **Jaipur-Kishangarh Expressway** in Rajasthan.
- (vii) **Chennai-Bangalore Expressway**
- (viii) **Durgapur Expressway** linking Dankuni with Memari on Grand Trunk Road provide faster movement between Calcutta and Durgapur.
- (ix) **Belghoria Expressway through Nivedita Bridge** provides faster movement between Dankuni and Dum Dum Airport.
- (x) **Panipat Elevated Expressway** is an uplift of National Highway No.1.
- (xi) **Shimla-Chandigarh Expressway** – Expansion of National Highway No.22 to four lanes will lead to smoothening of operations on this stretch.

Other expressways under construction/proposed include:

Kundli-Manesar-Palwal Expressway, Eastern Peripheral Expressway comprising 56 km long Faridabad-Noida-Ghaziabd section and 49 km long Ghaziabad-Kundli expressway section, Pathankot-Jalandhar-Ajmer Expressway, Bangalore-Mysore Expressway, Hosur Road Expressway, PV Narsimha Rao Expressway to HIAL, Chennai Elevated Expressway, Mumbai Eastern Expressway, starting from CST.

The following four expressways have been identified under NHDP VI:

- (i) Vadodara-Mumbai Expressway
- (ii) Delhi-Meerut Expressway
- (iii) Kolkata-Dhanbad Expressway
- (iv) Bangalore-Chennai Expressway

The Uttar Pradesh Government has planned, apart from the NOIDA-Ballia Ganga Expressway, five more expressways including Greater Noida-Saharanpur-Dehradun Expressway, Jhansi-Lucknow Expressway, Lucknow-Gorakhpur Expressway, Agra-Kanpur-Lucknow Expressway and Farrukhabad-Kotdwar Expressway.

The Ministry of Road Transport & Highways has envisaged construction of 15,600 km of national expressway network in three phases by 2022, the end of the 13th Five-Year Plan. There is also proposal for creating an Expressway Authority at the national level to oversee the work of developing expressways.

Motor Vehicle Population in the Country

The extent of growth of roads and their planned development has to be seen in the light of their usage by motor vehicles and other vehicles. There has been stupendous growth in number of registered motor vehicle as can be seen from the details for selective years between 1951 and 2004, the latest year for which data are available. **Appendix-3** lists the data. Between 1951 and 2004, the number of all vehicles has increased by 238 times, goods vehicles by about 46 times and buses by 23 times. Length of roads of all types has in the meantime increased by 9 times.

Nature of Road Transport Industry

Though not a part of the scope of the present study, information on trucking industry in respect of body structure, levels of handling at different loading and unloading locations, vehicle status by axles and owner-driven vehicles was collected during the countrywide road traffic surveys along

with the Vehicle Operating Cost Behaviour Survey. The results based on the data thus collected are given in Appendix 9.

2.4 COASTAL SHIPPING

Ports Handling Coastal Traffic

India has a 7517-km long coastline, dotted by 13 major and 185 non-major ports. All the 13 major ports in the country viz. Kolkata, Haldia, Paradip, Vishakhapatnam, Ennore, Chennai, Tuticorin, Cochin, New Mangalore, Mormugao, Mumbai, JNPT and Kandla handle Coastal traffic. However, amongst the 185 non-major ports, only around 61 are functional. Non-major ports which actually handled Coastal traffic during 2006-07 and 2007-08 numbered 32 are listed in **Appendix-4** at the end of the chapter showing information on location and available infrastructure.



Coastal Fleet – Historical Growth

In 1990, the total number of vessels of all types engaged in Coastal transport of cargo was 162 with GRT and DWT of 523000 tonnes and 675000 tonnes, respectively. By 2006, the number of vessels has grown to 526 with GRT of 841000 tonnes and DWT of 872000 tonnes. The number includes 14 passengers-cum-cargo vessels in 1990 and 46 vessels in 2006. **Appendix-5** at the end of the chapter presents details in this regard.

During 2006, 526 vessels with GRT of less than one million tonnes (841,000) were engaged in Coastal trade. 153 vessels out of total 526 were registered under the category “Tug” and only one vessel in the category “RO-RO”. The modal age of 253 vessels is about 20 years. Oil and Natural Gas Commission owns 42 vessels with GRT of 85000 tonnes engaged in Coastal trade. Great Eastern Shipping Co. Ltd., with 24 ships of about 20000 GRT ranks second in terms of number of vessels. There are about 75 companies with single vessel ownership accounting for a total tonnage of about 1,50,000.

2.5 AIR TRANSPORT

Growth of Civil Aviation - A Historical Perspective

Domestic air services in India started in December 1912 on Karachi-Delhi route operated by the Indian State Air Services in collaboration with the Imperial Airways of UK. This was in fact an extension of the Imperial Airways' London-Karachi flight.

The first Indian airline was founded in 1932 by J.R.D. Tata, a visionary, who himself piloted its inaugural flight. On October 15, 1932, J.R.D Tata flew a single engine De Havilland Puss Moth carrying airmail from Drigh Road Aerodrome in Karachi to Juhu Airstrip in Mumbai, via Ahmedabad.



The aircraft continued its flight to Madras via Bellary, piloted by former Royal Air Force pilot Naval Vincent. After regular commercial services were restored in India at the end of World War II,

Tata Airlines became a public limited company, named Air India, on July 29, 1946. By the time of India's independence, the number of air transport companies, carrying passengers and cargo, had grown to nine viz. Tata Airlines, Indian National Airways, Air Service of India, Deccan Airways, Ambica Airways, Bhat Airways, Mistry Airways and Orient Airways. With Orient Airways shifting to Pakistan, the number of airlines was reduced to eight. In early 1948, Air India International Ltd., a joint sector company was established with Government of India acquiring 49% of the stake in Air India, with an option to acquire additional 2%. The joint venture was headed by J.R.D Tata. With a capital of two crore and a fleet of three Lockheed Constellation aircrafts, it was on June 8, 1948 that the company in its new avatar undertook its first long-haul flight (Malabar Princess) from Mumbai to London via Cairo and Geneva. This was followed by a service to Nairobi via Aden in 1950. At the time of its nationalization in 1953, the airline was operating four weekly services between Mumbai and London and two between Mumbai and Nairobi.

The open-sky policy announced in April 1990 allowed air taxi operators to operate from any airport, both on charter and non-charter basis and to decide their own flight schedules, cargo and passenger fares. Seven operators viz., NEPC Airlines, Skyline NEPC, Jet Air, Archna Airways, Sahara Airlines, Modiluft and East West Airlines subsequently acquired the status of scheduled airlines. Two of the operators suspended operations in 1996 because of non-availability of aircraft.

At present, apart from Air India, IA Express, Indian Airline and Alliance Air, there are 8 private scheduled airlines operating in India.

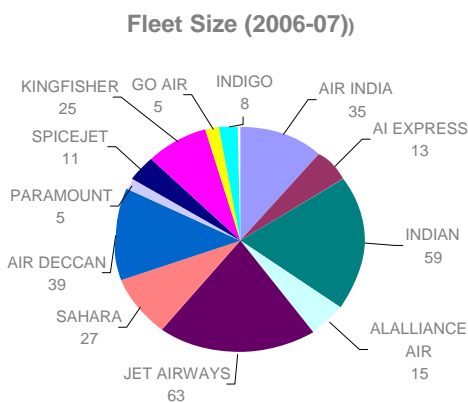
These include Jet Airways, Sahara Airlines, Air Deccan, Paramount, SpiceJet, Kingfisher, Go Air and Indigo. In the wake of current economic down turn, these airlines are in a consolidation mode e.g. merger of Jet and Sahara airlines and Kingfisher and Air Deccan.

