

Chapter I

Introduction

Infrastructure

Infrastructure is a prerequisite for economic growth. It represents, if not the “engine” the “wheel” of the economic growth. For a rapidly growing economy like India, infrastructure availability of adequate quality, quantity and reliability becomes a key limiting factor to growth.

The World Bank has included the following services in the definition of infrastructure¹

- Public Utilities- Power, Telecommunication, piped water supply, sanitation and sewerage, solid waste collection and disposal, and piped gas.
- Public Works - Roads and major dam and canal work for irrigation and drainage.
- Other Transport Sectors - Urban and inter-urban railways, urban transport, ports and waterways, and airports.

While the above listing include what is called economic infrastructure, the broader definition also includes social infrastructure, often encompassing education and health care, which represent equally important but different set of issues.

In India infrastructure has been defined by various expert committees and organisations in different manners. To bring in uniformity in approach to infrastructure by all concerned Secretariat for Committee on Infrastructure, Planning Commission has given a broad definition of infrastructure, which includes²:

- (i) Electricity (including generation, transmission and distribution) and R&M of power stations,
- (ii) Non-Conventional Energy (including wind energy and solar energy),
- (iii) Water supply and sanitation (including solid waste management, drainage and sewerage) and street lighting,
- (iv) Telecommunications,
- (v) Road & bridges,

¹ World Bank (1994), *World Development Report 1994 – Infrastructure for Development*, Washington DC: The World Bank

² Govt. of India, Planning Commission (2008), *Definition of Infrastructure*, New Delhi: The Secretariat for the Committee on Infrastructure.

- (vi) Ports,
- (vii) Inland waterways,
- (viii) Airports,
- (ix) Railways (including rolling stock and mass transit system),
- (x) Irrigation (including watershed development),
- (xi) Storage,
- (xii) Oil and gas pipeline networks.

The committee has also compiled various definitions of infrastructure by different authorities/organisations.³

The adequacy of infrastructure helps determine one country's success and another's failure- in diversifying production, expanding trade, coping with population growth, reducing poverty, or improving environmental conditions. Good infrastructure raises productivity and lowers production costs, but it has to expand fast enough to accommodate growth. Infrastructure capacity grows step for step with economic output- a one per cent increase in stock of infrastructure is associated with a one per cent increase in GDP across all countries⁴.

Infrastructure projects differ from industrial and other projects in terms of size, longevity and immobility. They require massive investments, have a long life and many a times are immobile. These infrastructure services have innate "public goods" characteristics and are normally "non-tradable" hence competition from foreign producers can not be used to check domestic monopoly power. Further, infrastructure projects often sell their services to government agencies, and their tariffs are politically sensitive and thus are not economically viable⁵.

Infrastructure Financing in Eleventh Five Year Plan

Eleventh plan document recognising that adequate, cost effective and quality infrastructure is a prerequisite for attaining the nine per cent growth had proposed raising the investment in physical infrastructure from five per cent of GDP during the 10th Plan to nine per

³ Available at <http://www.infrastructure.gov.in/pdf/doi.pdf>

⁴ World Bank (1994), World Development Report 1994 – Infrastructure for Development, Washington DC: The World Bank

⁵ Dhameja, Nand, "Infrastructure Management and Financing: Emerging Issues", *Nagarlok Vol. XXXV, April-June 2003*.

cent of GDP in the terminal year (2011-12) of the 11th Plan. Based on this, the secretariat for committee on Infrastructure, Planning Commission⁶ had made an assessment of the investment required by the Central and State Governments and the private sector in the ten major physical infrastructure sectors.

The committee has projected investment in two ways. The first is through a top-down ('order of magnitude') approach derived from the Government's growth targets and recent experiences of other emerging developing countries in investments in infrastructure as a share of GDP. The second is through a bottom up exercise, based on sector-wise project plans in the pipeline. Sector-wise plans, corrected for past trends and synchronised with the outcome of the top-down approach, yield a projected total investment of Rs. 20,56,150 crore or US\$ 514.04 billion (at constant 2006-07 prices) in infrastructure during the Eleventh Plan. The details of the sectoral projections are given in Table 1.1, the assumptions based on which these projections have been made are given in Appendix-I.

