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# India

## Indian Road Construction Industry

### Capacity Issues, Constraints & Recommendations

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## Exchange Rate

Indian Rupees (INR): Rs. 45 = US\$ 1.00

## List of Acronyms

BOT	Build, Operate and Transfer
BRO	Border Roads Organization
CAGR	Compound Annual Rate of Growth
CCF	Chief Conservator of Forests
CDC	Consultancy Development Council
CIDC	Construction Industry Development Council
CII	Confederation of Indian Industries
CFI	Construction Federation of India
DBMO	Design, Build, Maintain and Operate
DFO	District Forest Officer
DP	Displaced person
DPR	Detailed Project Report
DRB	Dispute Resolution Board
ESOP	Employee Stock Option Plan
FDI	Foreign Direct Investment
FICCI	Federation of Indian Chambers of Commerce and Industry
FIDIC	International Federation of Consulting Engineers
GOI	Government of India
GPS	Global Positioning Satellite/System
GSHP	Gujarat State Highways Project
HR	Human Resources
IRC	Indian Road Congress
IT	Information Technology
JV	Joint Venture
LTPBC	Long-term Performance-based Contract
LA	Land Acquisition
MCA	Model Concession Agreement
MHA	Malaysian Highway Authority
MoEF	Ministry of Environment and Forestry
MoSRT	Ministry of Shipping, Road Transport and Highways
NABARD	National Bank of Agriculture and Rural Development
NAC	National Academy of Construction
NH	National Highways
NHAI	National Highways Authority of India
NHDP	National Highways Development Project
NSE	North-South Expressway
PAP	Project-affected person
PMGSY	Pradhan Mantri Gram Sadak Yojana ( <i>Prime Minister's Rural Roads Program</i> )
PPP	Public Private Partnership
PWD	Public Works Department
R&D	Research and Development
R&R	Resettlement & Rehabilitation
RR	Rural Roads
SH	State Highways
SME	Small and medium enterprises
SOE	State-owned enterprise
SPV	Special Purpose Vehicle
VAT	Value Added Tax
VE	Value Engineering
WCT	Works Contract Tax

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# 1. Executive Summary

## A Background

1. Over the last few years, the Indian economy has been in a phase of unparalleled growth of about 8-10% per year, making it one of the fastest growing economies in the world. Sustaining this rate of growth will need huge investments in physical infrastructure such as roads (\$75-90 billion according to various reports), water, power and urban sectors. Preliminary estimates suggest that investment in infrastructure would need to increase from the current 4.6% of GDP to about 8% during the 11<sup>th</sup> Plan.
2. An efficient transportation system is critical for sustaining economic growth and the burgeoning demand for passenger and freight movement. Recognizing this, the Government of India (GOI) and several state governments have launched initiatives during the past decade to modernize and improve the transport infrastructure. Starting with the 9<sup>th</sup> Five Year Plan (1997-2002), road sector expenditures have gone up from 3% of the total Plan expenditure to almost 12% today. These expenditures were primarily for national highway and rural road development programs. In addition, GOI, some state governments and industry associations have taken initiatives such as encouraging private sector participation in highway financing, allowing wholly-owned foreign direct investment in the sector, establishing training centers for construction workers, and devising a grading/rating system for construction firms to foster the growth and efficiency of the road construction industry.
3. In India as elsewhere, the main element of road investment is civil works – typically 95% of the road sector budget. The success of road sector investments therefore depends on the capacity and capability of the Indian road construction industry. However, even as the magnitude of works has gone up significantly in the last decade, the industry has not kept pace with this growth, as evidenced by the under-utilization of funds allocated to road projects<sup>1</sup> and perennial time and cost overruns on national and state highway projects<sup>2</sup>. The industry is not yet geared up to meet the potential expanded volume of work on future road infrastructure projects. Furthermore, it faces evolving demands in the form of bigger projects involving more demanding technology and complex design, and requiring more sophisticated execution capabilities. At the same time, as it competes for skilled manpower with other booming sectors, the road industry faces increasing turnover of its experienced staff, dwindling appeal to fresh talent, and several other constraints in investment climate that inhibit its operations and attractiveness to firms, both domestic and foreign. These issues pose major risks to the planned rapid catch-up on road sector investments – risks that need to be addressed if the Government’s development objectives are to be met.
4. This study stems partly from GOI’s concern regarding the capacity of the road construction industry to deliver, and partly from the Bank’s growing need to understand the impact of the expanded road investments on the industry’s capacity in South Asia. The study attempts to outline the entire gamut of problems and capacity constraints faced by India’s construction industry. It builds on previous studies<sup>3</sup>, reports and industry-wide stakeholder surveys and workshops. It recommends key actions to the central and state governments and the industry for enhancing its capacity and efficiency.

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<sup>1</sup> Analysis of project allocation and expenditure data for the past five years on all categories of roads in India consistently shows that actual expenditures fell short of budget allocations by 15-20%.

<sup>2</sup> Analysis of data on completed and on-going national and state highway projects shows that ninety percent of all contracts had a time overrun of more than 25%; fifty-four percent had a cost-overrun of more than 25%.

<sup>3</sup> “Road Construction Industry Study (1999)”, “Design and Construction Review Study (draft stage)”, “Study on Improving Dispute Resolution Systems in Works Contracts (draft stage)”, and “Study on Delays due to Pre-Construction Activities in National Highway Projects (Bank’s internal study)”.



## **B Industry Structure and Profitability**

5. The Indian road construction industry is highly unorganized and fragmented. Only about 0.4% of the 250,000 contractors in India can be classed as medium to large firms (based on the number of people employed per firm). Many of the medium and large construction firms are still family owned and lack professional management and work culture. While small and medium contractors have mushroomed in the recent past, large contractors have not grown at the same rate either in size (turnover) or number. Consequently, on the medium to large-sized national and state highway projects there are few contractors to choose from; only about 45-50 Indian contractors and about 10-12 foreign contractors. Often these contractors form joint ventures or consortia among themselves to qualify for most of these contracts in the country. Subsequently, these contractors suffer from insufficient capacity; the result is time and cost overruns, related disputes and lower quality. As such, there is a critical need for reversing the slow growth of the large contractors and for enhancing the capacity of all sizes of contracting and consulting firms.
6. Contractors in road construction make much smaller profits (average typical margins of 6-10%) than those engaged in construction in real estate (about 20-25%), hydropower and industrial sectors (about 15%). These thin margins are mainly due to the delays in overall project implementation, investment climate bottlenecks and unhealthy competition. Players from other sectors find the road construction sector relatively unattractive due to its lower profit margins, management by predominantly weak public administrations, frequent contractual disputes, challenging project logistics and contract management arrangements. Consequently, whereas the industry should be gearing up to attract players from other sectors to meet the demand, in reality the reverse is happening: existing road firms are expanding their business interests into other, more lucrative sectors. Moreover, an increasing trend in the industry is for contractors to move up the value chain from traditional construction contracts to build-operate-transfer (BOT) type projects, to minimize their risks. This is creating a vacuum of good specialist contractors who can support the bigger players in the industry.
7. It is heartening to note that, in an effort to meet the surge in demand, deployment of human resources and equipment has increased substantially, but a shortfall still manifests itself in various forms in road contracts and their procurement. Moreover, the frequent substitution of staff on site (by both contractors and consultants) after contract award points to a shortage of skilled and semi-skilled manpower, that needs to be addressed.
8. Despite the growing demand, participation of foreign contractors in India has been steadily declining from 2003-04, possibly due to decline in their annual average turnover from Indian business. About a dozen foreign contractors are operating in India today, but many of them are not bidding on new contracts. Foreign contractors often face difficulties with taxation and audit procedures, in interacting with sub-contractors and suppliers, and in adjusting to the local work culture. This is a disturbing trend that again highlights an unattractive business environment. On the other hand, the performance of foreign contractors has also not been up to the mark, raising questions about the value they add.
9. Symptoms of capacity constraints in both quantity and quality are also evident from the fact that Indian equity research and rating agencies report unexecuted order books of 5-10 times the annual revenues for some of the leading construction companies in India to attract potential investors in the company stocks. However, this could mean that, on average, most of the construction firms would take anywhere between five to ten years to complete their works, which highlights a severe lack of capacity in the road construction sector. Time and cost overruns much above the original estimates also point to capacity constraints and poor use of the existing capacity to deliver works on time.

## C. Key Constraints Faced by the Road Construction Industry

10. From data collected through interviews with both domestic and international contractors, the following have been identified as key constraints:
  - Investment Climate constraints including operational issues, pre-construction activities, contract management and dispute resolution, institutional structure of road agencies and other entry barriers; and
  - Supply side constraints including qualified human resources, key construction equipment and materials
11. Foreign contractors also perceive cultural insensitivity to timeliness, quality and cost, lack of innovative approaches and laxity in contract enforcement as major constraints.
12. Road agencies cited as key issues the formation of so-called *paper joint ventures* to pre-qualify for contracts, poor quality of surveys and designs, frequent substitution of key personnel on site, and poor resource planning by contractors.

### C.I Constraints in Investment Climate

13. Investment climate parameters such as availability of skilled staff, operational issues (land, licenses and clearances, governance) and taxation were perceived as the prime constraints, followed by material costs, contract enforcement and dispute resolution, barriers to entry, and subsidies and fiscal concessions. Foreign contractors who were surveyed cited as the most critical issues cultural bias in project management style, poor governance, bureaucracy and corruption, risk allocation practices and contract conditions, visa and travel document processing for expatriates, and lack of information on the road construction industry. Besides these, foreign contractors also perceived some intangible constraints, such as preference given to domestic contractors during the bidding process.
14. Delays in pre-construction activities are a recurring problem across all road construction contracts. On average for national highway projects it takes 50% more time than scheduled to hand over encumbrance-free land to the contractors. Often, encumbrances such as the extent of land acquisition, utilities to be shifted and trees to be removed are not clearly identified and dealt with in a timely manner. These activities are also hampered by cumbersome procedures for obtaining the necessary clearances, unclear laws and regulations and a lack of coordination between the various government departments and levels. There is a distinct lack of a 'spirit of partnership' between the contractor and the employer. This is critical to effective project execution, as evidenced in other countries. The result is time and cost overruns and related disputes that invariably end up in litigation.
15. Although based on the FIDIC<sup>4</sup> framework, the present form of contract is inadequate and often contains unclear clauses that are open to interpretation, which subsequently lead to disputes and/or rent-seeking behavior. For instance, the role of the Independent Engineer is not clear, weak and often circumvented by the employer, violating the conditions of contract. Most of the employer's staff and domestic supervision consultants have little experience in FIDIC conditions of contract. For instance, there is a general lack of awareness that encashment of a bank guarantee can be invoked only upon default in the contractor's obligations. Further, the weak accountability framework and an overwhelming fear of vigilance by auditors (not fully conversant with FIDIC and newer forms of contracts) inhibit quick decision-making on time extensions or variation orders. On the other hand, contractors often try to exploit these weaknesses of the employer and raise frivolous contract claims that result in waste of administrative time and resources. Supervision consultants exploit contract

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<sup>4</sup> Federation Internationale des Ingenieurs-Conseils (International Federation of Consulting Engineers)

conditions by delaying decision-making, work-flow approvals that result in extension of the civil works, and thereby their time-based consultancy contracts. A related issue is rampant sub-contracting. Often contractors subcontract works to small local firms that otherwise would not have qualified for the works, either to curry favor with the local politician or due to pressure from the employer.

16. Design variations during construction, delays in pre-construction activities and unrealistic project completion schedules are often the cause of disputes on road construction projects. A rough estimate of the amount currently blocked in disputes is around Rs.540 billion (\$12 billion) for the entire construction sector in India. About 10-15% of this amount can easily be attributed to the road sector. While the contracts contain a dispute resolution mechanism, experience shows that in most cases the dispute resolution board is established only when a dispute arises. Recommendations of the board are often not reasoned due to lack of capacity and knowledge of the board members. Furthermore, neither the road administration officials, nor the contractors, hardly accept the recommendations of the board those have financial implications against the affected parties and invariably appeal for arbitration / legal intervention. The enforcement of arbitration awards is also time-consuming and often leads to significant delays even much beyond the project completion. This is a potential deterrent for new entrants in the industry that needs to be resolved.
17. The existing institutional structure in many road administration organizations does not provide for clear separation of owner and provider functions. The absence of an independent regulator to safeguard the interests of the various stakeholders, which exists in the telecom, energy and insurance sectors but not in road sector, is also a factor in the sector's slow evolution. In addition, some of the existing customs and foreign investment regulations have adversely affected the sector. On the other hand, the absence of regulation on worker health, safety and environment is not conducive to the industry's labor productivity and efficiency.
18. Distortions of direct and indirect taxes affect both foreign and domestic road contractors. Non-uniformity and multiplicity of taxes, the high level of taxes and duties, cumbersome tax assessment and collection procedures, and an absence of appropriate fiscal concessions have been a serious drag on the efficiency and profitability of the sector.
19. Contractors from other sectors face entry barriers such as strict qualification requirements related to previous technical experience in the sector. Rampant cartelization and collusion among contractors in some states also prevent these contractors and non-regional bidders from even submitting their bids. Furthermore, it is not possible for small and medium contractors to get a rating that would facilitate easier access to credit for expanding their business. The lack of a unified construction law (such as in China and Singapore) with the requisite legal framework governing all aspects of construction is another barrier to entry for players interested in entering this sector. Such a law would also strengthen the dispute resolution mechanism reducing the burden on the courts and the ensuing delays by satisfactory resolution of cases. In the year 2000, the Government of India notified construction as an approved activity under industrial concern but stopped short of declaring the sector as a full fledged industry. This has limited the sector's opportunity to be brought under industrial regulations and better access to market finance.

## **C.II Supply-side Constraints**

20. An analysis of the number of contracts and contractors shows that even in a medium growth scenario, contractor capacity would have to double immediately to handle the increase in work in 2007-08 and beyond. To meet the needs of the high growth scenario, contractor capacity would have to quadruple. But this can happen only with the entry of large construction companies, other sector players and foreign construction companies into the road sector. A related issue here is the vertically integrated nature of state road agencies, some of which may be overstaffed. In this scenario of

increased demand on the industry, this may not be the best structure for taking care of all aspects of delivery of road services.

21. Inadequacy of skilled human resources is a major constraint across the road construction industry. Its slow evolution, the rising appeal of other streams of engineering such as computer science, the closure of civil engineering specialization in some institutes, the non-availability of suitable jobs upon graduation (in some states), and the availability of more lucrative jobs in information technology and financial services are all draining the industry of civil engineers. The family-owned-and-managed nature of most of the medium-sized construction firms is another impediment to young aspiring civil engineering graduates. While there are limited technical courses for mechanics, welders and operators, there is no classroom or on-the-job training for other semi-skilled workers such as masons, carpenters, and electricians. Figures indicate that the supply of skilled and semi-skilled workers will barely keep up with the requirements of even a low-growth scenario. Under a medium-growth scenario, the supply will fall short by about 18-28%, while under a high-growth scenario, the gap will widen considerably from 55 to 64% over the next eight years. To meet this demand, the number of civil engineering graduates and diploma holders would have to go up by at least a factor of 3. The industry will have to take immediate steps to make the profession more attractive and enhance the starting emoluments to attract fresh graduates. As will be highlighted later in the report, there is also a scarcity of teachers catering to the needs of this industry.
22. As to key construction equipment, to satisfy the average demand over the next eight years under a medium-growth scenario, the supply needs to increase by about 60%. Under a high-growth scenario, the supply would need to increase by a factor of 3 to meet the demand. This will require significant enhancement of production capacities of the equipment manufacturers and streamlining of import procedures. Other measures could be to foster the equipment rental market, equipment bank and leasing concepts, to establish an efficient supply-chain for industry spare parts, and to offer operator/technician training.
23. As for key construction materials, while cement and steel requirements are not an issue, there could be a shortages in the availability of bitumen and stone aggregates. Both would have to increase by a factor of 2 or 3 under the medium and high-growth scenarios. Stone extraction and aggregate production face constraints in the form of stringent quarrying/mining regulations and capacity constraints of the crushing plants. These issues need to be addressed to ensure the availability of these materials.

## **D. Key Recommendations and Suggested Actions**

### **D.I Immediate and Short-term Actions (0 to 2 years):**

24. Strengthen sector policy, institutional structure and regulation: The Government should strengthen pre-investment planning, enhance project readiness, and improve the investment climate by initiating and implementing actions to:
  - (a) formulate a policy to establish a road user board which will act as a quasi-regulator and advisor for the sector to the governments at central and state levels;
  - (b) enable road sector agencies to undertake a master planning exercise to plan and prioritize investments for at least a three-year horizon;
  - (c) ensure that the schedule of rates are updated every year to reflect realistically the market conditions;
  - (d) develop a framework to opt for green-field projects on new alignments wherever economically and technically feasible, and encourage bypasses and expressways;
  - (e) ensure that at least 50% of encumbrance-free land is handed over to the contractor and/or concessionaire when signing the agreement, in minimum 10 km continuous stretches; the remaining land being handed over within a timeframe specified in the agreement;

- (f) prepare a comprehensive training policy and strategy for the sector which should also cover training to vigilance, audit and accounting staff to help them appreciate modern contractual practices;
  - (g) create an enabling environment for the formation of trade associations;
  - (h) enact the Unorganized Workers Bill;
  - (i) enact the pending LA (amendment) and the Rehabilitation and Resettlement (R&R) Bills;
  - (j) mandate social security schemes for construction workers across the country; and
  - (k) expedite implementation of the Construction and Other Building Workers Act (1996) by all states.
25. Promote Indian road sector and knowledge sharing: Primary road sector agencies like the Ministry of Shipping, Road Transport and Highways (MoSRTTH) and the Indian Roads Congress and industry associations like the Construction Industry Development Council (CIDC) should consider actively promoting Indian market opportunities and the Government's investment plans through annual road shows and conferences abroad to attract foreign road contractors. This will also provide a forum for the Indian government to take note of prevailing concerns of the international community, and help in attracting persons of Indian origin working overseas to return home ("reverse brain drain"). Similarly, more knowledge sharing and technology transfer training sessions on best practices in construction, institutional structure, e-procurement, governance and transparency and road safety among road agencies in the country could be encouraged to increase awareness and attract other players to the industry.
26. Strengthen contract enforcement and dispute resolution: The Government could signal its intent to strengthen the dispute resolution mechanism by making the decisions of the hierarchical process binding on each party until reversed or changed at the next higher level in the process. In addition, it should seriously deliberate on the establishment of a Road Appellate Tribunal at both the central and state levels for arbitration of disputes unresolved by the dispute resolution boards. To minimize payment related disputes, insertion of '*prompt payment*' contract clauses may be an option, especially in states that have a history of poor payments or those that are in poor financial condition.
27. Strengthen incentives for on-time completion and use of alternative contract structures: To reduce the risk of delays during contract execution, the Government should encourage the inclusion in contracts of bonus or early completion clauses as an incentive to contractors and consultants to complete works on time. As disincentives for delays, penalties should be enforced strictly on works contracts; accountability clauses should also be introduced for consultants. The Government may also wish to formulate a policy to enable road agencies to transition to alternative contracting methods such as Design-Build-Maintain, Design-Build and Long-Term Performance-based Contracts. By paying against results, these contract structures allow many lower-level management controls to be transferred from the road administration to the contractor, and offer contractors built-in rewards for timely completion.
28. Streamline pre-construction clearances and customs: To facilitate the process of land acquisition and environmental, forest and other clearances, the Government could establish specialized pre-construction units within each implementing agency, along with high-powered coordination committees at both central and state levels. A single-window mechanism should be established for obtaining duty exemptions. Processes for award of visa, visa extensions and other travel documentation for international staff working on road sector projects should be streamlined. In addition, restrictions on re-export/re-sale of imported equipment should be eased to reduce contractors' working capital requirements.
29. Improve transparency and increase competition in the bidding process: Institutionalizing the use of e-procurement methods should improve transparency, increase competition, attract other sector

players and minimize collusion and cartel formation, provided an independent assessment is done to establish its readiness in a state / agency.<sup>5</sup> Industry associations such as CIDC could establish and maintain a web-based contractor database to enable the procuring agencies (for a user fee) to confirm and verify the qualifications and performance of the contractors and consultants. To prevent misrepresentation of contractor/consultant qualifications, certification of their qualifications by the respective industry associations like CIDC or the Consultancy Development Council could be a supporting measure. Entry barriers for foreign firms in the road sector could be eased, if the agencies wish to, through: (i) allowing the experience of the parent firms to be used (in the case of new Indian subsidiaries of foreign firms) for evaluating them; (ii) withdrawing requirement of 51% stake of the lead partner throughout the concession period; and (iii) requiring registration of JV arrangements with the undertaking of partners to honor their commitments. Similarly, qualifying criteria requirements for domestic players from other sectors could be eased to ensure that contractors with similar experience and capability in managing and financing contracts of similar size are gradually able to enter the road sector.

30. Review the effectiveness of subsidies, fiscal concessions and taxation: The Government should consider:
  - (a) abolishing the Works Contracts Tax in states where it is still applied.
  - (b) extending Section 44BBB benefits to road sector projects to give foreign contractors an incentive to enter India.
  - (c) providing duty exemptions to all contractors working on contracts above a certain threshold value.
  - (d) reducing/rationalizing customs duty on importing of capital goods and machinery used in road construction from the current level of 37%.
  - (e) providing deemed export benefits for large road and expressway projects on the lines of Mega Power policy or by allowing higher depreciation rates on equipment.
  - (f) extending Central Value Added Tax benefits to certain construction equipment like crushing plants.
31. Enhance the capacity of human resources: The following should be considered immediately -
  - (a) Construction industry associations should professionalize management within construction firms by introducing registration/rating/grading and performance management for employees (such as ISO 9001) and incentive schemes like employee stock options (ESOPs) to retain people in the sector.
  - (b) Public road agencies, like private firms, should introduce merit-based rewards and promotions and other incentive schemes to enhance their attractiveness.
  - (c) Government and industry should conduct active marketing campaigns and provide opportunities for final year civil engineering students to work as interns on live road projects, to attract more fresh talent into the sector.
  - (d) The Government should formulate a policy to establish more training institutions and centers of excellence to train both unskilled and skilled workers, engineers and managers in the industry.
  - (e) The Government should expand vocational and technical education systems to the rural areas and set up centers of excellence for specific trades.
  - (f) State-of-the-art training taken by key personnel should be given due importance in bid evaluation.
  - (g) The Government should also create appropriate incentives for periodic training of its own employees through its performance evaluation process.
32. Ensure availability of supply of equipment and spares: The equipment manufacturing industry should be encouraged to set up (or strengthen) a dedicated industry body to foster the development of a good equipment rental and leasing market, which will benefit small and medium road contractors.

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<sup>5</sup> In this regard, the example of Andhra Pradesh, which has fully adopted e-procurement, is worthy of emulation by other states.

33. Use of value engineering techniques: Value engineering should be introduced on national and state highway projects (at least on a pilot basis) to ensure sound design, ground truthing of surveys and cost optimization. In addition, a peer review of the detailed project reports and a road safety audit at concept and design stage should be made a pre-requisite on all contract sizes larger than Rs 500 million (about \$10 million).

**D.II Medium-Term Actions (2 – 5 years)**

34. Strengthen sector policy, institutional structure and regulation: The Government should consider-
- (a) establishing a quasi-regulator cum advisor for the sector, including road user representatives;
  - (b) reviewing options, through engaging specialist services, to restructure government road agencies to enable them to perform their core functions of policy making, planning and overall sector management better, and spin off the remaining functions into autonomous construction and design outfits;
  - (c) implementing the framework for green-field projects.
  - (d) passing a Construction Law governing all aspects of construction;
  - (e) implementing the training policy for the sector and other allied functions;
  - (f) building a core cadre of officers within the National Highway Authority of India;
  - (g) formulating a better research and development policy for the sector to bring the country's construction specifications on a par with international standards for survey, design and construction of roads; and
  - (h) implementing a policy framework on e-procurement and contractor databases.
35. Facilitate access to finance/credit: The industry associations should take the initiative to upgrade the industry standards of accounting and make all transactions more transparent. Registration of contractors above a certain threshold and ratings for small contractors should be made mandatory. GOI and financial institutions should also take steps such as developing secondary corporate bond markets and introducing new instruments to facilitate long-term finance for project developers and concessionaires.
36. Ensure availability of key materials: GOI should map key input material sources and disseminate them on the Web, along with conditions and procedures for obtaining licenses for mining and quarrying. It should also review the Bureau of Indian Standards certification requirement for importing cement to ease imports.
37. Enhance the quality of human resources: Some actions in this regard which can be taken by government and the industry are:
- (a) Decide on a policy to replicate more training centers such as the National Academy of Construction (Hyderabad) and National Institute of Construction Management and Research.
  - (b) Provide specialized, certified freshman training for graduates joining the road sector.
  - (c) Provide on-the-job training at construction sites with best practices (such as the Delhi Metro) to encourage students to take up the challenges of mega-construction projects.
  - (d) Introduce new courses at engineering schools to strengthen the project and contract management aspects, public/private partnerships (PPP) and other basic aspects of project/non-recourse financing.
  - (e) Introduce gradually a system of periodic accreditation/certification as a basis of continual assessment of skills, as is the international practice. Give some additional weight/incentive for consultants and contractors to position certified/accredited persons for key positions of the project.
38. Adjust provisions of standard works contracts to focus more on timely achievement of results: Some key actions that the Government and the industry can take to improve the business climate and profitability for the industry are to:

- (a) inculcate self-regulation in the industry through industry associations;
- (b) increase delegation of powers to project-level officers to be able to take decisions required by the contract and comply with dispute resolution board awards;
- (c) introduce price escalation clauses in all contracts of more than three months, linking price increases to more realistic cost indices; and
- (d) strengthen supply chain by development of specialist regional sub-contractors, equipment banks etc.

### **D.III Long-Term Actions (5 – 10 years)**

39. In the long term, the Government should continue to widen the ambit of reform in the road sector and implement policies launched in the short and medium terms, by implementing wherever feasible, appropriate actions (as recommended by the specialist services) for the unbundling of state road agencies, promoting the sector overseas, and setting up more specialized training centers.

## **E. Suggestion for Taking Forward the Recommendations of This Study**

40. The Planning Commission/Department of Economic Affairs could set up a steering committee/working group/task force to assess the recommendations of this study and other similar studies, workshops and conferences, and secure high-level stakeholder commitment and ownership of the action plan. The task force's terms of reference would be to look into the detailed recommendation matrix in Chapter 7 and undertake actions which could result in quick wins in the short term and subsequently tackle the difficult ones over the medium to long term. The time duration for this review could be about two months. After the finalization of the action plan a series of virtual workshops could be conducted using the Bank's Global Development Learning Network with access to the National Informatics Centre Network in the capitals of states known for innovation, such as Andhra Pradesh, Gujarat, Karnataka and Uttar Pradesh.

## **F. Possible Areas For World Bank's Future Assistance**

41. The Bank could assist and advise the Government and the industry and work with them in taking forward the findings of the study through the following possible interventions:
- (a) Incorporating some of the recommendations in the design of future Bank-funded projects – long-term contracts, creating autonomous road corporations, independent road boards, supporting PPP, etc.
  - (b) Continuing to pursue some of the study recommendations and reform initiatives through the proposed study / note on 'investment climate in the construction industry' requested by Ministry of Commerce and Industries, Government of India
  - (c) Helping the central and state governments in improving governance through advising and helping in such areas as the implementation of e-governance/procurement, disclosures to comply with the Right to Information Act, and setting up vendor databases on qualifications and performance.
  - (d) Facilitating international knowledge transfer and help --especially in key institutional areas like management and financing of road network assets-- through overseas knowledge sharing trips.
  - (e) Assisting, if required, in piloting the transition from fully government road departments like public works departments to autonomous organizations, by creating public sector undertakings which can compete in the domestic market --an experience which has been successfully tried out in countries such as China and the UK.
  - (f) Training and sharing experience in state-of-the-art and best practices in the field of engineering and research --key areas could be new materials, survey techniques like aerial photogrammetry, new geodetic systems, latest construction techniques, value engineering methods, and road safety audits.
  - (g) Assisting, through technical and advisory services, to study some of the recommendations in greater depth and in implementing the suggested actions --in areas such as human resources development, equipment pooling and management and management of scarce natural aggregates.



## 2. Introduction

### 2.1 Context

1. Against the backdrop of India's burgeoning macro-economic prospects, the weaknesses of the road construction industry create monumental challenges that it will have to overcome, if it is to deliver the desired road development program. This chapter explains why the study was undertaken, its objective and methodology.

### 2.2 Macro Economic Perspective

2. There has been consistent growth in the Indian economy in the recent past. Until the mid-eighties it was growing at about 3% per year. Later, due to liberalized policies adopted by the GOI and partial demolition of the License Regime (also called License Raj), the economy started looking up and averaged a growth rate of 5.5% at the beginning of the 21<sup>st</sup> century. The Indian economy stood at about US\$510 billion in 2002. In the past four years, the GDP growth has hovered around 7-8% and in 2006 GDP reached about \$950 billion. It is expected that during the 11<sup>th</sup> Plan period (2007-2012) the growth rate may be about 9% p.a. It is well recognized that without investments in energy, water, urban and transport infrastructure it will not be possible to support the present rate of economic growth. Passenger mobility and goods movements are expected to continue growing at least as fast as the economy as a whole. Focus is therefore shifting towards infrastructure development, including investments in transport with a view to providing faster and safer transport services. The investments needed in the various infrastructure sectors have been estimated by working groups set up by the Planning Commission for the 11th Five-Year Plan and other sources like vision plans and sector demand notes, as well as rating and research agencies. These estimates are brought together in Table 2.1:

**Table 2.1: Range of Investments Required in the Infrastructure Sectors**

Sector	Investment Required (Rs. Billion)	US\$ (billions)	Works as Share of Total Cost (%)**
Roads (excludes PMGSY <sup>6</sup> /Rural Roads)	2,200-2,450	50-55*	95-100
Railways	2,000-3,000	45-68	40
Ports	500-850	11-20	60
Airports	400-500	9-11	50
Total investments in transport sector	5,100-6,800	116-155	
Investment needs in power and other infrastructure sectors	8,400-1,1000	191-250	40-60
<b>Total investment required</b>	<b>13,500-17,800</b>	<b>307-405</b>	

\* Inclusion of the PMGSY, other rural road programs and maintenance needs may raise this to about \$75-90 billion.

\*\* 'Total cost' means cost of delivery of infrastructure on site, excluding government agency cost, tendering and design costs.

3. According to recent news items and other sources, to accelerate GDP growth from 7% per year (as in the 10<sup>th</sup> Plan) to 9% per year (in the 11<sup>th</sup> Plan), total investment will need to be raised by six percentage points of GDP. About half of this will need to be in infrastructure: road, rail, air and water transport, power generation, transmission and distribution, telecommunications, water supply, irrigation and storage. Investment in such infrastructure will need to increase from 4.6% of GDP to around 8% in the 11th Plan period, totaling as much as \$500 billion over the five years. Within this total, roads will need \$75-90 billion, almost all in civil works. The success of the road investments will depend very much on the capacity of the construction industry.

<sup>6</sup> Pradhan Mantri Gram Sadak Yojana, the Prime Minister's Rural Roads Program

## 2.3 Demand for Roads is Outstripping the Supply

4. Freight traffic (in ton-km) on India's roads is growing at 13% per year, faster than on the railways (9%)<sup>7</sup>. Roads now carry about 80-85% of India's passenger traffic and 65-70% of freight. Passenger traffic is not growing quite as fast, so road traffic as a whole is growing at 7-10% per year. Such rapid traffic growth has far outstripped the capacity increase of the main road network, resulting in about 25-30% of national and state highways being heavily congested, with truck speeds hovering about 25-40 km/h. It is estimated that the average daily distance covered by a truck in India is about 300 km, far less than the world average of 600-700 km. This under-utilization of the freight traffic potential on the Indian roads is partly due to poor roads and unsafe conditions. Other reasons include: (i) the mixing on the same roads of high-speed modern vehicles and slow-moving, low-powered farm vehicles as well as animal-hauled carts and pedestrians; (ii) poor maintenance and overloading of vehicles by the owners; (iii) physical barriers at state and city boundaries for checking and security purposes; and (iv) delays at the terminal points. It will become difficult to sustain the present rate of economic growth unless immediate action is taken to provide a good quality road network throughout the country. There is an urgent need to construct more roads, increase the carrying capacity of the existing road network, and improve the quality of the riding surface. This would mean integrated development of road networks including National and State Highways, Major District Roads and Other District Roads. In addition, the Rural Roads also have to be constructed as a priority. This would take care of total transportation from the sources of production to the marketing points or the export points like the ports.