Domestic Routes in Operation

The map alongside shows the routes under operation in the country by the Indian Airlines (now renamed as Air India), which has the most extensive network of operations. Some of the other scheduled airlines, which have higher levels of traffic, operate on select routes only.

Airports

There are 449 airports in the country. Of these, Airport Authority of India (AAI) owns 127 airports which include 15 international, 79 domestic, 8 customs and 25 civil airport enclaves at Defence Airfields. A list of international and domestic airports is given at Annexure 2.3 (contained in Annexure Volume-1).



Fleet of Aircraft

During the nine-year period between 1997-98 and 2006-07, there has been around three-fold increase in number of aircrafts operated by different airlines. Details of fleet size during the period under reference are indicated in the graph as well as in Table 2.12.

TABLE 2.12: FLEET SIZE OF ALL SCHEDULED AIRLINES

SN	Name of The Airline	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Air India	26	26	26	28	29	31	35	37	38	35
2	AI Express	-	-	-	-	-	-	-	-	4	13
3	Indian	39	44	44	42	44	43	47	52	55	59
4	Alliance Air	12	12	12	11	11	11	15	15	15	15
5	Jet Airways	19	25	28	30	38	41	41	42	53	63
6	Sahara	6	8	9	7	10	12	20	22	29	27
7	Air Deccan	-	-	-	-	-	-	4	16	29	39
8	Paramount	-	-	-	-	-	-	-	-	1	5
9	SpiceJet	-	-	-	-	-	-	-	-	5	11
10	Kingfisher	-	-	-	-	-	-	-	-	11	25
11	Go Air	-	-	-	-	-	-	-	-	3	5
12	Indigo	-	-	-	-	-	-	-	-	-	8
13	Archna	2	-	-	-	-	-	-	-	-	-
TOTAL		104	115	119	118	132	138	162	184	243	305

2.6 INLAND WATERWAYS

Since ancient times, Inland Water Transport (IWT) has played a major role in transport of men and material in India. Even till the 19th century, navigation by power crafts and country boats carrying goods moved between Kolkata and Garh Mukteshwar on the Ganges, Agra on the Yamuna, Ayodhya on the Ghagra and Dibrugarh on the Brahmaputra. However, with the advent of Railways and development of Road Transport, this mode fell to disuse. Nevertheless in areas where rail and road was not all pervasive, IWT continued to operate as an alternate mode. For instance, in the northeastern region of the country movement of tea and jute from Assam to Kolkata continued till 1965 war with Pakistan after which this link snapped.

In view of cost effectiveness of the mode, several committees, at the instance of the Government, have examined the IWT system for its viability and revival for supplementing rail and road transport. National Transport Policy Committee in its report in 1980 recommended the institution of an authority for development and regulation of Inland Waterways. Accordingly, Inland Waterways Authority of India (IWAI) was formed on 27th October, 1986.



Since the formation of IWAI, three waterways viz. Ganga, Brahmaputra and West Coast Canal have been declared as National Waterways. For development of IWT mode, the 6th and 7th Plans enhanced fund provisions for the purpose. IWAI which is entrusted with the creation of facilities for growth of IWT had declared three National Waterways – NW 1 Ganga-Bhagirathi-Hooghly river system from Allahabad to Haldia (1629 km), NW 2 Brahmaputra river from Dhubri to Sadiya (891 km) & NW 3, the West Coast Canal from Kottapuram to Kollam. Apart from operations on these routes, the Goa and Mumbai Waterways also contribute to transport of goods.

Inland Waterways Infrastructure Development

In accordance with the developmental Action Plan of IWAI, the following specific infrastructure has been proposed to be created on the National Waterways.

NW-1: Fairway: 3m LAD (least available depth) in Haldia-Farakka, 2m in Farakka-Varanasi and 1.5m in Varanasi-Allahabad stretches.

Navigational Aids: 24 hours navigational facilities.

Terminals: Fixed terminals at Haldia, BISN (Kolkata), Pakur, Farakka and Patna and Floating terminals at Haldia, Kolkata, Diamond Harbour, Katwa, Tribeni, Behrampur, Jangipur, Bhagalpur, Semaria, Doriganj, Ballia, Ghazipur, Varanasi, Chunar and Allahabad.

NW-2: Fairway: 2m LAD between Dhubri-Dibrugarh & 1.5 m bet. Dibrugarh-Sadiya.

Navigational Aids: 24 hours navigational facilities from Dhubri to Dibrugarh

Terminals: Fixed terminals at Pandu. Floating terminals at Dhubri, Jogighopa, Tejpur, Silghat, Dibrugarh, Jamgurhi, Bogibil, Saikhowa and Sadiya.

NW-3: Fairway: LAD of 2m in the entire waterway.

Navigational Aids: 24 hours navigational aids in the entire waterway.

Terminals: Fixed terminals at Aluva, Vaikom, Kayamkulam, Kottapuram, Maradu, Chertala, Trikkunnappuzha, Kollam, Alappuzha with mechanical handling facilities.

National Waterway No. 1 (NW-1)

Ganga-Bhagirathi-Hooghly river system from Allahabad to Haldia (1620 kms) – declared as National Waterway in 1986.

National Waterway No. 2 (NW-2)

The Brahmaputra river from Sadiya to Dhubri (891 kms) – declared as National Waterway in 1988.

National Waterway No. 3 (NW-3)

The West Coast Canal from Kollam to Kottapuram along with Champakara and Udyogmandal canals (205 kms) – declared as National Waterway in 1993.

Maps of NW-1, NW-2 and NW-3 are given at **Appendix-6** at the end of the chapter.

New Proposals

The proposed new National Waterways include:

- ◆ **Kakinada-Pondicherry** stretch of canals including Kakinada canal, Eluru canal, Commamur canal, Buckingham canal and Kaluvelly tank along with Bhadrachalam-Rajahmundry stretch of river Godavri and Wazirabad-Vijayawada stretch of river Krishna (1095 km) in the States of Andhra Pradesh and Tamil Nadu and Union Territory of Pondicherry.
- ◆ **Talkcher-Dhamra** stretch of Brahmani-Kharsua-Dhamra river system along with Geonkali-Charbatia stretch of East Coast Canal, Charbatia-Dhamra stretch of Matai river and Mahanadi Delta river system between Mangalgadi and Paradip (623 km) in the States of Orissa and West Bengal. The parliamentary bills for the proposals have been referred to Parliamentary Standing Committee for examination. In addition, proposal for declaration of Barak river from Bhangra to Lakhipur (121 km) as a National Waterway is also being processed by the Government.

Public Private Partnership (PPP) Projects

For faster development of IWT, IWAI short listed some priority projects and for some bids were invited. As a result, 4 MOUs were signed during 2006-07 between IWAI and successful bidders for setting up and management of jetties at Bandel, Kolaghat and Budge Budge in West Bengal and for acquisition, operation and management of barges on O-D pairs of Kolkata-Mongla, Kolkata-Dhubri and Kolkata-Pandu.

Proposals for Cruise Tourism

IWT has so far been used primarily for transport of cargo. Of late, however, Department of Shipping is in the process of formulating a river cruise shipping policy which will offer incentives and relax prohibitive controls for promoting river cruises over the vast network of around 14500 km of navigable Inland Waterways.