Table 1.1: Infrastructure Investment in the Eleventh Plan based on Sectoral Analysis

(Rs Crore in 2006-07 prices)

Sectors	Rs Crore	US \$ Billion @ Rs.40/\$	Sectoral Share (per cent)
Electricity (incl. NCE)	6,66,525	166.63	32.42
Roads and bridges	3,14,152	78.54	15.28
Telecommunications	258,439	64.61	12.57
Railways (incl. MRTS)	261,808	65.45	12.73
Irrigation (incl. WD)	253,301	63.33	12.32
Water supply and sanitation	143,730	35.93	6.99
Ports	87,995	22.00	4.28
Airports	30,968	7.74	1.51
Storage	22,378	5.59	1.09
Gas	16,855	4.21	0.82
Total	2,056,150	514.04	100

Source: Planning Commission- Projections of Investment in Infrastructure during the Eleventh Plan

⁶ Govt. of India, Planning Commission (2007a), *Projections of Investment in Infrastructure during the Eleventh Plan*, New Delhi: The Secretariat for the Committee on Infrastructure.

In the Tenth Plan total expenditure on infrastructure was Rs. 887,794 crore (US \$ 222 Billion) amounting to 5.07 per cent of GDP, while the projection for Eleventh Five year Plan at Rs. 2,056,150 crore (\$514 Billion), at 7.6 per cent of the GDP is nearly 2.3 times the outlay of Tenth plan in absolute terms⁷. These estimates imply that there is need for a significant increase in investments in infrastructure as compared to the log-linear 'business as usual' projection of Rs. 15,52,657 crore or US\$ 388.16 billion. The public sector would continue to play a dominant role in investment for infrastructure, as in other countries. The total public sector investment envisaged is Rs. 765,622 crore by the Centre and Rs. 670,937 crore by the States.

A quantum jump has been envisaged in the investment by private sector, which includes Public-Private Partnership (PPP) projects, from Rs. 175,203 crore (\$43.8 billion) in Tenth Plan to Rs. 619,591 crore (\$154.17 billion) in the Eleventh Plan. Investment by the private sector is 30 per cent of the required total investment during the Eleventh Plan, a much higher share than 20 per cent realised during the Tenth Plan.

Of the projected investment of Rs. 765,622 crore by the Central Government, Rs. 565,622 crore is likely to be funded out of Internal and Extra Budgetary Resources (IEBR). In the case of States, Rs. 444,671 crore is expected from budgetary resources while about Rs. 226,266 crore is expected from their IEBR. These investments would require a much higher scale of effort by the Public Sector Undertakings especially for raising debt on commercial terms. The total requirement of debt by the public and private sectors is likely to be Rs. 988,035 crore or US\$ 247 billion. However, the availability of debt financing for infrastructure during the Eleventh Plan is estimated at Rs. 825,539 crore or US\$ 206 billion. There is, thus, a funding gap of Rs. 162,496 crore or US\$ 40.62 billion in the debt component. The required investment in infrastructure would be possible only if there is a substantial expansion in internal generation and extra budgetary resources of public sector, in addition to a significant rise in private investment. As a pre-requisite, this would require large infrastructure projects to be structured on sound commercial principles in an enabling policy and regulatory environment.

⁷ Planning Commission (2009), Private Participation in Infrastructure

Even if the public sector is able to achieve its ambitious targets, the required investment in infrastructure is only possible if there is a substantial expansion in private sector investment. The share of the private sector in total infrastructure investment has to be around 30 per cent. In some areas, the private sector's contributions would have to be far greater, for instance in telecommunications, ports and airports where over 60 per cent of the investments have to come from the private sector. If these initiatives succeed, India would deliver a large programme of PPPs even by international standards. The enormity and complexity of this effort would have to be recognised and addressed on an urgent footing and for this purpose, the policies and measures initiated so far would have to be consolidated and carried forward with outcome-based enhancements.