## 2.4 Government's Initiatives and Roads Development Program

5. The GOI is aware of the urgent need to develop the infrastructure in all sectors, including transport. Investments on roads as a percentage of total public sector investments declined in successive Plan periods from 7.5% during the Second Plan (1956-61) to about 3% during the Seventh (1985-90). During the Eighth Five-Year Plan (1991-96) again 3% of the Plan total was spent on roads (Rs. 161 billion), while under the Ninth Plan (1997-2002) expenditures on roads picked up to Rs.393 billion (4.6% of the Plan total).
6. The Tenth Five-Year plan (2002-07) stressed the need for improving mobility and easy accessibility; it envisaged balanced development of the total road network in the country. This included phased removal

of deficiencies in the existing network, widening and strengthening, improvement, rehabilitation and reconstruction of weak or dilapidated bridges, adequate maintenance of the roads, and road safety measures. It also laid stress on improving the riding quality of the existing national highways and for providing wayside amenities to road users. The national highways make up only 2% of the network's length but carry 40% of its traffic. The Bank-

	000 km	% of total
Expressways	0.2	0.1
National highways	66.6	2
State highways	131.9	4
Major district roads	467.8	14
Rural roads	2,650.0	80
Total	3,317.0	100

supported first and second national highway development projects (NHDP) were launched. The PMGSY program for rural roads was also taken up. It has recently been expanded to achieve the Bharat Nirman target of connecting communities of more than a thousand people (500+ for hilly and tribal areas) with all-weather roads by 2009-10. In all, the 10th Five-Year Plan provided Rs.595 billion for the road sector, 3.9% of the total Plan expenditure. In 2007, roads account for a significant 12% of total government capital expenditure.

<sup>7</sup> As per Indian Road Transport Federation and Indian Railways statistics

7. The Approach paper to the 11th Plan suggests a total investment of Rs.14,500 billion on infrastructure, of which Rs.2,200 billion (nearly \$50 billion) are for roads alone (about 1-1.2% of GDP). The 11th Plan is yet to be published; exact figures relating to the planned expenditure during 2007-2012 are not known. Working groups on various sectors have already given their recommendations. The sub-group on state roads has suggested an outlay of Rs.1 trillion.

## **2.5 The Current Industry Framework and Challenges Ahead**

8. There is a huge gap between demand and supply for improved roads. The domestic construction industry is not geared up to meet the future demand. There is a need to bring new players into the field, both domestic as well as foreign. During the five-year period 2000-2005, of the Rs.937 billion allocated for roads (all categories) only Rs.814 billion was spent, leaving 13% of the budget unspent. Large time over-runs and cost over-runs are endemic in both national highway and state road projects. This is a major drag on efficiency. Projects are getting larger. The technology is changing fast. New projects require complex design and execution capabilities. There is, therefore, an urgent need to address these issues.
9. The overall Indian construction industry, of which the road construction industry is a subset, is highly unorganized. There is no national record of the number of contractors, their background or capabilities. The present capability of delivery of India's construction industry is estimated at Rs. 3,100<sup>8</sup> billion (\$70 billion) per year. This works out to 12% of GDP. It is estimated that approximately 250,000 contractors provide employment to about 31 million persons<sup>9</sup> (about 10% of the total work force) directly or indirectly. There is an urgent need to build the capabilities of the contractors and workers. There has been a perceptible capacity building and growth of medium and small contractors in the past few years. The trend for large contractors, however, has remained somewhat unpredictable. Of the above numbers, it is reported that only about 25,000-30,000 firms form part of the formal sector, of which about 800-1,000 firms can be called medium to large in employment terms, i.e. they employ more than 200 persons.
10. The construction companies in India are building up gradually. A decade ago only 22 companies were qualified to work on medium-sized road construction projects. The number has gone up since then. On national highway projects and big state highway projects under way, about 60 contractors, Indian and foreign, are working. Many form joint ventures (JVs) and consortia among themselves to take up all medium to large contracts in the country, with insufficient capacity to handle them. This is clearly visible from the delays and cost over-runs in projects. Poor quality is also witnessed in some cases.
11. Though the relevant legal framework in the country is reasonably sound, there is a long felt need to streamline the system in order to more expeditiously respond to the ever increasing demands on the judiciary. The construction industry operates under a large number of civil laws and this needs simplification. In several foreign countries (for example Singapore and China) there is a single construction law governing the industry. There is already a move to bring in a construction law in India also. Dispute resolution mechanisms need to be strengthened, as the intermediate mechanisms (like dispute resolution boards or adjudicators) are virtually ineffective and almost all disputes are referred to the courts, with resolution taking three to five years.
12. The present contract procedures and requirements need major modifications, as they do not encourage incorporation of technological, labor and other major innovations. It is estimated that the total cost of

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<sup>8</sup> Report of the Working Group on Construction for the 11<sup>th</sup> Five Year Plan (2007-12)

<sup>9</sup> "Construction Sector Suggestions for Faster Implementation of Infrastructure (2007-12)" – Construction Federation of India

designs, procurement, monitoring and supervision comes to about 20% of the cost of the asset created (government agency and non-government costs). Also, there are loopholes in the evaluation criteria. There are quite a few issues related to contract management, working environment and the construction industry itself.

13. Any investment in construction leads to a spurt in the activities of ancillary industries. Construction activities contribute to almost one third of the projected GDP growth. As construction activity increases, it stimulates increased output from the manufacturing sector and a very substantial increase in employment. It has been reported<sup>10</sup> that every rupee invested in construction causes a corresponding increase of about Rs0.80 in the GDP as against Rs 0.20 and Rs 0.14 in the fields of agriculture and manufacturing.
14. Contractors, reportedly, make a much smaller profit than those in real estate, hydropower or industrial sectors. The profit margins need to be pushed up to attract more contractors to the road sector.

## 2.6 Driver and Objectives of the Study

15. The road construction industry is a major player in the process of India's infrastructure development and yet it is fraught with problems, as outlined above. Even though there has been some increase in the number of contractors in the road sector, there still is an acute shortage of contractors to handle the enormous amount of work required to be done. There is a possibility of some road contractors shifting to other lucrative sectors like real estate development, airports, ports, and oil and gas pipelines. The Government and the Planning Commission need to view the capacity of the road construction industry as a major risk to the achievement of the national developmental and economic agenda. To this end, the Bank has highlighted these issues time and again, and discussed them with the GOI during the periodic portfolio reviews. Later, with the consent of GOI, this study has been undertaken by the Bank to look into what could be done to improve the prevailing situation in the road construction industry. This will, hopefully, help the country and the associated funding and implementing agencies to be aware of the risks and to adopt mitigating measures. The present study, built on the previous studies and reports as well as industry-wide stakeholder surveys, attempts to more comprehensively capture the whole gamut of problems plaguing the construction industry and the capacity constraints faced in the industry. It puts forward recommendations and suggested actions to the central and state governments and to the road construction industry for enhancing its capacity and efficiency.
16. This study also reflects the Bank's growing concern, not only in India but elsewhere in the South Asia and Africa regions, to understand the level of dependence of planned investments in the roads sector on the road construction industry capacity. There is also an urgent need to update the Bank's knowledge on the construction industry issues in India, as the last report produced by Bank titled the "Construction Industry in Development: Issues and Options" dates back to 1999. Further, there is an emerging interest from other countries in the region (e.g. Pakistan) and some other countries in the Middle East and Africa regions to undertake similar studies on construction industry capacity and constraints. The current study would serve as a model.
17. The objective of this study has been to answer the main question "***How to have a vibrant and strong road construction industry to meet India's needs in the near to medium-term future?***" Its main focus is on delivery of works contracts, i.e. contractors, manpower, materials, equipment and any other important related factors. The study's ultimate goal has been to examine and recommend

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<sup>10</sup> "Challenges before Construction Industry in India" – Laskar and Murty, IIT Kanpur.

measures through which GOI and various stake holders could strengthen the road construction industry to meet the future demands by garnering more resources in terms of contractors, manpower, equipment, materials, and finance, while improving the business environment. Barriers to entry have also been investigated and recommendations made to ease them, to encourage enhanced entry of contractors from outside the country and from other sectors. Ways have also been explored to enhance the efficiency of service delivery by adopting more efficient contracting practices.

## 2.7 Study Methodology

18. It was decided to achieve the above objectives in a phased manner through this study and possible follow-on studies. This study was split into two stages.
19. In the first stage, based on the investment needs and projections of the Government under three different scenarios, the consequent demand on the key factors was determined. Operational aspects, resource gaps and investment climate issues have then been identified. The analyses were based mainly on data collected through questionnaires, interviews and focused discussions with some of the key agencies involved in the road sector development i.e. the Ministry of Shipping, Road Transport and Highways (MoSRTTH), National Highway Authority of India (NHAI), some of the state public works departments (PWDs) or equivalent road agencies, rural road agencies at the center and state levels, contractors, consultants, equipment manufacturers, material suppliers, and industry associations. Through such data collection and analyses, an assessment has been made of the increases in demand on the road construction industry, critical issues and constraints affecting the investment climate in this sector, and capacity enhancement of the industry to meet the increased demand.
20. In the second stage, data were gathered on the actual experience and perceptions of international contractors, consultants and industry associations by engaging two international specialists --one providing inputs from the European market (France, Italy and UK) and the other from comparator countries in South East Asia and the Far East (China and Malaysia). Overall, the primary surveys covered 145 road construction industry entities, representing the entire gamut of industry segments as presented in the table below.

**Table 2.3: Categories and Numbers of Stakeholders from whom Data Collected**

S. No.	Department/Company	Sample size		Total
		Indian	Foreign	
A.	Government	18	5	23
B.	Contractors	30	15	45
C.	Consultants	6	13	19
D.	Equipment manufacturer/supplier	11	8	19
E.	Material Suppliers	6		6
F.	Industry Associations	5	13	18
G.	BOT Concessionaires	4	1	5
H.	Financial Institutions	7		7
	<b>Total</b>	<b>87</b>	<b>55</b>	<b>142</b>

21. To further strengthen the understanding of these complex issues, case studies were undertaken in two comparator countries (China and Malaysia) and one developed country (France) to assess how the country and the industry overcame various challenges in a period of rapid growth and transition. The international case studies are presented in Chapter 6 and form a basis for study recommendations.

22. A stakeholder workshop was conducted on the June 13, 2007. Senior officials of the GOI, state governments, contractors, industry associations, consultants, equipment manufacturers and material suppliers took part in this workshop and expressed their views.
23. The participants suggested broad actions and recommendations synthesizing the analyses of the primary and the secondary data, with due importance to the views of GOI representatives and other industry stakeholders. The recommendations were categorized into procurement, contract administration and management, tax simplification, financing and equipment leasing and other business environment aspects. The international consultants presented the three country case studies (China, Malaysia and France) and, from their experience in policy formulation for the industry, offered advice on the institutional and corporate culture aspects of doing business in India and the comparator countries. The above process also helped in highlighting the key areas for further in-depth investigation.
24. The Bank could, if required, further help in facilitating knowledge sharing trips to countries where some of the recommendations of this study have been implemented successfully. GOI could then, based on the recommendations and the shared experience, finally decide to implement the critical actions which it feels merit priority.

### 3. Past Performance of Road Construction Industry

#### 3.1 Context

1. This chapter reviews the investment trends and the gap between the budget allocations and actual expenditures in the road sector over the past five years; assesses the construction industry's response in meeting the past demands; and analyses the supply constraints faced by the industry. This analysis provides the necessary basis for: (a) identifying the key operational issues/constraints inhibiting construction industry capacity at present and likely to continue in the foreseeable future; and (b) demand forecasts over the medium term. Some efforts made by the Government and the industry associations are also highlighted.

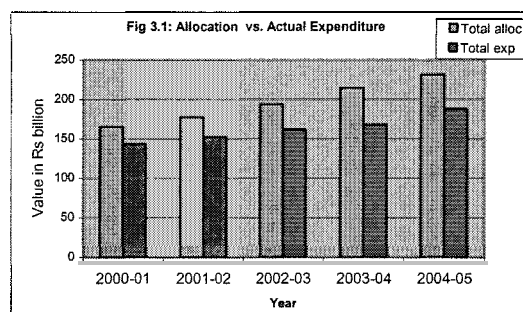
#### 3.2 Analysis of the Past Demand

##### 3.2.1 Comparison of budget allocations and actual expenditure in the past

2. Budget allocation and expenditure data were collected for the period FY01-05 for all categories of roads (i.e. national highways, state roads and rural roads). The annual budget allocation and expenditure trend during this period was established for national highways (executed under NHAI, MoSRTTH and the Border Roads Organization), state highways (executed under state governments, data collected from the Planning Commission) and rural roads (executed under PMGSY, the National Bank of Agriculture and Rural Development, and states' own programs). The allocation/expenditure gap analysis shows that spending always fell short of allocations for all categories of roads during FY01-05. At an aggregate level (national highways, state highways and rural roads combined) the gap between annual allocations (revised estimates) and actual expenditures steadily widened from 9% to 18% over FY01-04 but then slightly reduced to 15% in FY05. In FY05, the allocation versus expenditure gap was lowest for rural roads (about 5.8%) and highest for national highways (about 24.4%), with the state roads falling in the middle (about 12.1%). This indeed represents a worrying trend, as the Indian government's strategy is to increase investments in national and state highways massively over the medium term.
3. Table 3.1 and Figure 3.1 below show that during the period 2000-2005 the actual expenditures on every category of roads fell significantly short of the budget allocations.

**Table 3.1: Allocation vs. Actual Expenditure data (Rs. billion)**

Year	2000-01	2001-02	2002-03	2003-04	2004-05
NH (alloc)	48.1	49.6	58.1	61.8	69.7
NH (spent)	41.8	48.4	51.5	51.8	52.7
SR (alloc)	77.0	86.2	92.8	109.9	111.3
SR (spent)	70.5	73.0	79.4	84.5	97.8
RR (alloc)	32.3	33.4	33.5	32.5	39.6
RR (spent)	31.5	30.7	30.9	31.5	37.3
<b>Total alloc'n</b>	<b>158</b>	<b>169</b>	<b>185</b>	<b>204</b>	<b>221</b>
<b>Total spent</b>	<b>144</b>	<b>152</b>	<b>162</b>	<b>168</b>	<b>188</b>
<b>% difference</b>	<b>-9</b>	<b>-10</b>	<b>-12</b>	<b>-18</b>	<b>-15</b>



#### 3.3 Industry's response to meet the past demand

4. The construction industry's response to the demand over the past five years (FY 01-05) was analyzed in the following areas –
- Monetary output / turnover
  - Distribution of contract sizes
  - Time and cost overruns
  - Capacity and resource base of the contractors; and
  - Constraints faced by the industry in implementing the planned program.

### 3.3.1 Industry Output / Turnover

5. From the analysis of samples of road contractors, it was noted that turnovers of contractors of all sizes, namely large (capable of implementing contracts more than Rs.1,250 million, i.e. \$28 million), medium (capable of implementing contracts in the range of Rs.400 to 1,250 million), small (capable of implementing contracts in the range of Rs.50 to 400 million) and very small (implementing contracts less than Rs.50 million) grew during the FY01-05. As evident from the attached Table 3.2 below, the average annual turnover growth was better for very small contractors (about 43%) and medium-sized contractors (about 24%). Turnover of the small contractors grew at about 21% but large domestic contractors at about 4% only. The small and very small contractors grew rapidly riding on the fast-expanding PMGSY program, long-term performance-based contracts in certain states and rapidly expanding sub-contracting practices. The slow growth of the turnover of the large domestic contractors represents a worrying trend and this must be reversed if the construction industry is to meet the major scaling up of demands in the medium term. The analysis shows that the contractors' response to the increased demand over FY01-05 has been unsatisfactory, as evident in huge performance lapses in time and cost over-runs.

**Table 3.2: Annual Average Turnover in Rs. million**

Contractor Sizes	Year					CAGR (%)
	2000-01	2001-02	2002-03	2003-04	2004-05	
Large domestic	1,650	1,500	1,490	2,010	1,910	4
Medium domestic	520	650	1,000	1,210	1,205	24
Small domestic	230	310	400	490	485	21
Very small	90	120	190	280	370	43

*CAGR= Compound annual growth rate*

### 3.3.2 Utilization of input resources by the industry

6. Employment of human resources and equipment owned or leased were also analyzed over the five years FY 01-05 for a sample of contractors, stratified by size, as presented below.

**Table 3.3: Average Numbers of Skilled Persons and Key Equipment**

Resources	2000-01	2001-02	2002-03	2003-04	2004-05	CAGR(%)
<b>Skilled Human Resources Employed</b>						
Large Domestic Contractors	331	406	488	553	783	23
Medium Domestic Contractors	146	186	260	330	590	40
Small Domestic Contractors	80	92	112	126	185	22
Very Small Domestic Contractors	55	61	73	76	105	16
<b>Equipment Deployed (units)</b>						
Large Domestic Contractors	443	545	649	731	1,058	23
Medium Domestic Contractors	36	41	60	67	74	21
Small Domestic Contractors	38	39	44	62	120	32
Very Small Domestic Contractors	43	52	59	67	72	14

*CAGR= Compound annual growth rate*



7. The growth in employment of human resources was conspicuous across all segments of the industry and the average compound annual growth rate was about 20%. In deployment of skilled human resources (managers, engineers and other technical support staff), the medium-size contractors registered the fastest growth rate (40%), followed by large domestic contractors (23%), small contractors (22%) and very small contractors (16%). The growth in deployment of equipment (pavers, graders, crushers, hot-mix and batching plants, and tandem rollers) was also considerable across all segments of the road construction industry. The small contractors registered the fastest (32%) annual average growth, followed by large domestic contractors (23%), medium contractors (21%) and very small contractors (14%). It was encouraging to note that human resources and equipment deployment have increased in the industry to respond to the spurt in demand. However, even considering the lead and lag effect of the resources mobilized vis-a-vis the turnover achieved (typically, about a year, for construction sector), it is evident that the growth in turnover/financial output was not commensurate with the increased deployment of input resources, especially for the large contractors. The contractors do not seem to have derived any benefit due to economies in scale and fell significantly short of effective utilization of the input resources. This can be attributed to a combination of factors including (a) poor construction planning by the contractor and (b) implementation delays in the contract due to working environment related issues and contract administration issues often beyond the control of the contractor. It is evident from actual experience, by the frequent changing and substitution of staff by both the contractors and the consultants at site and after award of contracts, that there is an acute scarcity of skilled and semi-skilled quality manpower which needs to be urgently bridged.

### **3.3.3 Contract Size and Framework**

8. For the purpose of this study, the contracts have been categorized in four categories: (a) Large (> Rs.1250 million), (b) Medium (Rs.400 -1250 million), (c) Small (Rs.50 to 400 million) and (d) Very Small (<Rs.50 million). Analysis of the primary data collected from national highways, rural roads and several state highway projects indicate that during FY 01-05, the national highway works were predominantly executed through only large and medium contracts, rural road works were executed through small and very small contracts, and state highway projects were executed through a mix of medium, small and very small contracts. Over the FY 2001-05 period, an annual average expenditure of about Rs.50 billion funded about 75 large and 64 medium-sized contracts annually in the national highway sector; for state highways Rs.72 billion were spent annually through implementation of about 30 medium and 500 small contracts; and the rural road program was implemented through about 4,000 small and very small contracts annually.
9. The majority of the contracts were traditional cash contracts except a small percentage (for NHAI and states like Gujarat, Punjab and Rajasthan) which were procured through Build, Operate, Transfer (BOT) – toll and BOT-annuity modes. All large and medium-size contracts in the national highways and the medium-sized contracts (majority of those were internationally funded) in the state highway sector were procured through international competitive bidding (ICB) with pre-qualification, while the small contracts in the state highway sector were generally procured through national competitive bidding (NCB) with post-qualification. Most of the small contracts in the states' own funded programs were procured through a two-envelope system. The small and very small contracts in the rural roads program were procured through either NCB or through local competitive bidding (limited within the states) usually following a two-envelope system.
10. For the large and medium contracts procured through international competitive bidding, the contracts were based on FIDIC, and supervised by Independent Engineers. The small contracts procured through national competitive bidding were largely based on the respective road administration's own contract document format, with the exception of those funded by international development organizations, which followed standard bidding documents largely based on FIDIC. These contracts were supervised mostly by the road administration staff themselves.

### 3.3.4 Time and Cost Overruns

11. A time and cost overrun analysis was carried out for 37 on-going and 10 recently completed national highway contracts and 17 on-going and 18 completed state highway contracts. The summary results of the analyses, presented in Table 3.4 below, show that for the completed contracts (national and state highways put together) about 29% of contracts were completed with about 25% time extension, whereas the time overrun for a further 15% of contracts was up to 50% and a whopping 56% were completed with time extensions of more than 50% of the original contract period. The scenario on time overruns gets even worse if all completed and on-going works are considered together, as only 10% of the contracts are likely to get completed within a 25% time extension and a very high 80% of contracts are likely to be completed with over 50% time delay. The time delays are exorbitantly high by international standards. (In the UK even 20% time delays are considered high.) They accrue over the project life due to several factors ranging from pre-construction delays, delays due to decision making and design changes, delayed mobilization by the contractor, poor resource management during implementation, and unreliable sub-contractors. Average delay per contract works out to about 73%, about three times what elsewhere can be considered tolerable under extreme circumstances.

**Table 3.4: Time and Cost Over-run Details**

NHAI + State Govt Contracts	Percentage Overrun [over original estimates of time and costs]	Completed Contracts (%)		All Contracts (%) (completed+ongoing)	
		Time	Cost	Time	Cost
	<25%	29.4	55.8	10.4	53.7
	25-50%	15.0	40.5	9.7	31.6
	50-75%	33.0	3.7	38.0	9.7
	75-100%	15.0	0.0	29.5	5.0
	>100%	7.6	0.0	12.3	0.0

12. About 56% of the completed national and state highway contracts had cost overruns limited to 25% of the initial contract price. An alarmingly large 40% of completed contracts had cost overruns in the range of 25-50%. The cost overrun figures for the completed contracts do not include a large portion of the pending claims and arbitration orders. Considering that about Rs.540 billion is currently locked in arbitration and legal proceedings for all sectors combined and the road sector could contribute about 15-20% of that amount, the cost overrun could easily go up by another 10-15%, if even part of the disputed amount is released by virtue of arbitration/court orders. The cost overruns are largely on account of poor quality of designs, large changes in the scope of work during implementation (often effected to placate local and political demands), price escalation on account of delays, and an ineffective dispute resolution system.
13. It is worth noting that about 80% of projects (completed + on-going) have *time* delays of more than 50% while the same percentage of contracts have *cost* overruns of less than 50%. This can also be interpreted as: (i) time extensions without financial implications are higher because of delays due to contractors' faults – poor planning, resource mobilization etc.; and/or (ii) the contractors are getting squeezed into accepting large time extensions without appropriate compensation by the clients.

### 3.3.5 Participation of Foreign Contractors in the Past

14. The foreign contractors started participating in NHDP contracts (and to a limited extent in state highway works) from FY 2000-01. In FY 2000-01, there were about 20 contracts in the NHDP where foreign contractors participated either alone or in joint venture. The number of contracts with foreign contractors' participation grew to about 32 in 2003-04 but started declining from then to about 11 in FY2005-06. Based on the analysis of a limited sample of foreign road contractors, it was also noted that their annual average turnover from Indian business annually declined by about 15% during FY 01-05. The foreign contractors taking part were from Malaysia, Korea, China, Russia, Turkey,

Indonesia, Iran and some niche contractors for specialized jobs from Europe. It is presently estimated that about a dozen foreign road contractors are operating in India, but many of them are not bidding for new contracts. The fact that only a few foreign contractors had entered the market in India and some of them had already left despite the sharp increase in the demand over this period could largely be attributed to the unattractive business environment and issues such as preference given to domestic contractors during the bidding process.

15. The experience so far on the few contracts executed by foreign contractors is not encouraging. The average time overrun for a sample of NHDP contracts completed by foreign contractors was as high as 60%. A few contracts managed by foreign contractors were even terminated largely on account of contractors' non-performance. In many joint ventures between foreign and local contractors, the foreign party was found to be completely absent during implementation. The foreign contractors' role in those particular joint ventures was to make the local contractors qualify for the award of work. Foreign contractors often faced difficulties with taxation and audit procedures, dealing with subcontractors and suppliers. They also found it difficult to get adjusted to the local working environment and the culture of decision making and delegation, interpretation of their contract, and application of quality control procedures. Moreover, European contractors seem to face further constraints on cost competitiveness compared to the East Asian contractors. Foreign contractors might be interested in taking up BOT schemes where they could control a larger part of project risks, but apparently the large international contracting firms were not ready to get involved in pure construction contracts in India, since the risks are large in number with margins which are not commensurate.

### **3.3.6 Migration of Contractors from Other Sectors to Roads in Past**

16. Many traditional road contractors have diversified into real estate, hydropower and industrial infrastructure, sensing growth opportunities in those sectors, but contractors traditionally engaged in other infrastructure sectors have not ventured into road construction in a big way. While some of the large domestic irrigation and railway contractors ventured into road construction in the early and mid 90s due to similarity in the nature of the works, many of these contractors did not continue their engagement for long. The entry of contractors from other sectors to the roads sector is being inhibited by a variety of factors, among them:
  - (a) low operating profit margins (typically 6-10% ), lower than real estate (about 20-25%) or hydropower (about 15%);
  - (b) management of the sector predominantly by public road administrations with weak contract administration capacity leading to delayed decision making, delayed payments and a large number of inordinately delayed unresolved disputes, unlike some other sectors like industrial infrastructure or real estate managed by more professionally run private institutions or serving the public directly; and
  - (c) more challenging logistics and elaborate contract management arrangements, as the projects are linear in nature.

17. It is estimated that at present the road construction industry represents about 10-15% of the overall construction industry in India. If the significantly scaled up demand is to be met, attracting contractors from other sectors of infrastructure to road construction will be critically important.

### **3.3.7 Facilitation by Government to Strengthen the Road Construction Industry**

18. GOI, some of the state governments and the other construction industry stakeholders have taken quite a few initiatives to facilitate growth and efficiency of the construction industry in recent times. A few initiatives are outlined below:
  - (a) *Private financing*: GOI is encouraging the upgrading of main highway corridors through the public/private partnerships (PPP) approach. This would help to supplement financial resources by tapping into the private sector and funds from the market. It is also hoped that implementation on the ground will improve with full utilization of the managerial expertise of the private

entrepreneurs. The model concession agreements stipulate performance-based outputs, which would help the government to shift the design risk to the concessionaires. This would be a welcome move, considering that the current experience of the road agency getting the detailed project reports<sup>11</sup> prepared by the design consultants is not encouraging. The PPP approach would also lend itself more to fixed cost/fixed time construction of projects with liquidated damages for delay and bonuses for early completion, setting a good example.

- (b) *100% Foreign Direct Investment (FDI) in infrastructure development*: The biggest policy initiative over the past two years has been the cabinet approval for wholly foreign owned direct investment in the road sector. It is hoped that this initiative will facilitate rapid investments in infrastructure, but the results of the policy will not become apparent for at least three to five years.
  - (c) *Mechanism to implement Dispute Review Board (DRB) decisions*: NHAI has recently set up a high-level committee to review recommendations of the DRBs which are in favor of the contractors. It is understood that they have decided in several cases to implement such recommendations and not proceed with further arbitration. This is a healthy trend and would give a right signal to the contracting industry.
  - (d) *Skill upgrading of construction workers*: The state governments of Madhya Pradesh, Rajasthan, Haryana and Bihar have cooperated with the Construction Industry Development Council (CIDC) to enhance the skills of construction workers. The workers would then be absorbed in various national and state schemes, such as the National Rural Employment Guarantee Scheme.
  - (e) *Training centers for construction workers*: The Government of Andhra Pradesh, with the support of construction contractors, took a laudable initiative of creating a National Academy of Construction (NAC), with the objective of enhancing the skills of construction workers and equipment operators in the state. The Academy also runs short and long courses on construction management. It is a model agency worthy of emulation by other states.
  - (f) *Initiatives by the Construction Industry Development Council* in recent times include:
    - Devising a grading system for construction companies
    - Developing common lending norms to facilitate financing
    - Designing quality assurance systems and several programs for upgrading workers skills
    - Formation of two separate associations by CIDC: the Construction Industry Professional Development Training Association for senior and executive levels and the Construction Industry Vocational Training Association for worker and supervisory levels
    - Setting up a separate body: the Construction Industrial Arbitration Centre in association with Singapore Institute of Arbitration
19. Since the preparation of the first draft which was shared with the government in October-November, 2007, there have been a few more positive initiatives taken by the government and hence the corresponding recommendations made in the first version have been modified or deleted. A few important steps taken are -
- (a) Approval of a national policy for Rehabilitation and Resettlement (R&R) of project affected persons in October 2007. However, the corresponding R&R Bill and amendment to the Land Acquisition Bill (1894) have yet to be enacted by the parliament.
  - (b) Raising the limits of External Commercial Borrowing (ECB) for infrastructure companies from \$100 million to \$500 million effective September 2008. The new norms also allow the companies to pay interest on the ECB up to 4.5% above LIBOR (as against the previous ceiling of 3.5%+LIBOR). However, the capacity of the firms to borrow in outside markets would clearly depend on their rating and the risk perspectives of doing business in India.

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<sup>11</sup> Standard Indian requirement for a detailed design and engineering report, which includes the social and environmental assessments and all data for estimating the project costs

(c) Scrapping the requirements of upper limits to number of bidders for PPP projects and concessions. All bidders who meet the minimum qualifying criteria can bid. However, since they are still to be pre-qualified the fear of cartelization and collusion remain.

20. The above initiatives of the Government and the industry are laudable, but there is a need to speed up their implementation. Moreover, the PPP mode of road project delivery would help as far as re-distribution of risks is concerned, but the actual delivery of the road works will still depend on the capacity of the construction industry in this sector.

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## 4. Key issues for the Road Construction Industry

### 4.1 Context

1. This chapter analyses the key issues and constraints faced by the construction industry in the past and likely to continue in future based on the primary surveys of the stakeholders. The findings form the basis for making recommendations which GOI and the stakeholders could adopt to improve the overall efficiency of the construction sector and satisfactorily meet the projected upsurge in demand.

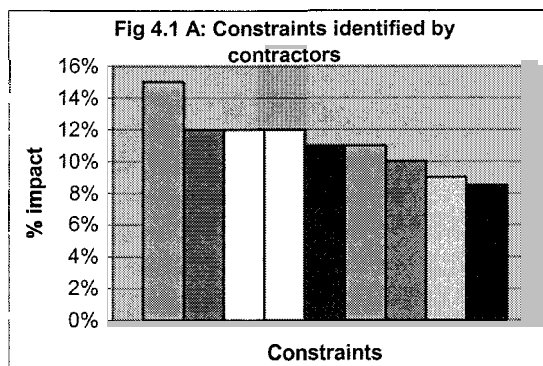
### 4.2 Key Issues identified through the Primary Surveys

#### 4.2.1 Issues identified on input resources and operational aspects

2. Fifteen state road authorities, 24 large, medium and small contractors and six consultants were interviewed to assess their perceptions about the key issues and constraints faced by the construction industry in efficient delivery of the road infrastructure development program in the past and likely to continue in future. Tables 4.1 and 4.2 (Fig 4.1A and B) below present the severity of constraints as seen by the contractors and the road agencies in descending order of impact.