Ministry of Tourism is also upbeat about exploiting the potential and proposes to promote Ganga heritage cruise circuit. Once the policy for river cruise is ready, more tourism cruise projects can be developed. There are also proposals for developing Goa Waterways as National Waterways. These river cruises may not, however, be able to operate during monsoons.

Sequel to developmental efforts by IWAI, while cargo movement by IWT has increased from 1.63 billion tonne-km (btkm) in 2003-04 to 3.38 btkm in 2006-07, its share in total inland freight movement in terms of tonne-kilometres is 0.26% approximately. Operational performance of IWT for the years 2003-04 to 2007-08 is given in **Appendix-7** (at the end of chapter).

2.7 PIPELINES

Pipelines are a growing mode of transport. Major part of commodities moved through Pipelines is oil, crude, LPG and petroleum products. There are slurry Pipelines also which cater to localized movements as also long-lead movements.

Petroleum Product Pipelines

The existing petroleum product Pipelines extend over 14969 kms, details of which in terms of lengths, capacities and throughput for years 2002-03 to 2006-07 are given in **Appendix-8** at the end of the chapter.



Slurry Pipelines

As mentioned earlier, there are number of slurry Pipelines in operation which cater to localized movements at mines for further processing of products as well as comparatively long-lead Pipelines for inter-regional movement of products. The localized short-lead slurry Pipelines include:

- ◆ Slurry transportation in the mines of M/s Hindustan Zinc Ltd. Rampura-Agucha Mine, Zawar Mines, Rajpura Dariba Mines, Banmdalamottu Lead Mine.
- ◆ Ore/Tailing transportation system at Khetri Copper Complex Concentrator Plant of M/s Hindustan Copper Limited.
- ◆ Slurry transportation in Chromite Ore Beneficiation Plant of Ferro Alloys Corporation Ltd. at Boula Chromite mines in Orissa.
- ◆ Transport of slimes/slurry in Bolani Ore Mines, Kiriburu Iron Ore Mine and Meghataburu Iron Ore Mines of Steel Authority of India.
- ◆ Ore processing at Pale Mines & Costi Mines of M/s Chowgule & Co. Ltd.
- ◆ Slurry transportation system at Codli Mines of M/s Sesa Goa Ltd.
- ◆ Slurry transportation at National Aluminium Company's Refinery at Damanjodi.

Kudremukh iron ore mine in Karnataka State was the first mine in India from where iron ore concentrate in slurry form started moving through pipeline to Mangalore Port facility situated at a distance of 67 kilometres from the mines. A still longer slurry pipeline has been laid by M/s Essar from Kirandul village, District Dantewara, in Bailadila Iron Ore sector to Pellet Beneficiation Complex of Essar Steel Ltd. at Vishakhapatnam. 268 km long, the pipeline passes through three states viz. Chhatisgarh, Orissa and Andhra Pradesh.

SECTION II: PAST MODAL PERFORMANCES

2.8 HISTORICAL PERSPECTIVE

Different modes of transport forming part of the transport sector had varying time paths of growth before achieving their present status. Their past performance over a long period has necessarily to be studied in this context. Against the backdrop of historical role of different modes of transport over time, this section deals with past modal performances in terms of traffic handled, based on review of published data and past study reports by various agencies.

At the time of Independence in 1947, India inherited a well-spread out rail network and associated infrastructure compared with road sector which was in a nascent state both in terms of expanse of roads as well as goods and passenger vehicles. In 1951, while Indian Railways (IR) network extended over 53,956 kilometres, the length of National Highways in the country was 19,811 kilometres. Against IR's operating fleet of 8,209 locomotives, 1,95,000 wagons and 19,628 coaching vehicles, the total population of registered motor vehicles in the country was 3.06 lakhs including 82,000 goods vehicles and 34,000 buses. Coastal Shipping too had its limitations in terms of geographic coverage and infrastructure. It came to acquire a fleet of 162 vessels with GRT of 523 thousand only by 1990. Airline operations which started in 1912 were still in initial stages of development and had limited linkages. Organised operations of IWT on Calcutta-Karimganj link through erstwhile East Pakistan also snapped in the wake of 1965 war with Pakistan. Efforts for revival of this mode started with the formation of IWAI in 1986. Petroleum and gas Pipelines have gradually developed over the last two decades and at present account for around 3% of total freight traffic.

In the above scenario, IR had near monopoly in inland transport of goods. In the year 1950-51, its share in total inland movement of goods amounted to around 90%. IR could achieve this premier role not only because of its capability to cater to traffic in smalls, wagon loads as well as train-loads but also owing to lack of competition from road transport which, at that point of time, lacked necessary infrastructure in terms of roads and moving units to provide an alternative. IR had its share of increasing investments in development of infrastructure flowing from enhanced provisions in the first three Five Year Plans for strengthening of transport sector to meet the requirements of increasing transport demand emerging from economic development. Impact of improvements in infrastructure was reflected in the 63.7% decadal growth in originating traffic for the period 1950-51 to 1960-61. The historical growth of IR freight traffic is presented in Table 2.13.

TABLE 2.13: HISTORICAL PERFORMANCE OF ORIGINATING TRAFFIC ON IR

Year	TONNES ORIGINATING (Million Tonnes)		NET-TONNE KMS (Million)		AVERAGE LEAD (Kms)
	Revenue Earning Traffic	Total Traffic	Revenue Earning Traffic	Total Traffic	
1950-51	73.2	93.0	37,565	44,117	470
1960-61	119.8	156.2	72,333	87,680	561
1970-71	167.9	196.5	110,696	127,358	648
1980-81	195.9	220.0	147,652	158,474	720
1990-91	318.4	341.4	235,785	242,699	711
1996-97	409.0	423.4	277,567	279,992	661
1997-98	429.4	445.5	284,249	286,771	644
1998-99	420.9	441.6	281,513	284,270	644
1999-00	456.4	478.2	305,201	308,039	644
2000-01	473.5	504.2	312,371	315,516	626
2001-02	492.5	522.2	333,228	336,445	644
2002-03	518.7	542.7	353,194	356,027	656
2003-04	557.4	581.4	381,241	384,074	661
2004-05	602.1	626.2	407,398	411,280	657
2005-06	666.5	682.4	439,596	441,762	647
2006-07	727.75	744.56	480,993	483,000	661

However, inadequate allocations in the ensuing three Five Year Plans constrained the transport infrastructure leading to increasing gap between the demand and supply for transport. Its impact could be seen in the progressive decline in the decadal growth of rail traffic from 40.2% during 1960-61 to 1970-71 and subsequently 16.7% during 1970-71 to 1980-81.

In the early Nineteen Eighties, IR, under pressure for transporting increasing volumes of bulk commodities to meet the requirements of the economy and facing capacity constraints, decided to do away with smalls and wagon-load traffic and resorted to end-to-end running of single commodity rake loads. As a result of this change in pattern of movement, IR could carry significantly higher volumes of traffic which was reflected in the decadal growth of 62.5% achieved by 1991. However, in the process, IR practically lost most of the piecemeal wagon load traffic to a growing road transport system.

Thereafter, Railways' share in total inland movement of goods has been on the decline. While major part of traffic has shifted to road transport, substantial quantities of POL products have shifted to Pipelines. Movement of cargo by Coastal Shipping has also been on the increase. IWT accounts for a small share of traffic. During the past couple of years, however, various policy initiatives and innovative measures have been adopted by IR which have resulted in improved productivity of assets and given a boost to traffic handling capability of the Railways. The historical performance of different modes in terms of share in total originating tonnes has been shown in Table 2.14.