Financing the Roads Sector

In the Tenth Plan the anticipated expenditure on roads and bridges is Rs. 144,892 crore or US\$ 36.22 billion, out of which expenditure by Centre is Rs. 71,534 crore, expenditure by states, is Rs. 66,354 crore and expenditure by private sector is Rs. 7,004 crore. Planning Commission has projected the investment in roads sector during the Eleventh Plan at Rs. 314,152 crore or US\$ 78.54 billion, which is 2.2 times the Tenth Plan investment. Its break up by public sector (Rs. 207,359 crore) and private sector (Rs. 106,792 crore) is depicted in Table 1.2, and that by type of roads is in Table 1.3

Table 1.2: Projected Public and Private Investment in Roads & Bridges- Eleventh Plan

(Rs. Crore at 2006-07 Prices)

Investment By	Public	Private	Total
Centre	107,359	79,840	187,199
States	100,000	26,952	126,952
Total	207,359	106,792	314,152

Source: Planning Commission- Projections of Investment in Infrastructure during the Eleventh Plan

Table 1.3: Projected Investment by type of Roads during Eleventh Plan

(Rs. Crore at 2006-07 Prices)

National Highways	State Roads	Rural Roads	NE Roads	Total
145,853	126,952	36,582	4,765	3,14,152

Source: Planning Commission- Projections of Investment in Infrastructure during the Eleventh Plan

The important thing to note is that the dependence on private sector for financing in road sector is expected to go up sharply from 4.8 per cent in 10th plan to 40.3 per cent in Eleventh plan. In absolute terms also the private sector outlay is proposed to increase by 19 times the tenth plan outlay. Attracting such a large quantum of private investment would require suitable policy mix to attract investment, which government has been able to put up in last 2-3 years.

Indian Road Network

India has an extensive road network of 3.3 million km, the second largest in the world. It consists of National Highways, Expressways, State Highways, Major District Roads, Other District Roads and Village Roads with following length distribution:

National Highways/Expressways	70,548 km
State Highways	1,28,000 km
Major and other District Roads	4,70,000 km
Village Roads	26,50,000 km

Annual Report MORTH⁸ 2008-09

The National Highways have further been classified depending upon the carriageway width of the Highway. Generally, a single lane has a width of 3.75 m and 3.5 m per lane in case of multi-lane National Highways. The percentage of National Highways in terms of width is as under:

Single Lane/ Intermediate lane	20,849 km (30per cent)
Double Lane	37,646 km (53per cent)
Four Lane/Six lane/Eight Lane	12,053 km (17per cent)

Annual Report MORTH 2008-09

The National Highways serve as the arterial road network of the country. It is estimated that about 60 per cent of freight and 87.4 per cent of passenger traffic in the country is being handled by roads. While Highways/ Expressways constitute only about two per cent of the length of all roads, they carry about 40 per cent of the road traffic leading to a strain on their capacity. The number of vehicles on roads has been growing at compounded annual growth rate (CAGR) of

⁸ Ministry of Road Transport and Highways, Government of India

over eight per cent in the last five years (2003-04 to 2008-09). The rapid expansion and strengthening of the road network, therefore, is imperative, to provide for both present and future traffic and for improved accessibility to the hinterland.

The need for investment in roadways for increasing competitiveness and sustaining economic growth has been well established. Various studies have pointed out the socio-economic benefits of investing in roads. According to World Bank⁹ (2002), every rupee spent on roads creates seven rupees in economic benefits. An ESCAP study¹⁰ (2007) also reached similar conclusion; a rupee spent on roads leads to seven times greater poverty reduction than a rupee spent on anti poverty programmes. Another World Bank study found that the GDP benefit derived from the Golden Quadrilateral (GQ) which cost INR 303 bn, was INR80 bn per annum, a return per annum of more than 25 per cent.