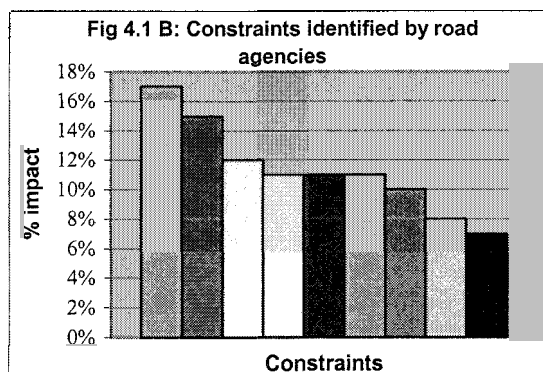
**Table 4.1: Constraints Identified by Contractors**

<i>Constraints identified by the contractors</i>	Severity of impact
<i>Parameters considered</i>	
Delay in handing over of site	15%
Cash flow	12%
Delay in decision by the Employer	12%
Inadequate design and drawings	12%
Inadequacy of experienced manpower	11%
Migration of experienced personnel	11%
Delay in payment	10%
Inadequacy of modern plant/equipment	9%
Procurement of critical materials	8%



**Table 4.2: Constraints Identified by Road Agencies**

<i>Constraints identified by road agencies</i>	Severity of Impact
<i>Parameters considered</i>	
Delay in handing over of the site	17%
Non availability of qualified contractors	15%
Delay in decision - contractual approvals	12%
Environmental clearance	11%
Inadequate allocation of fund	11%
Inadequacy of experienced manpower	11%
Inadequacy of modern plant/equipment	10%
Rehabilitation and resettlement	7%
Inadequate design and drawing	6%

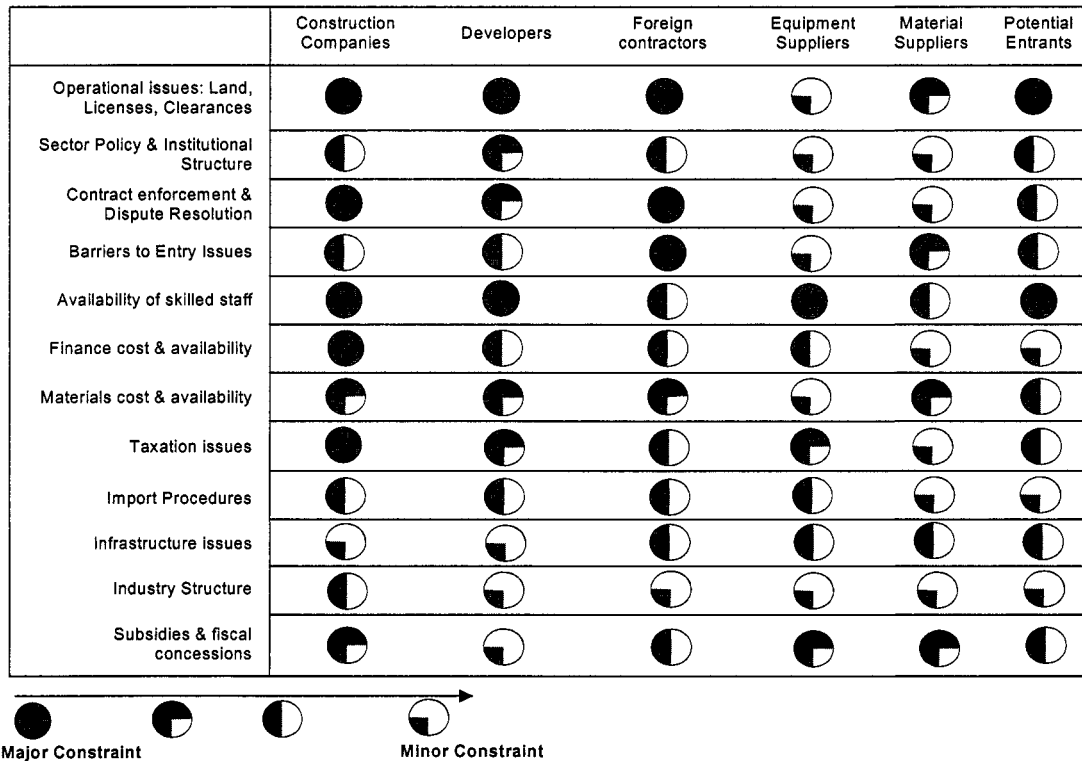


- As evident from the above analyses, both the contractors and the road agencies have identified the delays in handing over of the sites (due to delayed pre-construction activities) and delayed decision making by the Engineer/Employer as the two most critical issues. Non-availability of experienced staff, delays in allocation of funds and release of payments and poor quality of designs and drawings also feature in the top critical issues and constraints. The constraints can be clubbed into three categories of (a) pre-construction activities attributable to the employer; (b) other constraints attributable to the Employer/ Engineer; and (c) constraints attributable to the contractors. Based on the discussions/interviews with the contractors and state road agencies, the range of severity of impacts attributable to the above three categories are 27-55%, 12-22% and 33-51% respectively. From a thematic point of view the most critical constraints perceived by the contractors and road agencies are: (a) design, pre-construction, decision making/approval, timely payments and other project implementation issues; (b) non-availability of skilled personnel and frequent staff migration/turnover; (c) construction planning and resource management capacity of the contractors; and (d) to some extent, timely availability of key construction material and equipment.

#### 4.2.2 Issues Identified on Business Environment

- A stakeholders' primary survey was conducted with 1 national road agency, 2 industry associations, 4 lenders, 21 road contractors, 8 equipment manufacturers and material suppliers and 6 potential new entrants in the sector. The primary objective of the surveys was to establish an investment climate perceptual map and ranking, summarizing the perceptions of various industry stakeholders on the different investment climate/business environment issues, as presented below in Fig 4.2.

**Fig 4.2 Perception Matrix**



- The rankings of the various investment climate parameters, as presented in Table 4.3 below, clearly indicate availability of skilled staff, operational issues (i.e. land, license and clearances, and governance) and taxation as the prime constraints. These are followed by contract enforcement and

dispute resolution, and material costs and availability. The barriers to entry issues and subsidies and fiscal concessions also figure relatively high in the ranking of perceived constraints.

**Table 4.3: Investment Climate Perceptual Map and Ranking**

Parameters	Ranking
Availability of skilled staff	1
Operational issues: land, licenses and clearances, governance	1
Taxation issues	1
Materials cost and availability	2
Contract enforcement and dispute resolution	2
Barriers to entry	3
Subsidies and fiscal concessions	3
Finance cost and availability	4
Sector policy and institutional structure	5
Import procedures	6
Infrastructure issues	6
Industry structure	7

#### 4.2.3 Perceptions of Foreign Contractors, Consultants and Equipment Manufacturers

6. To facilitate participation/entry of more contractors it is essential to look into the entry barrier and investment climate issues. Consequently it was decided to do an in-depth study on these aspects and also carry out a perception survey of potential large contractors and other industry stakeholders from Europe (France, Italy and the UK) and to a limited extent from comparator Asian countries (China and Malaysia).
7. The survey sample included a cross section of large international road contractors and equipment manufacturers who already entered India, as well as internationally reputed road contractors and equipment manufacturers not yet active in India. It is understood that the entry barrier issues and their relative impact reported by the firms already engaged in the Indian market were based more on experience, while those mentioned by the firms not yet involved were based mostly on perception. The sample size included 14 large road construction firms (5 from France, 4 from Italy and 5 from UK), 10 international consultants (5 from France, 2 from Italy and 3 from UK) and 7 large road equipment manufacturers (3 from France, 3 from Italy and 1 from UK). Twelve industry associations and institutions spread over three countries were also interviewed. About 40% of the firms surveyed had past engagements or are presently active in India either directly or through their associates; the other 60% had never entered the Indian construction market, but many of them are seriously exploring opportunities in the fledgling Indian road construction market.
8. A consolidated mapping of the significant entry barriers for all European stakeholders combined is presented in Table 4.4 below in descending order of impact experienced and perceived. The **cultural bias in project management style** (this encompasses decision making structure and culture, general apathy towards timeliness, quality, cost consciousness and innovative approaches, lack of enforcement of contracts and agreements, and the overall responsibility and accountability framework) was perceived as the biggest entry barrier. This was followed by poor governance and bureaucracy, and risk allocation practices and contract conditions (more applicable for BOT projects). The law and order situation and regulatory framework and bottlenecks also featured high in the list of barriers. The French contractors, in particular, expressed concern with profitability and return on investments, as well as visa and travel document processing for their expatriate staff. The contractors and consultants of Italy and UK mentioned the dispute resolution system as one of the significant entry barriers, possibly due to their earlier bad experience in India. The French construction industry did not seem to consider the dispute resolution mechanism as a significant entry barrier. Table 4.5 below breaks out the opinions of the European stakeholders not yet active in India (based primarily on their perceptions); while Table



4.6 does the same for the European stakeholders previously engaged and still active in India's road construction market (based primarily on their experience).

9. The three issues rated most critical were consistently: (a) cultural bias in project management style, (b) poor governance, bureaucracy and corruption, and (c) risk allocation practices and contract conditions. Visa and travel documents processing followed closely. The order for the other barriers is more or less similar. Lack of information on the availability of Indian construction market opportunities was also highlighted as an entry barrier, especially by UK contractors.

**Table 4.4: Consolidated Significant Entry barrier for Foreign Stakeholders**

Consolidated Significant Entry Barriers for Stakeholders	France	Italy	UK	Total
1 - Cultural bias in project management styles by clients/partners	12	3	4	19
2 - Poor governance, bureaucracy, corruption	10	4	4	18
3 - Risk allocation practices and contract conditions	9	3	4	16
4 - Law and order situation to respect/protect signed contracts	6	3	4	13
5 - Regulatory framework, and bottlenecks	6	2	4	12
6 - Profitability and return on investment (bidding opportunities)	7	2	0	9
7 - Visa and travel documents processing for expatriates	7	2	0	9
8 - Procurement of works by institutions (NHAI, PWD)	6	1	2	9
9 - Import / export framework, customs clearance procedures	7	1	0	8
10- Dispute resolution mechanism	0	3	3	6
11- Prevailing labor laws, equipment leasing practices	0	0	3	3
12- Information availability on construction market in India	0	0	3	3
13- Access to input resources (skilled manpower, equipment)	0	0	3	3
<b>Total Frequencies</b>	<b>70</b>	<b>24</b>	<b>34</b>	<b>128</b>

**Table 4.5: Perception of Entry Barriers of Road Construction Industry Players not active in India**

Perception of Significant Entry Barriers	France	Italy	U.K.	Total
1 - Cultural bias in project management styles by clients/partners	5	2	1	8
2 - Poor governance, bureaucracy, corruption	4	3	1	8
3 - Risk allocation practices and contract conditions	5	2	1	8
4 - Visa and travel document processing for expatriates	4	2	0	6
5 - Law and order situation to respect / protect signed contracts	2	2	1	5
6 - Regulatory framework and bottlenecks	2	1	1	4
7 - Procurement of works by institutions (NHAI, PWD)	2	1	0	3
8 - Import/export framework, custom clearance procedures	2	1	0	3
9 - Profitability and return on investment (bidding opportunities)	1	1	0	2
10- Dispute resolution mechanism	0	2	0	2
11- Prevailing labor laws, equipment leasing practices	0	0	1	1
12- Information availability on construction market in India	0	0	1	1
13- Access to input resources (skilled manpower, equipment)	0	0	0	0
<b>Total Frequencies</b>	<b>27</b>	<b>17</b>	<b>7</b>	<b>51</b>

**Table 4.6: Experience of Entry Barriers of firms who have already worked or are presently active in India**

<b>Experience of Significant Entry Barriers</b>	<b>France</b>	<b>Italy</b>	<b>U.K.</b>	<b>Total</b>
1- Cultural bias in project management styles by clients/partners	7	1	3	11
2- Poor governance, bureaucracy, corruption	6	1	3	10
3- Risk allocation practices and contract conditions	4	1	3	8
4 - Law and order situation to respect/protect signed contracts	4	1	3	8
5 - Regulatory framework, and bottlenecks	4	1	3	8
6 - Profitability and return on investment (bidding opportunities)	6	1	0	7
7 - Procurement of works by institutions (NHAI, PWD)	4	0	2	6
8 - Import/export framework, custom clearance procedures	5	0	0	5
9 - Dispute resolution mechanism	0	1	3	4
10- Visa and travel document processing for expatriates	3	0	0	3
11- Access to input resources (skilled manpower, equipment)	0	0	3	3
12- Prevailing labor laws, equipment leasing practices	0	0	2	2
13- Information availability on construction market in India	0	0	2	2
<b>Total Frequencies</b>	<b>43</b>	<b>7</b>	<b>27</b>	<b>77</b>

#### 4.2.4 Experience of some Asian Contractors in India

10. Some large international contractors and industry associations from China and Malaysia were also interviewed in connection with the case studies undertaken in those two countries to assess their experience/ perception of the Indian road construction market. Some of the comments made by the contractors and industry associations in these two countries are reproduced below verbatim.

- Projects in India are always delayed and for many reasons:
  - badly prepared contract documents
  - lack of acquisition of required land
  - bad management of contract
  - corruption
  - technical problems
- Problems in India have no resolution.
- There is no effective dispute resolution process in India and contractors can be hurt badly financially.
- Indian employers refuse to reasonably negotiate a settlement.
- Indian workers have a different work ethic.
- It is very difficult to get visas to work in India and it can take weeks to get one, whereas to get a visa to work in Russia takes one day.
- After award of a contract prompt mobilization by the contractor is not possible, since the right of way is not provided and the land has not been acquired. In some cases, it is not possible for the land to be acquired, so the Employer simply makes changes to the line of the road with no additional payment for delay, or change in scope of work. The Employer should be obligated to issue a certificate that all the land is clear for access and has been acquired at the time of bidding, or at least by start of the project.
- Tree cutting along the line of the project becomes a huge contractual issue, since the trees are considered to be in a forest reserve and special permission is required to cut each tree. The subcontractor selection process to cut the trees by the forest department is non-transparent (involves corruption) and takes a long time.
- In India top-level management may make a decision, but even this is unlikely. Lower down the chain every employer representative is scared to make a decision because of the risks of accusation

of corruption or inappropriate decisions.

- Contractors from Malaysia are normally management contractors who rely on a suitable infrastructure of subcontractors, specialist contractors, material suppliers and equipment suppliers, but this infrastructure does not exist in India. So international contractors cannot assume that they can administer a project in the same way as in their home country. There are no reliable subcontractors in India and by experience one subcontractor cannot be allowed to be solely responsible for a particular activity, since there is no tendency for subcontractors to honor any contract.

#### **4.2.5. Entry Barriers Experienced and Perceived by Foreign Construction Firms**

11. To sum up, the major entry barriers as perceived and experienced by large international contractors, consultants and equipment manufacturers from Europe and Asia, are: weakness of project administration and governance, cultural insensitivity towards timeliness, quality and cost, lack of innovative approaches, laxity in contract enforcement, and delays in pre-construction activities.

### **4.3 Critical Issues Pertaining to Capacity of the Road Construction Industry**

12. The common strands of critical issues emerging out of the primary surveys with road administrations, domestic and foreign construction/consultant entities, and industry associations as possible reasons for the unsatisfactory past and present performance were:
  - (a) overall contract administration, contract enforcement and pre-construction activities,
  - (b) availability of skilled workforce and resource planning and management capacity of the contractors, and
  - (c) operational issues, overall business environment and governance.
13. The critical issues can be grouped under (a) business environment and investment climate issues; and (b) supply constraints – i.e. poor performance of the contractors and consultants, and scarcity of input resources, especially human resources. The remainder of this chapter examines these in more detail.

### **4.4 Business Environment and Investment Climate Issues**

14. Here the focus will be on (a) quality of pre-construction activities, project/contract management, dispute resolution and other implementation issues; and (b) investment climate and barriers to entry issues – procurement, clearances, taxation, incentives and other policy/regulatory issues.

#### **4.4.1 Pre-construction and Implementation Issues**

15. As discussed earlier in the report, the analysis of the past five years' data on the gap between budget allocations and actual expenditures shows that the industry was not able to spend its full allocation and fell short by 15 to 20%. Furthermore as discussed in Chapter 3, the analysis of past contract data reflects that about 70% of contracts have been delayed and about 50% of contracts suffer from cost overruns of more than 25%. The mean delay was about 73% of the original contract duration. *About 70% of the road contractors' capacity tied up in existing contracts could be released if contracts were completed on time.*
16. These statistics raise serious concerns about the industry's existing capacity and efficiency. They call for a through analysis of the project implementation issues affecting the delivery of projects. These can be grouped under three categories: (i) pre-construction issues; (ii) land surveying, investigations and design issues; and (iii) construction and contract management issues.

17. Some of the problems related to the design and construction issues would be minimized by adopting options such as design-build (DB), design-build-maintain/operate (DBMO) or build-operate-transfer (BOT) contracts. Nevertheless, the items discussed below will remain of concern for the government agencies, irrespective of the contract delivery type used. The parameters defining the quality of planning, design and contract management will continue to be set by the government agencies, even though the extent of involvement may vary. The handing over of an encumbrance-free site to the contractor/concessionaire will always be the responsibility of the government. In fact, the role of the planning and scoping phase becomes even more critical as the contract delivery process changes from the traditional contract type to design-build (DB) and warranty contracts including BOT.

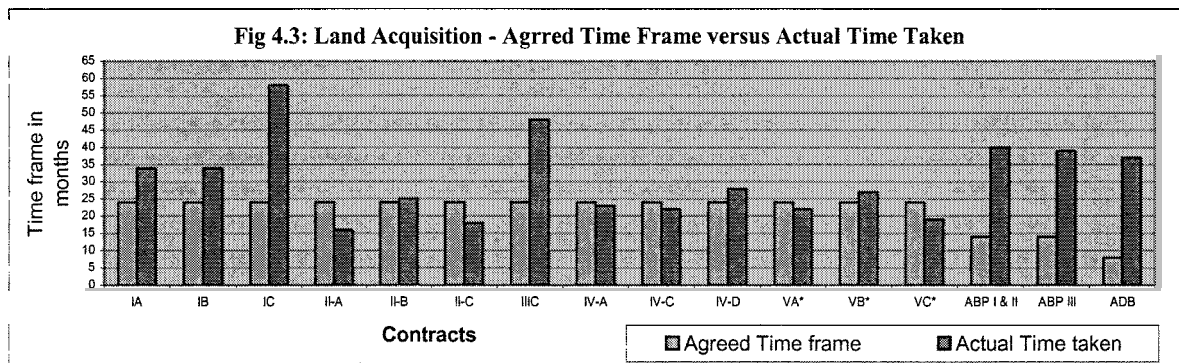
#### *4.4.1.1 Pre-construction Activities*

18. Pre-construction site preparation activities include land acquisition, resettlement of project-affected persons, tree cutting and utility relocation. Delays in carrying out the pre-construction activities have been affecting several road improvement contracts. As the site was not ready at the time of contract award, the contractors delayed their mobilization while cashing in the advance payment and did not mobilize before a year on average until there were large enough initial works on the fully unencumbered sections. Due to poor quality of designs and outdated land revenue maps, the extent of land acquisition is often not properly identified during designs. Once the limit of land acquisition is transferred to the ground, additional land acquisition requirements become necessary to accommodate the design right of way. Similarly, often the utilities (especially the underground ones) are not properly mapped and the trees to be cut are not properly demarcated on the design drawings, leading to initiation of the identification of such encumbrances only during the implementation stages, resulting in consequent time delays. Moreover, carrying out the pre-construction activities usually involves various levels of government and several utility departments with cumbersome procedures, and relevant laws and regulations are usually not clear.
19. The analysis of delays in pre-construction activities presented in this section is based on 21 on-going and completed multi-lateral funded NHAI contracts (with an average contract duration of 36 months) through a Bank's in-house study carried out in 2006 (draft report). However, the analysis represents the global scenario in the country and the situation is very similar across all categories of road improvement projects. It was observed that on average about 30 months were required to hand over the project stretch fully encumbrance free to the contractors although these activities were planned to be completed in an average of 20 months. The maximum time taken at one instance was 52 months, about 40% more than the entire contract completion period.
20. The Employers failed in large majority of the cases from one of their fundamental obligations: handing over encumbrance-free land for the contractually committed first milestone section (about 30% of the overall length) during the award of the contract. Even when the land was made available, encumbrances of varying natures constrained the contractor's capacity to undertake work in a continuous uninterrupted manner. Such delays in pre-construction activities often led to substantial time extensions, consequent cost overruns and in some instances large contract claims on idle resources and perverse opportunities for rent seeking and unjustified compensation demands by the various stakeholders. The extent and reasons for delays for all the four main categories of pre-construction activities are presented below.

#### *4.4.1.2 Land Acquisition and Relocation of Displaced Persons*

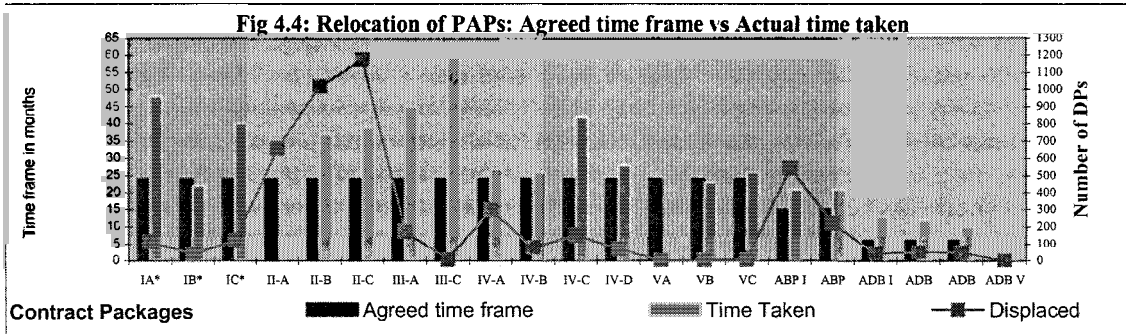
21. Land acquisition for highway projects is carried out in accordance with the principles laid down in either the Land Acquisition Act, 1894 or the National Highways Act, 1956 (applicable only to national highways). In some states there are laws (like Tamil Nadu Highways Act) which are improvements on the 1894 Act. These two acts govern the acquisition of land under eminent domain for defined public

purposes and compensation. To acquire the land, detailed assessments are required and plans are to be prepared to meet requirements of these laws. The provisions in both these acts require various stages of notification, and time for hearing objections from the affected persons and for agreeing on appropriate compensation. If all due processes are followed it is expected that land acquisition following the NH act (or some of the improved state acts) should take about 15 months and the conventional Land Acquisition Act about 24 to 30 months, depending on the state where the land is acquired. The long time required for the process warrants starting the acquisition much earlier in the project life, concurrent with the project design stage. However, in reality the land acquisition plans are prepared very late, often towards the end of the design phase, and the surveys by the revenue department staff are taken up only when the projects reach the bidding stage or even later. Consequently, the agencies struggle to discharge the fundamental obligation of making encumbrance-free land (that too only the first milestone, which is usually about 30% of the whole stretch) available to the contractor on signing the contract. From the analysis it has been noted that the average time for land acquisition was about 21 months against 15 months originally planned for, as presented below in Fig 4.3.



22. There are several reasons for this delay in land acquisition, which include:

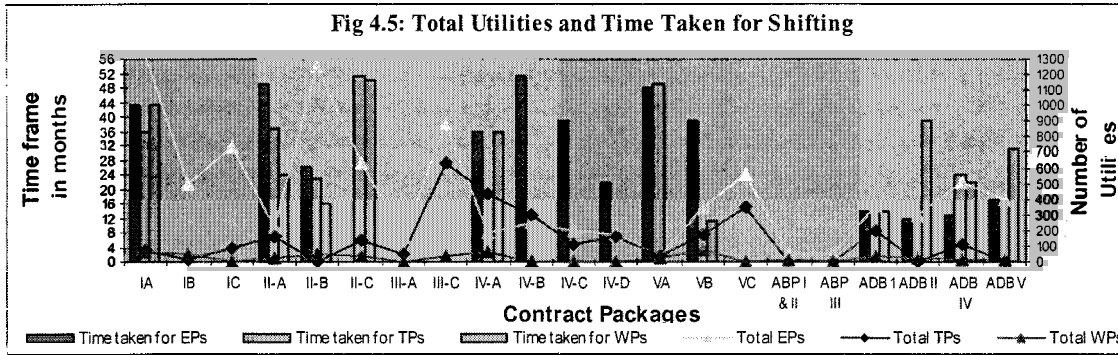
- Outdated revenue maps form the basis for preparation of land acquisition plans. Land records often exist in the form of village maps which present the boundaries of land parcels including public lands and roads. Details of each land parcel are available in the form of field measurement books marking the exact boundaries and sizes. The maps have been prepared through plane table surveys. These records have often not been updated for the last thirty years.
- The design consultants lack expertise for preparing proper land acquisition plans and ground verification of the design or the alignment is not carried out, due to which the plans are often not realistic.
- Frequent changes in designs and alignments during implementation result in duplication of resources for land acquisition. In some cases, discrepancies between the project coordinates and the reference frames that underlie the old revenue land maps lead to land acquisition mismatch and cause redesign of the alignment.
- The project authorities have to depend on already stretched human resources from the revenue departments to undertake the land surveys, as well as the skills and influence of non-governmental organizations to agree on the valuation and compensation for the land and structures to be acquired. The process of surveys and registration are often simply delayed in the absence of any urgency or incentive on the part of the land revenue department.
- In the absence of clear guidelines on providing compensation in special cases (e.g. land owners with unclear titles or multiple owners) the process of settlement takes very long.



23. Among the project-affected persons (PAPs) the most impacted are the physically displaced households. All road improvement projects include the provision of resettlement and relocation of the physically displaced households. The relocation process includes: (i) identification of land (preferably government land) for relocating the displaced persons (DPs) within the agreed radius; (iii) transfer of ownership of land to the borrower/client; (iv) development of land including marking of plots and provision of basic amenities; and (v) allocation of plots to the DPs. This entire process is usually planned to be completed over 18 to 24 months, but the analysis shows that it has taken about 28 months, as presented Fig 4.4. The reasons for the delay in resettlement can be summarized as below:
- (a) Delays in finalization of alignment and corridor of impact during project preparation stage;
  - (b) List of titleholders can only be finalized after the declaration of award by the land acquisition office/competent authority. Since land acquisition is often delayed, identification and finalization of the list of DPs cannot be carried out on schedule.
  - (c) The alternative land for relocation during the preparation stage is not firmed up. The relocation sites are often firmed up during project preparation and are developed using the road contractor’s resources or employing a nominated sub-contractor. Often the facilities developed at the new site are not adequate (usually the sanitation facilities are ignored) and the affected households/communities refuse to move out, further delaying the whole process.

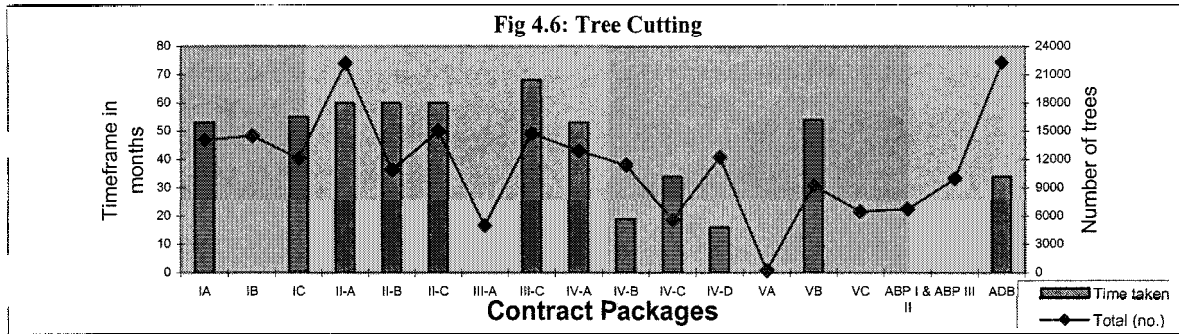
#### 4.4.1.3 Utility Relocation

24. In road improvement contracts utility relocation is usually the employer’s responsibility --with a few exceptions in recent times where the road contractors were asked to undertake these activities in a few national and state projects. The utilities are shifted under supervision of the respective utility departments and often due to poor coordination between the road administration and the various utility departments, the process of relocation gets unduly delayed. This is evident from the analyses presented in Figure 4.5 below, where shifting of electrical utilities took about 33 months, telephone utilities about 31 months and water utilities about 29 months on average, against the planned target of about 18 months for all these utilities –that is, more than one whole year late. The delays for utility relocation are highest among all the pre-construction activities and the reasons can be summarized as:
- Poor quality of investigations during project preparation and poor level of data and details, often leading to the utility agencies ‘discovering’ utilities (especially the underground ones) during the project implementation stage;
  - Poor coordination between road agencies and utility relocation departments; road agencies have very little leverage on the utility agencies to get the works done on an urgent basis.
  - Weak capacity and financial situation of many of the state utility agencies; there are instances of utilizing the deposit money for paying utility staff salaries at the expense of delaying the relocation process;
  - In some cases, the road agencies have not acquired margin land for the relocation of utilities, which delayed the relocation process.



#### 4.4.1.4 Tree Cutting

25. The process of tree cutting involves several government agencies, namely the local/district forest department, state forest department and Ministry of Environment and Forests (MoEF). Normally in a road project, two kinds of forest areas are encountered, namely. protected areas and avenue plantations. The process of getting clearance for tree cutting in protected areas is longer than those in avenue plantations. In protected areas, the steps followed are:
  - The road agency forwards an application for tree cutting in a prescribed format to the Divisional Forest Officer (DFO).
  - The DFO on receipt of the application arranges for a joint measurement survey, where a representative of the Forest Department and the road agency jointly conduct the survey and arrive at a specific number of trees to be cut and classify the trees based on species and by girth size.
  - After this survey, a Range Forest Officer calculates compensatory planting, the area to be diverted and the net present value, and he forwards the same to the DFO, who in turn forwards it to Chief Conservator of Forests (CCF). The CCF after scrutiny forwards the application to MoEF. In some states the forest departments even ask the road agencies to provide 10m wide strips all along the road for compensatory planting of trees.
  - MoEF then issues “in principle” clearance in a prescribed format and it goes back to the road agency following the same route.
  - After receiving the clearance from MoEF, the road agency deposits money for formal clearance from MoEF.
  - MoEF then issues the formal clearance, which is routed to the DFO through the CCF.
  - The DFO then issues tree cutting permission.
  
26. This highly cumbersome process of cutting trees takes anywhere between one to three years to be completed. The delays are often exacerbated by the poor quality of design, requiring re-enumeration of trees and re-classification of forest/trees during project implementation and the road agency engineer’s abdication of responsibilities to facilitate the process. Moreover, although a resettlement implementation plan is prepared in many projects, implementation plans for utility relocation and tree cutting are often not prepared during the project preparation stage and are left to the contractor to manage during implementation. The average time taken for tree cutting is 32 months against a planned target of about 18 months. The delays in tree cutting are a close second highest to that of utility relocation among all pre-construction activities.



## 4.4.2 Construction and Contract Management Issues

### 4.4.2.1 Contract Enforcement and Decision Making

27. The contract management and enforcement environment is very weak in the country (The Doing Business 2008 report –compiled by the World Bank group-- ranks India 120th among 178 countries). Although most of the medium and large contracts are based on the FIDIC framework, the role of the Independent Engineer is not clear, weak and often circumvented by the Employer, often subverting the conditions of contract. Moreover, many of the Employer staff and domestic supervision consultants still do not have the requisite experience in FIDIC conditions of contract, which inhibits decision making and playing their intended roles in the contract. There is a lack of realization that the Government and the contractors both could benefit from speedy and timely project execution and a spirit of ‘partnership’ should be actively encouraged during the project implementation. There are often unclear contractual clauses, open to too many possible interpretations, which easily give rise to disputes. Many of the contract conditions on encashment of guarantees, defaults of contractors and employers, local taxation and price escalation are usually not understood in the same way by the contractors and the employer. For example, there are instances of threats from the employers to encash the performance securities as a means to deter contractors from submitting claims, including legitimate interest claims on delayed payments. There is a general lack of understanding by the employer’s staff that encashment of bank guarantees can be invoked only if there is a default in the contractor’s obligation. Moreover, as the employer usually takes some latitude in fulfilling his obligations under the contract such as timely delivery of land, timely decision making on contract variations, making timely payments, early activation of dispute resolution mechanism, etc., his leverage in enforcing the contract gets severely diminished.
28. Lack of decision making is often a recurrent problem in the contracts. The employer’s project-in-charge (or project director) is often not empowered to take decisions. The weak accountability framework within the road agencies promotes insensitivity to performance and quick decision making. At the same time, there is no immunity or protection to officials in respect of actions taken in good faith. Hence there is a resistance to accepting the responsibility for any decisions, recommendations or award, even if the case merits such an acceptance. This is further aggravated by the overwhelming fear of ‘vigilance’, investigations by auditors, controllers or review agencies on the decisions taken by the responsible government officials. Such environment encourages the culture of ‘passing the buck’ at all stages of decision making severely delaying critical decisions. Even decisions like time extension and issuing of a variation order are inordinately delayed. There are instances when the employer took two years to decide on a 4-month time extension requested by the contractor. It is not unusual for the contractors to refuse to take up additional works necessary for project completion in absence of an agreed variation order, thereby causing avoidable time extension and price escalations. The employers have often been known to withhold certified payments for obscure reasons completely violating the principle of FIDIC and repeatedly returning the certified invoices to the engineers and contractors



seeking explanation. Further, the new version of FIDIC has changed many of the recognized clauses and would now require further training of the Engineer and the contractors' staff to fully understand and adequately manage the contracts.

#### *4.4.2.2 Contract Management by Contractors and Supervision Consultants*

29. Contractors' performance is often constrained due to the dearth of construction management skills in the country. Lack of skills and professional management culture affect contractors' work planning, resource and workflow management, cash flow management and the overall project management. Unfortunately, there is a growing trend among road contractors of underbidding to win contracts and subsequently making up the margins through compromised quality, escalation payments on account of delays and return on claims. In order to make money out of delays and claims, the contractors often try to exploit the Employer's and Independent Engineer's weakness in contract administration and resort to putting up a variety of contract claims often on frivolous grounds. Huge unnecessary correspondence generated by the contractors on potential disputes and claims results in waste of scarce contract administration time and resources, distracts the key focus from critical issues like time and quality to fault finding and blame gaming, and strains the relationship between the contractual parties. Moreover, contractors --including reputable international firms-- exploit the weakness in the prevailing regulatory environment on safety and environment and compromise with the workers' health, safety and environment issues, often not realizing that such compromises affect labor productivity at the site, resulting in deterioration in their own efficiency.
30. Supervision consultants are supposed to act as Independent Engineers in the contracts based on the FIDIC framework. The role of the Engineer in most cases, however, is not clear, weak and often circumvented by the Employer violating the conditions of contract. The supervision consultancy contracts are time based, which unfortunately creates a perverse incentive to delayed decision making, resulting in extension of the civil works and the associated supervision consultancy contract. Moreover, many of the consultant staff are not fully conversant with FIDIC procedures and are not up to date with latest quality management techniques and emerging technologies. Lack of knowledge and capacity in such areas often constrains the consultants' ability to manage contracts effectively with timely and quality decision making. Further, there are instances of serious allegations on consultant staff for seeking rent by delaying work flow approvals (particularly the approval of requests for inspection certificates) and colluding with contractors by approving poor quality materials and works. Sometimes, government auditors not conversant with newer forms of contracts raise queries which make the implementing agencies over-cautious.