TABLE 2.14: HISTORICAL MODAL PERFORMANCE (INTER-REGIONAL TRAFFIC)

(Million Tonnes)

Year	TOTAL ORIGINATING TONNES (MT)	MODAL SHARES IN TOTAL ORIGINATING TONNES					
		Railways	Highways	Coastal Shipping	Airlines	Pipelines	IWT
1950-51	82.2 *	73.2 (89%)	9.0 (11%)	-	-	-	-
1978-79	283.40 **	184.70 (65%)	95.60 (34%)	3.10 (1%)	-		
1986-87	484.9 **	255.40 (53%)	224.00 (46%)	5.50 (1%)	-		
2007-08	2555.35	768.72 (30.08%)	1558.87 (61.01%)	59.10 (2.31%)	0.28 (0.01%)	113.50 (4.44%)	54.88 (2.15%)

* Exclusive of Coastal Shipping, Airways, Pipelines and IWT.

** Exclusive of Airways, Pipelines and IWT.

Appendix-1 Chapter 2

ROAD LENGTH BY CATEGORIES AND BY TYPE OF SURFACE (AS ON 31.03.2004)

INDIA CATEGORY	TOTAL (KMS)	SURFACED			UN-SURFACED		
		Total	W.B.M.	B.T./C.C	Total	Motorable	Non - Motorable
A. Highways	2107061	1238306	300761	937545	868755	613778	254977
a. PWD Roads	918003	794486	83474	711012	123517	100880	22637
National Highways	65569	65358	0	65358	211	211	0
State Highways	133177	131262	2840	128422	1915	1418	497
Other PWD Roads	719257	597866	80634	517232	121391	99251	22140
b. Panchayat Raj Roads	1189058	443820	217287	226533	745238	512898	232340
Zilla Parishad Roads	529092	303091	156948	146143	226001	136827	89174
Village Panchayat Roads	479114	94326	40533	53793	384788	288855	95933
D/Panchayat Samiti Roads	180852	46403	19806	26597	134449	87216	47233
B. Urban Roads	301310	218361	57177	161184	82949	62340	20609
(i) Municipal Roads	275766	194997	54534	140463	80769	60481	20288
(ii) MES Roads	13255	13113	253	12860	142	126	16
(iii) Railway Roads	11212	9249	2318	6931	1963	1705	258
(iv) Major Ports Roads	695	681	21	660	14	6	8
(v) Minor Ports Roads	382	321	51	270	61	22	39
C. Project Roads	261625	69388	34368	35020	192237	117350	74887
(i) Forest Dept. Roads	150533	21741	13650	8091	128792	85950	42842
(ii) Irrigation Dept. Roads	76313	24392	13686	10706	51921	23274	28647
(iii) Electricity Dept. Roads	4874	4353	883	3470	521	454	67
(iv) Sugarcane Auth. Roads	24053	13376	5460	7916	10677	7379	3298
(v) Coal Mines Roads	3352	3248	439	2809	104	72	32
(vi) Steel Authority Roads	2500	2278	250	2028	222	221	1
D. Rural Roads (PMGSY)	51511	51511	0	0	0	0	0
TOTAL	2721507	1577566	392306	1133749	1143941	793468	350473
Excludes JRY Roads							
Source: Basic Road Statistics of India, July 2008, Transport Research Wing, MOSRTH, GOI							

Appendix-2
Chapter 2

STATE-WISE TOTAL AND SURFACED LENGTH OF ROADS

States/ UTs	T-Total S-Surfaced	Years (Length in km)				
		2000	2001	2002	2003	2004
Andhra Pradesh	T	191031	192057	196649	201895	206125
	S	118861	119151	119975	124341	128308
Arunachal Pradesh	T	18322	18362	15660	15661	15712
	S	5659	5699	5966	5984	6062
Assam	T	100414	114026	144795	160380	192980
	S	12753	12891	15939	19017	22422
Bihar	T	76867	77478	76065	78750	73834
	S	33660	34271	32858	32729	28491
Chattisgarh	T	33825	33858	52179	72729	73993
	S	22716	22450	31571	38548	39160
Goa	T	9504	9563	9672	10231	10240
	S	6650	6726	6830	7360	7369
Gujarat	T	137281	137384	138506	142755	143660
	S	123402	123818	126263	128751	129981
Haryana	T	28093	28158	28203	28511	28673
	S	26011	26101	26311	26585	26754
Himachal Pradesh	T	29398	29510	29617	32039	32582
	S	16621	16675	16754	16820	17956
Jammu & Kashmir	T	23200	23301	23429	20722	21095
	S	9816	9904	9943	8771	8962
Jharkhand	T	700	10069	11486	11391	11783
	S	644	1423	2840	3425	3817
Karnataka	T	152068	152453	182906	199711	200112
	S	105895	106352	126733	135725	136288
Kerala	T	148151	150495	134947	139590	143276
	S	47737	49745	68532	74056	76943
Madhya Pradesh	T	162309	162370	160968	164803	165340
	S	79135	79575	78191	80124	80660
Maharashtra	T	258858	261783	270301	271369	272684
	S	198022	203050	210045	210530	212001
Manipur	T	11434	11434	12561	12594	12599
	S	3863	3863	3801	3834	3839
Meghalaya	T	9360	9497	9565	9564	9701
	S	6248	6566	6560	6551	6687
Mizoram	T	4731	4970	5075	4913	4898
	S	2743	2887	2877	2805	2764
Nagaland	T	21015	21021	21021	20523	20647
	S	6450	6451	6451	6446	6570
Orissa	T	236082	236993	211692	213049	213820
	S	51231	51849	30501	32143	32670

Appendix-2 (Contd.)
Chapter 2

STATE-WISE TOTAL AND SURFACED LENGTH OF ROADS (Contd.)

States/ UTs	T-Total S-Surfaced	Years (Length in km)				
		2000	2001	2002	2003	2004
Punjab	T	61275	61525	61530	40023	45767
	S	52503	52746	52747	31178	31662
Rajasthan	T	141055	142010	129557	140160	144898
	S	90193	91340	82473	89917	95196
Sikkim	T	1911	1992	1957	2023	2063
	S	1514	1546	1546	1612	1652
Tamil Nadu	T	159706	163111	166116	167450	170823
	S	119468	123373	126191	129663	133175
Tripura	T	14801	14031	16296	22295	23856
	S	4391	4390	4393	8569	9080
Uttar Pradesh	T	240646	247248	248482	259928	244442
	S	156908	164371	166660	174196	182057
Uttara Khand	T	32306	31881	21597	34716	58054
	S	9600	9402	10439	14376	16783
West Bengal	T	88818	90245	86599	88500	89699
	S	48419	48345	48692	50276	51164
UNION TERRITORIES						
A & N Island	T	1177	1183	1180	1181	1481
	S	1154	1166	1180	1181	1481
Chandigarh	T	2005	2025	2045	1637	1637
	S	2005	2025	2045	1637	1637
Dadra & Nagar Haveli	T	563	564	580	559	632
	S	563	564	580	539	610
Daman & Diu	T	414	414	234	240	318
	S	324	324	232	227	316
Delhi	T	25785	25785	25785	29802	29812
	S	23274	23274	23274	21116	21126
Lakshadweep	T	135	141	148	154	160
	S	135	141	148	154	160
Pondicherry	T	2525	2587	2503	2559	2600
	S	2030	2093	2115	2173	2252
All-India	T	2425765	2469524	2499906	2601957	2669996
	S	1390598	1414547	1451656	1491359	1526055
Source: Basic Road Statistics of India, July 2008, Transport Research Wing, MOSRTH, GOI						