National Highways Development Project (NHDP)

The development of National Highways is the responsibility of the Government of India. The Government of India has launched major initiatives to upgrade and strengthen National Highways through various phases of the National Highways Development Project (NHDP). The National Highways Authority of India (NHAI) is mandated to implement the NHDP, which is one of the largest road development programmes to be undertaken by a single authority in the world and involves widening, upgrading and rehabilitation of about 55,000 km, of highways entailing an estimated investment of INR 3,00,000 Crore (USD 60 billion). Most of the projects have been developed or are under development on Public Private Partnership (PPP) basis through Build Operate and Transfer (BOT)-Annuity and BOT-Toll mode. Typically, in an annuity project, the project IRR is expected to be 12-14 per cent and equity IRR would be 14 -16per cent. For toll projects, where the concessionaire assumes the traffic risk, the project IRR is expected to be around 14-16 per cent and equity IRR around 18-20 per cent.

The NHDP is being implemented under seven phases:

⁹ Quoted in Mukherjee, Saian and Harish Venkateswaran, (2009), "India: Roads, The road ahead", Mumbai: Nomura Financial Advisory and Securities (India) Private Limited.

¹⁰ Op. cit.

NHDP I & II: Four/six laning of the Golden Quadrilateral (GQ) and North-South and East-West (NS-EW) Corridors at a total cost of Rs. 65,000 crore at 2004 prices

NHDP-I involves widening (to 4 lanes) and upgrading of 7,498 km of the national highway network at an estimated cost of Rs. 30,300 crore (1999 prices). It has four component packages:

- Highway network linking the four metropolitan cities in India i.e. Delhi-Mumbai-Chennai-Kolkata, covering a length of 5,846 km, popularly known as the **Golden Quadrilateral (GQ) project**;
- Highways along the **North-South (NS) and East- West (EW) corridors**, covering a length of 981 km; The North-South corridor connects Srinagar in the North to Kanyakumari in the south including a spur from Salem to Kochi; the East-West corridor connects Silchar in the East to Porbandar in the West.
- Port connectivity projects covering a length of 356 km; and
- Other highway projects, covering a length of 315 km.

NHDP-II involves widening (to 4 lanes) and up gradation of the NS-EW corridors (not covered under Phase-I) covering a distance of 6,736 km, besides providing connectivity to major ports on the east and west coasts of India and some other projects at an estimated cost of Rs. 34,339 crore (2002 prices). This includes 6,240 km of NS-EW corridors and 496 km of other highways. The total length of the NS-EW network under Phases I & II is about 7,200 km.

Four-laning of the GQ has almost been completed. Phase II is expected to be largely completed by December 2010.

NHDP-III: involves up gradation of 12,109 km (mainly 4-laning) of high density national highways, through the Build, Operate & Transfer (BOT) mode at a cost of INR 80,626 Crore (USD 16.1 billion). The project consists of stretches of National Highways carrying high volume of traffic, connecting state capitals with the NHDP network under Phases I and II and providing connectivity to places of economic, commercial and tourist importance. This phase is likely to be completed by December 2013.

NHDP-IV: 2-laning of 20,000 km with paved shoulders

It envisages upgrading of 20,000 km of single / intermediate / two lane National Highways to two lane with paved shoulders, at an indicative cost of INR 27,800 Crore (USD 5.6 billion), with a view to providing balanced and equitable distribution of the improved/widened highways network throughout the country. This will ensure that these two lane highways have the capacity, speed and safety to match minimum benchmarks for national highways. The government has already approved strengthening of 5,000 km to two lane paved shoulders on BOT (Toll/ Annuity) under NHDP-IV A at a cost of INR 6,950 Crore (USD 1.4 billion).