#### *4.4.2.3 Claims and Disputes*

31. Design variations during construction, delays in pre-construction activities and unrealistic contract completion deadlines are often the cause of disputes on road construction projects. The works contracts generally contain a dispute resolution mechanism which requires that the dispute/claim will be first referred to the Dispute Resolution Board (DRB) or Adjudicator, and then if not resolved, to arbitration. However, the use of dispute resolution provisions is defective and the parties resort to a variety of methods to delay resolution. Often, the Capacity of the DRB members to arrive at an acceptable verdict based on 'reasoned recommendation' in a reasonable time frame is also limited. It was observed that in 50% of the DRB cases, the average time for reaching a decision was 8 months --whereas the prescribed time period is 8 weeks. The DRB recommendations are not accepted in about 80% of cases. The road administrations (employers) do not seem to have in place an appropriate accountability framework and officials often fear vigilance and audit probes in accepting the recommendations of a dispute resolution board that are against the Government. The execution of the arbitration process in India is again time-consuming, taking anywhere between 1.5 years to 3 years. Setting up the arbitration council through two mutual nominees and a mutually acceptable third nominee takes time. If the ruling of the arbitration

process is not acceptable to one party, the case moves on to the civil court system. With the huge backlog of cases in the Indian courts, it is not easy to obtain a quick decision – again it takes any time between 2 to 20 years, with an average of 8 years. Experience shows that in many works contracts in India, the DRB is not established as per the requirements of the contract. In most cases, a DRB is not appointed until a dispute arises. The enforcement of arbitral awards is also a time consuming process which often leads to significant delays. It has been reported by various industry associations that about Rs.540 billion are locked in disputes on infrastructure projects in India. This is really a worrisome issue for the industry policy makers and can also be viewed as a potential deterrent factor for new entrants into the industry. The Bank has recently carried out a study on enhancing the effectiveness of the dispute resolution system in construction contracts. A summary of this study’s main findings and recommendations is presented as Annex 1 to this report.

#### 4.4.3 Investment Climate Issues Affecting Competitiveness of the Industry

32. The preceding sections have identified various entry barriers to India’s road construction industry, and problems affecting the implementation of road projects in India. Together, these are deterring the entry of contractors from other sectors and from other countries into India’s road construction program. To help set priorities for remedial action, the competitiveness of the road construction industry was assessed on several factors, grouped under appropriate determinants, following a standard template used for any manufacturing or infrastructure industry. The five determinants adopted for this exercise are: (a) industry competency, (b) inputs –materials, equipment, (c) workforce, (d) infrastructure and (e) government role. Each of the determinants was then subdivided into four to eight factors. Three ratings were used for assessing the performance of each factor - *unsatisfactory* (need to immediately improve), *tolerable* (need to monitor and find ways to improve) and *satisfactory* (which can be maintained). Table 4.7 below summarizes the assessment.

**Table 4.7: Assessment Mapping on Competitiveness**

Determinants	Factors	Performance
Industry Competency	Demand – Supply & capacities	<i>Unsatisfactory</i>
	Finance cost and availability	<i>Tolerable</i>
	Industry structure and barriers to entry	<i>Tolerable</i>
	Profitability	<i>Unsatisfactory</i>
	Quality and delivery systems	<i>Tolerable</i>
Inputs – Material, Equipment	Availability	<i>Tolerable</i>
	Cost and price trends	<i>Tolerable</i>
	Import procedures	<i>Tolerable</i>
	Quality	<i>Satisfactory</i>
	Taxes and duties	<i>Tolerable</i>
Workforce	Availability of staff	<i>Unsatisfactory</i>
	Education and skill levels	<i>Unsatisfactory</i>
	Cost of manpower	<i>Satisfactory</i>
	Productivity	<i>Tolerable</i>
	Labor regulations	<i>Tolerable</i>
	Condition of unorganized workers	<i>Tolerable</i>
Infrastructure	Transportation cost & time	<i>Satisfactory</i>
	Power costs and availability	<i>Satisfactory</i>
	Water costs and availability	<i>Tolerable</i>
	Communication facilities	<i>Satisfactory</i>
Government Role	Sector policy	<i>Satisfactory</i>
	Institutional structure	<i>Tolerable</i>
	Regulation	<i>Unsatisfactory</i>
	Dispute resolution	<i>Unsatisfactory</i>

Determinants	Factors	Performance
	Operational issues	Unsatisfactory
	Incentives and subsidies	Unsatisfactory
	Law and order	Tolerable
	Foreign investment related restrictions	Tolerable

33. The competitiveness assessment highlights the following key areas for immediate improvement –

- Industry capacity and profitability
- Availability of skilled staff
- Absence of regulatory framework
- Dispute resolution
- Operational issues such as land acquisition, utility relocation, clearances, licenses and procedures
- Incentives and subsidies

Moreover, the cost of funds, although assessed as Tolerable at present, may come under some pressure due to the recent upsurge in demand and hardening of interest rates.

#### 4.4.3.1 Institutional Structure and Regulation

34. The implementing agencies discharge an all-encompassing role i.e. they are responsible for both awarding contracts and regulation. There is still no clear separation of owner and provider functions. In the absence of an independent oversight mechanism at either the central or state level, there is hardly any provision to safeguard the interests of the various stakeholders, which affects the level of confidence of the developers/ BOT operators in particular to make investments and stay engaged in the sector. The absence of an independent body/regulator, who should be in regular communication with the industry, provide advice and support and collate and distribute relevant data connected with the industry, is often felt. Moreover, some of the existing regulations regarding customs and other foreign investment-related restrictions have adversely affected the industry. Further, the virtual absence of regulation on health, safety and environment (other than trees) has also not been conducive to efficiency and growth of the road construction industry.

35. To send the right signals to the players and balance the interests of all stakeholders, there is need for a fair and independent body, more in the form of a road authority/user board rather than a complete economic regulator (similar to telecom, energy and insurance sectors). This will act as a quasi-regulator and assume enhanced importance in view of the emerging hopes for a public/private participation framework as the preferred mechanism for developing the national highway network. In the absence of any independent oversight/control mechanism, the toll rates may be set so high as to deter many users, or without reference to the economic benefits and costs arising through externalities and social considerations. This is all the more important keeping in mind the vulnerabilities of public/private participation as experienced particularly in Latin America and Central Europe.

#### **Box 4.1: Long-term Lending to Infrastructure Sectors**

Banks' exposure to infrastructure has been increasing over the last three years. With the government's thrust on infrastructure increasing, the growth is likely to continue in the future. The aggregate assets of scheduled commercial banks were Rs. 27,879 billion (\$620 bn) as on March 31, 2006. Banks' exposure to infrastructure was a mere 4% of total assets. However, given the short-term maturity profile of banks' liabilities, lending long term to infrastructure projects could result in an asset liability mismatch. This is likely to restrict banks from lending to the infrastructure sector if such loans make up a significant portion of total loans.

**Financial Institutions** that have significant exposure to the infrastructure sector include IIBI, SIDBI and insurance companies like LIC and GIC. Though recent data regarding their assistance to the sector is not available, these FIs disbursed an assistance of Rs. 110 billion during FY 2004. Out of this, insurance companies' disbursement aggregated to Rs. 95 billion.

Over the past two years, LIC and other institutions including SIDBI have increased their exposure to the infrastructure sector. During FY 06, LIC disbursed an amount of about Rs. 140 billion (@CAGR of 21% over FY 2004 to 2006).

Among **specialized institutions**, IDFC disbursed Rs. 61 billion to the infrastructure sector during FY06.

36. The absence of a construction law to govern the setting up and operation of construction firms, modes of procurement, dispute resolution, legal liabilities, quality control and management, is a big lacuna in the industry. Moreover, although the Government of India has notified construction as an approved activity under 'industrial concern' in 2000, the sector has not been accorded full-fledged industry status. There is an immediate need for transparency and increased efficiency in the procurement of contractors and consultants. It has been observed that there is rampant cartelization and collusion among contractors, often with tacit support from road agency officers in providing access to bidding documents. This possibly is also acting as a barrier to entry for some of the local small and very small contractors entering the road sector. The above paragraphs clearly point to a lack of political commitment –or a champion-- to reform policies and results, supported by incentives and penalties to shape behavior.

#### *4.4.3.2 Cost of Funds*

37. As a definite shift towards BOT contracts is envisaged in the medium term, given the need for long-term funds for such contracts, availability of funds might become an issue, particularly so with the looming global financial crisis. According to analysis carried out under a study done for India Infrastructure Finance Corporation Limited, it is estimated that the Indian financial system could disburse about Rs. 7,300 billion over the next five years, resulting in an infrastructure lending gap of about Rs. 1,300 billion. This would affect the road construction industry as well as other infrastructure sectors.
38. The working capital cycle is typically not very long in road construction projects (unless the contract payments are severely delayed) and not a major issue for large organized players. Besides fund-based limits, most construction companies also seek significant levels of non-fund-based products, such as letters of credit and performance guarantees. However, availability of working capital is more of a problem for smaller players. They often cannot afford to buy equipment and therefore need substantial working capital for renting equipment. Moreover, the increasing interest rates on working capital loans (current rates are around 11.5%) are likely to put pressure on the margins of the contractors. The cost of long-term debt has also risen significantly --from 9.25% to around 11.5% for national highway projects. Moreover, lenders lack the comfort that might be gained from a rating system of road contractors and developers by independent accredited agencies.

#### *4.4.3.3 Tax Structure, Incentives and Subsidies*

39. The distortions of direct and indirect taxes affect both foreign and domestic road contractors. In a nutshell, non-uniformity and multiplicity of taxes, the high level of taxes and duties, cumbersome tax assessment and collection procedures, and an absence of appropriate fiscal concessions, are having a serious drag on the profitability of the industry.
40. *Direct taxes:* Only BOT operators are now eligible for tax benefits under Section 80-IA of the Income Tax Act, which provides for 100 percent deduction of profits for any ten consecutive years out of fifteen, starting from the year of operation. Budget 2007-2008 has clarified that the construction companies claiming Section 80-IA benefits will have to provide for full tax on contracting profits with retro-active effect from April 1, 2000. This would have an especially negative impact on those contractors who had been claiming 80-IA benefits for the last six years. Foreign contractors engaged in road construction are not eligible to claim tax benefits as per Section 44BBB of the Income Tax Act, which is applicable to foreign companies engaged in turnkey power projects. The taxable profit in this case is assumed to equal 10% of the contract amount, but foreign road contractors are ineligible to pay taxes as per this simplified system. Even the domestic contractors engaged in civil construction are eligible for presumptive taxation benefit as per Section 44AD of the income tax act (which allows for 8% of the gross receipts paid or payable to the assessor to be treated as profit), but only if the gross

receipts of the contractors do not exceed Rs.4 million. In today's fast emerging context of very large-value contracts, such low limits are not justified. Further, the Section 10(23)G benefit of tax exemption available for investments in infrastructure projects has now been done away with and there is a request that it be re-instated and extended to road projects.

41. *Indirect taxes:* Among indirect taxes, the works contract tax (WCT) is worth mentioning. It is applied on the material portion of the contract value. Works contracts of purely labor and services are exempt from WCT. WCT tax rates vary from state to state and no input tax credit is available under WCT in general. WCT has been merged into sales tax or value added tax (VAT) in many states. In VAT states, input credit is provided on locally purchased construction materials. However, the contractor has to adhere to very complicated compliance requirements involving maintaining books of accounts with actual calculation of material and labor portions in the contract. Calculation and application of WCT is in urgent need of streamlining.
42. *Import benefits:* Deemed export benefits were extended to Mega Power Policy projects but not to the large national highway projects. Customs levies on road construction equipment have gradually been reduced over the years but still remain high (currently about 37%) compared to many East Asian emerging economies. The customs and excise duty exemption was only extended to internationally funded projects, but the exemption required issuing of project authority certificates, which were delayed on several occasions leading to time delays in the project. Moreover, although liberal imports of road construction equipment and excise duty exemptions are being allowed, there seem to be some restrictions on re-sale and re-exporting of the imported equipment. As much of the equipment is used in a project for only 2-3 years, this provision is actually forcing many contractors to charge off the full cost of the equipment, ultimately resulting in increased project costs. The absence of a good leasing or rental market for equipment may be part of the problem

#### 4.4.3.4 Entry barriers to road sector

43. Foreign contractors have often faced artificial barriers of entry due to (a) stringent qualification requirements and absence of any provision for the Indian subsidiary of the foreign firms to be able to use the parent company's experience for getting pre-qualified; (b) absence of a level playing field by use of a restrictive domestic preference clause to protect the interest of domestic contractors; (c) stringent visa and travel documentation procedures for international staff; and (d) absence of incentives for technical innovation, efficient implementation management systems and mismatch of the technical specifications and standards with the prevailing international standards. Domestic contractors from other sectors have also faced entry barriers due to stiff qualification requirements related to previous technical experience in the sector. In some states with poor law and order situation contractors have even alleged that they have been unable to buy the bid documents or submit the bids due to poor governance and the formation of contractors' cartels. Moreover, it has been difficult for the medium and small contractors to move up the value chain due to the scarcity of working capital finance<sup>12</sup>. The sector being unorganized, it has not been possible for these smaller players to get an SME rating, which would have given them easier access to finance.
44. In the case of conventional works contracts, the pre-qualification process when adopted seems to have increased the chances of collusion. As a result, many firms choose not to bid, thus reducing competition. In addition, many contractors have managed to circumvent the spirit of pre-qualification by sub-contracting an excessive portion of their contract to incapable subcontractors. In some other cases, the same parties have succeeded in getting pre-qualified through different combinations of joint ventures, effectively reducing the number of active parties, as a firm can bid through one joint venture only. The prequalification process has often been time-consuming, and there has usually been a large

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<sup>12</sup> In China the interest on working capital is in the range of 4-5% depending upon the rating of the corporation, much lower than India.

time gap between prequalification and actual tendering, requiring elaborate updating of prequalification data.

45. A widespread lack of innovative approaches in construction and an aversion to adopting cost-saving cutting edge technologies and trying out unconventional innovative materials in road construction, on a par with international standards, is also an impediment for the industry. This was cited as one of the reasons by some of the international stakeholders for not entering India. The issues in research and development opportunities and recommendations are presented in detail in Annex IV to this report.

#### *4.4.3.5 Administrative/Procedural Issues – Licensing, Clearances, Governance, Law and Order*

46. Setting up a business and obtaining requisite licenses for operation have always remained difficult issues in India with myriad pre- and post-incorporation procedures, excessive time required to complete the registration process, and many payments, both regular and irregular. These issues have also been seriously affecting the road construction industry. The delays in clearance from state and district forest officials on tree cutting, and clearance from state pollution control boards on establishment and operating the quarries and construction plants, have often contributed to considerable delays in project implementation. In the absence of a clear policy or law governing construction labor, contractors have had to manage with a large unskilled and migratory workforce, operating under poor working conditions and exploited by petty labor contractors, unprotected by any form of social security system. These weaknesses have often contributed to low productivity. In some pockets of India the law and order situation has been poor. The contractors operating in these areas have had to pay protection money to the local mafias and to risk the life and limb of their workers, ending up paying higher risk premiums to the insurance companies<sup>13</sup> and further cutting into their limited profits. In areas with poor law and order, several cases of mining quarries being taken over by mafia gangs have been reported, which reduced the supply of key aggregates and pushed up their price. There are instances when the contractors had to placate the wishes of local politicians and powerful local groups by sharing their equipment and resources for free to take up local works beyond the scope of the contract. Overall, the cumbersome administrative procedures and poor governance and law and order situation in some parts of the country have also been a deterrent to efficiency and growth of the road construction industry.
47. On average about 11 steps/procedures are needed for setting up a new business in India. For a foreign company a couple more may be required. The standard requirements for a firm wishing to bid for a road contract take about 70 days, far higher than the 30 days required in South East Asia on an average for about 8 clearances.

#### *4.4.3.6 Profitability and Returns*

48. Profitability and return on capital have been an issue in this sector. Operating profit margins (6-10% typically) are considerably lower than in real estate (about 20-25%), hydropower (about 15%) and other comparable sectors of infrastructure. These low margins can be attributed to delays in overall project implementation, inefficiencies in overall investment climate, and unhealthy competition. It is also speculated that the low margins are usually made up through a compromise in quality, delays and through claims. Analysis of balance sheets from a few selected construction firms in 2006, showed that some mid-size road construction companies were actually destroying value (i.e. the cost of capital was greater than the return on capital employed, or the cost of equity was greater than the return on equity). However, it could not be ascertained whether this value erosion was exclusively on account of road construction business, as these companies had other lines of business too. Improving operating profit margins will be critical to attract investments and new construction companies in this sector. Moreover, the inherent risks and low profitability of the road construction

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<sup>13</sup> Insurance companies charge extra premium of about 0.5% in areas affected by poor law and order – CFI Report on Construction Sector Suggestions for faster implementation of infrastructure

sector make compelling arguments for extending some tax breaks or other fiscal incentives to the industry and accelerating reforms in the sector.

#### 4.4.4 Summary of Business Environment & Investment Climate Issues

49. The investment climate issues mentioned in this chapter affect the various segments of the industry with different degrees of impact. Keeping this issue of differential impact on different segments in mind, an effort has been made to summarize the key investment climate issues relevant for each stakeholder segment, as presented in Table 4.8.

**Table 4.8: Summary of Business Environment and Investment Climate Issues**

Stakeholder segment	Key Issues
Construction companies (conventional contracts)	<ul style="list-style-type: none"> <li>▪ Procedural delays including delays in land, availability leading to time and cost overruns.</li> <li>▪ Withdrawal of Section 80-IA income tax benefits and other taxation issues like TDS Section 10(23)G, and joint venture partners being charged tax on their joint income for the project.</li> <li>▪ Payment of WCT applicable in different states has a cascading impact due to unavailability of input on tax credit, except in cases where inputs are purchased locally and proper accounts are maintained.</li> <li>▪ Availability of working capital finance a constraint, especially for smaller, unorganized players</li> <li>▪ Unavailability of import duty exemption on import of specified equipment in most cases</li> <li>▪ Unavailability of skilled staff at various levels</li> <li>▪ Unavailability of adequate road construction materials and price increases on steel and cement</li> <li>▪ Law and order – a deterrent in certain eastern and north-east states</li> </ul>
Project Developers	<ul style="list-style-type: none"> <li>▪ Issues with model concession agreement: restriction on increase in tolls may limit returns from BOT projects</li> <li>▪ Serious constraints in availability of skilled personnel and semi-skilled/unskilled labor</li> <li>▪ Issues with land acquisition and obtaining encumbrance-free land</li> <li>▪ Ineffective dispute resolution process; role of Independent Engineer unclear and weak</li> <li>▪ Issues with DPR quality and changes in DPRs</li> <li>▪ Availability of adequate road construction materials; price escalation not fully compensated</li> <li>▪ Availability and cost of long-term debt</li> </ul>
Foreign contractors/ developers	<ul style="list-style-type: none"> <li>▪ Entry issues: Experience of parent company not counted as part of that of the Indian firm</li> <li>▪ Availability of encumbrance-free land: acts as an entry bottleneck</li> <li>▪ Difficulty in obtaining visas for expatriate staff</li> <li>▪ Difficulty in obtaining documentation required for substantiating international experience</li> <li>▪ Lack of scope for innovation and rigid specifications in India act as a deterrent to bringing in new technology and know-how.</li> <li>▪ Extending Section 44BBB benefits available for power sector to roads also</li> </ul>
Equipment Suppliers	<ul style="list-style-type: none"> <li>▪ Unavailability of spare parts for equipment</li> <li>▪ Pricing competition from foreign players</li> <li>▪ High import duty on equipment sourced from abroad (31-32% plus cost of freight)</li> <li>▪ Non-uniformity of tax rates (e.g. state sales tax, central sales tax, octroi) across states making inter-state movement of equipment cumbersome</li> <li>▪ Some equipment (e.g. crushers) denied CENVAT benefits, as the plants are used in production of aggregates, which is not “goods” as per current laws</li> <li>▪ Availability and retention of quality/trained manpower</li> <li>▪ Absence of any strong industry body/association to protect the interests of the industry</li> </ul>
Material Suppliers	<ul style="list-style-type: none"> <li>▪ Quarrying rights on aggregates; control of mines by mafia</li> <li>▪ Issue with quality standards for steel used in road construction</li> <li>▪ Increasing prices of key inputs such as cement, steel affect contractors/developers</li> </ul>
Potential Entrants	<ul style="list-style-type: none"> <li>▪ Availability of encumbrance-free land</li> <li>▪ Entry issues because of qualification criteria facing foreign and other sector contractors</li> <li>▪ Skilled manpower constraint</li> </ul>

Stakeholder segment	Key Issues
	<ul style="list-style-type: none"> <li>▪ Reduced requirements for setting up business and have a single window system.</li> </ul>

## 4.5 Supply Constraints Faced by the Industry

50. This section deals with the reasons directly attributable to contractors or consultants for delays in delivery of works. The problems due to scarcity of human resources have also been highlighted. The contractor's construction planning and construction management issues have also been identified as a key constraint, but it can be argued that this is primarily on account of poor quality of human resources and some investment climate issues.

### 4.5.1 Lack of Contractors – in Numbers and Capacity

51. The road construction industry is highly fragmented. From a sample of listed companies, it seems that about 86%<sup>14</sup> of the road construction market is dominated by a few large road construction firms (20-25 in number). The rest of the market is controlled by a few foreign contractors with limited presence in India and several thousand small to medium construction firms. Limited participation of foreign contractors and limited migration of contractors from other sectors of infrastructure did not help in widening the contracting capacity base either. There is also an increasing trend in the industry to move up the value chain from traditional construction contracts to BOT (both annuity and toll) project operators/developers, as the BOT framework is seen as giving the contractors more control over key risks. The project implementing agencies' increasing preference for BOT over conventional contracts (more significantly for national highways) is also actively supporting this trend. This trend, though healthy, is clearly creating a vacuum of good specialist road contractors or sub-contractors who can support the bigger players and foreign contractors in delivery of works to quality, time and budget.
52. The capacity constraint in the industry is evident from the high time and cost overruns in recent road projects and contractors' turnover not commensurate with the input resources mobilized. The road contractors, across the spectrum, suffer from a varying degree of poor construction planning and project management, work methods, sequencing of operations and effective utilization of machinery and other input resources. The capacity constraint can be traced back in history. Before the late 1990s, demand was both low and unpredictable in the road construction sector, and force account was still extensively used by many state road administrations. With a few exceptions, the construction industry was opportunistic, responding to openings as they arose. Nevertheless, while Indian contractors can try to increase their capacity, time is needed to acquire construction management skills and reach the level of mechanization and productivity needed to meet the demands of a large road construction program.

### 4.5.2 Constraints Directly Related to Road Contracting Industry

53. Many of the medium-sized and a few large road construction firms are still family-owned enterprises and suffer from a serious lack of professional management structure and culture. These contractors usually have lacked the expertise of project management and administration, including the right skills to carry out proper cash flow analysis, and planning for use of equipment and manpower. Many such contractors have run into serious cash flow problems and use their inputs inefficiently as manpower sits idle due to lack of equipment or vice-versa. The contractors often seem to misuse the mobilization and

<sup>14</sup> On an analysis of 25 companies available on the Capital Line database, it was noted that large companies (turnover > Rs.10 billion) account for as much as 86% of the market size on the basis of turnover



equipment advances paid to them by diverting them to other projects and this results in major cash flow problems later during the execution of projects.

54. At the technical level the contractors lack staff experienced in contract execution and management. Due to the late development of the road construction industry, the construction firms have had to largely rely on fresh inexperienced civil engineering professionals and some retired engineering professionals from the road administrations. The senior staff who have spent a large part of their career with the road administrations have little understanding of the intricacies of contract management and running a construction firm, as they were mostly accustomed to the force account method of implementation. In several projects, even large Indian contractors found it hard to mobilize and retain professional and skilled staff capable of managing large road contracts. In the absence of a mature supply chain, the contractors often struggled to establish their own stone crushing, hot mix and concrete batching plants and keep them effectively operational and utilized. In some projects average utilization of plant was as low as 40-50%. Although many contractors procured advanced construction equipment taking advantage of exemption of excise and customs duty (applicable for externally aided projects), the contractors did not make adequate provision for spares and inventories, and there was an acute lack of trained operators and maintenance technicians.
55. Contractors have misused the legal option of joint ventures (JVs). Many JVs have been formed for executing large and medium-sized contracts. From a review of 107 on-going NHAI contracts in March 2005, it was revealed that 53 (49% of total) contracts were awarded to joint ventures. Twenty-six percent of those involved an international contractor as the lead partner in the JV. The JVs were often formed to allow one of the partners (in most cases the junior partner) to pre-qualify for the work, without the senior partner expecting to participate substantially in actual implementation of the works. The spirit of joint and several responsibility was commonly flouted, the lead partner being completely absent during implementation, leaving practically all the works to the JV's minor partner(s), who lacked the capacity in managing and implementing such large contracts for which the JV was pre-qualified.
56. Subcontracting was also a rampant issue. In many cases, the contractor became a management company subcontracting nearly all works to small local firms with sometimes no experience whatsoever in road construction. Even more serious, payments were sometimes not disbursed to subcontractors from the main contractor, leading to obstruction of project sites by subcontractor workers. In other cases, it was the Employer who imposed on the contractor to employ specific subcontractors for parts of the works, either frustrated by slow progress of works or other reasons. Indeed, it was also not unusual for subcontractors to work directly with the Employer, circumventing both the main contractor and the engineer.

### **4.5.3 Consultant Issues: Surveying, Investigation and Design Issues**

#### *4.5.3.1 Quality of Survey Reports and Lack of Modern Surveying Techniques*

57. The topographical survey is the most critical activity in project preparation, on which rests project execution. But the quality of survey work is often poor, resulting in several design variations during the execution of projects. In general, the basic concepts of checking and rechecking are not adhered to. Consequently, large errors in the survey results are passed on undetected from the design consultants to the contractors.
58. The quality of the survey reports that summarize the vertical and horizontal survey controls is often substandard. The data from the leveling surveys and GPS surveys performed in the design phase, which establish vertical and horizontal controls for the contractor, are poorly reported on. The report lacks information on accuracy estimates of the produced results (coordinates and heights), units, reference system indicators, controlling reference benchmarks and control points. Use of the GPS surveys has

become normal practice for horizontal controls, but information about the GPS survey method followed (i.e. the occupation time, type of receivers, software, types of antennas, fixed-height tripods, etc.) is not provided in the survey reports. Design consultants often sublet the survey work to the surveying companies and do not take adequate care to ensure quality control. Aerial surveys, even if feasible and of sufficient accuracy, are never undertaken for road projects. Aerial mapping is not possible in the security and sensitive zones.

#### *4.5.3.2 Investigations*

59. Subsoil, pavement, material and hydraulic investigations, which form the basis of good engineering design, are often carried out by semi-skilled professionals sub-contracted by the design consultants. Poor and inaccurate levels of details often cause problems during implementation and sometimes necessitate repetition of these activities during project implementation and consequent disputes and delays. The use of modern and faster investigation techniques and instruments such as falling weight deflectometers, road profilometers, or nuclear density gauges, is also very limited and constrains the designer's ability to accurately assess the material properties, proper treatment type and quantities.

#### *4.5.3.3 Substandard Quality of Design*

60. The poor quality of designs, prone to several variations during the construction, is also one of the reasons for delays in project delivery. In many cases, under time and cost pressures designs are not carried out and consultants fail to anticipate the field conditions with reasonable accuracy. Nor do they explore alternative designs in sufficient detail to determine cost-effectiveness.
61. In the present (conventional) system of contract delivery- engineering, procurement and construction, the contractor and supervision consultant are left to solve problems without the benefit of the background knowledge the design consultant had obtained through public consultation, study of the general area and deliberation with state and local governmental officials. The design consultant may have made design decisions based on information of which the contractor and supervision consultant is unaware. Some way to retain the design consultant during the construction phase, as was done in the Bank-funded state highway projects, needs to be looked at.

#### *4.5.3.4 Unrealistically Low Consultant Fees*

62. There is a tendency among consultants to quote low prices, expecting to cut corners at the survey, investigations and design stages (probably to be consistent with some outdated rules of thumb). The norm is to limit design services, even for very complex projects, to no more than 12-18 months, sometimes leaving the consultant too little time to estimate properly the construction inputs needed without compromising on quality. The limited time and cost resources restrict consultants' ability to accurately design, innovate and apply modern techniques in the design process. Many consultants under-estimate the time needed for construction, requiring multiple time extensions, due to ignorance or neglect of site-specific conditions and complexities. The contract period is often dictated by the pressure on the implementing agencies to build the road in a constrained time frame decided with an eye on the next election at the state or central levels.

#### *4.5.3.5 Lack of Thrust on Quality Control and Optimization of Costs*

63. There appears to be no routine design review, constructability check or ground verification of designs prepared by the consultants. The implementing agencies lack in-house resources and capacity for design review and checks, which results in design variations during the construction and causes delays that could have been avoided. It is often observed that no efforts have been put in by the consultants to

optimize design. A recent design and construction review undertaken on a sample of contracts also indicates that there is scope for improving designs in road projects. This issue can be largely addressed by adopting a tool called “value engineering (VE)” in the design process. Value engineering is a detailed and systematic review of the design carried out by industry experts and selected stakeholders, which improves the quality of design and constructability as well as reduces the life cycle cost of the project. The concept of VE is well known in the highway industries of the developed countries but is relatively unknown in India. A detailed note on the value engineering process and its benefits is attached as ANNEX V to this report.

#### 4.5.3.6 Accountability of the Consulting Industry

64. There is a general lack of accountability and professionalism at all levels in the consulting industry. Design and supervision consultants are not held accountable for their performance; no performance management system exists in India to measure their performance. There is also no form of liability on the consultants for the costs incurred by the nation due to poor quality of work rendered by them at design and supervision stages.

#### 4.5.4 Human Resources and Skills Development Issues

65. Both the investment climate surveys and the surveys on input resources highlighted the shortages of skilled persons as the most critical input factor for the construction industry. These shortages are prominent across all segments of the human resources engaged in the construction industry. Although the industry has a cheap labor advantage, the fact that productivity is low<sup>15</sup> and the equipment downtime is high is a manifestation itself of low level of skills even for the masons, welders, mechanics, electricians, carpenters, bar benders and machine operators. No classroom or on-the-job training courses are offered, though a system of certification and registration is available for masons, carpenters, and electricians. Limited Industrial Training Institute courses are offered for some skills like mechanics, welders and operators. The opportunity for enhancing skills for these semi-skilled professions also gets constrained due to the high level of illiteracy among the construction workers and the prevailing culture of general lack of appreciation towards quality and good workmanship in road construction. At the other end of the spectrum, the contractors suffer from lack of quality construction managers and planners, skilled accountants and finance managers and even sometimes experienced and average skilled construction engineers and foremen. Due to the late development of India’s road construction industry, very few engineers experienced in road construction are available in the market and the contractors have to depend largely on retired executives from the road administrations and fresh inexperienced engineering graduates. After obtaining the initial academic qualifications and degrees/diplomas there is no system of periodic re-evaluation of technical personnel to validate their appropriateness for the job.
66. Only 3% teaching in the country addresses the direct need of the construction industry. <sup>16</sup>Why? The profession of civil engineering lost some of its sheen in the past decades (eighties and nineties) due to evolving competition from other sectors of engineering like electronics, telecommunications and computer science, where the entry-level emoluments have been much higher and the quality of life better. Surprisingly, even in last ten years while the demand for civil engineers has sharply risen due to the spurt in infrastructure investments, the entry-level salaries for civil engineers have not significantly improved, offering young aspiring students little incentive to join this stream. Even today the more

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<sup>15</sup> According to an MIT study quoted in the Construction Federation of India Study on “Construction Sector Suggestions for Faster Implementation of Infrastructure”, against a human Productivity Index of 100 in the USA, Japan is 52, Egypt 10 and India a poor 3.

<sup>16</sup> 14<sup>th</sup> Engineering Congress on Human Capita Development, January 2002, as quoted in the paper by Laskar and Murty referred to in Chapter 2.

talented civil engineers are migrating to IT and other more attractive services. Many of India's mid-sized road contracting firms are family-managed firms and not professionally run. The engineers do not find adequate opportunities for advancing their careers in such family-run businesses and therefore abstain from joining them. So much so, that some engineering colleges have now discontinued their degrees in civil engineering. Overall, the dearth of skill at the senior technical and management level is as acute as that of the operators and semi-skilled workers.

67. Other studies done for some specific states show that quite a proportion of civil engineers do not get a job immediately after graduation and hence are forced to change their areas of work. This has been attributed to: (i) an acute shortfall of trained faculty, which results in poor level of skills and knowledge in fresh graduates; and (ii) a large disconnect between the academic curricula and the industry requirements.
68. Increasing use of private financing and public-private partnerships would add many challenges to the sector's knowledge gap. Skills are and will be required not only in technical designs but also in project management, financial and legal aspects, and social and environmental aspects. The inevitable increase in project/contract size will add further complexities. While the government agencies dealing with roads will increasingly face the challenge of rational planning, project identification and development, efficient and transparent contract procurement, administration, operation and management of roads to give road users a good quality of service, the contractors will be facing difficulties in getting skilled workers, equipment operators and quality construction managers. The consultants would also face shortage of experienced and skilled personnel for design and engineering for undertaking feasibility studies, as well as preparation of detailed project reports and for supervision of projects during construction.
69. One of the aspects noted during the limited data collection process is that the state road agencies and the rural road agencies have a much higher level of staffing than most contractors. Are these agencies overstaffed vis-à-vis the responsibilities and work to be done in the respective areas? This could be an area which needs to be looked at by the government with a view to re-allocating people to more useful areas. Some countries have tried this out – China, New Zealand and Shropshire county in the UK.
70. Capacity building through training of various stakeholders in the road sector thus leaves a lot to be desired and it is now posing one of the formidable challenges to meet the needs of several ambitious programs announced by the Government. It is, therefore, imperative that the central and state governments attach high priority to the need for training in the highway sector. A detailed note on skill development and training issues and recommendations is attached as Annex III to this report.