Appendix-2 (Contd.)
Chapter 2

STATE WISE DISTRIBUTION OF NATIONAL HIGHWAYS

SN	STATE/ UNION TERRITORY	LENGTH OF ROADS (km.)
1	Andhra Pradesh	4,472
2	Arunachal Pradesh	392
3	Assam	2,836
4	Bihar	3,537
5	Chandigarh	24
6	Chhatisgarh	2,184
7	Delhi	72
8	Goa	269
9	Gujarat	2,871
10	Haryana	1,468
11	Himachal Pradesh	1,208
12	Jammu & Kashmir	823
13	Jharkhand	1,805
14	Karnataka	3,843
15	Kerala	1,440
16	Madhya Pradesh	5,200
17	Maharashtra	4,176
18	Manipur	959
19	Meghalaya	810
20	Mizoram	927
21	Nagaland	494
22	Orissa	3,704
23	Pondicherry	53
24	Punjab	1,557
25	Rajasthan	5,585
26	Sikkim	62
27	Tamil Nadu	4,183
28	Tripura	400
29	Uttar Pradesh	5,599
30	Uttara Khand	1991
31	West Bengal	2,325
32	Andaman & Nicobar	300
Total		65569

Appendix-3 Chapter 2

TOTAL NUMBER OF REGISTERED MOTOR VEHICLES (1951 to 2004)

Figures in '000

YEAR (AS ON 31st MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS & TAXIS	BUSES	GOODS VEHICLE	OTHERS *
1951	306	27	159	34	82	4
1956	426	41	203	47	119	16
1961	665	88	310	57	168	42
1966	1099	226	456	73	259	85
1971	1865	576	682	94	343	170
1976	2700	1057	779	115	351	398
1981	5391	2618	1160	162	554	897
1986	10577	6245	1780	227	863	1462
1991	21374	14200	2954	331	1356	2533
1996	33786	23252	4204	449	2031	3850
1997	37332	25729	4672	484	2343	4104
1998	41368	28642	5138	538	@ 2536	4514
1999	44875	31328	5556	540	@ 2554	4897
2000	48857	34118	6143	562	@ 2715	5319
2001	54991	38556	7058	634	@ 2948	5795
2002	58924	41581	7613	635	@ 2974	6121
2003	(R) 67007	47519	8599	721	@ 3492	6676
2004	(P) 72718	51922	9451	768	@ 3748	6829
* Includes Tractor, Trailers, Three wheelers (Passenger Vehicles) & other misc. @ Includes Omni Buses, (P) Provisional, (R) Revised.						

Appendix-4
Chapter 2

**NON-MAJOR PORTS HANDLING COASTAL TRAFFIC
LOCATION & INFRASTRUCTURE (2007-08)**

SN	PORT	LOCATION	BERTHS	CARGO HANDLING EQUIPMENT	STORAGE
1	BEDI (Gujarat)	Lat: 22° 31'N Long:70° 02'E	1wharf each at Bedi & New Bedi Port and 1 wharf at Rozi Pier	Various capacity Cranes – Bulk handling System	Many Transit sheds covered warehouses & open space
2	BELEKERI (Kerala)	Lat: 14042.50'N Long: 70740 16'E	Dry stone masonry wharf	Mechanized ore loading 2 chutes	Transit shed
3	BHAVNAGAR (Gujarat)	Lat: 21045.'N Long: 720 14'E	Concrete jetty, Akwada wharf north quay, 3 finger jetty.	Various capacity Mobile & electric cranes	Transit shed, storage godown, pucca platform, kuttcha platform
4	CUDDALORE (Tamil Nadu)	Lat: 11044 24".N Long: 790 45' 54"E	A 200m long & a 1132 m long wharf for berthing lighters	Weighbridge – 20 tonnes, Water barges 30 tonnes	25 tonne each Open roadstead port cargoes brought to shore through lighters. 790m Chemical storage tank of Tamil Nadu Petrol Prod Ltd, 3 covered RCC sheds & two 80,000 sq mtrs stacking area transit sheds
5	DABHOL (Maharashtra)	Lat: 170 35'N Long:730 11'E	One jetty	-	Ample open area
6	DAHEJ	Lat: 16010'N			
7	DHARMATAR (Maharashtra)	Lat: 180 37'N Long:720 52'E	One jetty	-	Ample open area
8	HAZIRA (Gujarat)				
9	JAFARABAD (Gujarat)	Lat: 200 51'N Long:710 21'E	New clinker jetty, Rcc jetty, Fish Landing Wharf, three landing slopes	Various Capacity Cranes	Godowns
10	JAKHAU				
11	KAKINADA (Anchorage Port) (Deep Water Port)	Lat: 160 59'N Long:820 19'E -	Open roadstead port 3 nos. 610M continuous length	Mobile cranes – 10t to 18t,35t to 15 t. Fork lifts: 2.0t-8, 2.5t-2, 3.0t-2	Transit sheds, godowns, stacking area for bulk cargo Ware house 1 no. (130Mx40M), back up area behind berths 610Mx75M
12	KARWAR (Karnataka)	Lat: 140 48'N Long:740 07'E	Two berths	Cranes, front pay loaders & other Port equipment	3 transit sheds,1 ware house shed, open stackyard,25 liquid cargo tanks of private companies
13	Kozhikode (Kerala)	Lat: 110 15'N Long:750 46'E	Two piers with trolley lines, Cranes	Various cranes of 1t to 5 t capacity	Open yard, covered area & stacking space
14	MAGDALLA (Gujarat)	Lat: 220 45'N Long:690 42'E	RCC Jetty No.1 and 2	Mechanical loading system with conveyor bulk for cement/clinker	Transit area, godown and platform
15	MALPE (Karnataka)	Lat: 130 21'N Long:740 42'E	2 jetties,1 passenger & 1 wooden	-	Cargo shed & cargo stocking platform

Appendix-4 (Contd.) Chapter 2

NON-MAJOR PORTS HANDLING COASTAL TRAFFIC LOCATION & INFRASTRUCTURE (2007-08)