NHDP-V: Six Laning of 6500 Km of already four laned Highways

GQ and certain other high density stretches of four lane highways would be converted to six lane highways through PPP on DBFOT (Design, Build, Finance, Operate and Transfer) basis at an estimated cost of INR 41,210 Crore (USD 8.2 billion). These corridors have been four laned as part of the GQ in Phase-I of NHDP. Implementation of initial set of projects has already commenced and the entire package is expected to be completed by 2012. Of the 6,500 km proposed under NHDP-V, about 5,700 km would be taken up in the GQ and the balance 800 km would be selected on the basis of predefined eligibility criteria. This phase is expected to be completed by December 2012.

NHDP VI: Development of 1000 kms of Expressways

NHDP Phase VI envisages development of 1,000 km fully access controlled expressways to be constructed on new alignments under Public Private Partnership (PPP) model following Design – Build – Finance - Operate (DBFO) approach. This includes expressways connecting Vadodara-Mumbai, Delhi-Meerut, Bangalore-Chennai and Kolkata-Dhanbad stretches. The Phase has been approved at an estimated cost of Rs. 16,680 crore (USD 3.3 billion) in 2006. Out of this, Rs. 9,000 crore will come from the private sector and the balance Rs 7,680 crore will be Government share for bridging the viability gap as well as meeting the cost of land acquisition, utility shifting, consultancy, etc. The entire project is targeted to be completed by December 2015.

NHDP VII: Other Highway Projects of 700 km

Government has approved construction of stand alone Ring Roads, Bypasses, Grade Separators, Flyovers, elevated roads, tunnels, road over bridges, underpasses, service roads etc on BOT

(Toll) mode under NHDP Phase VII in December 2007 at an estimated cost of Rs. 16,680 crore (USD 3.3 Billion). The development of ring roads, bypasses, grade separators and service roads are considered necessary for full utilisation of highway capacity as well as for enhanced safety and efficiency. This phase is scheduled for completion by December 2014.

Financing National Highway Projects

Presently, the development and maintenance of National Highways is financed by following modes:

- (a) Government's general budgetary sources
- (b) Dedicated accruals under the Central Road Fund (by levy of cess on fuel)
- (c) Lending by international institutions like World Bank, ADB and JBIC
- (d) Private financing under PPP frameworks:
 - Build Operate and Transfer (BOT)/Design Build Finance Operate and Transfer (DBFOT) - Investment by private firm and return through levy and retention of user fee (Toll).
 - Build Operate and Transfer (Annuity) - BOT (Annuity) - Investment by private firm and return through semi-annual payments from NHAI as per bid.
 - Special Purpose Vehicle – SPV (with equity participation by NHAI)
 - Market Borrowings

NHAI also has a provision for providing grant up to 40 per cent of the project cost to make projects commercially viable. However, the quantum of grant is decided on a case to case basis and typically constitutes the bid parameter in BOT projects generally not viable based on toll revenues alone. The disbursement of such grant is subject to provisions of the project concession agreements.

NHAI projects, with higher traffic volumes, have also been bid out on Negative Grant. However, under the revised MCA, projects under BOT/ DBFOT framework have also been awarded on a revenue share basis, where the bidder offering the highest revenue share (subject to technical qualification) is awarded the project. Details of these projects are given in Appendix-II.

The core group on financing of NHDP headed by Member secretary planning Commission prepared the financing plan for NHDP in 2006, according to which the total outlay for completion of NHDP Phase I-VII was estimated at Rs. 220,000 crore at 2006 prices. The requirement under BOT Toll/Annuity was estimated at around Rs. 180,000 crore and the outlay under EPC¹¹ (CC) was assessed at Rs. 40,000 crore. The phase-wise details are in Table- 1.4:

Table 1.4: Outlays under Different Modes of Delivery

(Source: Report of the Core Group on financing of NHDP)