## 5. Assessment of Demand over the Medium Term

### 5.1 Context

1. This chapter forecasts the demand likely to be generated in road construction over the medium term under three different scenarios and analyses the gap between demand and supply of critical input resources and number of contracts/contractors in each scenario. We also keep in mind the possible marketing of India's road sector and construction industry program over the next 5-8 years.

### 5.2 Projection of Future Demand

#### 5.2.1 The three scenarios

2. Based on the issues and the constraints highlighted in Chapter 4, an assessment of demand has been made for the eight-year period from 2007-08 to 2014-15. Three typical scenarios considered are: (i) Scenario 1 - Growth rate extrapolated as per achievement in the last five years (2000-01 to 2004-05), i.e. lower growth rate; (ii) Scenario 2 - Medium growth scenario as per the vision documents of the states and the country; and (iii) Scenario 3 - High growth scenario incorporating the massive investments in national highways and rural roads announced by GOI.
3. For Scenario 1, the trend of total annual road sector expenditures over five recent years (FY01-05) was extrapolated by regression analysis. This scenario represents the likely investments based on the past growth trend and can be considered as the lower bound projection. For Scenario 2, a medium growth scenario, the expenditure projections were based on the planned projections by the various road authorities/departments and the vision documents published by GOI. An assumption of 10% annual growth was made for the national highway (NH) works under MoSRTTH and the Border Roads Organization (BRO), as separate planned projections were not available for these sectors. Scenario 2 represents a combination of (a) NHAI's own projection for NH works under its jurisdiction, (b) 10% annual growth for other NH works under MoSRTTH, (c) 10% annual growth for NH works under BRO, (d) state highway projection from the Vision 2021 documents, and (e) rural roads projection from the Vision 2025 document. Scenario 3, a highly optimistic scenario, incorporates (a) the massive investments in national highways to achieve accelerated growth during the 11th Plan period by 2012, and (b) announced expenditure of Rs. 480 billion on rural roads under "Bharat Nirman Scheme" for the period 2005-2009. For national highways under MoSRTTH and BRO and for the state highways the projections under this scenario are identical with Scenario 2.
4. All past and future expenditures in the three scenarios were normalized at 2004-05 prices for ease of comparison. The scenarios are presented in Table 5.1 below.

**Table 5.1: Explanation of the Three Scenarios**

Scenario (Low Growth)	Scenario II (Medium growth)	Scenario III (High Growth)
Extrapolated from 2001-05 expenditure on National Highways (NH), State Highways (SH) and Rural Roads (RR)	NHAI's own projection	NHAI's accelerated growth projection
	+	+
	10% annual growth for other NH under MOSRTH	10% annual growth for other NH under MOSRTH
	+	+
	10% annual growth for NH under BRO	10% annual growth for NH under BRO
	+	+
	Vision Document 2021 for SH	Vision Document 2021 for SH

	+	+
	Vision Document 2025 for RR	Bharat Nirman Scheme for RRs

### 5.2.2 Items covered in Demand Projections

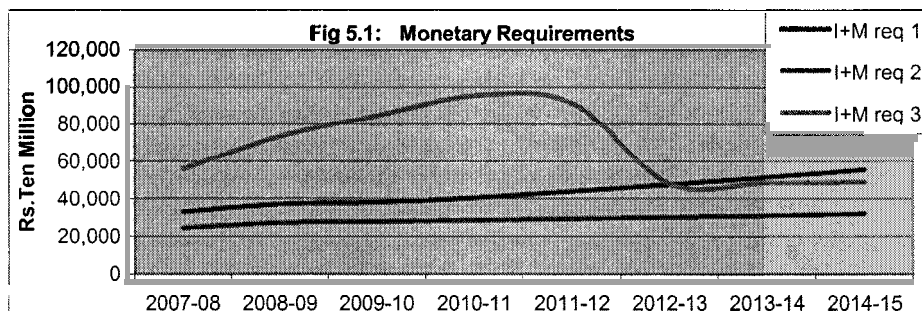
5. The main items for which the demand projections have been carried out are (i) monetary values of projected expenditure for the entire road sector; (ii) distribution of probable contract sizes being executed each year and therefore the need of the corresponding sizes and numbers of contractors; (iii) human resources; (iv) key road construction equipment; and (v) critical input materials like cement, bitumen, steel and aggregates. The above assessment also includes an estimate for maintenance requirements for the investment plans – though only in a very rough manner.

### 5.2.3 Projection of Expenditure

6. The expenditure projections (Rs. billion) in the sector over the period 2007-15 projected under the three scenarios are shown in Table 5.2 below. The first three rows of the table give the capital works investments under the three scenarios, whereas the last three rows add in the maintenance expenditures. For a realistic estimate of maintenance on national highways, it has been assumed to grow annually by 10%, keeping up with the growth in the network. For state highways, the maintenance expenses have been assumed to grow annually by 5% from the level stipulated in 12th Finance Commission Report.
7. The accelerated national highways and Bharat Nirman Program (for rural roads) are planned to be substantially completed by 2011-12. Therefore, in Scenario 3 for capital works investments, the projection beyond 2011-12 has been made to account for only some residual limited capital investments, and full maintenance investments for the assets created. The projected figures are marginally lower than Scenario 2 in 2012-15. From the analysis, it is evident that the present level of capital expenditures will have to be more than trebled over 2008-2011 under Scenario 3, which will indeed be a very tall order. Even under Scenario 2, the capital expenditures will be increased by about 80% from the present level during years 2012-15. The expenditures actually incurred during FY 2006-07 and FY 2007-08 for national highways and rural roads have been around the Scenario 2 values predicted for these two years.

**Table 5.2: Projected Capital Investments in the Road Sector (billion rupees)**

Year	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
<b>Scenario 1</b>	199.8	204.2	208.5	212.9	217.3	221.6	226.0	230.4
<b>Scenario 2</b>	285.3	303.5	310.3	330.6	362.4	395.6	429.6	465.4
<b>Scenario 3</b>	516.3	667.2	777.5	881.9	840.3	400.0	400.0	400.0
<b>Maint req</b>	70.2	72.8	75.6	79.7	84.1	88.7	93.5	98.6
<b>Sc-1+Maint</b>	267.0	277.0	284.2	292.6	301.3	310.3	319.5	329.0
<b>Sc-2+Maint.</b>	355.5	376.3	385.9	410.3	446.4	484.3	523.1	564.1
<b>Sc 3+Maint</b>	586.5	740.0	853.1	861.6	874.4	488.7	493.5	498.6



8. The above analysis (Fig 5.1) shows that the industry capacity will have to gear up to respond to the increased demands. The reforms in the sector need to be accelerated also to enhance the road construction industry's efficiency to meet the investment targets set by the country's planning bodies.

#### 5.2.4 Projection on Number of Contracts

9. It is obvious that to deliver the increased capital investments the number of contracts every year will significantly increase. Based on the past trend of contract size mix in various categories of road works (i.e. NH, SH and RR) the total number of contracts for all categories of road works was projected up to 2015, under the different scenarios. The contract sizes assumed for this analysis are large (> Rs 1,250 million, i.e. \$28 million), medium (Rs 400-1250 million), small (Rs 50-400 million) and very small (< Rs 50 million). The contract sizes were kept the same as the past performance analyses for ease of comparison, although it is envisaged that with the present focus on PPP in both national and state highway sectors, the contract sizes will become larger, and in any program the mix of contracts will be skewed more towards larger contracts. The projection, presented in the table below, shows that under Scenario 2, by 2015 the average number of large and medium contracts being executed every year will be more than double the present level and would be more than four times under Scenario 3. The total number of contracts will grow from the present level by about 80% under Scenario 2 and 125% under Scenario 3.

**Table 5.3: Annual Average Numbers of Contracts of Different Sizes (2007-15)**

Contract sizes	Scenario 1	Scenario 2	Scenario 3
Large	90	180	400
Medium	100	250	550
Small	2,800	5,100	6,600
Very small	4,100	7,100	8,800
<b>Total</b>	<b>approx 7,100</b>	<b>approx 12,600</b>	<b>approx 16,400</b>

10. Considering the present trend of outsourcing periodic maintenance works, it is envisaged that about 30% of periodic maintenance works will be procured through contracting in the study horizon of 2008-14. In that case the total investments to be executed through maintenance contracts will grow from about Rs. 140,000 million (\$3 billion) in 2006-07 to about Rs. 270,000 million in 2014-15. This could translate to addition of about another 4,000-5,000 small contracts by 2014-15. The detailed input resources analyses for the maintenance contracts have been kept outside the purview of this study, considering that there could be some freed up capacity from small contractors engaged in state highways and the rural sector to participate in such contracts by the time this concept takes root. However, the industry has to remain prepared to cater to the additional demands generated from such maintenance needs also.

### 5.2.5 Projection on Human Resources (HR) Requirements

11. The HR projection includes those of road agencies at the center and state levels, the contractors and the consultants. It includes the full range of skilled staff from engineers to surveyors and operators. The HR information furnished by the various road agencies, contractors and consultants formed the basis for projection. Since staffing needed for contractors is closely correlated with their turnover and the road agency and consultants' supervisory manpower with the level of investments made, our projections were made using a regression model. The results (Table 5.4) were then verified for reasonableness against the number of contracts and the typical manpower structure for execution of such contracts.

**Table 5.4: Skilled Human Resources Required (000 persons)**

Year	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
<b>Scenario 1</b>	116.5	123.5	130.5	137.5	148	158.5	169	180
<b>Scenario 2</b>	141	152	160	171.5	190.5	210	229	249
<b>Scenario 3</b>	258	319	356	382	339.5	200	200	200

12. It can be observed (in Table 5.5) that the annual average skilled staff requirement under Scenario 2 will be about 200,000, while under Scenario 3, the annual average requirements during the peak demand period of 2007-2012 will be a whopping 330,000. This would represent about 30% and 120% increases respectively from Scenario 1.

**Table 5.5: Peak Annual Requirements (\* average over 2007-12)**

Skilled HR Req'd- Annual Average	Scenario 1	Scenario 2	Scenario 3
<b>Total (approx)</b>	150,000	200,000	330,000*

### 5.2.6 Projection on Key Construction Equipment

13. The key equipment considered for this study include items like pavers (electrical and mechanical) for bituminous and concrete pavements, hot-mix plants, concrete batching plants, motor graders, tandem rollers and crusher plants. Like human resources, it was also observed that the total major equipment requirement could be correlated with the contractors' turnover through a regression equation ( $R^2$  in the range of 0.86 to 0.98). The projections (Table 5.6) were made individually for separate categories of equipment and then combined to develop a total projection scenario. These numbers were then verified from the aspect of expected average equipment usage for contracts with respect to the projected number of contracts under the various scenarios. As presented in Table 5.7 below, the annual average requirement in Scenario 2 will be about 60% higher than Scenario 1. The equipment requirement in Scenario 3, over the peak period of 2007-12, will be about 3 times Scenario 1, which would indeed be a challenge to meet.

**Table 5.6: Key Equipment Requirements (000 units)**

Year	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
<b>Sc - 1</b>	27.7	28.3	28.9	29.5	30.1	30.7	31.3	31.9
<b>Sc - 2</b>	40.5	43.4	45.0	48.5	53.3	56.8	64.0	70.0
<b>Sc - 3</b>	83.6	111.3	114.6	109.2	100.2	55.0	56.0	58.0

**Table 5.7: Peak Annual Requirements (000 units)**

Key Equip Req'd- Annual Average	Scenario 1	Scenario 2	Scenario 3
<b>Total (approx)</b>	35.0	55.0	100.0*

\* average over 2007-12



## 5.2.7 Projection on Critical Construction Materials

14. Requirements for critical road construction materials, i.e. bitumen, cement, steel and stone metal/aggregates, were projected for the period 2007-15 under the three scenarios. The estimate was based on case studies carried out for different types of works under national highways, state highways and rural roads. The estimated material consumption was then correlated with the number and size of contracts and in turn the level of capital investments these contracts support. The projection (Table 5.9) was based on the same rate of growth as the capital investments.
15. The annual average key material requirements under different scenarios are presented below in Table 5.8. It is evident that average annual material requirement under Scenario 2 will be increased by about 60-65% over Scenario 1. For Scenario 3 the annual average requirement of key construction material during the peak demand period of 2007-12 will be 2.6 to 3.2 times the 'business as usual' Scenario 1.

**Table 5.8: Annual Average Key Materials Requirements (mn tc**

Materials Required	Scenario 1	Scenario 2	Scenario 3*
Stone metal	170	280	450
Bitumen	1.25	2.0	4.0
Cement	6.5	10.5	17.0
Steel	1.25	2.03	3.28

**Table 5.9: Annual Key Input Materials Required**

Year	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
<b>Aggregates (million ton)</b>								
Sc - 1	159	163	167	167	172	176	177	177
Sc - 2	220	235	252	266	291	321	346	364
Sc - 3	375	485	496	466	425	300	310	315
<b>Bitumen (000 tons)</b>								
Sc - 1	1,093	1,140	1,153	1,183	1,213	1,298	1,372	1,402
Sc - 2	1,743	1,782	1,745	1,826	1,984	2,146	2,411	2,580
Sc - 3	2,815	3,665	4,745	4,421	4,167	2,000	2,050	2,100
<b>Cement (million tons)</b>								
Sc - 1	5.6	6.1	6.3	6.5	6.6	7.0	7.1	7.1
Sc - 2	8.7	9.1	9.2	9.7	10.6	11.6	12.6	13.5
Sc - 3	13.1	16.8	17.9	18.5	18.5	10.0	10.3	10.5
<b>Steel (000 tons)</b>								
Sc - 1	1,139	1,170	1,201	1,232	1,263	1,337	1,325	1,356
Sc - 2	1,659	1,751	1,757	1,856	2,033	2,213	2,397	2,586
Sc - 3	2,510	3,210	3,038	3,538	4,106	2,000	2,050	2,100

## 5.3 Gap Analysis

### 5.3.1 Number of Contracts vs. Contractors

16. Data collected from progress reports of NHAI projects and other state highway projects show that at present approximately 200-220 medium-to-large contracts are under way (excluding contracts whose award took place less than 3 months ago, as well as contracts which are likely to finish in the next three months). In Scenario 2, the requirement is increasing the contract numbers to about 400 in 2007-08 to about 500 in 2014-15. This calls for an immediate doubling of contractor capacity. For Scenario 3, this

value goes up to about 900 contracts in 2007-08 and to about 1,100 in 2011-12. This implies that the capacity may need to be five times larger if the demands of the accelerated program are to be met. As mentioned earlier, this range of contracts are presently being undertaken by a pool of about 60 contractors (national and international), who are already stretched with unsatisfactory performance levels.

17. Meeting the high demand would only be possible if many of these large construction companies diversify into the road sector and foreign construction companies also participate in a substantial manner. This increase in demand would also offer an opportunity for innovative arrangements like hiving off independent public sector construction companies from the state road administration organizations (public works departments). Further, as more and more large BOT projects are being mooted in the road sector, in the near future the country will also need to seriously promote participation of very large conglomerates/joint ventures to deliver contracts of sizes above Rs. 6 billion (about \$130 million). Recent press articles indicate such concessions being let out for Rs.10 billion.
18. As of now about 6,000-6,500 small and very small contracts are being executed in the country under the state road agencies and the rural road agencies. This is expected to substantially increase over the next 8 years by about 100% under Scenario 2 and 150% under Scenario 3. However, it is estimated that about 27,000 such small contractors are available in the formal sector and over 250,000<sup>17</sup> small contractors, suppliers and subcontractors are engaged in various sectors of infrastructure in India in an informal manner. It is expected that the demands can be met if the work environment is made more conducive and opportunities for reasonable profits can be facilitated. Many of them could be trained to become specialist sub-contractors to provide support to the big contractors and strengthen the supply chain. Further detailed recommendations on increasing the number of contractors are presented in Chapter 7 of this report.

### **5.3.2 Human Resources**

19. It is observed that the numbers of skilled and semi-skilled persons working in the road sector are still growing at a moderate pace and could only be able to cope up with Scenario 1. Surveys done show that the number of such manpower working in the road sector at present is about 110,000. Data mining and some realistic assumptions suggest that at present about 6,000-7,000 fresh engineers and diploma holders are joining the road sector workforce (replacing retirees from the sector). But this is not even sufficient to even meet the annual increased requirements of 7,500-10,000 skilled personnel under Scenario 1 over the next eight years. Under Scenario 2 this annual requirement increases from a minimum of 10,000 to about 20,000 over the next eight years. The additional annual average requirement of such persons, whose qualifications are a diploma and above, could be about 50,000 over the period 2007-15. The annual average peak requirement of such skilled persons increases to about 330,000 during the next five-year plan. The annual increase under Scenario 3 increases from a minimum of about 25,000 to a maximum of about 60,000.
20. The scarcity of human resources is clearly visible in the road sector from the inexperienced staff available at site or retired government officers working on site. Also frequent requests for replacement of key staff of contractors and consultants who leave existing assignments for even slightly better emoluments are noteworthy. In order to meet such large increase in the demand, the number of civil engineering graduates and diploma holders joining the profession after getting their degrees and diplomas should be increased at least 2-3 times by making the civil engineering profession more attractive and by substantial enhancement of the present level of market compensation, at least at the entry level. For meeting the peak demand, as short-term antidotes, it would also be worth exploring the

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<sup>17</sup> Construction Federation of India: Construction Sector Suggestions for Faster Implementation of Infrastructure in the 11<sup>th</sup> Five Year Plan

opportunity of hiring engineers from other developing countries and encouraging returning Indian expatriates to participate in the expanding road construction program (reverse the brain drain). Further detailed recommendations on enhancement of human resources are presented in Chapter 7.

### 5.3.3 Key Construction Equipment

21. Due to the import incentives being given to contractors and developers, the critical equipment pool available has improved considerably and can be said to be between the needs of Scenarios 1 and 2. To satisfy the average demand for equipment over the next eight years under Scenario 2, the supply of major equipment needs to be increased by about 60% from the Scenario 1 base case. Likewise, the average peak demand under Scenario 3 during the coming five-year plan would warrant an almost three-fold increase over Scenario 1 in the supply of major equipment.
22. Considering the present capacity of domestic equipment manufacturers, it would be imperative to provide a major boost to their production capacity and also streamline the equipment import procedures to meet such high demands. As enabling measures, it would be essential to encourage the equipment rental market, provide fillip to equipment bank and leasing concepts, promoting setting up of an efficient supply chain industry for equipment spare parts and improved operator/technician training. Detailed recommendations to bridge the demand supply are presented in Chapter 7.
23. Another point which needs to be borne in mind and which has been observed during the Bank missions, is the long downtime whenever equipment breaks down. This is either due to the non-availability of critical spare parts or the need to fly down the technical support team from abroad or from the regional center. This downtime varies from 15 days to 2 months. The after-sales service and spares could be franchised out to local Indian firms by the international manufacturers to minimize delays due to repairs.

### 5.3.4 Key Construction Materials

24. A demand–supply gap analysis of key construction materials (aggregates, bitumen, cement and steel) is presented in Table 5.10 below.

**Table 5.10: Materials Needed for Road Construction**

Gaps (million tons)	Aggregates	Bitumen	Cement	Steel
Planned capacity	Naturally occurring	6.37	255	88
Maximum Req'd. (approx)	550-600	4.6-5.2	18-20	5

25. Cement, steel and bitumen are commercially available materials, while the aggregates are naturally occurring. Of the above, except bitumen, there are competing demands from other sectors for these materials. It would be prudent to carry out the demand analysis for commercially available construction materials keeping in mind the total planned capacity of such materials in the medium term. The road sector represents only a small percentage of the cement and steel requirements for the overall infrastructure activities in the country. However, the maximum annual average peak demand of bitumen would be close to the planned installed capacity and it might be necessary to import bitumen from time to time to meet the peak demands, often bunched during the pre-monsoon and the post monsoon dry months of the year. This is also because, as part of our analyses, we have not fully taken account of the maintenance requirements. Stone extraction and aggregate production is already facing constraints due to (a) restrictions on quarrying in certain parts of the country due to stringent mining/quarrying regulations and increasing awareness on health and safety issues of quarry workers, and (b) under utilization of the crushing plants partly due to weak supply chain management, poor maintenance and

upkeep of the machineries and increasing local protests on quarrying around the habitation and work areas. Unless these issues are dealt appropriately and timely, increasing the present aggregate production to two to three fold will be a remote possibility.

26. Bureau of Indian Standards certification requirement of foreign cement plants under the Cement Quality Control Act may cause some artificial restrictions to cement import when there is an increase in demand. This needs to be looked into so as to reduce any artificial barriers to cement import and to introduce an element of competition. The option of innovative pavement design (e.g. use of cement stabilization techniques or in-situ ground improvement techniques to reduce the thickness of granular pavement layers) needs to be seriously explored to achieve reduction in quantity of stone aggregates. If the availability of cement is eased, it would also make eminent sense to look at cement concrete options at state, urban and rural road levels along with concepts like white-topping.

## **6. Experience on Evolution of the Industry**

### **6.1 Context**

1. As part of the study to identify ways that could help strengthen the capacity of the Indian highway construction industry, two developing countries that have experienced recognized success in the development of their own highway networks were selected as case studies to determine how the network development was achieved. The objectives of the case studies were to:
  - (a) understand how the highway network was developed,
  - (b) understand how the highway construction industries in the selected countries have strengthened their capacity to meet the requirements of their governments' highway network expansion plans, and
  - (c) identify what measures were taken by the governments and the industry itself.
2. The case studies provide a list of lessons learned that may be useful for India to consider as it implements its highway development plans. Similarly a developed country, France, which had undergone considerable reforms in the road construction sector during the last decade, was selected to identify ways in which the Government provided support to the industry. It did so by strengthening its concession framework, improving infrastructure financing arrangements, streamlining contract administration and enhancing its quality management framework. The industry has responded by adopting innovative technology and management measures, grown in size and capacity through mergers and acquisition, and proactively managed the human resources and skills challenges. All these reform measures bear significant relevance for India and are immensely useful lessons to learn from. Further, best practices from one Indian state, Gujarat, were also studied to understand how the highway construction industry has performed more efficiently in that state, achieving quality output with minimal time and cost overruns and contractual disputes.

### **6.2 Selection of Countries**

3. As comparator developing countries, initially four countries were considered as candidates China, Korea, Malaysia and Vietnam. The final selection was China and Malaysia. China was selected due to its similar size and population to India and because it has demonstrated that it has the capacity to be able to achieve the fastest development of an integrated highway network in the world. Malaysia was chosen since it has earned itself the reputation of creating the best expressway network in Southeast Asia and has based the network on the principles of BOT. The full case study is attached to this report as ANNEX II.
4. As a developed country comparator, France was a natural choice as the French road construction industry has experienced substantial growth over the last decade and is globally ranked as the second major exporter, after the United States, in terms of turnover abroad. France is also home to two top road contracting firms in Europe and has a long-standing tie with India in technology transfer and business delegation exchanges in the road construction sector. Further, France has recently embarked on a serious effort to improve its PPP framework to be more competitive in the larger European Union construction market and the industry itself has undergone substantial reform to adopt innovative technology and management culture and to improve its human capital.

### **6.3 China Case Study**

#### **6.3.1 History of Highway Development**

5. According to the China Highway Construction Association, the expansion of the road networks in China has dramatically increased from 0.9 million km in 1978 to 1.7 million km in 2000 and to 3.45 million km in 2006. These figures include expressways, all classes of roads and all unclassified roads down to and including, village level. From 1990 to 2006 during the period of the eighth, ninth and tenth Five-year Plans, China completed nearly 45,000 km of high-grade toll expressways through the investment of upwards of US\$40 billion per year. This unprecedented expansion in the expressway network was accompanied by continuing development of intermediate Class I and II roads under the coordinated efforts of the national government and the governments of China's 31 provinces and municipalities. No other country has been able to create such a major enhancement to its national road asset base in such a short period. In the initial planning days the traffic use of roads was very mixed with animal driven carts, cycles, tractors and trucks, resulting in an overall low efficiency. As the master plan was developed, the main deciding factor was not how it would be funded, but what type of road and what type of network was needed. After the decision on the type of roads had been established, the way to raise funds was analyzed and ultimately appropriate financial policies were introduced.
6. The expressway program started gradually from 1988 to 1997, when approximately 10,000 km were completed through the construction of eight sections of expressways. After gaining considerable experience the Chinese highway industry was capable of achieving the rapid development which occurred between 1998 and the present, when nearly 45,000 km of expressways were completed. In 1992 the State Council issued the "5 - 7" Expressway Trunk Highway Network Plan, which was designed to connect all the major cities and provincial capitals with populations greater than 500,000 by the construction of 12 major expressways – five vertically (north-south) and seven horizontally (east-west). In 2005 the central government revised this plan with the "7-9-18" Expressway Trunk Development Plan. This expanded the initial "5-7" plan to have expressways linking all provincial capitals and all the large and medium-sized cities with populations of more than 200,000. This was to be achieved by the construction of seven vertical, nine horizontal and 18 expressways linking the others through radial and grid patterns to maximize coverage and connectivity.

### 6.3.2 How Was It Achieved?

#### 6.3.2.1 Building Management Capacity

7. At the beginning of the expressway planning in the late 70s there was little experience within the Chinese road construction industry of high-quality design, procurement, implementation, construction and management of highways. The main construction companies in China were state-owned enterprises (SOEs) with insufficient experience in large highway construction to be competent to undertake the new expressway expansion on their own. The government of China understood that the international contractors who undertook mainly large scale and technically complicated projects brought to their Chinese counterparts advanced technology, improved management techniques and modern, high tech equipment. They therefore invited the international contracting community to become involved with their initial expressway projects, but with strict requirements that all contractors had to bid the project as a joint venture with local Chinese construction companies as partners. The international contractors who were attracted to China were predominantly from Hong Kong, Japan and South Korea<sup>18</sup>.
8. China recognized from an early stage in the highway development process that it was vital to develop an effective and workable Master Plan. To achieve this goal the provincial governments would need to be fully involved, since they were to be responsible for implementing the program. At the national level the Ministry of Communications (MOC) established a comprehensive planning department which designed the master plans with inputs from the international community. The MOC organized training

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<sup>18</sup> Source: ILO paper "The Construction Industry in China" October 2001

to build capacity in the provincial agencies but each province dispatched study tours to other countries to improve their knowledge. By 1998 they believed that they had mastered both the management and the technology of the highway construction business and they were well prepared for the rapid expansion.

#### *6.3.2.2 Industry Structure*

9. In 1978 the Chinese Communist Party announced the decision to shift the focus of its work from class struggles to economic development. This was the beginning of major institutional changes. The vast majority of businesses were SOEs and the government recognized that the policy of using SOEs as a social framework for employment was leading to major inefficiencies and debt due to bloated pay rolls, redundant construction, and incompetent management. The Government believed that construction could be a profit making industry and they introduced a series of reform programs, which included the principle that SOEs were to be run on a corporate basis. The speed of SOE reform substantially accelerated after China's accession to the WTO in December 2001<sup>19</sup> and by May, 2003 new regulations were introduced to allow foreign investors to buy blocks of hitherto non-transferable "state shares" and "legal person shares" in Chinese domestically owned companies.
10. Today the industry consists of large SOEs, some with substantial private ownership through share holdings, small SOEs and small private subcontractors and specialized subcontractors. There is a comprehensive supply chain.

#### *6.3.2.3 Building Manpower Capacity*

11. China enjoys wide manpower resources from the many central and provincial SOEs and it was only up to the mid/late 90s that the capacity was considered to be insufficient to meet the demands of the expressway program. The Chinese highway industry rapidly learned from their international joint venture partners and MOC now reports that it is now unusual to require the assistance of the international highway building community on expressways<sup>20</sup>. Skilled operators for plant and equipment have been trained initially by the international machine manufacturing companies who when selling plant and equipment to Chinese companies arranged to either train operators in their own country and/or send trainers to China with their equipment to work alongside the trainee operators.
12. There has never been a shortage of high caliber civil engineers in China. The profession is highly regarded in the community and salaries are higher than the average for other professions. There is great competition for students entering universities, particularly certain institutions and the interest in civil engineering has been defined as "hot"<sup>21</sup>.

#### *6.3.2.4 Building Equipment Capacity*

13. At the beginning of the expressway expansion most high tech and sophisticated construction equipment and plant were imported. Entrepreneurs in China then obtained the specifications for the machinery and began manufacturing their own, sometimes in joint venture arrangements with foreign manufacturers.

#### *6.3.2.5 Materials Capacity*

14. At the beginning of the expressway program there was a possibility of a shortage of some materials such as cement, but businessmen became aware of the potential rewards and invested in new

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<sup>19</sup> Source: Dr. B.A. Shusong of the Finance Research Institute, State Council of P.R. China

<sup>20</sup> Source: Interview with MOC on May 31, 2007

<sup>21</sup> Source: Interview with CCCC on May 31, 2007

manufacturing plants. These companies are generally still SOEs. The only construction material that needs to be imported is bitumen and occasionally some very specific high grade steel.

### *6.3.2.6 Regulations and Associations*

15. The construction industry in China is regulated by the Ministry of Construction (MOCn), who applies and monitors regulations and legislation relevant to the industry. It checks the qualifications of construction companies when bidding for projects; monitors and administers the licensing law; and monitors the construction process and administration of projects. Major regulation changes have been introduced to assist the development of the industry. The government has encouraged the creation of trade associations for almost all branches of construction and these are in close communication with the MOCn and in some cases have adopted the responsibility for self-regulation.
16. There has been a growing acceptance in China to use other forms of procurement such as Design Build/Turnkey; and BOT --although the use of BOT has not been too successful in the Chinese highway construction market.

### *6.3.2.7 Funding Restructuring*

17. Before the adoption of reform and opening of China to the outside world, the financing of highway construction was controlled through the provincial governments. This limited the investment in highways, so at the beginning of the expressway planning in the 1980s China began to source highway construction from loans provided by local banks and introducing relevant policies, rules and regulations. From the early 1990s China continued with a combined investment system which included investment by central government, local government through their ability to charge tolls, social capital and foreign capital and using the principle of “build with a loan and repay through charging tolls”. In 1998 the Government created a fresh source of funding by establishing the special fund on infrastructure construction by issuing state bonds.
18. All expressways are tolled, and all intersections are grade-separated and access is fully controlled. Approximately 60% of the expressways have been built and managed by the provincial governments. The remaining 40% of expressways tolls have either been developed under BOT conditions by a concessionaire or the provincial governments have initially coordinated the construction of the highway and then sold a section to a concessionaire to operate and maintain.

## **6.4 Malaysia Case Study**

### **6.4.1 History of Highway Development**

19. In the early 1970s road travel in Malaysia was mainly by federal roads. But as the number of cars increased, major ports and airports opened, and major cities grew in population, the federal roads became overcrowded and new highways were needed. The Government initially considered widening existing highways, but this caused substantial social problems with land acquisition and ultimately the Government elected to develop a ‘greenfield’ expressway network to underpin its economic development. The first mega project for the expressway development plan was the 848-km North-South Toll Expressway (NSE), which was started in 1980. The expressway network continued to be developed to connect all major cities and conurbations with a current total length of 1,192 km. It is now considered the best expressway network in Southeast Asia and third in Asia after Japan and China.



## 6.4.2 How was it achieved?

### 6.4.2.1 Building Management Capacity

20. Once the decision was made to develop the highway network through greenfield expressways, there was a need for the Malaysian government to enact the appropriate policy changes to allow the plan to be implemented. A new government agency, the Malaysian Highway Authority (MHA) was created to supervise the work and at that time MHA was staffed by engineers who were mainly experienced only with the design of rural roads and not large contracts. To assist MHA, engineers and international design consultants from Japan (JICA), Italy (ANAS) and the UK were invited to Malaysia to help MHA build their capacity in design and implementation. It was accepted that international contractors were vital to fulfill Malaysia's expansion plans and an influx of foreign contractors into the country had opened the eyes of local contractors to new construction technology and construction management techniques for delivering projects on time or even ahead of schedule.
21. The North-South Expressway connected Thailand to Singapore through the length of Malaysia. The project was started in 1980 using normal type contracts, but in the early 80s public funding was restricted through economic difficulties. The Prime Minister believed that the project was so vital that it could not be delayed and he personally encouraged the immediate use of privatization. In 1980 the Government launched its "corporatization policy". In 1983 MHA organized an international open competition, inviting consortia to submit proposals to complete the remaining 514 km of expressway on a privatized BOT basis. Finally the first concession agreement was signed between the Government and M/s PLUS. International contractors and consultants helped to lead the team, which resulted in immense capacity building opportunities.
22. M/s PLUS administered the project with an optimal use of local contractors. They subdivided NSE into 40 main contracts, with some sections having lengths as short as 15 km, which could be competitively bid and completed by the domestic contractors without overloading their resources.
23. From the early 80s the Malaysian government had understood that if money was spent in construction, it would flow directly through the people and improve the economy of the country. After the experience with the initial BOT contract for NSE, further development of the expressway network continued with similar BOT arrangements. The initial PLUS project is recognized as spawning a large number of contractors and increasing the capacity of the highway construction industry. The principles of BOT continued to be used until the late 90s, when the Asian economic depression occurred. At that time it was difficult to raise loans for further private highway construction schemes. Private financing of the expressways then stopped and the Government, eager to use road building to ease the problems of the recession, continued with the construction of expressways through conventional priced contracts. This continued until 2006, at which time MHA began to explore possible private finance schemes, which they are currently testing.