SN	PORT	LOCATION	BERTHS	CARGO HANDLING EQUIPMENT	STORAGE
16	MANGALORE (Karnataka)	Lat: 120 52'N Long:700 51'E	North, Central, Salt, South, New south wharf	Tata 320 crane	Open space
17	MULDWARKA (Gujarat)	Lat: 120 52'N Long:700 51'E	0		
18	MUNDHRA				
19	NAGAPATTINAM (Tamil Nadu)	Lat: 100 49' 36"N Long:790 51' 06"E	Three wharfs, RCC jetty with approach trestle	Weighbridge – 20 tonnes, one motor launch	1000 tonnes of storage tank for edible oil of M/s Foods, Fats & Fertilizers Ltd., 9 cargo sheds with capacity of 51,000 tonnes, 2 top covered open cargo transit sheds
20	OKHA (Gujarat)	Lat: 220 28'N Long:690 05'E	Sayaji Pier, dry cargo berth, lighter wharf, passenger jetty at Okha & Beyt Dwarka	Coles cranes	Go-down, open shed, platform, stacking yard
21	PANAJI (Goa)	-	-	-	-
22	PIPAVAV (Gujarat)				
23	PORBANDAR (Gujarat)	Lat: 210 38'N Long:690 37'E	Steamer berth, private finger, coast guard jetty	Diesel and steam cranes	Transit go-downs
24	PY-OILFIELD (Tami Nadu)	Lat: 110 19'14"N Long:800 02' 12"E	-	Tug boat, mooring boat	Floating Prod unit, Floating storage off- loading vessel, single point mooring
25	RATNAGIRI (Maharashtra)	Lat: 160 55'N Long:730 15'E	One jetty	-	Ample open space
26	RAWA (Andhra Pradesh)	Lat: 160 24' 05"N Long:810 81' 57"E	SBM	-	-
27	RAVDANDA (Maharashtra)	Lat: 180 32' 05"N Long:720 56' E	One jetty	-	Ample open area
28	SIKKA (Gujarat)	Lat: 220 26'N Long:690 50'E	One jetty and one wharf	Different category Cranes	Sufficient open space
29	THIRUKKADAIYU (Tamil Nadu)	Lat: 110 04'27.5" N Long:790 51'28.9"E	SPM with submarine Pipelines	-	-
30	TROMBAY (Maharashtra)	Lat: 190 01'N Long:720 53'E	One jetty	-	Ample open area
31	ULWA BELAPUR (Maharashtra)	Lat: 190 00'N Long:730 02'E	One jetty	-	Ample open area
32	VERAVAL (Gujarat)	Lat: 200 54'N Long:700 22'E	Finger jetty, 5 Wharf	H.M, Das Jones	2 transit go-downs open storage

Appendix-5 Chapter 2

GROWTH OF COASTAL FLEET BY TYPE OF VESSELS (AS ON 31.12.2006)

YEAR	ITEM	TYPE OF VESSELS							TOTAL (^{'000} GRT/ ^{'000} DWT)
		DRY CARGO LINER	DRY CARGO BULK CARRIER	OIL TANKER	PASSENGER / CARGO	OFF-SHORE SUPPLY	SPECIALISED OFF-SHORE SERVICE	TIMBER CARRIER	
1990	Vessels	32	6	15	14	63	31	1	162
	GRT	25	121	171	39	68	95	4	523
	DWT	45	189	268	20	76	71	6	675
1991	Vessels	32	10	18	13	63	32	1	169
	GRT	25	127	193	49	68	95	4	561
	DWT	46	198	300	23	76	71	6	720
1992	Vessels	38	20	16	12	67	33	1	187
	GRT	29	235	154	59	74	85	4	640
	DWT	52	384	235	26	85	62	6	850
1993	Vessels	44	23	16	12	73	33	1	202
	GRT	32	217	154	59	91	85	4	642
	DWT	54	352	235	26	92	62	6	827
1994	Vessels	61	13	17	13	74	27	1	206
	GRT	46	247	150	60	91	83	4	681
	DWT	66	410	234	26	92	63	6	897
1995	Vessels	72	13	18	15	73	27	1	219
	GRT	60	247	155	60	89	83	4	698
	DWT	80	410	245	26	90	63	6	920
1996	Vessels	88	12	17	15	71	27	1	231
	GRT	101	226	152	53	86	83	4	705
	DWT	72	369	240	23	87	63	6	860
1997	Vessels	97	11	14	15	68	26	1	232
	GRT	107	192	138	52	83	78	4	654
	DWT	80	305	219	23	82	58	6	773
1998	Vessels	109	12	15	15	69	26	1	247
	GRT	118	198	132	53	73	76	4	654
	DWT	89	313	213	23	81	57	6	782
1999	Vessels	124	15	16	22	68	27	-	269
	GRT	129	194	139	68	73	77	-	680
	DWT	89	306	221	28	81	57	-	782
2000	Vessels	164	12	15	23	69	28	-	312
	GRT	158	194	132	68	74	83	-	709
	DWT	128	306	172	28	85	61	-	780
2001	Vessels	178	13	16	26	69	27	-	229
	GRT	184	205	118	71	74	79	-	731
	DWT	150	323	179	28	85	59	-	824
2002	Vessels	261	9	17	33	73	31	-	424
	GRT	236	226	100	76	78	89	-	805
	DWT	195	350	150	26	96	53	-	870
2003	Vessels	263	9	17	36	73	31	-	429
	GRT	236	226	100	77	78	89	-	806
	DWT	195	351	149	25	96	53	-	869
2004	Vessels	282	9	16	37	78	32	-	454
	GRT	238	226	96	77	81	90	-	808
	DWT	187	350	144	25	98	54	-	858
2005	Vessels	305	10	14	38	82	36	-	485
	GRT	248	234	85	77	85	87	-	816
	DWT	183	363	123	25	100	52	-	844
2006	Vessels	332	10	15	46	87	36	-	526
	GRT	272	234	87	79	87	82	-	841
	DWT	203	363	131	26	102	47	-	872

Source: Basic Road Statistics of India, July 2008, Transport Research Wing, MOSRTH, GOI

Appendix-6
Chapter 2

MAPS SHOWING DIFFERENT NATIONAL WATERWAYS (NW)



NW-1
The Ganga



NW-2
The Brahmaputra



NW-3
West Coast Canal

Appendix-7
Chapter 2

**CARGO MOVEMENT FOR
NATIONAL WATERWAYS, GOA & MUMBAI WATERWAYS
(2003-04 TO 2007-08)**

WATERWAY	UNIT	2003-04	2004-05	2005-06	2006-07	2007-08	MAJOR TYPES OF CARGO MOVED
NW-1 The Ganga	MT TKM BTM	786,159 159,573,347 0.160	887,328 311,882,762 0.312	1,001,450 410,880,280 0.411	1,317,387 580,317,191 0.580	1,497,964 709,153,891 0.709	CEMENT, WOOD LOGS, PACKED AND BULK EDIBLE OIL, POL LUBRICANTS, FLY ASH, PULSES, STONE CHIPS AND IRON DUST
NW-2 The Brahmaputra	MT TKM BTM	795,651 29,493,936 0.029	810,145 38,093,094 0.038	804,401 32,160,989 0.032	1,086,026* 172,769,869 0.173	1,304,114* 42,236,249 0.042	CEMENT, BUILDING MATERIAL, FERTILIZER, PETRO COCK, FOOD GRAINS, COAL, PLANT & MACHINERY, MISC. GENERAL CARGO
NW-3 West Cost Canal	MT TKM BTM	1,362,149 21,913,759 0.022	1,158,783 15,377,312 0.015	1,172,889 16,923,544 0.017	1,022,776 14,936,770 0.015	673,127 8,872,101 0.009	SULPHUR, FURNACE OIL, ROCK PHOSPHATE, LIQUEFIED AMMONIA, PHOSPHORIC ACID GAS, CONCENTRATED POL PRODUCTS, ZINC, DRINKING WATER
SUB TOTAL IN NW	MT TKM BTM	2,943,959 210,81,042 0.211	2,856,256 365,353,168 0.365	2,978,740 459,964,813 0.460	3,426,189 768,023,830 0.768	3,475,205 760,262,241 0.760	
The GOA (Mormugao)	MT TKM BTM	22,876,763 1,143,838,150 1.144	35,000,000 1,698,840,460 1.700	36,271,650 1,760,564,188 1.761	40,500,000 1,965,250,000 1.966	38,500,000 1,925,000,000 1.925	IRON ORE, PIG IRON, ORE PELLETS, COAL
Mumbai Waterways	MT TKM BTM	6,661,279 273,112,439 0.273	7,720,709 416,549,069 0.416	11,162,168 602,757,072 0.603	11,897,322 642,455,388 0.642	12,906,154 696,932,316 0.697	STEEL, CEMENT, IRON ORE, COCK, SULPHUR, ROCK PHOSPHATE, PELLETS & RELATED RAW MATERIAL, LIME STONE, CLINKERS
GRAND TOTAL	MT TKM BTM	32,482,001 1,627,931,631 1.628	45,576,965 2,480,742,697 2.481	50,412,558 2,823,286,073 2.824	55,823,511 3,375,729,218 3.376	54,881,359 3,382,194,557 3.382	