NHDP Phase	Item	CC	BOT(TOLL)	BOT(Annuity)	Total
NHDP-I (Balance Work)	Length (in km.)	1,711	20	7	1,738
	Cost (in Rs. cr.)	8,145	581	85	8,811
NHDP-II (Balance Work)	Length (in km.)	4,569	1,237	930	6736
	Cost (in Rs. cr.)	29,493	8,065	6,064	43,623
NHDP-III	Length (in km.)	-	10,000	-	10,000
	Cost (in Rs. cr.)	-	65,197	-	65,197
NHDP-IV	Length (in km.)	-	5,000	15,000**	20,000
	Cost (in Rs. cr.)	-	6,950	20,850	27,800
NHDP-V	Length (in km.)	-	6,500	-	6,500
	Cost (in Rs. cr.)	-	41,210	-	41,210
NHDP-VI	Length (in km.)	-	1,000	-	1,000
	Cost (in Rs. cr.)	-	16,680	-	16,680
NHDP-VII	Length (in km.)	-	-	-	-
	Cost (in Rs. cr.)	2,594	9,638	4,448**	16,680
Total	Length (in km.)	-	-	-	45,974
	Cost (in Rs. cr.)	-	-	-	2,20,000

*Length to be covered under NHDP VII is yet to be finalised

**To be determined based on budgetary resources and the tolling policy for 2 lane highways

Public Private Participation

Historically, investments in the infrastructure sector, particularly in the highways, were being made by the Government mainly because of the large volume of resources required, long gestation period, uncertain returns and various associated externalities. The galloping resource

¹¹ EPC- Engineering, Procurement and Construction; CC- Construction Contract

requirements and the concern for managerial efficiency and consumer responsiveness have led in recent time to an active involvement of private sector. To encourage participation of private sector, the government has also announced several incentives such as tax exemptions and duty free import of road building equipments and machinery etc. It has been decided in April 2007 that all the sub projects in NHDP Phase-III to Phase-VII would be taken up mainly on Public Private Participation (PPP) route by awarding them first on BOT (Toll), failing which on BOT (Annuity), failing which on Engineer Procurement Construction (EPC) basis with the approval of the Government.

There are several forms of PPP, the common forms that are popular in India and have been used for development of National Highways are:

- Build, Operate and Transfer (Toll) Model
- Build, Operate and Transfer (Annuity) Model
- Special Purpose Vehicle (SPV) for Port Connectivity Projects
- NHAI is also proposing to award projects under a long term Operations, Maintenance and Transfer (OMT) concession.

BOT (Toll)

Private developers/ operators, who invest in tollable highway projects, are entitled to collect and retain toll revenues for the tenure of the project concession period. The tolls are prescribed by NHAI on a per vehicle per km basis for different types of vehicles. The Government in the year 1995 passed the necessary legislation on collection of toll.

A Model Concession Agreement (MCA) has been developed to facilitate speedy award of contracts. This framework has been successfully used for award of BOT concessions. The MCA has been revised recently and current projects are being awarded under the revised MCA.

So far 94 projects (69 NHAI + 25 MoRT&H) valued about Rs. 38168.04 crore on Built Operate and Transfer (BOT) basis (Toll based projects) have been awarded. Out of these, 43 projects (18 NHAI + 25 MoRT&H) have been completed and 51 projects are under progress.

BOT (Annuity)

The concessionaire bids for annuity payments from NHAI that would cover his cost (construction, operations and maintenance) and an expected return on the investment. The bidder quoting the lowest annuity is awarded the project. The annuities are paid semi-annually by NHAI to the concessionaire and linked to performance covenants. The concessionaire does not bear the traffic/ tolling risk in these contracts.

Twenty five projects covering a length of 1376.22 km have been taken up on Annuity Basis and out of these ten projects covering a length of 637.32 km have been completed.