### 6.4.2.2 Industry Structure

24. The highway industry structure has not required such a huge institutional change as occurred in China, since even before the development of the expressway program there was a substantial supply chain of contractors, specialist subcontractors, and material suppliers. Generally these were small and relatively unsophisticated. The majority of the construction companies had been privately developed by the Malaysian Chinese from the early days of economic development in the 19<sup>th</sup> century. Over time the three major political parties developed ownership of companies including construction enterprises. Today, thanks mainly to NSE there is a strong network and supply chain within the industry. There are

both large and small private contractors, large government linked companies, private specialized subcontractors, equipment rental companies and a solid support mechanism of domestic consultants.

#### 6.4.2.3 Building Manpower Capacity

25. The NSE privatized highway project involved considerable technology transfer from foreign to local builders especially in tunneling, bridge construction, slope management, paving technologies, road safety engineering, project management, and flood management. Skilled machine operators were obtained by using international equipment suppliers to supply equipment and training.
26. The principal contractors' civil engineers at the time were supplied by the Chinese, who were considered to be very hard working and efficient. Their capacity was increased by their interaction with the international consultants. Civil engineering is also held in high regard in Malaysia and with the excitement of the construction growth there is a reasonable supply of new civil engineers.

#### 6.4.2.4 Building Equipment Capacity

27. Initially international contractors brought sophisticated and high tech equipment and plant to Malaysia. Local contractors then began purchasing the equipment they required and plant hire companies have been established. Unlike China, however, the need for such equipment did not spawn the growth of home manufacturing companies and currently most equipment is still imported.

#### 6.4.2.5 Materials Capacity

28. The supply of materials has generally not been a problem in Malaysia. The cement industry, entrepreneurial in character, recognized the NSE's potential and increased its manufacturing capacity. The Government, also realizing NSE's potential for increasing economic growth dictated that a certain percentage of the NSE (30%) had to be concrete pavement, which supported the national cement industry.

#### 6.4.2.6 Regulations and Associations

29. All regulations and licensing for companies and individuals in the Malaysian construction industry are conducted through the Government's Construction Industry Development Board (CIDB) established in 1996. CIDB established the required regulations and legislation for all phases of the construction process including design, procurement, award, construction and management. They work closely with the trade associations and organizations that have been established in Malaysia. The Malaysian Master Builder's Association has become the recognized voice of the Malaysian construction industry.

#### 6.4.2.7 Funding Restructuring

30. Malaysia has relied on BOT forms of financing for the major section of the toll road network. To provide the appropriate legal framework to permit the concessionaire groups to operate the Private Management Act was approved in 1981.

### 6.5 Lessons Learnt (from China & Malaysia)

Group	China	Malaysia
Planning	Develop a good effective master plan for an integrated highway network and link it through regular economic plans.	Develop a good, integrated master highway network plan.

Group	China	Malaysia
Policy	Implement policies to facilitate implementation of plan.	Recognize required changes in policy and implement changes to support the implementation of the overall plan.
Planning Account-ability	Ensure that the plan is formulated mainly by the provincial governments, since they will be responsible for administering the construction process and repaying the loans.	Plan developed by MHA.
Land Acquisition	Greenfield development is the fastest and most productive method of constructing a new national network due to the lack of interference from existing networks.	Greenfield development was found to be the most advantageous with the least social problems.
Building Highway Industry Capacity	International contractors were invited to bring advanced technology, improved management techniques and modern, high tech equipment.	In the early days of development of the network, use the international highway construction community for guidance and capacity building.
	The supply chain was improved through institutional reform and privatization initiatives.	Divide large projects into appropriate packages to give smaller domestic contractors chance to subcontract and build supply chain.
Regulations and Legislation	Develop appropriate regulations and legislation to support and enable the overall policies to be implemented.	Establish one government organization to administer regulations. Must have dialogue with industry.
	Ensure appropriate agencies are established to administer policies.	Established the MHA specifically to manage the expressway program.
	Develop clear and transparent RCI regulations.	Develop regulations but too cumbersome.
Trade Associations	Support the growth of trade associations. Ensure open dialogue with government. Encourage self regulation by industry.	Trade associations help to build the capacity of the industry.
	Establish one trade organization (or group of associations) to be voice of industry.	
BOT	Not used too successfully in China.	Used extensively but now they believe that the change from totally public to totally private was too fast.
	Government wants to buy back concessionaires to reduce tolls.	Criticism by the public about the "irritation" of tolls and their level.
Alternative Contract Arrangements	Be open to different contract arrangements. Currently exploring private financing.	Now experimenting with private financing.
Operation & maintenance	Used for about 40% of toll expressways.	
Building National Asset Base	Vital to complete projects with minimal delay. Team approach to resolving problems at site level and no delays in issuing instructions.	Team approach to resolving problems.
	Site staff has authority to make decisions.	Project level staff to make on site decisions to avoid delay in project addition to asset base.
Dispute Resolution	Not normally a problem due to team approach.	Historically not a problem but a new adjudication act is being considered.

## 6.6 Case Study on France

31. The French road construction industry has dramatically improved its capacity during the last decade, thanks to government infrastructure policies coupled with strong internal reforms mooted by the

construction industry itself. New challenges are ahead now concerning the strategy and the performance of the French road construction sector in the national as well as global market in the near future.

### 6.6.1 Key Issues of the French Road Construction Industry in the Last Decade

32. Among the key issues of the French road construction sector in the last decade, evolution of large financial structures required to match the investments in concessions was a crucial one. The other significant issue was the necessity of diversification to meet the scope of domestic demand in different types of infrastructure: expressways, bridges, tunnel works, decentralized national roads maintenance, urban roads, industrial pavements, etc. Globalization of economies and international demand of infrastructure influenced a concentration of medium and large construction firms into large groups such as Vinci Group (world leader construction group) and Bouygues Group (second largest group in the world) or Eiffage group (currently number seven in Europe).
33. Most of the main road construction firms are branches of the three first French construction groups mentioned above, including the eight major road construction firms as follows:
  - Bouygues Group : Colas, Screg, Sacer
  - Vinci Group : Eurovia, Jean Lefebvre, Viafrance, Sogea-Satom
  - Eiffage Group: Appia
34. In 2006, the overall turnover of the French road construction industry was €14.3 billion (\$18.7 billion), which represents 34.2% of the total construction industry (€41.8 billion or \$54.7 billion), with a growth rate of 6.5% from 2005 to 2006 (10% expected in 2007). The share of the industry's turnover was 48% from new construction works and 52% from rehabilitation and maintenance works. The total manpower working in the road construction industry was 103,000 in 2006. In 2006, the French road construction firms produced €8.1 billion (\$10.6 billion) turnover abroad, 57% of its overall turnover.

### 6.6.2 Government Policies Implemented to Improve the Construction Sector Capacity

35. The capacity building of the French construction industry has been largely sustained by main public programs, established within continuous five-year master plans by the *Direction de l'Aménagement du Territoire*, a central agency in charge of infrastructure programming, with branches in the regions.
  - Expressways which are directly owned by the State represent a network 2,625 km long. Total length of expressways is 10,805 km, for traffic of 123 billion veh-km.
  - National roads construction and maintenance are financed jointly by the central state and regions in master plan contracts and project contracts. The total length of national roads is 90,000 km, carrying traffic of 96 billion veh-km.
  - Department Roads ("*Département*") is an administrative area smaller than a region) connecting national roads with a network of 383,000 km and carrying traffic of 219 billion veh-km.
36. Decentralization policies have been implemented during this decade (2001-2010). Large budgets transferred to the regions along with a push towards privatization of road maintenance resulted in a larger market for road construction works. Supportive actions have been taken by the Government in terms of procurement (*Code des Marchés Publics*), dispute resolution, more streamlined payment of invoices, labor protection and training, legal framework, and stronger commitment towards quality, safety and the environment. Moreover, a quality assurance plan, required from contractors when bidding and before the start of works, was made mandatory to ensure full compliance with quality, safety and environment issues during the execution of contracts.
37. In order to finance the master plans a specific transport infrastructure financing agency was created: "Agence de Financement des Infrastructures de Transport en France". In 2007, this agency is financing €2.17 billion (roughly \$2.9 billion) of investment for two expressway sections, one canal, and three

high-speed railways. The budget planned for 2008-2013 is €7 billion (\$9.3 billion). Moreover, a large state-owned financing agency called the “Caisse des Depots et Consignations” (CDC) is implementing a special fund dedicated to transport and energy infrastructure. CDC will be granted €2 billion in the context of a merging asset management market in Europe and is posing a serious challenge to existing international funds such as Australian Macquarie, ABN-AMRO, and HSBC.

38. A strong effort is being made on improving the concession/PPP contract framework. The law governing the PPP framework, “Contrats de Partenariat”, enacted in June 2004, covers partnership contracts between the state or state-owned enterprises and a private partner or between a local authority and a private partner. The law transfers the control of public assets to the private partner during the concession period, comparable to a BOT or DBFOT framework.

### **6.6.3 Internal actions taken by the French road construction industry to improve its capacity**

39. The three following steps have been taken in the last decade:
- Emergence of conglomerates with huge concentration of capacity through merger and acquisition
  - Diversification strategies of main French contractors
  - Improvement of performance and productivity (by introduction of SAP-type workflow systems, training of staff, research and development)
40. Construction of transport infrastructure is more demanding now than decades ago, and this requires changes in methods, organization, management and attitudes in the construction industry. In order to thrive in a larger but more competitive construction market, the industry has resorted to a variety of measures including:
- Enlargement of expertise base to match the technological progress on methods and materials
  - Be more pragmatic, flexible and innovative to match the pressure of competition
  - Growing effort in Research and Development to match complexity of works
  - Cost reduction & productivity to match the competition on prices
  - Evolution of services including PPP and DBOT contracts to match the emerging PPP culture
41. In parallel, the influence of professional associations such as the *Fédération Nationale des Travaux Publics* has been reinforced, order to give them leverage in negotiations with institutions and local authorities. (Web site is: [www.fntp.fr](http://www.fntp.fr)). Actions in the media led to the creation of an important editor specialized in the construction industry: *Le Moniteur* Group.

### **6.6.4. Key issues and strategy of the Road Construction Industry in the past and near future**

42. The main strategic trends observed during the last few years in the road construction sector in France are the following:
- Acquisition of road construction firms in Central and Eastern Europe (EU enlargement)
  - Strong lobbying at the EU institutions to participate in 30 top priority projects (2007-20)
  - Concession contracts at the international level (bridges : Masan Bay in Korea and Rion in Greece)
43. It is interesting to observe that other large European construction groups have also followed the same strategy with external expansion based on acquisition of other road construction firms in their own country and in Central Europe. Central European countries which recently joined the European Union have been granted heavy subsidies to upgrade their transport infrastructure, creating opportunities for the road construction firms to make reasonable profit with limited risks.
44. Road construction is a key economic activity in France. More than a million km of roads need to be maintained and upgraded and the road construction business, therefore, is considered to be a worthy and promising profession in the near future. Moreover, the French road construction industry is at the

cutting edge of technology and innovation and the French construction firms are present worldwide, especially in the niche segments of road construction. The industry still attracts talented professionals, creates significant numbers of jobs, and there is a perceptible sense of pride within the industry, which has been very healthy for the growth of the industry.

45. The main actions currently taken by the construction industry are devoted to facing the challenges mentioned above, but one of the most crucial ones is hiring and training staff in order to reduce the shortage of manpower. The strategy for hiring and keeping qualified staff stresses four initiatives:
  - Large and costly publicity campaigns in the media to promote the image of the construction industry
  - Increase of wages of 30% in the five last years (inflation rates were under 2%)
  - Partnerships with technical institutes and colleges, active support of civil engineering colleges
  - Promotion of women in the industry, aiming at an overall 20% participation (from presently 10%)
46. However, the challenges ahead for the industry are also significant and can be summed up by various key issues and strategies:
  - Keeping a high level of performance with competition from emerging economies like China and Turkey
  - Hiring and training young staff to cope with retirement of qualified seniors among the staff
  - Innovative services to cope with a reduction of public investment in infrastructure and demanding clients
  - Complying with environmental requirements considering construction cost reduction objectives
  - Attracting qualified young civil engineers into the road construction field
47. A new trend derived from studies made by social and economic think tanks is now influencing the road construction industry, giving at the same time optimistic expectations for the near future. The key issue is sustainable development related to environmental issues and climate change concerns:
  - Energy savings with new materials for pavement and recycling of existing pavement
  - Recycling of dirt and industrial waste products into road pavement materials
  - Reduction of costs on bituminous products with new technologies using organic substitutes
  - Reduction of noise pollution with new materials for pavements, including gums/latex.

## **6.7 Case Study on Gujarat – Gujarat State Highways Project**

48. The World Bank-financed Gujarat State Highways Project (GSHP), implemented by the Government of Gujarat, stands out as an example of a well managed road project in India in recent times. The GSHP has been successful on various counts. This project is closing in December 2007.
49. Contrary to significant cost overrun in almost all highway projects in the country, GSHP is expected to be completed with a significant cost savings compared to the originally estimated project cost. The project was originally estimated to cost Rs. 21.2 billion (\$533 million) but is now expected to be completed at a cost of Rs 17.6 billion, resulting in a net saving of about 17% of the estimate. The saving has been achieved in spite of marginal increase in the scope of the project. The upgrading works contracts were signed at an overall 18% lower price than the estimated costs, a significant measure of the project's procurement efficiency. Moreover, only six of the 15 upgrading works contracts had an upward variation in contract price during implementation, whereas the remaining nine have been completed at lower than contract price, reflecting adoption of efficient contract management and cost control measures during implementation.
50. The project overall has taken two years more than the originally estimated project period. However, the delays were primarily due to a devastating earthquake in 2001 leading to diversion of resources to earthquake recovery, and unprecedented rainfall and floods during the years 2005 and 2006, and not

due to delays in pre-construction activities or implementation delays usually experienced in other projects in India. Many works contracts performed well and were completed without much extension of the completion date. Four of the five upgrading works contracts in Phase 1 of the project were completed within two months of the original completion date, in spite of the diversion of the contractors' equipment for earthquake recovery. One upgrading works contract of Phase 2 was completed well before the original stipulated completion date.

51. GSHP has been also exceptional in the number of cases of contract claims or disputes. Only seven disputes have arisen in 15 upgrading works contracts, out of which only two cases were referred to arbitration and none was referred to the court. This is exemplary considering that in other large road projects in the country the number of disputes for each contract on average would exceed far more than the total number of disputes in GSHP.
52. Preliminary analyses show that continuity of a highly motivated and dedicated project team of the Gujarat government for the entire duration of the project is one of the main reasons for such a stupendous success. The project received the full support and attention of the highest level of the state government at every stage, helping in smooth interdepartmental coordination and efficient implementation of the project.
53. Reasonably good business and working environment in the state has helped in obtaining competitive bids, often even lower than the estimated costs. Moreover, right from the initial project preparation phase the Government of Gujarat efficiently handled the project preparatory and pre-construction activities, which contributed to better quality project design and fewer contract variations, faster implementation progress and fewer contract claims and disputes. Further, during the implementation stage, the pragmatic and efficient project management by the state government and a true spirit of partnership that it fostered among all the three contracting parties (implementing agency, contractors and consultants) have helped in efficient and dispute-free progress of the works to a high quality standard. The state government's focus on value-for-money, willingness to adopt cost-effective and modern technology and better application of technical specifications stipulated in the contract also led to cost-effective road construction. Overall, this project demonstrates how a conducive business environment and efficient project administration can create an enabling environment for the construction industry to deliver timely, cost-effective and quality outputs.

## **7. SUGGESTED ACTIONS & RECOMMENDATIONS**

### **7.1 Context**

1. This chapter focuses on recommendations based on the three strategic pillars that have emerged as key to increasing the capacity of the road construction industry. Some of these pertain to the general construction industry but are also important for the road sector to flourish. Our analysis of the data shows that the capacity of the construction industry, if it continues to increase at the present rate, will hinder India in achieving the targets of road sector growth in support of broader economic growth targets. Depending on the growth scenario envisaged for the country, the delays could be anywhere from about 60-75% (Scenario 1) to about 150% (Scenario 3) of the targeted time of completion. This does not speak well for the plans or targets. Hence there is an urgent need for the governments at central and state levels and the industry to take action to improve the capacity of the road construction industry, without compromising on quality and cost.
2. The recommendations stem from three strategic considerations or principles, which emerge from the previous chapters, for improving the capacity of road construction sector in India. They are:
  - (i) Strengthening the capacity of the industry through timely completion of projects. This would help to unlock the existing capacity unnecessarily held up in on-going contracts due to time delays in project completion. The delays could be due to poor planning by the implementing agencies as well as the contractors, delays in availability of encumbrance-free construction sites, poor contract management practices, and governance and corruption issues before and during construction.
  - (ii) Improving the supply of good road contractors and consultants in the various sizes capable of helping in the timely and quality execution of works. This is all the more relevant, keeping in mind the trend of the contractors to move up the value chain from small to large and very large contractors and then finally becoming concessionaires in PPP projects. The risk-taking appetite is increasing, but at the same time it has to be borne in mind that works on site have to be executed only by civil works contractors, whatever be the source of financing; and
  - (iii) Thinking ahead on how to address the scarcity of key input resources for road construction likely to be encountered by the contractors, such as key equipment, human resources, construction materials and working capital. Absent such foresight, the resources will probably not be available at the right time in the right quantities and of the right quality.

### **7.2 Key Areas of Recommendations and Suggested Actions**

3. Recommendations and suggested actions which could be taken up by the governments and the industry associations are presented below. Actions should include ways to improve the planning from the government and contractors' side, investment climate in the road construction sector, project and contract management, capacity building and training of human resources, and the promotion of research and development (R&D) in India's road sector. In response to a specific request from the MoSRTTH, we also offer suggestions for improving the quality of design and supervision

#### **7.2.1 Speeding up Contract Execution through Improved Quality at Entry**

4. This needs to be done with a view to ensuring timely completion of projects and thereby releasing the locked up capacity of the existing contractors. Some key recommendations to this end are:

##### *7.2.1.1 Timely Completion of Pre-Construction Activities*



5. To enact the pending LA (amendment) and the new R&R Bills as soon as possible, so that there is a clear legal framework available in the country to follow where displacements of people are involved. Ensuring that pre-construction activities like land acquisition, resettlement and rehabilitation, obtaining environmental clearances, and utility shifting, which clearly are the responsibilities of the government, are substantially completed before construction sites are handed over to the contractor/developer. The current Model Concession Agreement requirement that at least 50% of land free of encumbrances should be ready for handing over to the road developer, at the time of agreement signing, should also be made applicable to fully conventional item-rate government-funded contracts, with an additional caveat that these stretches should be in continuous stretches not less than 10 km long. The remaining length be handed over within a fixed period (preferably not exceeding 6 months) specified in the contract agreement failing which the road agency will have to bear penalties.
6. Specific recommendations would be:
  - (a) for the road implementing agencies at the center and state to set up dedicated cells adequately staffed from the respective departments like revenue, forests, environment and railways to undertake pre-construction activities and clearances;
  - (b) to create high-powered multi-departmental committees to expedite pre-construction activities; and
  - (c) as a less preferred option: to transfer the responsibilities for utility shifting and tree cutting to the works contractor, who may have better access to get these done and pay for it. (The required clearances will have to be facilitated by the government agencies.)
7. A small guideline information brochure and a web page highlighting the procedural steps with expected timelines could be of help to the implementing agencies, contractors and developers. It would be managed by a high-powered committee comprising all key responsible agencies like revenue, environment and forests and other utility agencies. Also a dialogue could be taken up at senior levels in the concerned ministries (e.g. Ministry of Railways) to discuss ways of cutting out avoidable delays.

#### *7.2.1.2 Strengthening the Investment Planning and Programming Functions of the Road Agencies*

8. Using computerized information systems based on electronic data collection systems for road inventory and condition, these agencies must be able to plan and program their investments through 3-year rolling plans. This will enable the agency to then sequentially allocate appropriate time for the proper survey and designs and also take up the necessary pre-construction activities on the finally selected road corridors. Such actions would possibly help in prioritizing the sections for which the pre-construction activities have to be completed, so that they do not delay the project during actual execution. Also this will help in reducing the gap between the budgetary provisions and actual expenditure. Another important step would be for the road agencies at the state level to update the Schedule of Rates every year to reflect the actual market conditions in their region.

#### *7.2.1.3 Structuring Contractor and Consultant Arrangements Differently*

9. The goal is to minimize variations and disputes during execution and consequently to reduce construction time. This could be possible through clear delineation of risks and responsibilities for activities to be undertaken before start of construction and then during construction. The present trend of embracing the PPP concession framework in the roads sector --wherever found viable and feasible-- is appropriate from both angles of pushing the financing (at least partly) and the performance risks to the private sector. However, even for the fully government-funded projects, it would make eminent sense for the road agencies to gradually move to contracting methods other than the conventional item rate contracts for road construction, rehabilitation and maintenance, after taking some short-term improvement measures as discussed elsewhere in this chapter. Those could be (i) Design-Build-Maintain (DBM) contracts, (ii) Design – Build (DB) contracts and (iii) Long-Term Performance-based Contracts (LTPB). For DBM

contracts (may be about ten-year concessions) the design, construction and consequent performance risk of the road is passed on to the contractor. There could be a periodic audit undertaken by the road agency or an independent consultant to check construction quality and compliance with the performance parameters. In DB contracts the design and construction risks are passed on to the contractor, who will be fully liable to produce good designs which will meet with his skills and resources, leaving little opportunity for variations due to deficiencies in surveys or designs. However, the road agency may still need to proof check the designs, provide value enhancement advice, and then either take up full time supervision or sample audits. This could be done in-house if the agency has the requisite skills or through an independent consultant. This activity is needed because the contractor is now not responsible for the performance of the road after construction is over. LTPB contracts provide a solution to the DB and item rate contracts for taking care of the maintenance aspects after the completion of the defects liability period. These could be taken up on either a network or corridor basis.

10. However, some significant difficulties are foreseen when combining the design and construction responsibilities with the contractor:
  - (i) how the bid documents and the contract specifications could be made specific on the minimum performance and other requirements;
  - (ii) how the bidding parameters and the bid evaluation criteria can be formulated and used; and
  - (iii) how the government (employer) will be able to discharge one of its primary responsibilities of handing over encumbrance-free land, in stages, to the contractor as soon as the design is completed to enable start of construction as specified in the contract.
11. In the case of conventional contracts, the quality of designs and surveys needs to be improved to prevent delays during contract execution. Independent peer review checking, including field verification, is important, at least on a sample basis, by either the implementing agency or an independent consultant before approving the designs. Use of value engineering techniques for ensuring sound design principles and cost optimization could be tried out for contracts larger than Rs.500 million (\$11 million). It should be ensured that the plans for the road alignments are on the same platform as the drawing of the land/revenue and other maps to avoid discrepancies when evaluating impacts. Use of GIS will help in taking care of this.
12. A strategic decision in favor of greenfield projects on new alignments (like bypasses and expressways) wherever economically, financially and technically feasible without much environmental and social distress, will go a long way in speeding up contracts. Time lost in delays during construction on existing alignments like managing traffic, shifting utilities and moving people can all be avoided, once the required land is acquired.

### **7.2.2 Increasing the Number of Contractors and Consultants Working in India's Road Sector**

13. The Government and the industry should focus on ways and means to increase the number of players of different sizes in the road construction industry. This may be done by pursuing the following strategies:
  - Facilitating setting up of new firms in the sector. This should be done either by new entrepreneurs setting up firms at the lower end, which could then slowly migrate up the value chain, or by creating an environment where already existing large commercial/industrial enterprises could move in with finances to set up construction or concession firms which are higher up the value chain;
  - Attracting larger construction firms from other sectors like real estate, industrial buildings, irrigation, dams and power, to also work in the road sector;
  - Creating an environment, free of any barriers, to enable foreign or international firms to set up shop in India or just be able to compete and work in India;

- Providing an enabling environment for creation of trade associations with a free interchange of views and advice between them and the governments. The trade associations can go a long way in helping self regulation and debarment/sanctions within their own industry groups and also help in marketing the country's needs and business strengths abroad; and finally
  - Taking a close look at the staffing levels in Indian government road agencies and other public sector agencies, to enable them to perform the main role of policy, planning and overall management functions and then decide whether the other functions of these agencies can be spun off into autonomous construction and design outfits. This might be difficult to achieve in social terms and would need a strong political will to implement. But countries such as China, the UK and New Zealand have tried it out with some success. They could be first made into autonomous public sector undertakings and then slowly the Government might decide to divest them. This measure, if feasible, would be able to solve some of the problems of scarcity of contractors and the weak supply chain to bigger and international contractors. A case study on hiving off autonomous construction and design outfits from a public road administration organization is presented as Annex VI to this study.
14. All the above options would depend on the investment climate prevailing in the sector and the country. This would encompass factors like ease of being able to compete and win jobs, licensing and other clearances required, working environment like security (law and order) conditions, timely payments, availability of input resources, contract management and dispute resolution, subsidies and fiscal concessions, and profitability. Medium- to long-term planning by the Government with assured financing will encourage the road construction industry to develop, with the private players gaining confidence to take risks to set up new businesses or move in from other sectors.

#### *7.2.2.1 Making Procurement and Selection Process for Contractors and Consultants more Transparent*

15. Mandating accelerated use of e-procurement methods will go a long way in introducing transparency and minimal interference of external factors in the selection of firms, in the beginning for contracts above a certain threshold value and then for all contracts, provided independent assessments are taken to establish the readiness of adopting e-procurement in an agency or state. It will also prevent situations where the contractors allege not being able to buy the bidding documents and/or not being able to submit their bids (reasons being the formation of contractors' cartels, collusion between client staff and preferred contractors and poor governance). This should be properly institutionalized and ensured so that the result thrown up by the computerized system can be overridden only by a high-powered committee and that too only under certain exceptional circumstances. Andhra Pradesh is one of the states which has completely adopted this and seems to be reaping considerable benefits. A post-qualification process for procuring contractors and concessionaires for road works will perhaps prevent collusion and forming cartels while bidding.
16. Setting up web-based contractor databases updated at periodic intervals will enable the procuring agencies to confirm and verify: (i) the detailed credentials and qualifying criteria directly and/or through a consolidated grading of the firm; and (ii) a contractors' performance database, which could include qualitative comments of previous clients as well as tangible information on performance like time delays, disputes engaged in versus the disputes lost, and defects noticed during the defects liability period. This database could be expanded to include a list of specialists and experts in the field with their biodata and experience details. This web site, which should be accessible to anyone, could be owned, updated and managed by some industry association (like the Construction Industry Development Council-CIDC) for a fee that it could charge from the Government and the contractors.

17. To prevent misrepresentation of contractors' and consultants' qualifications, they could be certified by the respective industry associations, like CIDC or the Consultancy Development Council (CDC). These umbrella organizations could also set up state-level centers to encourage the industry at state level. This could also be done through collaboration with existing similar organizations at the state level.

#### *7.2.2.2 Easing Barriers For New and Foreign Firms to Enter the Road Construction Sector*

18. Measures worth considering include:
  - (a) In the case of new Indian subsidiaries of foreign firms, allowing the experience of the parent firms with some sort of undertaking/guarantee by the parent firm might help, provided that the capabilities and skills of the parent firm meet the work requirements.
  - (b) Easing visa and other travel documentation procedures for international staff working on road construction projects, especially for those on short assignments. Visa extensions also seem to be taking an inordinately long time, far longer than in many other countries.
  - (c) Bringing the construction specifications of our country on a par with international standards for survey, design and construction of roads through improved R&D, which can be partly industry sponsored.
  - (d) Easing qualifying criteria requirements to enable contractors from other sectors to slowly enter the road sector, at least for some minor and/or maintenance works and then slowly build up their capacity. This could be done by the firms showing some similar experience or their capability in managing and financing contracts of similar size, and they could then participate in a joint venture or as an associate with a road construction firm.
  - (e) Facilitating the access of road construction firms to working capital finance, especially for small and unorganized players. These contractors can fill in the essential areas of maintenance and rural road works and free up the capacity of stronger contractors for taking up larger works. Here the industry associations should take upon themselves to upgrade the standards of accounting and make all transactions more transparent. Lenders and other registration agencies could use "proxies" for assessing small players. With the Reserve Bank of India extending the lending norms for small and medium enterprises (SME), it is prudent for the industry associations to get the very small, small and medium contractors to obtain an SME rating, to allow them easier access to finance.

#### *7.2.2.3 Improving Dispute Resolution and Contract Management*

19. This section is extremely important from the point of view of profitability. Profitability in the road sector among all sectors is possibly the lowest due to non-transparency and poor governance, which often leads to compromise in quality. Informal sources indicate that this is one of the prime reasons for entering into litigation by contractors to make up for the losses or scant profits. This is also probably discouraging some of the better Indian and foreign contractors from taking up item rate road contracts.
20. Timely resolution of disputes during contract execution will go a long way in reducing delays in time and increases in cost. One option could be to institutionalize the arbitration process by setting up Road Appellate Tribunals at central and state levels. These should be independent from the implementing agencies as well as any form of regulator which the government might later decide to bring into the sector. Any disputes not resolved by the Dispute Resolution Board/Adjudicator (DRB) system provided in the contract could be referred to these Tribunals (having a fixed constitution of arbitrators specialized in contract law) and their decisions should be considered final. The existing provision of referral to an arbitration panel (made up of persons named by the contractor and client) is more time consuming and possibly results in dissatisfaction and consequent appeal in higher courts of law. Another strong suggestion is that in a sequential process of dispute resolution the decision of the previous process in the sequence should be implemented till the next higher process either reverses or changes the award and

recommended awards should be made suitably backed by a guarantee / security deposit. This should be applicable to both contractors/consultants and road agencies.

21. Another suggestion is for the employer, engineer and contractor to sit together when works begin, to clearly interpret the contract and come up with a set of bulleted guidelines clarifying their respective roles, responsibilities and approval powers. Here, it is strongly recommended that all road agencies should have some expert in contractual law to advise them to ensure correct interpretation of the contract, as well as issue notices and approvals as per the contract's provisions. This will help give the field level project officer some confidence in taking ownership of DRB awards and complying with them without pushing the decision-making upwards.

#### *7.2.2.4 Subsidies, Fiscal Concessions and Taxation Related Issues*

22. Recommendations which came out of the interviews with contractors and their associations were:
  - Abolishing works contracts tax in states wherever it is still levied. The central sales tax is already being phased out, but all states should also fall in line.
  - Extending Section 44BBB benefits to road sector projects to provide incentive to foreign contractors to enter the road sector. This benefit allows the foreign companies to assume that their profits will be 10% of their contract value, minimizing confusion and delay during taxation. Domestic contractors enjoy a similar tax benefit under Section 44AD.
  - Providing duty exemptions to all contractors working on contracts above a certain threshold value instead of being provided for only certain projects funded by multi-lateral agencies or NHAI projects. Similarly, the GOI could look at the possibility of reducing customs duty on importing of capital goods and machinery used in road construction from the current level of 37%. Duty exemptions which sometimes are extended to only a part of the equipment, should be rationalized.
  - Deemed export benefits should possibly be given for large road and expressway projects on the lines of the Ministry of Power's Mega Power policy. Another way to achieve a comparable fiscal incentive could be by providing faster depreciation rates on equipment.
  - Central Value Added Tax benefits are not being extended to certain road construction equipment like crushing plants on the grounds that they produce input materials for road construction which cannot be termed as "goods". This could also be reviewed by the Government.
  - Certain road contractors doing a high level of cash contracts are requesting extension of Section 80-1A benefits, which according to the current year budget clarifications were deemed applicable only to developers. Similarly there is a request from certain potential developers to reinstate the Section 10(23)G, at least for a certain period longer to enable easy access to long-term funds (refer to para. 40 in Chapter 4).
  - Reviewing taxation of joint-venture firms as an association of persons. This has been preventing them from offsetting an individual member's share of profit against its individual losses and vice versa. Similarly, allow existing import benefits on equipment to be passed on to the JV members rather than the JV as an entity. It will help the members by giving them more freedom in their balance sheet assets.

#### *7.2.2.5 Administrative/Procedural Issues - Licenses, Clearances, Tax Administration and Customs*

23. Some important procedures need to be streamlined, including:
  - **Streamlining procedures for customs and excise exemptions for import of equipment/purchase of materials**, especially for duty-free import of equipment on specified projects. The requirement of producing excise/customs exemption certificates at multiple points leads to delays and procedural hassles and could be done away with.