Appendix-8 Chapter 2

THROUGHPUT OF EXISTING PRODUCT PIPELINES IN INDIA (2005–2007-08)

PIPELINE OWNER	Name of the Pipeline	Capacity (MMTPA) 1.4.2007	Length (KM) 1.4.2007	2007-08 ('000 Tons)			2005-06 ('000Ton)	2006-07 ('000Ton)
				MOVT. CAPACITY	ACTUAL MOVT.	% UTILZN.		
PRODUCT PIPELINES								
IOC	BARAUNI-PATNA-KANPUR	0.82	435	0.82	1.30	158.5%	1260	1230
IOC	GUWAHATI-SILLIGURI	1.25	525	1.25	0.94	75.2%	870	960
IOC	HALDIA-BARAUNI	1.35	277	1.35	1.58	117.0%	1760	1900
IOC	HALDIA-MOURIGRAM-RAJBANDH	1.1	116	1.10	0.61	55.5%	520	540
IOC	KOYALI-AHMEDABAD	3.7	763	1.80	0.14	78.0%	4630	4990
IOC	MATHURA-JALLANDHAR	1.5	219	4.10	3.18	77.6%		1290
IOC	PANIPAT-BHATINDA	1	75	3.70	5.49	148.4%	520	470
IOC	DIGBOI-TINSUKIA	1.2	56	1.50	1.46	97.3%	250	250
IOC	MATHURA-TUNDIA	1.8	78	1.00	0.44	44.0%	230	70
IOC	KOYALI-VIRAMGAM-SIDHPUR	4.1	1056	1.20	0.24	20.0%	2060	3010
IOC	PANIPAT-REWARI	1.5	155	1.50	1.41	94.0%	910	1240
IOC	CHENNAI-MADURAI	1.73	683	1.80	1.37	76.1%	130	820
IOC	KOYALI-DAHE	0.66	103	2.60	0.90	34.6%		180
IOC	-	5.3	745	5.30	3.87	73.0%	4180	4050
HPCL	MUMBAI-PUNE	3.67	506	10.62	8.05	75.8%	2780	3240
HPCL	VIZAG-VIJAYAWADA-SECUNDERABAD	5.38	572	3.67	3.36	91.6%	2880	3500
BPCL	MUMBAI-MANMAD-MANGLIYA	4.33	610	5.38	3.85	71.6%	3792	4300
Petronet	VADINAR-KANDLA	1.25	100	3.84	0.62	16.1%	1115	190
Petronet	KOCHI-COIMBATORE	3.3	292	3.30	1.36	41.2%	1101	1220
Petronet	MANGLORE-HASAN-BANGALORE	2.14	361	2.14	2.14	99.9%	1012	1440
SUB-TOTAL		47.08	7727	58.0	42.3	73.0%	30000	34890
LPG PIPELINE								
GAIL	JAMNAGAR-LONI	2.5	1250	2.50	2.23	89.3%	1910	2030
GAIL	VIZAG-VIJAYAWADA-SECUNDERABAD	1.33	600	1.33	0.52	39.2%	320	460
SUB-TOTAL		3.83	1850	3.83	2.75	71.9%	2230	2490
CRUDE PIPELINES								
OIL	DULIAJAN-BONGAIGAON-BAURANI	7.68	1405	7.68	6.07	79.0%	5990	6000
IOC	SALAYA-MATHURA-PANIPAT	21	1870	21.00	21.69	103.3%	20300	21910
IOC	HALDIA-BARAUNI	7.5	943	7.50	7.25	96.7%	7040	7060
IOC	MUNDRA-PANIPAT	3.78	1174	6.00	6.93	115.5%		3460
SUB-TOTAL		39.96	5392	42.18	41.94	99.4%	33330	38430
GRAND TOTAL		90.87	14969	103.98	87.00	83.7%	65560	75810
GRAND TOTAL (Product + Crude Oil Pipelines)				165.7	113.5	68.5		

Appendix-9 Chapter 2

Nature of Road Transport Industry

Structure of road goods transport industry (or trucking) is highly amorphous and an exhaustive analysis calls for an elaborate and independent exercise. Earlier detailed studies undertaken by NCAER in 1979 (NCAER, 1979)¹ and by Central Institute of Road Transport (CIRT) in 1993 (CIRT, 1993)² are dated. Most recent study by Sriraman (Sriraman and et. al., 2006)³ for the Competition Commission, with focus on nature of the competition in industry, is an assessment of how tariff is fixed by different players in the industry and the extent of monopoly power exercised by these players. Structural status of road transport industry requires to be updated.

This analysis, though not part of the terms of reference, is a modest attempt to serendipitous collation of information collected as part of the country wide road traffic surveys undertaken by RITES. The data on the nature of the industry were collected along with vehicle operating cost survey and the sample was sizeable. In addition to the costs, the data were collected in respect of:

- ◆ Point of loading and unloading
- ◆ Body of the road carrier
- ◆ Information on owner driven vehicles
- ◆ Number of axles
- ◆ Classification of the commercial status of the vehicle

Loading and Unloading Points

Since the cargo is collected and delivered at different points, information was collected regarding loading and unloading done at any of the following locations:

- ◆ Container Depot
- ◆ Factory
- ◆ Farm
- ◆ Godown
- ◆ Mandi (market yards)
- ◆ Others
- ◆ Railway Shed

Emerging information with regard to trucks handled at different loading and unloading points is given in Table below. It is seen that, amongst loading points, maximum handling of trucks (40 %) took place at factories. Amongst unloading points, go-downs accounted for maximum handling of trucks (30 %). Agricultural mandis accounted for 8 per cent and 10 per cent of the trucks at loading and unloading points respectively.

Distribution of Vehicles in Loading and Unloading Points

POINT FOR LOADING/UNLOADING	LOADING POINT	% SHARE	UNLOADING POINT	% SHARE
Factory	18,992	40.1	12,695	26.8
Godown	12,134	25.6	15,237	32.2
Mandi	3,668	7.7	4,615	9.8
Farm	2,028	4.3	1,282	2.7
Railway Shed	326	0.7	237	0.5
Container Depot	1,285	2.7	1,220	2.6
Others	8,987	19	12,001	25
Grand Total	47,420	100.0	47,287	100.0

¹ NCAER (1979) Road Transport Industry, National Council of Applied Economic Research, New Delhi.

² C.I.R.T (1993) The Road Goods Transport Industry in India, Central Institute of Road Transport, Pune.