Operate, Maintain and Transfer (OMT) Concession

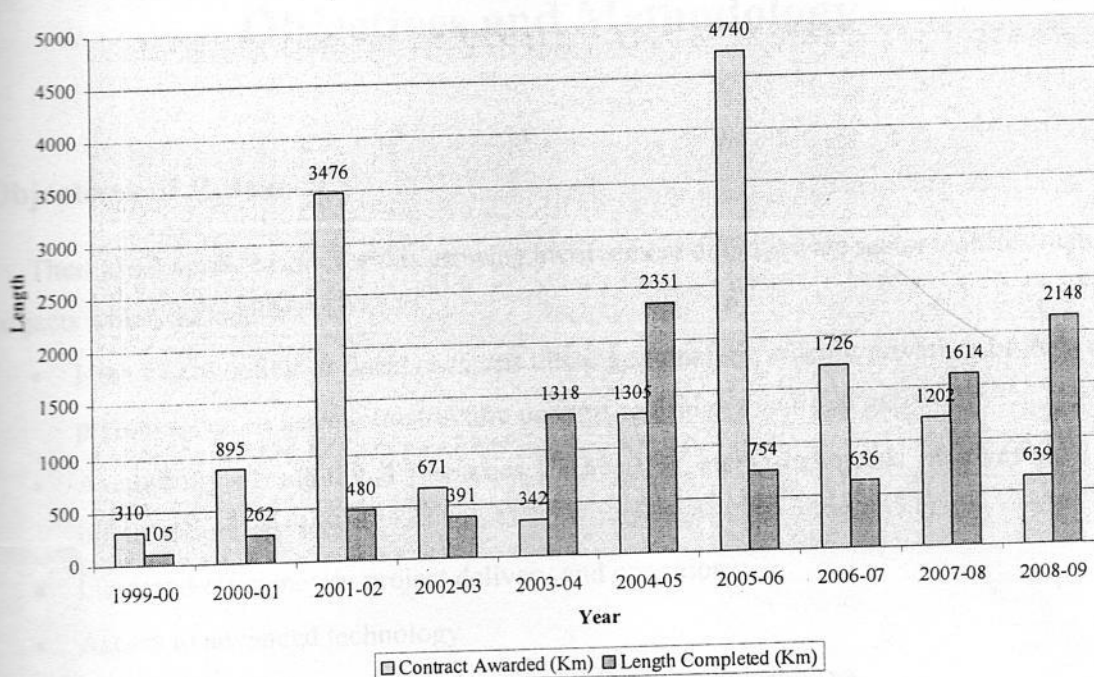
NHAI has recently taken up award of select highway projects to private sector players under an OMT Concession. Till recently, the tasks of toll collection and highway maintenance were entrusted with tolling agents/ operators and subcontractors, respectively. These tasks have been integrated under the OMT concession. Under the concession private operators would be eligible to collect tolls on these stretches for maintaining highways and providing essential services (such as emergency/ safety services).

Special Purpose Vehicle for Port Connectivity Projects

NHAI has also taken up development of port connectivity projects by setting up Special Purpose Vehicles (SPVs) wherein NHAI contributes upto 30 per cent of the project cost as equity. The SPVs also have equity participation by port trusts, State Governments or their representative entities. The SPVs also raise loans for financing the projects. SPVs are authorised to collect user fee on the developed stretches to cover repayment of debts and for meeting the costs of operations and maintenance.

NHDP had received a major setback in last two years due to delays in finalisation of MCA and subsequently global financial crisis due to which very few projects could be awarded under PPP. The projects awarded though were bigger in length. The progress of NHDP in terms of contracts awarded and length completed is shown in the Figure 1 below:

Figure I-NHDP Progress of contracts awarded and Length Completed



In August 2009 PM undertook a comprehensive review of the NHDP and directed setting up of a committee headed by Member Planning Commission Shri B. K. Chaturvedi to recommend measures to expedite work under NHDP so as to achieve the target of construction of 20 km of highway everyday. The report of the committee has been received and all the recommendations of the committee have been accepted and orders issued. The programme is picking up speed once again and NHAI has been able to award large number of projects. Construction has also picked up and around 10 Kms of highways have been completed every day in the last two months (December 2009 & January 2010) against an achievement of 2-5 Kms per day in last 3 financial years. Things seem much brighter for highway users in the years to come.