- **Easing restrictions governing re-export and re-sale of imported equipment.** Equipment users face issues with respect to refund of import duty on re-export of imported equipment. Easing time and other restrictions currently imposed on re-sale of imported equipment eligible for duty and other exemptions will also help increase the equipment pool available within India.
- **Facilitating access to aggregates.** Several cases of mining quarries being taken over by mafia gangs have been reported and this reduces the supply of key materials such as aggregates. The Government should attempt to ensure that the Mafia is not allowed to interfere with the workings of the mining quarries. It would also be useful if each state prepared maps showing material sources and made them available on the web. Conditions and procedures for obtaining licenses for mining and quarrying should be spelt out on this web page, which could also be downloaded as a booklet.

#### *7.2.2.6 Institutional Structure and Regulation*

24. Since there is already a move in India to bring in a Construction Law, it may now be a good idea to speed it formulation and then further enactment. This would essentially form the legal basis for the entire construction sector and would be essentially a compendium of all laws which have direct impact on construction business with necessary revisions to reflect latest developments and international best practices. This would further pave the way for declaring the construction activities as an industry.
25. Another important aspect of investment climate is the need for safeguarding the interests of all stakeholders --users, government and the private sector players. Since a substantial part of the financing for roads comes from fuel levies and other budgetary support, there is a strong need for an independent road board, comprising members from the key stakeholders in private and government sectors. The board could be set up at the central and state levels with functions to:
  - a. periodically assess the needs for investment and maintenance of all the roads;
  - b. identify the sources of financing from government and fuel levies;
  - c. identify the gaps in funding after a prioritization exercise and advise how the private sector and other funding agencies can recoup their investments through appropriate levels of tolling or other means;
  - d. periodically review and advise the GOI/MoSRTTH on the various aspects of road concession agreements, especially on the risk allocation and sharing and the need for refining them as the sector evolves;
  - e. manage a dedicated road fund, if one exists; and
  - f. set up a medium-term monitoring framework for the performance of different categories of roads, irrespective of ownership or operating and maintenance rights, and ensure its adherence for a level playing field.

#### *7.2.2.7 Timely Completion of Contracts*

26. It has been noticed that bonus or early completion incentives are working well in works contracts let out by private concessionaires. However, this could also be an important incentive for cash contractors to complete works on time and prevent delays on the contractors' part in government-financed contracts. However, this needs good contract management by the client and timely decision making. Delegation of powers to the appropriate implementing agencies will help them take decisions and not resort to a legal/dispute resolution mechanism at the drop of the hat.

### **7.2.3 Improving the Availability of Inputs**

27. Road agencies and the contractor/consultant key persons need to be better trained to tackle contracts with newer forms of financing and risk sharing options. Thorough knowledge of the forms of contracting and concessions and the liabilities and accountabilities of all parties is very important for all signatories.

Moreover, conventional input-based contracts are being slowly and steadily replaced by performance-based contracts, and new materials are being used which perform better over the long run but are marginally costlier at an initial level. Specialized training needs for these different aspects of contracting and construction engineering need to be imparted to the road agencies as well as to contractors and consultants.

### 7.2.3.1 Human Resources

28. India is a young country: about 50% of its population is below the age of 25 years. As such it seems anomalous that it should be faced with a human resources crunch. During the past decade, civil engineering is slowly regaining its lost glory but the demand for civil and road engineers is far more than the supply. Many of the graduates move to other attractive options of working with IT, financial and other sectors which pay better and probably are much less physically demanding. Options of working in developed countries which offer a better quality of life is an added benefit in working in these sectors. Some important recommendations for improving the quantity and quality of manpower are:

- Empowering construction industry associations: Many of the large and medium contractors of the country are closely held family-managed firms with very little professionalism. Many skilled and capable employees know that rising above certain limits is not possible in such companies. Public ownership with professional management will be an ideal solution for large construction firms. This will enable the private sector to bring in the incentives like employee stock options (ESOPs), which are absent in the present form of family-based organizations. Construction industry associations can go a long way in professionalizing management within construction firms by bringing in registration/rating/grading and performance management for employees.
- Providing for merit-based rewards and promotions in the private and public sector agencies and disseminate the concept of incentives for employees who perform well (including ESOPs in private firms), to improve the attractiveness of the road sector firms.
- Active marketing by contractors, consultants, implementing agencies and the respective industry associations; and sponsor students in their final year for practical projects based on real-life problems. This may go a long way in attracting more graduate and post-graduate students into the road sector.
- Looking at options for hiving off parts of public works departments and other government agencies into autonomous construction/design firms which may increase the availability of highly skilled staff in the fields of construction and designing. If implemented, this would reallocate presently sub-optimally utilized engineering and other technical human resources to more active and needy parts of the industry.
- The Government and one of the industry associations could take up and prepare a training policy and strategy for the entire road sector of the country. This could talk about institutionalizing training as an integral part of the jobs, finding the funding needed, and mapping out the key skill gaps. This report has done a preliminary study but this needs far more detailing.
- Setting up more regional centers for training road construction engineers, skilled workers and unskilled laborers. One example is the training center called National Academy of Construction in Hyderabad set up as a PPP effort. There is an urgent need for replicating such structures in at least the major regions of the country. The National Institute of Construction Management and Research is another agency which provides training on construction management for contractor personnel.
- Fresh graduates and post-graduates joining the road sector agencies, especially with the contractors and consultants, are put right away on the job – either at construction sites or other design and planning offices. This tends to infect them with some of the incorrect practices. Instead, it may be good idea to make them undergo a 6-month freshman's training at a reputed institute with some certification --which will need periodic validation.
- On-the-job training at construction sites with best practices (like Delhi Metro) may also encourage the students to take up the challenges of mega-construction projects.

- Introducing new courses to strengthen the project and contract management aspects, PPP roles and needs and basic aspects of project/non-recourse financing (see Annex III for details).
- Gradually introducing a system of independent accrediting and certification and giving incentives to contractors and consultant to post such accredited people for key and important positions in projects.
- Ensure proper working conditions for labor – since they are one of the most important resources for road construction it should be ensured that their living conditions, health, child care and wages are based on certain minimum standards. All existing laws pertaining to this should be adhered to as well as any pending Bills would need to be enacted soon.

#### *7.2.3.2 Equipment*

29. Key ways to overcome constraints in the supply of equipment and spares (in addition to incentives mentioned above under exemptions for duties and taxes) are:
- A dedicated construction equipment manufacturing association could be set up. It could be affiliated to some international organization of a similar kind. This is important from the view point of carrying out frequent assessments of the market potential, supply gaps and methods for filling them.
  - Scarcity of spare parts for equipment already in use is a big problem for contractors when implementing key time-bound projects. The long lead times to supply spare parts when needed in a timely manner delay projects. Appropriate vendor bases in each region to be set up by both national and international manufacturers aiming to achieve timely delivery should be one of the objectives of manufacturing firms.
  - Small and medium-size contractors complain of obstacles to buying equipment, especially for shorter duration contracts. At the same time larger Indian and international contractors are able to import some listed equipment through incentives provided for certain types of projects. However, there are delays in paper processing and delivery at site. Equipment leasing and rental seem to be viable options but they are not well established in India. There seem to a very few players in the market like QUIPO and NACEIL. It may be worthwhile to explore what actions it would be appropriate for governments (central or state) to take to facilitate the setting up by the private sector of equipment leasing companies.

#### *7.2.3.3 Material Resources*

30. Scarcity of materials is not seen as a big issue in general. But naturally occurring stone metal and aggregates will indeed be a problem. Even at the present level of construction under way in the country, it has been observed that crushed aggregates production is always behind schedule and causes delays. Access to mines and quarries is sometimes difficult due to strict regulations in environmentally sensitive areas, and this is further aggravated by poor crushing capacities planned by contractors. Implementing some of the recommendations mentioned above under B (v) and (vi) might improve the situation. Recently localized scarcity of cement has been observed due to the prevailing monopolistic situation of the Indian cement manufacturers. This is probably because of the Cement Quality Control Order of 2003, which requires Bureau of India certification for foreign cement manufacturing units, and the difficulties associated with this process. This could be reviewed and actions taken based on the practices followed in other countries. Locally available alternative materials and industrial wastes may prove acceptable substitutes without compromising on quality.

#### **7.2.4 Marketing Indian Road Sector and Experience Sharing within India**

31. During our discussions with international firms and associations, one point raised was the lack of information available about the investment and business potential in the road sector in India and about



recent regulatory/fiscal/procedural changes happening in the country. Prime road sector agencies like the MoSRTTH and the Indian Roads Congress (IRC) and industry associations like CIDC can help in marketing the opportunities that exist in India for foreign road contractors, consultants and concessionaires. This could be done by collaborating with the commercial attaché in Indian embassies/high commissions abroad. Annual road shows on each continent (probably in a different country each year) could highlight the opportunities in Indian markets and the steps the Indian Government is taking to welcome international firms and expertise. The successes and failures should be candidly presented. This will also provide a forum for the Indian government to take note of any remaining concerns the international community has and ways to help solve them. This marketing exercise will help in attracting to India not only foreigners but also persons of Indian origin working abroad.

32. Similarly, many innovative and good practices are being followed in different states, but they exist in silos. International organizations when they work across different states find this amazing and it is therefore recommended that, apart from the annual IRC sessions, there could be many more opportunities for the engineering and other road sector communities to visit other states and learn more about the best practices in construction, institutional structure, governance and transparency, and fiduciary provisions.
33. At the end of this chapter a table of recommendations is presented in the form of an action plan matrix. It also includes suggested time frames and the responsible agencies. The critical areas are:
  - Sector-wide policy and planning;
  - Institutional structure and regulation;
  - Marketing, raising international awareness of the Indian road sector and knowledge management;
  - Contract structuring, management, enforcement and dispute resolution;
  - Easing restrictions and administrative procedures to improve the business environment;
  - Easing entry barriers to foreign contractors and contractors from other sectors;
  - Improving cash flow and access to finance and credit;
  - Providing incentives like subsidies and fiscal concessions for attracting more and larger contractors;
  - Improving access and availability of the critical input materials;
  - Capacity building for human resources in both quantity and quality – attracting and retaining high quality professionals to this field –from both the contractors’ and employers’ side;
  - Improving the availability of key plant and equipment;
  - Strengthening R&D to integrate and support the industry;
  - Ensuring that the employer/client gets value for money from the contractors and consultants through improved contractual conditions and structuring the contracts differently; and
  - Improving profitability for the industry to create win-win situations for the client and contractors.

### **7.3 Expected Outcomes**

34. The ultimate aim of the above exercise is to provide good quality road infrastructure at the best prices to the road users. Some of the key outcomes which we expect from implementing the recommendations are:
  - Increase in the number of contractors capable of executing different sizes of contracts;
  - Increase in the number of international road contractors working alone or in associations;
  - Increase in the number of projects completed on time and within costs;
  - Decrease in the number and amounts locked up in disputes – quicker resolution of disputes;
  - Increase in average number of contractors bidding for every project/contract;
  - Bid prices and contract values in real terms coming down – this will probably happen only after an initial increase and later stabilization;
  - Increased use of modern equipment, technology and specifications to meet international standards for high-end roads;
  - Time frame for setting up a business in the sector reduced and doing business made easier;
  - Reduction in constraints on human resources, equipment, raw materials and finance; and
  - Increased returns and better profitability to the key players in the road construction industry.

## 7.4 Concluding Remarks

35. Some of the recommendations listed here have been voiced by the construction industry stakeholders already where actions have been initiated by the concerned agencies. Unless actions are taken immediately on the remaining recommendations and the process accelerated for actions already launched, the improvement of the road network will be delayed, dragging down the performance of the whole Indian economy.
36. The policy and institutional reforms which have been suggested here have emerged as major issues from the feedback of the different stakeholders in the road sector or from the case studies of the three comparator countries prepared as part of this study. The various players are concerned about the need for transparency and effective governance structures, as well as sound planning through master plans, rolling three-year plans and annual plans, all of which need to be properly marketed. It is also to be understood that while India is viewed as a place with very high business potential, the same time there is a lot of scope for improving the business environment through changes in policies and regulations. The human resources problem, for example, really needs to be tackled on a war footing by all parties. Attracting younger people to the profession and retaining them in the road sector is something to be considered through further brainstorming. The Government and private sector have to encourage continuous skill upgrading and to ensure quality. The latest techniques, brought in through active R&D efforts need to be internalized through appropriate incentives.
37. It is now suggested that the Planning Commission/Department of Economic Affairs could set up a steering committee or task force to look into the detailed recommendations of this and other studies, workshops and conferences. This will help to secure high-level stakeholder commitment and to ensure ownership of the final action plan. The terms of reference would be to look into the detailed recommendation matrix at the end of this chapter, and then to take up actions which could result in quick wins in the short term, and then some of the more difficult ones with a view to the medium to long term. The time duration for this review could be about 2 months. After the action plan is finalized a series of virtual workshops could be held using the Bank's Global Development Learning Network with access to the National Informatics Centre Network, in some of the state capitals like Andhra Pradesh, Gujarat, Karnataka and Uttar Pradesh.
38. The Bank could assist and advise the Government and the industry and work together with them in taking forward the findings of the study through the following possible interventions –
  - (i) Incorporating some of the recommendations mentioned above in the design of future Bank-funded projects, such as: long-term contracts, creating autonomous road corporations, independent road boards, and supporting PPP.
  - (ii) Helping the central and state governments in improving governance through advice and help in the implementation of e-governance/procurement, disclosure to comply with the Right To Information Act, and setting up databases of vendor qualifications and performance.
  - (iii) Continuing to pursue some of the study recommendations and reform initiatives through the proposed study / note on 'investment climate in the construction industry' requested by Ministry of Commerce and Industries, Government of India
  - (iv) Facilitating international knowledge transfer and help --especially in key institutional areas like management and financing of road network assets-- through knowledge sharing trips internationally.
  - (v) Helping, if required, in piloting the transition from fully government road departments like public works departments to autonomous organizations by creating public sector undertakings which can compete in the domestic market --an experience which has been successfully tried out in such countries as China and the UK.

- (vi) Training and sharing experience in good practices and the latest in the field of engineering and research. Key areas could be new materials, survey techniques like aerial photogrammetry, new geodetic systems, latest construction techniques, value engineering methods, and road safety audits.
- (vii) Assisting, through technical and advisory services, to study some of the recommendations in greater depth and then help in implementing the suggested actions –for example, management of human resources, equipment and natural aggregates.

**Recommendations & Suggested Actions Plan**

S. No.	Recommendation area (Key issues addressed)	Recommended Actions	Responsibility	Envisaged Timeframe*
1.	<p><b>Sector policy and policy implementation;</b></p> <p>Key issues addressed:            Improving investment climate            Strengthening pre-investment planning            Enhancing project readiness</p>	<p>Widening the ambit of reform.</p> <p>Pass a construction law to enable dealing with aspects like legal framework for establishing and operating construction firms, their procurement, legal liabilities, dispute resolutions mechanisms, safety, quality, market regulations etc. Give construction the full fledged status of an industry.</p>	<ul style="list-style-type: none"> <li>▪ Planning Commission</li> <li>▪ MoSRTH</li> <li>▪ State implementing agencies</li> <li>▪ Ministry of Law</li> </ul>	<ul style="list-style-type: none"> <li>▪ Widening reform: Ongoing and continuous process</li> <li>▪ Pass construction law: Medium term</li> <li>▪ Give construction sector the full fledged status of an industry: Long term</li> </ul>
		<p>Selecting the right model for PPP projects including appropriate types of bidding.</p>	<ul style="list-style-type: none"> <li>▪ MoSRTH</li> <li>▪ State implementing agencies</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short to medium term</li> </ul>
		<p>Undertake a Master Planning exercise, multi-yr rolling and annual planning based on actual road needs and budgeting based on them.</p>		<ul style="list-style-type: none"> <li>▪ Master planning: Short term</li> <li>▪ Multi-yr and annual planning: Short to medium term</li> </ul>
		<p>Enact the pending LA (amendment) and the new national R&amp;R Bills as soon as possible.</p> <p>Ensure at least 50% of land free of encumbrances is handed over to contractors/concessionaires with at least 10km in continuous stretches at the time of award. Remaining stretches be handed over in not more than 6 months.</p>		<ul style="list-style-type: none"> <li>▪ Take decision immediately and implement in short term</li> </ul>
		<p>Decision to go in for greenfield projects on new alignments wherever economically, financially and technically feasible. Encourage bypasses and expressways. Construction is much faster after the land acquisition.</p>	<ul style="list-style-type: none"> <li>▪ Planning commission</li> <li>▪ MoSRTH/NHAI</li> <li>▪ State implementing agencies</li> </ul>	
		<p>Create an environment for forming trade associations with opportunities for free and open dialogue with the governments. Encourage self regulation by the industry (refer S No 7)</p>		<ul style="list-style-type: none"> <li>▪ Initiate training policy preparation: Short term</li> <li>▪ Approve and start implementing: Medium term</li> </ul>
		<p>Training policy and strategy prepared for the entire road sector to cover private and government workers at all levels in centre and states. Requisite training would need to be imparted to vigilance, audit and accounts personnel to help them appreciate the modern contracting procedures and risk sharing aspects.</p>		

2.	<p><b>Institutional structure and regulation</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>Improving investment and business environment</li> <li>Strengthening project planning &amp; management</li> </ul>	<p>Setting up a Road Board (with government and non-government members) at central and state levels as a quasi-regulator/advisor to take care of (i) assessing the gaps between road sector needs and available funding and strategies to make up the gaps; (ii) advise the governments on the model concession agreements and tolling levels; (iii) managing the dedicated road fund, if one exists; and (iv) set up a monitoring framework and ensure its adherence for the performance of the roads irrespective of current ownership.</p> <p>Capacity building of NHAI to include a core cadre of its own officers</p> <p>State level reforms: restructuring of PWDs and streamlining of functions</p> <ul style="list-style-type: none"> <li>creating of state road corporations to plan and manage core network;</li> <li>limiting the role of PWDs to policy, planning and overall management and unbundling the remaining functions into autonomous public sector undertakings (or profit centres) specialized in designs and/or construction.</li> </ul>	<ul style="list-style-type: none"> <li>Planning commission</li> <li>MoSRTTH</li> <li>State Finance and Road departments</li> </ul>	<ul style="list-style-type: none"> <li>Take policy decision: Short term</li> <li>Establish functioning Road Boards: Medium term</li> </ul>
3.	<p><b>Marketing India's Road Sector abroad and knowledge sharing.</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>Raising the awareness levels of Indian road sector plans and other updates internationally;</li> <li>Improving the awareness of good practices happening within and outside the country</li> </ul>	<p>Having annual road shows and conferences in different countries to let the world know of the updated investment plans and any changes in the business environment.</p> <p>Best practices being undertaken in each state should also be shared more frequently instead of working in silos. Specialized knowledge-sharing fora in the format of IRC sessions can be more frequently held with less formality.</p> <p>Devising web-based dissemination strategies to give up-to-date information about the Indian road sector and any other industry initiatives</p>	<ul style="list-style-type: none"> <li>Ministry of External Affairs</li> <li>Indian High Commissions</li> <li>MoSTRH &amp; IRC</li> <li>Ministry of Finance</li> <li>Industry Associations</li> </ul>	<ul style="list-style-type: none"> <li>Decision for marketing and knowledge sharing: Immediate</li> <li>Annual implementation</li> </ul>
4.	<p><b>Contract Enforcement and Dispute Resolution.</b></p> <p>Key issues addressed:</p> <ul style="list-style-type: none"> <li>Improved business environment;</li> <li>Strengthen dispute resolution mechanism</li> </ul>	<ul style="list-style-type: none"> <li>Setting up Roads Appellate Tribunal (RAT), as a permanent body, at central and state levels for arbitration if the DRB mechanism provided in the contract fails during contract/concession execution;</li> <li>As one moves up the ladder of legal recourse, it should be ensured that the final decision of the previous process be honoured, if required backed with a financial guarantee or security, till it is changed or reversed.</li> <li>Increase delegation of powers to the field manager to respect the DRB decision without pushing it up for further action. Having a legal person in the implementing agency may help in giving such confidence.</li> <li>Inserting Prompt Payment clauses in contracts, especially in states in poor financial conditions with clear penalties.</li> <li>Developing performance management system for contractors and consultants.</li> </ul>	<ul style="list-style-type: none"> <li>Law ministry and state departments</li> <li>MoSRTTH</li> <li>State Road Agencies</li> </ul>	<ul style="list-style-type: none"> <li>Discussions and decision to establish RAT: Short Term</li> <li>If acceptable, then actual implementation at Central and State levels: Medium Term</li> <li>Decision to honour the previous decision of the dispute resolution process till the next step reverses or changes it: Immediate</li> <li>Prompt payment facilitation: immediate to short term</li> <li>Increase delegation of powers to field officers: Short to medium term</li> <li>Developing performance management system for firms: Medium.</li> </ul>

	<p><b>Contract structure and risk sharing with strengthened independent supervision arrangements.</b></p> <p>Key issues addressed:</p> <ul style="list-style-type: none"> <li>Enhanced efficiency of contract delivery;</li> <li>Better risk allocation and accountability.</li> </ul>	<p>Structuring contracts differently – moving to pass on more risks to the contractors, so as to avoid delays during contract execution due to design/survey inconsistencies, i.e.</p> <ul style="list-style-type: none"> <li>BOT/DBFO-shadow tolling/ SPV type concessions;</li> <li>Design-Build-Maintain or Design-Build or Long-term performance-based contracts;</li> <li>Introducing bonus or early completion incentives for contractors and consultants to facilitate early completion.</li> <li>Strict imposition of penalties for works contracts and introducing penalty/accountability clauses for consultants</li> </ul>	<ul style="list-style-type: none"> <li>MoSRTTH</li> <li>NHAI</li> <li>State Road agencies</li> </ul>	<ul style="list-style-type: none"> <li>Policy decision taken or needs to be taken immediately</li> <li>Implementation to be speeded up: Short to Medium term</li> <li>Introducing early completion initiatives: Short to Medium term</li> </ul>
5.	<p><b>Administrative/procedural issues- licenses, clearances and customs</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>Improved project readiness;</li> <li>Improving the business environment and investment climate.</li> </ul>	<p>Land acquisition and other pre-construction clearances –</p> <ul style="list-style-type: none"> <li>Creating specialized pre-construction units within each implementing agency, appropriately staffed, at state and central level to facilitate easy licenses and clearances for land acquisition, environment, forests and railways;</li> <li>Creating high-powered multi-departmental govt committees at state and central levels to facilitate clearances and acquiring land.</li> <li>Creating a web page and producing an information brochure of all clearances licenses required and minimum timelines to help the implementing agencies and project developers.</li> </ul>	<ul style="list-style-type: none"> <li>MoSRTTH</li> <li>NHAI</li> <li>State governments and road agencies</li> <li>Revenue, forest and railway ministries at centre and respective departments at state level.</li> </ul>	<ul style="list-style-type: none"> <li>Creating specialized pre-construction units: Short to Medium term</li> <li>Other two actions: Short term</li> </ul>
		<p>Process of obtaining duty exemptions and other licenses/clearances for special projects – <b>single window mechanism.</b></p>	<ul style="list-style-type: none"> <li>Ministry of Finance</li> <li>State Governments</li> </ul>	<ul style="list-style-type: none"> <li>Short term</li> </ul>
		<p>Streamlining the process of award of visas to foreign personnel (especially from a few countries like Thailand, Philippines etc.) including visa extensions for expatriates and NRIs.</p>	<ul style="list-style-type: none"> <li>Ministry of External Affairs</li> </ul>	<ul style="list-style-type: none"> <li>Immediate to Short term</li> </ul>
		<p>Easing restrictions on re-export/re-sale of imported equipment by:</p> <ul style="list-style-type: none"> <li>Streamline procedures to refund import duties if re-exported after use;</li> <li>Easing time and other restrictions on resale within India within a certain period.</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Finance</li> <li>Directorate General of Foreign Trade (DGFT), Ministry of Commerce &amp; Industry</li> </ul>	<ul style="list-style-type: none"> <li>Short term</li> </ul>
6.	<p><b>The Bidding process and easing Entry Barriers</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>Improving transparency and governance;</li> <li>Increased participation of contractors;</li> </ul>	<p>Making the bidding process fair and transparent through –</p> <ul style="list-style-type: none"> <li>E-procurement of tenders to ensure no influence of collusion, cartels and prevention of bidding; Setting up web-based vendor databases for verifying the qualifications and the performance of the contractors/consultants;</li> <li>Certification of qualification by industry associations like CIDC/CDC to be set up at central and state levels</li> <li>For PPP concessions, following two-stage procurement process.</li> </ul>	<ul style="list-style-type: none"> <li>Planning commission</li> <li>Ministry of Finance</li> <li>MoSRTTH / NHAI</li> <li>State road agencies</li> <li>MoRD / NRRDA</li> <li>CIDC / CII / FICCI</li> </ul>	<ul style="list-style-type: none"> <li>Policy decision for e-procurement, setting up vendor databases etc.: Short term</li> <li>Implementation of the policy framework and setting up e-procurement, vendor databases, certification process etc.: Medium term</li> <li>Two-stage process (already recommended by PPPAC): Short term</li> </ul>

		<p>Easing entry barriers for foreign firms (entry criteria) by –</p> <ul style="list-style-type: none"> <li>Parent firms' experience taken into account for evaluating foreign contractors/concessionaires with Indian subsidiaries;</li> <li>PPP concessions: Requirement of the lead partner holding 51% stake in the SPV throughout the concession period could be done away with. Exit should be allowed after a minimal holding period.</li> </ul>	<ul style="list-style-type: none"> <li>MoSRTTH / NHA</li> <li>State road agencies</li> </ul>	<ul style="list-style-type: none"> <li>parent firms' experience decision: Immediate</li> <li>Lead partner stake reduction in SPVs: Short term</li> </ul>
		<p>Making criteria more effective for participation of Joint Ventures (JV):</p> <ul style="list-style-type: none"> <li>joint-deed/JV agreements, giving commitment of partners to honor stipulated responsibilities, should be registered.</li> </ul>	<ul style="list-style-type: none"> <li>MoSRTTH</li> <li>NHA</li> <li>State road agencies</li> </ul>	<ul style="list-style-type: none"> <li>Short term</li> </ul>
		<p>Ensuring that working conditions in selected states with poor law &amp; order are eased by providing better security.</p>	<ul style="list-style-type: none"> <li>PM's office &amp; home ministry/departments</li> <li>State and central govt &amp; road agencies</li> </ul>	<ul style="list-style-type: none"> <li>Short to medium term</li> </ul>
7.	<p><b>Access to finance/credit</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>Improving the investment climate;</li> <li>Improving the working and other capital flows;</li> </ul>	<p>Making the industry more organized through (i) a culture of rating/grading; and (ii) making financial statements more transparent by -</p> <ul style="list-style-type: none"> <li>registration of contractors above certain threshold (say Rs 1mn.)</li> <li>grading/rating and ISO certification encouraged;</li> <li>mandating ratings for SMEs and small contractors</li> </ul>	<ul style="list-style-type: none"> <li>Industry associations (e.g. CIDC, CII, SMERA)</li> <li>Industry players</li> <li>GOI</li> <li>State Governments</li> </ul>	<ul style="list-style-type: none"> <li>Short to Medium term</li> </ul>
		<p>Facilitating long-term finance for project developers and concessionaires. Steps taken to</p> <ul style="list-style-type: none"> <li>ease flow of long-term finance;</li> <li>develop secondary corporate bond markets to increase liquidity;</li> <li>introduce new instruments like take-out and mezzanine financing;</li> <li>encourage new players like insurance cos., pension funds and other FIs to participate in the long-term debt markets and financing of road infrastructure projects; and</li> <li>promote credit enhancement services by specialized credit guarantee firms such as monocline insurance providers.</li> </ul>	<ul style="list-style-type: none"> <li>GOI</li> <li>Lenders and FIIs</li> <li>Multilateral Banks</li> </ul>	<ul style="list-style-type: none"> <li>Short to Medium term</li> </ul>
8.	<p><b>Subsidies &amp; fiscal concessions and taxation-related issues</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>Improving profitability in the road construction industry;</li> <li>Improving the investment climate</li> <li>Expanding the equipment resource base within the country.</li> </ul>	<p>Import duty exemptions on imported equipment and all input materials -</p> <ul style="list-style-type: none"> <li>for all projects above a certain threshold value instead of only multilateral funded or NHDP projects.</li> <li>sub-contractors working under main contractors/concessionaires who import/buy equipment to get the benefits. Lowering duty on importing equipment purchased abroad by contractors who have worked abroad.</li> <li>Lowering customs duty on capital goods and equipment from the current levels of about 37% and rationalizing to include all parts of any equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Finance</li> <li>MoSRTTH</li> <li>Directorate General of Foreign Trade (DGFT)</li> </ul>	<ul style="list-style-type: none"> <li>Short term</li> </ul>

		<p>Deemed export benefits for equipment under ICB for large road projects along the lines of Mega Power Policy or provide increased tax depreciation rates on equipment.</p> <p>Abolishing WCT wherever it still exists as it creates much confusion.</p> <p>CENVAT benefits to road equipment like crushers.</p> <p>Extending Section 44BBB benefits to foreign road contractors.</p> <p>Rationalizing JV taxation away from the current system of taxing it as an Association of Persons. Members of a JV should also be allowed to import equipment on their books rather than on the books of JV.</p> <p>Section 10(23)G tax benefits may be reinstated for a limited period for project developers and investors and extended to road projects.</p>	<ul style="list-style-type: none"> <li>▪ Ministry of Finance</li> <li>▪ DGFT</li> </ul>	
			<ul style="list-style-type: none"> <li>▪ Ministry of Finance</li> </ul>	
9.	<p><b>Critical input material resources</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>▪ Accessibility to naturally occurring sand and stones increased</li> <li>▪ Increased use of alternative materials.</li> </ul>	<p>Mapping of the key input material sources like stone &amp; sand quarries, bitumen outlets, cement and steel factories and putting them on the web.</p> <p>Developing a mechanism for use of alternative locally available materials, industrial waste and better alternative specifications/technology (also mandate in case there is a scarcity of materials).</p> <p>Ensuring government facilitation of mining quarries – freeing them from mafia and other monopolistic ownership.</p> <p>Review the BIS certification requirement for importing cement so as to make it consistent with best practices used internationally and ease imports.</p>	<ul style="list-style-type: none"> <li>▪ MoSRTH &amp; State road agencies.</li> <li>▪ Industry associations and players</li> <li>▪ Ministry of mines</li> <li>▪ MoSTRH / IRC</li> <li>▪ Ministry of Commerce</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short to Medium term</li> </ul>
10.	<p><b>Capacity of Human Resource: Numbers &amp; Quality</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>▪ Increasing the size of the HR pool in the Road Sector;</li> <li>▪ Improving the quality of human resources which should get translated into more efficient planning, designing, construction and monitoring.</li> <li>▪ Creating better labour working conditions to enhance output and prevent exploitation.</li> </ul>	<p>Increasing the human resources pool by</p> <ul style="list-style-type: none"> <li>▪ incentivizing through better salaries, merit recognition and offering ESOPs like the software cos.</li> <li>▪ active marketing with pre-final year students of engineering and diploma colleges and sponsoring final year student project works or fees or both.</li> <li>▪ professionalize the management in contracting firms allowing any person to be able to enter the senior management levels based on merit;</li> <li>▪ expanding Government supported vocational and technical education systems right up to the rural levels and upgrading some of the good existing ones into centres of excellence for certain specific trades.</li> <li>▪ creating incentives and marketing them and the programme to attract foreign and non-resident Indian engineers to work in India.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Industry associations</li> <li>▪ Industry players</li> <li>▪ Central and State Governments</li> </ul>	<ul style="list-style-type: none"> <li>▪ First 4 actions can be initiated in the short term and implemented in the medium term.</li> </ul>