³ Sriraman S., A. Venkatesh M. Karne, V. Mohite (2006) Competition Issues in the Road Goods Transport Industry in India with special reference to the Mumbai Metropolitan Region available as on 10/02/2010 at http://www.cci.gov.in/images/workshop/14_15march07/14s_sriram.pdf?phpMyAdmin=NMPFRahGKYeum5F74Ppstin7Rf00

A matrixed tabulation of unloading and loading points presented below indicates an origin destination picture of truck handling at different points. It is observed that maximum movements are noticed between factories and go-downs which points to high levels of movement of manufactured goods by road transport.

Cross Table of Vehicles in Unloading and Loading Points:

UNLOADING POINT	LOADING POINT							TOTAL
	FACTORY	GODOWN	MANDI	FARM	CONTAINER DEPOT	RAILWAY SHED	OTHERS	
Godown	5,752	7,596	468	270	107	66	465	14,724
% Share	12.5	16.5	1	0.6	0.2	0.1	1	31.9
Factory	8,681	1,501	290	264	220	54	1,089	12,099
% Share	18.8	3.3	0.6	0.6	0.5	0.1	2.4	26.2
Mandi	615	659	2,224	493	23	20	395	4,429
% Share	1.3	1.4	4.8	1.1	0	0	0.9	9.6
Farm	387	180	62	467	23	11	89	1,219
% Share	0.8	0.4	0.1	1	0	0	0.2	2.6
Container Depot	261	144	14	60	538	14	97	1,128
% Share	0.6	0.3	0	0.1	1.2	0	0.2	2.4
Railway Shed	99	22	4	9	5	67	20	226
% Share	0.2	0	0	0	0	0.1	0	0.5
Others	2,699	1,622	470	364	311	77	6,729	12,272
% Share	5.9	3.5	1	0.8	0.7	0.2	14.6	26.6
Grand Total	18,494	11,724	3,532	1,927	1,227	309	8,884	46,097
% Share	40.1	25.4	7.7	4.2	2.7	0.7	19.3	100

Body of the Road Carriers

The body of the road carrier is designed to meet the need of the type of material required to be carried eg. bulk cargo would use open trucks and the closed body trucks would be loaded with manufactured goods or less than truck load of goods. The trailers are used for finished products like iron steel or machinery. However, the classification is not rigid but only indicative. In this context, information was collected in respect of following types of trucks:

- Closed
- Flat
- Open
- Tanker

Based on the data collected, break-up of the composition of the vehicles is given below. As expected, the share of open trucks is very high, constituting 70 per cent of the total. But more important is the share of closed body trucks accounting for 22 per cent of the total. Presence of large number of closed body trucks is an indication of movement of the manufactured articles and less than truck load cargo in the total. It also indicates the potential for domestic containerization.

Composition of Vehicles

BODY TYPE	TOTAL	% SHARE
Closed	9,991	22.1
Flat	1,464	3.2
Open	31,682	70.2
Tanker	2,023	4.5
Grand Total	45,160	100.0

An analysis of the type of body with nature of permit and number of axles and tyres is presented in the following two tables. The composition of the vehicles is more or less uniform across different categories of vehicles for closed & open body vehicles. However, tankers and flats are usually heavy vehicles and they constitute a larger share of heavy commercial vehicles and 4 & 5 axle vehicles.

Type of Body with Nature of Vehicle:

BODY TYPE	HCV	% SHARE	LCV	% SHARE	MCV	% SHARE	TOTAL
Closed	4,970	19.5	940	22.8	4,081	26.4	9,991
Flat	1,110	4.3	53	1.3	301	1.9	1,464
Open	18,064	70.7	3,098	75.0	10,520	68.0	31,682
Tanker	1,405	5.5	40	1.0	578	3.7	2,023
Grand Total	25,549	100.0	4,131	100.0	15,480	100.0	45,160

HCV: Heavy Commercial Vehicle, MCV: Medium Commercial Vehicle and LCV: Light Commercial Vehicle

Type of Body with Number of Axles and Tyres:

BODY TYPE	2 AXLES-4 TYRES	% SHARE	2 AXLES-6 TYRES	% SHARE	3 AXLES-10 TYRES	% SHARE	4 AXLES-14 TYRES	% SHARE	5 AXLES & ABOVE	% SHARE	TOTAL
Closed	1,061	23.7	5,027	23.5	3,674	20.9	252	16.7	198	18.1	10,212
Flat	55	1.2	360	1.7	412	2.3	422	28.0	268	24.5	1,517
Open	3,269	73.1	15,172	70.9	12,600	71.6	646	42.9	567	51.7	32,254
Tanker	87	1.9	836	3.9	923	5.2	186	12.4	63	5.7	2,095
G. Total	4,472	100.0	21,395	100.0	17,609	100.0	1,506	100.0	1,096	100.0	46,078

Information on Owner-Driven vehicles

A detailed analysis of the ownership of the trucks is beyond the scope of the Study but information on owner-driven vehicles was collected to understand the cost implications. The information on owner-driven vehicles is given in the table below. Out of the total sample, about 14 per cent of the vehicles are driven by the owners. This, however, does not give information of the complete ownership structure which requires detailed probe on the ownership pattern.

Ownership of Trucks:

OWNERSHIP	NUMBER OF VEHICLES	% SHARE
Vehicles driven by others	42608	86
Vehicle driven by owner	6866	14
Total	49474	100

The pattern of owner driven vehicles changes with classification and size of the vehicle as evident from the following tables. The tables show that smaller vehicles (LCVs and 2 axle vehicles) tend to be more owner driven.

Pattern and Number of Axles of Owner-Driven Vehicles:

VEHICLE TYPE	VEHICLE OWNED BY OTHERS	% SHARE	VEHICLE OWNED BY DRIVER	% SHARE	TOTAL
HCV	24,791	87.1	3,661	12.9	28,452
LCV	3,553	81.4	812	18.6	4,365
MCV	14,264	85.6	2,393	14.4	16,657
Grand Total	42,608	86.1	6,866	13.9	49,474

AXLE TYPE	VEHICLE OWNED BY OTHERS	% SHARE	VEHICLE OWNED BY DRIVER	% SHARE	TOTAL
2 Axles-4 Tyres	3,975	82.0	875	18.0	4,850
2 Axles-6 Tyres	20,073	86.4	3,150	13.6	23,223
3 Axles-10 Tyres	16,732	86.6	2,585	13.4	19,317
4 Axles-14 Tyres	1,606	88.0	219	12.0	1,825
5 Axles & Above	1,150	85.6	193	14.4	1,343
Grand Total	43,536	86.1	7,022	13.9	50,558

Number of Axles and Status of Vehicles

The number of axles and the status of the vehicle is presented below. The predominant share is of conventional two-axle and 6-tyre vehicles accounting for 45.8 per cent. However, more interesting is the growth of multi-axle vehicles which account for 44 per cent of vehicles and three-axle vehicles accounting for 38 per cent of the total. Similarly HCV account for 57 per cent of the total goods vehicle population.

No. of Axles & Status of Vehicle

NUMBER OF AXLES	TOTAL	% SHARE
2 Axles-4 Tyres	5011	9.9
2 Axles-6 Tyres	23238	45.8
3 Axles-10 Tyres	19374	38.2
4 Axles-14 Tyres	1818	3.6
5 Axles & Above	1335	2.6
Grand Total	50776	100.0

Classification of Vehicles

CLASSIFICATION	TOTAL	% SHARE
HCV	29205	57.5
LCV	4475	8.8
MCV	17096	33.7
Total	50776	100.0