		<p>Improving quality of the human resources pool by -</p> <ul style="list-style-type: none"> <li>▪ setting up more regional/state level training institutions like NITHE, NAC of AP, NICMAR to train and re-train all types of persons right from labourers to mechanics and technicians to engineers and managers in govt and private firms;</li> <li>▪ providing specialized freshmen training for students from colleges entering the road sector along with some certification which will need periodic validation;</li> <li>▪ on-the-job training at construction sites with best practices should be encouraged at college level.</li> <li>▪ consideration of training as part of the performance appraisal process for Government engineers.</li> <li>▪ Incorporating weighting to recent training in relevant area and to professional accrediting to key personnel when evaluating bids.</li> </ul>	<ul style="list-style-type: none"> <li>▪ All India Council for Technical Education (AICTE)</li> <li>▪ Industry associations</li> <li>▪ Central and State Governments</li> </ul>	<ul style="list-style-type: none"> <li>▪ Setting up more institutions: Policy decision to be taken in the Short term and actual setting up in the Medium to Long term.</li> <li>▪ Providing freshmen/induction training, periodic on-the-job training: Short to Medium term</li> <li>▪ Decision to considering training for performance appraisal in Government sector: Short term</li> <li>▪ Consideration of recent training in key persons of contractors, consultants and concessionaires: Immediate</li> </ul>
		<p>Improving the labor conditions of work and living by -</p> <ul style="list-style-type: none"> <li>▪ ensuring good working conditions and occupational, environmental, housing and safety standards – follow the EHS standards of ISO;</li> <li>▪ mandating social security schemes such as welfare funds for construction workers implemented across all states;</li> <li>▪ passing of unorganized workers Bill into an act and implementing it;</li> <li>▪ ensuring flexibility in employing contract labor through appropriate modifications at state level as per Contract Labour Act (1970) and the proposed amendment of 2002.</li> <li>▪ Speedy implementation of the Construction and other Building Workers Act 1996 by all states</li> </ul>	<ul style="list-style-type: none"> <li>▪ Central and State Governments</li> <li>▪ Industry players</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short to Medium term</li> </ul>
11.	<p><b>Availability of plant and equipment</b> Key issues addressed</p> <ul style="list-style-type: none"> <li>▪ Increased access to and use of modern and latest technology plant/equipment especially among the medium &amp; small contractors.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Creating a dedicated industry body/association to represent equipment manufacturing industry.</li> <li>▪ Facilitate development of a good equipment rental and leasing market by passing on benefits of import and excise duty exemptions and other such financial incentives to equipment banks and leasing companies.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ministry of Finance/DEA</li> <li>▪ DGFT</li> <li>▪ MoSRTTH</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short term</li> </ul>
12.	<p><b>Research and Development Aspects</b> Key aspects addressed</p> <ul style="list-style-type: none"> <li>▪ Improving the road construction specification to international standards to allow ease barriers to technology transfer.</li> </ul>	<p>Develop a R&amp;D Vision and Policy for the sector through which -</p> <ul style="list-style-type: none"> <li>▪ strengthening Highway Research Board (HRB) to be the apex body for implementing the vision on a PPP basis;</li> <li>▪ giving tax incentives for setting up and operating R&amp;D centers in the private sector;</li> <li>▪ mechanism for doing field trials – providing sites and a back-up mechanism to write off failures.</li> </ul>	<ul style="list-style-type: none"> <li>▪ MoSRTTH / IRC /HRB</li> <li>▪ Ministry of Finance</li> <li>▪ Industry association and players</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short to Medium term</li> </ul>



13.	<p><b>Value engineering</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>▪ Improved quality at entry.</li> <li>▪ Better value for money.</li> </ul>	<p>Introduce a VE exercise to ensure optimal designs, better quality control process, sample ground-truthing of surveys, road safety audit at concept and design stage (at least for project costing more than Rs.500 million) and introduce the practice of peer review of DPRs prepared by consultants</p>	<ul style="list-style-type: none"> <li>▪ MoSRTH/NHAI</li> <li>▪ State Road Agencies</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short term</li> </ul>
14.	<p><b>Industry structure and profitability</b></p> <p>Key issues addressed</p> <ul style="list-style-type: none"> <li>▪ Better business environment</li> <li>▪ Improved profitability for various industry players.</li> </ul>	<p>Work culture needs to change as can be observed from the Chinese and Malaysian experience by –</p> <ul style="list-style-type: none"> <li>▪ increased delegation of powers to the project level officers in the government to take financial and other administrative decisions to prevent disputes going beyond the DRB stage.</li> <li>▪ resolving issues and disputes as a team rather than taking adversarial positions.</li> <li>▪ industry associations to bring in self-regulation within the industry to ensure quality and ethics.</li> </ul> <p>Safeguarding against cost escalation and increases for key materials by:</p> <ul style="list-style-type: none"> <li>▪ Ensuring that Schedule of Rates is updated each year for all regions in the country to reflect actual real-life market situation by every state.</li> <li>▪ Introducing price escalation clauses in all contracts above 3 months duration and linking price increase of key inputs to alternate (to WPI) cost indices which are more realistic – could even think of pass through feature in exceptions.</li> <li>▪ Greater use of index futures.</li> </ul> <p>Strengthening the supply chain through a vigorous vendor development process - creating specialist sub-contractors with regional knowledge, equipment suppliers/banks. Creating state owned public enterprises (from existing PWDs) for design and construction could strengthen the supply chain by partnering big national and foreign firms.</p>	<ul style="list-style-type: none"> <li>▪ MoSRTH / NHAI</li> <li>▪ State road agencies</li> <li>▪ Industry associations and players</li> </ul> <ul style="list-style-type: none"> <li>▪ MoSRTH / NHAI</li> <li>▪ State road agencies</li> <li>▪ Industry associations</li> <li>▪ Industry players</li> </ul>	<ul style="list-style-type: none"> <li>▪ Short to Medium term</li> </ul> <ul style="list-style-type: none"> <li>▪ Medium term</li> </ul>

\* Immediate: < 1 year, Short term: 1-2 years, Medium term: 2-5 years, Long term: 5-10 years

# **ANNEXES**

## Summary of the Study on the Operation of Dispute Resolution Mechanism in Civil Works in India

1. India is rapidly ramping up its capital spending, the efficiency of which will be determined by the Government's ability to manage infrastructure spending effectively. Unfortunately civil works, worldwide, have the tendency to create strong differences in opinion between even the best intentioned parties, which can quickly degenerate into acrimonious disputes and become difficult to resolve. The ability, therefore, to resolve contract disputes quickly and effectively is the difference between a project that is completed on time and a failed capital investment that is completed only after many years of delay. The current system for resolving contractual matters for civil works in India frequently fails to function and matters of contract interpretation degenerate into prolonged disputes, with tremendous costs for both the public and private sectors.

2. The concept of the Dispute Resolution Board (DRB) process is to provide a mechanism to address and resolve contractual disputes before they escalate into the lawyer-dominated processes of arbitration and/or litigation, both with inherent delays and major costs. The DRB (or Board) is a panel of three experienced, respected, and impartial professionals, selected by the contract parties and familiar with the project and its development. If the parties cannot resolve a dispute according to the contract provisions, the DRB considers the contemporary facts and provides a recommendation which is normally non-binding but includes an explanation of the Board's reasoning which led to its conclusion. Acceptance by the parties is facilitated by their confidence in the technical expertise of the DRB, its first-hand understanding of the project conditions, and the party's opportunity to be heard.

3. The DRB process is recognized globally as a best practice for dispute resolution as a cost-effective mechanism to help the parties head off problems before they escalate into major disputes resulting in arbitration or litigation<sup>22</sup>. Since 1994 DRBs have been required on all World Bank<sup>23</sup>-funded civil contracts above US\$50 million and in 2004 the Multilateral Development Banks (MDBs)<sup>24</sup> jointly agreed to the publishing of harmonized procurement documents that included the requirement for DRBs.

4. It is against this background that the study was undertaken to review and analyze the mechanism of DRBs in India, and to review the results of arbitration and court proceedings pursued after rejection of DRB recommendations. The study is based on a review of disputes taken from sample contracts which have DRB and arbitration provisions. The contracts have been selected from infrastructure projects financed by both the Bank and other sources in several states in India and representing various sectors, including roads, power, water, sewage and ports. A wide variety of disputes have arisen on these contracts and, based on information and data made available, the study provides an analysis of the key issues relating to the functioning of the dispute resolution mechanisms. It also reflects the views and comments received from industry experts.

### ***Key findings of the study were as follows:***

5. DRBs are often not established until a contract dispute arises. When they are established they are dominated by elderly members who often serve on multiple boards.

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<sup>22</sup> According to the DRB Foundation, international experience of DRBs shows that 97% of disputes are resolved successfully through the DRBs with no disputes resorting to litigation.

<sup>23</sup> In this report, the Bank refers to IBRD and IDA

<sup>24</sup> The MDBs that published the harmonized documents are: African Development Bank, Asian Development Bank, Black Sea Trade and Development Bank, Caribbean Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank, International Bank for Reconstruction and Development (the World Bank), Islamic Bank for Development, and Nordic Development Fund.

- DRBs take too long to reach decisions when disputes are addressed to them. Over 50% of DRB recommendations take more than 8 months to render. The time taken to reach a decision is far in excess of the mandated 8 weeks.
- DRB recommendations often have little effect, since the vast majority are rejected. 79% of DRB recommendations are rejected – 44% are rejected by the Employer and 35% by the Contractor.
- The recommendations of DRBs have been validated by arbitration panels as well as by the courts. Rejection of the DRB recommendation does not appear to have substantive merit, since the vast majority of DRB recommendations are upheld in arbitration and court decisions. Arbitration has upheld DRB recommendations in 92% of cases and courts have upheld these recommendations in 90% of the cases where decisions have been handed down.
- The rejection of DRB recommendations has serious negative consequences for the efficiency of public spending. There is a clear difference in the time it takes to complete a project in cases where DRB recommendations are rejected, as compared to those where recommendations are accepted. Rejection of a DRB recommendation almost always results in extensive delays in project completion, sometimes of over 100%, while acceptance of a DRB recommendation is associated with on-time project delivery.
- Contract dispute resolution processes that happen after the rejection of a DRB recommendation are very lengthy and costly. Arbitration decisions can take up to three years, with a court decision taking on average 8 years 11 months.

6. The study also took a broad look at the operation of the Arbitration Act. The absence of clear guidelines on the resolution of arbitration cases, as well as the Act’s ambiguity concerning the recovery of judgments in disputes involving international companies, are issues that appear to reduce the effectiveness of the arbitration process in resolving contractual disputes in an efficient manner.

7. The report is intended to bring to the notice and focus of GOI, the value of DRBs and to develop changes that will improve the effectiveness of DRBs. To achieve this goal it is recommended that virtual workshops be held using GDLN<sup>25</sup> with access to NICNET<sup>26</sup> (National Informatics Center), attended by GOI, those who participated in providing information for the research, and invitees from other countries particularly China, who are experienced in the use of DRBs. Possible areas for facilitated discussion to develop these recommendations would be an international perspective on the value of DRBs, training, changes in the rules, working with Chief Vigilance Commissioner (CVC), and greater incentives for better project management. With the help of the international community, generally accepted DRB best practices and the steps required to be taken to mitigate the problems faced in India in accepting DRB recommendation, could be discussed. Finally a high-level meeting with GOI is proposed to summarize the findings of the workshops and to provide recommendations for improving the effectiveness of DRBs in India. GDLN/NICNET could then be utilized to provide training for potential employers, contractors and DRB members to share the principles of DRBs; the contractual and legal implications; and how the members of DRBs are appointed with a concentration on the “how” of making DRBs work with actual examples of problems and obstacles that have to be overcome.

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<sup>25</sup> World Bank’s Global Development Learning Network (GDLN) – a facility developed to communicate through video conferencing.

<sup>26</sup> The Indian Governments communication network

## Building the Capacity of the Indian Road Construction Industry (Case Studies from Other Countries)

### A. Identification

#### The Issues

India is experiencing rapid economic development and the GOI has proposed an extensive road construction plan to provide adequate infrastructure to support its economic growth. The success of constructing the new road network depends to a large extent on the capacity of the India's existing road construction industry. It consists of a large number of inexperienced and fragmented companies that may not have the experience or technical ability to rise to the challenge to successfully achieve the production required by the GOI plan. The road expansion in India is based on extensive use of the private industry through Build Operate and Transfer (BOT) mechanisms. The issue is therefore how can the fledgling road construction industry increase its capacity and sophistication to be capable of providing sufficient resources to satisfy the requirements of the expansion plans?

#### Description

The objective of these case studies is to identify other countries that have experienced rapid road development and to examine how they strengthened the capacity of their road construction industry to meet the demand of their roads program. The purpose of these case studies is to identify what measures were taken by other governments and industry, to improve the construction industry capacity. The studies are also intended to determine how much emphasis the countries placed on the use of foreign contractors; what actions were deemed necessary to attract them; and how did the country market their program. The studies will also examine the history of the expansion.

### B. Comparator Countries

The countries considered as suitable subjects for case studies were China, Malaysia, Korea and Vietnam.

#### *China*

Since the 1990s China has enjoyed a rapid increase in the rate of road construction and has become one of the fastest countries to build its road network<sup>27</sup>. At the core has been the National Trunk Highway System (NTHS), designed to connect all the major cities and provincial capitals with populations greater than 500,000 through the construction of twelve major highways. This has now been expanded by the "7-9-18 Highway Network" which is intended to link all cities with populations above 200,000 to those connected by the NTHS. According to the UN Economics and Social Commission for Asia and the Pacific<sup>28</sup>, road construction investment in China has been steadily increasing from US\$25 billion in 2001 to US\$68 billion in 2005.

#### *Malaysia*

Malaysia decided in 1977 to build a toll expressway from north to south of the peninsular to link all the main towns. To facilitate this construction the Malaysia Highway Authority was established in October 1980<sup>29</sup> with the objectives to (a) provide a fast, safe and efficient means of road transport for the entire country; (b) link all existing major townships and potential areas of development; (c) enable an effective interurban public road transportation to be provided throughout the country and (d) train personnel and further develop expertise on

<sup>27</sup> Source: website at

<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTEAPREGTOPTRANSPORT/0,,contenMDK:20458714~menuPK:2066295~pagePK:34004173~piPK:34003707~theSitePK:574066,00.html>

<sup>28</sup> Source: website at [http://www.unescap.org/ttdw/common/TIS/AH/files/egm06/financing\\_china\\_2nd.pdf](http://www.unescap.org/ttdw/common/TIS/AH/files/egm06/financing_china_2nd.pdf)

<sup>29</sup> Source: Malaysia Highway Authority downloaded from [http://en.wikipedia.org/wiki/Malaysian\\_Highway\\_Authority](http://en.wikipedia.org/wiki/Malaysian_Highway_Authority)

all facets of road construction, operation and maintenance. Most of the highways are toll operated. Malaysia is currently following the Ninth Malaysia Plan<sup>30</sup> (2006 to 2010) which is considered by the Prime Minister to be one of the country's most significant phases of the overall master economic development plan called "Vision 2020"(the Plan). The Plan includes US\$800 million for rural road construction, US\$265 million for village roads and major infrastructure projects totaling US\$1.45 billion. The government plans to widen the implementation of Private Finance Initiative (PFI) based projects during the Plan period to increase opportunities for the private sector to participate in infrastructure and utilities development and help drive growth in the construction industry.

### ***South Korea***

The highway program in Korea is governed by the National Transport Network Plan (NTNP), which has guided road development over the last 40 years from 313 km of major highways in 1960 to 2,778 km in 2003 (an almost 800% expansion) and from 27,169 km of general roads in 1960 to 94,473 km in 2003 (250% increase)<sup>31</sup>. According to the NTNP between 2000 and 2019, 3,753 km of additional highways are to be built, increasing the length of highways by three times the length that existed in 1997, together with increasing four-lane highways from the 24% in 1997 to 50% in 2010<sup>32</sup>. Korea has also developed a way for private investors to profit from 2,844 km of its toll roads by the development of the Korean Road Infrastructure Fund, which is traded on the Korean Stock Exchange. The fund includes shares of various concessionaires including organizations such as the Macquarie Infrastructure Group, the world's largest operator of toll roads<sup>33</sup>.

### ***Vietnam***

In Vietnam the upgrading of rural roads since 1999 has been instrumental for the overall development of the country and poverty alleviation<sup>34</sup>. The five-year socio-economic plans have been specific on which roads are to be improved and which areas are to receive enhanced access through new road construction. This has resulted in the rehabilitation of 7,600 km of roads and 26 km of bridges; 70 percent increase in road use between 2002 and 2004, with a 12 percent drop in travel time. The country is moving rapidly from a central command economy to one based on market influences and the road construction industry has been instrumental in assisting this movement. The fledgling private sector has been assured access to the rural road construction market, where until recently it was the normal expectation that the State would provide the contractors. Participation of small private contractors increased from 35 percent of contracts awarded in the first year of the development to 100 percent in the final year. Expansion of the road/highway system continues.

## **Selecting the Countries for Case Studies**

Each of the four suggested countries has specific history that could provide lessons for the India Road Construction Industry.

- China has seen remarkably fast changes in its transition from a command economy to a competitive market economy and in the strengthening of its construction industry. Only in 1983 did China classify the construction companies as a service industry. China has reformed its procurement process and now more than 90% of urban and industrial projects are awarded based on competitive or selective bidding.

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<sup>30</sup> Source: Address from Malaysian Prime Minister on 9<sup>th</sup> Malaysia Plan downloaded on May 19, 2007 from [http://www.btimes.com.my/Current\\_News/BT/bt\\_ebooks/btrmk9.pdf](http://www.btimes.com.my/Current_News/BT/bt_ebooks/btrmk9.pdf)

<sup>31</sup> Source: Statistics Bureau, *Annual Statistics of Korea*

<sup>32</sup> Source: UN Economics and Social Commission for Asia and the Pacific (UNESCAP) 2<sup>nd</sup> Regional Policy Dialogue, May 2006 Beijing. Downloaded from

[http://www.unescap.org/esd/environment/mced/tggap/documents/2RPD/presentation/4\\_Session%204/pdf/20\\_Chung%20Mo%20Koo.pdf](http://www.unescap.org/esd/environment/mced/tggap/documents/2RPD/presentation/4_Session%204/pdf/20_Chung%20Mo%20Koo.pdf)

<sup>33</sup> Source: International Herald Tribune downloaded from <http://www.iht.com/articles/2005/09/27/bloomberg/sxmac.php>

<sup>34</sup> Source: Website

<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/VIETNAMEXTN/0,,contentMDK:21202868~menuPK:387571~pagePK:1497618~piPK:217854~theSitePK:387565,00.html>

China has developed various forms of contracts recognizing the use of Build Operate and Transfer (BOT), design build<sup>35</sup> and turnkey<sup>36</sup> forms of contract.

- Malaysia provides an example of a country developing its road program through the construction of toll roads. It learned lessons, which included the reality of restrictive public funds limiting its ability to expand the road network and leading to cancellation of projects. This prompted the opening up to the private industry with BOT arrangements.
- Korea provides a good example of rapid expansion using the private industry and public/private partnerships (PPP). Most of the road network consists of PFI projects, which has demonstrated the strengths and weaknesses of BOT-type development.
- Vietnam provides another example of a country experiencing the transition from a central command economy to a socialist market economy. Construction is a major contribution to its GDP and the government has taken progressive steps in the last ten years to change the structure of the construction industry through its determination to equitize the state-owned enterprises (SOEs). Road construction has been a major plank of its development plan and the country has enjoyed rapid road expansion, particularly over the last five years.

Each of these countries could provide valuable information to help guide India in the development of the capacity of its own road construction industry, but due to time limitations only two countries could be selected for case studies. China was an obvious first choice. It is of similar size and population to India and has been faced with many of the challenges of rural development. Of the remaining three it was considered that at this stage Malaysia will offer the opportunity to discover how the system of private funding has affected the expansion of the road program.

### C. China Case Study

#### History of Highway Development

According to the China Highway Construction Association (CHCA) the expansion of the road networks in China has dramatically increased over the past six years.

**Table 1: Road Expansion in China According to the China Highway Construction Association**

Year	Length of Roads (km)	Comments
1949	80,000	Closed society
1978	890,000	China opened up for reform
2000	1,700,000	Includes an increase in the length of unclassified roads after a road census (also see Table 2)
2006	3,450,000	Includes all roads including at village level

According to official figures of the Comprehensive Transportation Research Center of the National Development and Reform Commission, the road development has been according to Table 2, which indicates the growth of expressways but also a lower total length of all roads than provided by CHCA. CHCA explained that the difference was due to the inclusion, for the first time, of the length of roads at village level.

<sup>35</sup> Design Build is a construction process that combines the design, permit and construction schedules to capture time lost in traditional design-bid-build contracts. The Owner is involved throughout the process. He prepares the requirements for the project and engages a design-build company (DBC) to help him develop the concept. When a budget has been defined the DBC designs and builds the project.

<sup>36</sup> Turnkey is a construction process where the Owner provides the specification and then competitively bids for companies to design and build it for a fixed price. The Owner is not involved until he ultimately accepts delivery of a fully functioning project (i.e. "takes the key" to the new project).

In previous years the figures included expressways, national to provincial roads, county and township roads but not village roads.

**Table 2: Road Network Growth by Technical Classification**

Year	Number of Km by Road Class ('000)						
	Total	Express-way	Class I	Class II	Class III	Class IV	Non-classified <sup>1</sup>
1985	942	0.0	0.4	21.3	128.5	456.3	336.0
1990	1,028	0.5	2.6	43.4	169.8	524.8	287.2
1995	1,157	2.1	9.6	84.9	207.3	606.8	246.2
2000	1,403	16.3	20.1	152.7	276.7	750.3	186.7
2004	1,871	34.3	33.5	231.7	335.3	880.9	354.8

Source: NDRC Comprehensive Transportation Research Center, October 22, 2005

Notes: 1. After a road census in 2000 the length of unclassified roads was adjusted



From 1990 to 2006 during the period of the Eighth, Ninth and Tenth Five-Year Plans, China completed nearly 45,000 km of high-grade toll expressways through the investment of upwards of US\$ 40 billion per year. This unprecedented expansion in the expressway network was accompanied by continuing development of intermediate Class I and II roads under the coordinated efforts of the National Government and the governments of China's 31 provinces and municipalities. No other country has been able to create such a major enhancement to its national road asset base in such a short period.

In the initial planning days the traffic use of roads was very mixed with animal-driven carts, cycles, tractors and trucks, resulting in an overall low efficiency. As the master plan was developed the main driving factor was not how was it be funded but what type of road and what type of network was required. After the decision on the type of roads had been established, the way to raise funds was analyzed and ultimately appropriate financial policies were introduced.

The first major step in the development of China's highway program occurred in 1988 with the construction of a short 17 km expressway from Shanghai to Jiading. It was the Shanghai highway that was recognized as the "beginning" of the expressway program. The development of expressways occurred in two stages: the first from 1988 to 1997, which was called the "kick off", since expansion was gentle. The second stage was from 1998 to the present, which was known as the "rapid development" period. There was no real middle stage because of the Asian financial crisis in the late 90s, during which the Chinese used road construction as a vehicle for stimulating the economy.



In 1992 The State Council issued the "5 - 7" Trunk Highway Network Plan, which was designed to connect all the major cities and provincial capitals with population greater than 500,000. This was to be achieved by the construction of 12 major expressways – 5 vertically and 7 horizontally, and was intended to provide a solid foundation for future road expansion. By 1998 the Asian economic crisis actually provided an



unexpected boost for highway construction.

In 2005 the central government issued the revised “7-9-18” Expressway Trunk Development Plan, which was intended to expand the initial “5-7” Plan to have expressways linking all provincial capitals and all the large and medium-sized cities with populations of more than 200,000. This was to be achieved by the construction of 7 vertical, 9 horizontal and 18 expressways linking the others through radial and grid patterns to maximize coverage and connectivity.

How was it achieved?

### ***Building Management Capacity***

At the beginning of the expressway planning in the late 70s there was little experience within the Chinese road construction industry of high-quality design, procurement, implementation, construction and management of roads. The expressway expansion was discussed and planned for ten years before it started in 1988.

All companies in China were SOEs, but none were adequately experienced<sup>37</sup> in expressway construction to be competent to undertake the new expressway expansion on their own. The government of China understood that the international contractors who undertake mainly large-scale and technically complicated projects brought to their Chinese counterparts advanced technology, improved management techniques and modern, high-tech equipment. They therefore invited the international contracting community to become involved with their initial expressway projects, but with strict requirements that all contractors had to bid the project as a joint venture with local Chinese construction companies as partners. This was specifically required to ensure that the local road construction industry would benefit from technology transfer and develop its capacity. To ensure that foreign contractors were attracted to China and had a level of comfort with entering an unknown market, FIDIC was adopted as the conditions of contract. This was also a condition of the World Bank procurement rules associated with the loans used to fund these initial projects. The international contractors who were attracted to China were predominantly from Hong Kong, Japan and South Korea<sup>38</sup>.

A major Chinese SOE involved with these early projects was the First Highway Bureau which was, at that time, directly responsible to the Ministry of Communications (MOC) – the central government’s Ministry responsible for the overall highway program. This SOE had acquired some capacity for larger highway projects due to some early ventures into limited international highway contracting. The SOE formed consortia with the international companies, who provided mainly management and technical personnel to site, with the SOE completing the actual work. The SOE JV then subcontracted different sections of the work to other smaller SOEs. Through this exchange Chinese SOEs accumulated a wealth of integrated experience in design, construction and management.

During this period international contractors knew more about FIDIC than the provincial supervising and implementing teams and there was substantial discussion between the parties about the principles of supervision and management. This provided a great resource for China to continue to learn. China recognized from an early stage in the highway development process that it was vital to develop an effective and workable master plan. To achieve this goal the provincial governments would need to be fully involved. At the national level the MOC established a comprehensive planning department, which designed the master plans with inputs from research institutes; international seminars organized to collect input from foreign experts and academics; other line agencies at MOC; but most importantly, the provincial communications departments (PCDs). The PCDs having participated in the overall definition of the 7-9-18

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<sup>37</sup> Some SOEs had been supported by the government of China to venture into international markets in the 1980s but many of these ventures were unsuccessful due to their lack of experience. Although the SOEs completed the projects, they suffered large financial losses.

<sup>38</sup> Source: ILO paper “The Construction Industry in China” October 2001.

corridors then completed the detailed alignments and designs within the respective provincial boundaries. This permitted the PCDs to add expressway links that were required for local needs. This process also defined the financing needs for the expressway. When the provincial government had developed a proposal for an expressway project, they would submit it to the central planning body, which was originally called the State Development Planning Commission (SDPC) but which is now known as the National Development and Reform Commission (NDRC). The central planning body reviews the provincial plans and makes comments or suggestions for consideration by the PCD. Ultimately the design and alignment is the responsibility of the PCD and NDRC will only interfere if the alignment of a road traversing two provinces is not agreed between the relevant PCDs.

The MOC organized training to build capacity in the provincial agencies, but each province dispatched study tours to other countries to improve their knowledge. During these early days China was learning and building capacity. By 1998 they believed that they had mastered both the management and the technology of the road construction business and they were well prepared for rapid expansion.

CHCA estimates that the Chinese road construction industry has developed its capacity to an estimated three times greater than demand, so China's construction capacity is now being exported.

### ***Industry Structure***

To understand the structure of the road construction industry it is useful to review the dramatic institutional changes that have occurred in China over the last 30 years. Prior to 1976 during the leadership of Mao Zedong business enterprises and communes, including construction organizations, were all directly controlled by central or provincial government. In many rural areas the agricultural communes actually replaced local government and provided the basic services, such as health care, education, welfare for the elderly and granted permission to couples to have their one child. This was the time of the "iron rice bowl", when enterprise workers were guaranteed life-long employment and security despite enterprise redundant over-staffing and lack of finances to provide adequate services. Construction was viewed at this time as a simple activity of assembling materials, plant and other items made by the other sectors of the economy to create building or civil engineering works and was considered to have no significant added value to the total social product. Most of the central ministries formed their own construction companies to implement their own specific capital projects.

After the Third Plenum of the 11<sup>th</sup> Central Committee in December 1978 the Chinese Communist Party (CCP) announced the decision to shift the focus of its work from class struggles to economic development. This involved redistribution of land held by communes to individuals and groups of families, who were permitted to enter into contracts to farm the land and make profits. Until 1983 construction companies were classified as a service industry. At this time the requirement for rural residents to be tied to the land by China's system of *hukou*, the resident permit or household registration, which restricted an individual's ability to move to the cities, was effectively diluted (although not entirely removed) due to the collapse of the commune system. This resulted in a floating population of rural workers moving to the cities to look for work and these provided the core of those employed in the construction industry. At the end of 2002, 76% of the total employment in the construction industry was from the rural labor force.<sup>39</sup>

The need for reform in China was highlighted by the problems with the SOEs. In 1984 it had been recognized that the policy of using SOEs as a social framework for employment was leading to major inefficiencies and debt due to bloated pay rolls, redundant construction, and incompetent management. Accordingly a "responsibility" system was introduced by the CCP for enterprise managers to separate economic management of the enterprise from CCP's political presence within these organizations. This provided the managers with much greater flexibility and control over who they could hire and fire. This in turn has led to SOE employees, who once had a job-for-life situation, now facing job insecurity and working on temporary contracts. The

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<sup>39</sup> Source: 2004 Paper by Professor Li Shirong, Government of Shapingba District, PRC "Construction in China"

government now believed that construction could be a profit making industry and they agreed on a series of reform programs which are detailed in the “regulation” section of this report. In 1993 the CCP decided that due to the inefficient operation of SOEs, large and medium-sized SOEs should in future be run on a corporate basis. Accordingly the State Economic and Trade Commission (SETC) was set up in May 1993 to formulate sectoral programs for SOE reform and to ensure that enterprise administration was separated from enterprise management. In 1998 the SETC was reshuffled to provide specific responsibilities of regulating and overseeing the need for policy changes. As one of these policies SETC promoted the setting up of a credit guarantee system for small- and medium-sized enterprises (SMEs) to help them obtain financing. While 99% of China’s 10 million registered firms in all sectors are SMEs, which employ 75% of urban workers, the financing system favors large SOEs, because SMEs are a bigger credit risk with their limited assets. The commission raised funds through credit guarantee organizations and special industrial and technological bonding companies to encourage banks to grant loans to SMEs, especially those SMEs that depend on high technology or that produce high-tech products. The SETC also promoted venture capital and encouraged domestic entrepreneurs to invest in SMEs<sup>40</sup>.

Since 1998 the number of SOE employees has dramatically reduced and incompetent managers have been sacked. Many SOEs turned to the talent market for new management recruits, including attempts to attract foreign managers. There were, at that time, examples such as China Construction (Group) Corporation and Sino-coal International Engineering Group advertising for foreign deputy general managers to introduce new management ideas to the SOE reform process.<sup>41</sup>

**Figure 1: Example of the Role of a Provincial SOE**

**The Beijing Municipal Construction Commission**  
 The Beijing Municipal Construction Commission has four construction corporations and a number of other municipal government-owned construction or installation companies under its control. One of these corporations –the Beijing Construction Engineering Corporation-- oversees:

- Six building construction companies
- An installation company
- Two pre-cast concrete plants
- A timber component factory
- A construction machinery factory
- A marble milling factory
- A design institute
- A contracting company
- A real estate development company
- A joint venture with a Japanese contractor
- A fitting out and decorating business
- A research institute
- A consulting firm
- A hospital
- A computer center
- A continuing education and training center

The speed of SOE reform substantially accelerated after China’s accession to the WTO in December 2001. An example of a successful business enterprise is the China State Construction Engineering Corporation, originally owned by the MOC but now completely autonomous. It is organized into 8 engineering construction bureaus (headquartered in Beijing (2), Tangshan, Wuhan, Guiyang, Changsha, Nanyang, and Jinan), 36 subsidiaries, 15 overseas branches, 6 design institutes, a material and equipment supplying company and several affiliated organizations.

In May, 2003 the SETC was replaced by a new organization, the State Asset Management Commission (SAMC), created specifically to manage new regulations that had been introduced for selling state-owned assets. According to a leading attorney operating in China, Mr. Howard Chao<sup>42</sup> of O’Melveny & Myers, the Chinese government is reducing its stakes in large SOEs by privatizing them by listing them in domestic and overseas stock markets, and by reducing the government’s stock in listed companies. New regulations have also been introduced that allow foreign

investors to buy blocks of hitherto non-transferable “state shares” and “legal person shares” in Chinese domestically owned companies.

In many cases the SOEs have been assigned to provinces, autonomous regions, municipalities and counties, for the purpose of completing construction projects in these areas. Companies assigned to the local

<sup>40</sup> Source: China Online January 2000

<sup>41</sup> Source: “Foreign Talent to help upgrade SOEs” China Daily, June 25<sup>th</sup>, 2004

<sup>42</sup> Source: New wave of privatization coming to China. O’Melveny & Myers LLP, April 4, 2003

government are normally grouped in one or more corporations that report to the local construction commission. These corporations plan, organize, direct and coordinate the activities of the subordinate companies. (See text box “An Example of the Role of a Provincial SOE”)

In addition to the SOEs there are collective construction enterprises in both urban and rural areas that have expanded rapidly since the 1984 reforms. Urban collectives have been developed and are under the administration of municipal, borough, district, town governments or community committees. They are normally given small and relatively simple work to complete, and act somewhat like a small public works unit. There are approximately 25,000 urban collectives. Rural collectives or brigades are owned and run by townships or villages and are employed to build houses or small projects. There are currently some 50,000 such brigades in China. They are normally restricted to their own communities, although they can take part in other projects in other parts of the country with permission from the local construction commissions. Both urban and rural constructive brigades are allowed to work in urban areas either as a general contractor, subcontractor or as a labor-only contractor on major works for the SOEs.

From the initial development of the expressways it was established that the provincial governments would be responsible for the design, implementation and construction of the expressways and each province had their specific SOE teams to complete the work. The quality was initially not good but it improved gradually with imported technology and the experience of working with international consortia. Every project they completed led to greater experience and the number of teams developed rapidly. In the early days the PCDs would tend to use their local construction enterprises, but the principle of competitive bidding became very well established in China and SOEs centrally and provincially were permitted to bid against each other for contracts. This led to a strengthening of the industry’s capacity through good and transparent business practices.

As the expressway program developed, small entirely private enterprises were spawned from the SOEs. These are still small and are normally specialist subcontractors. The general consensus is that the prospect of a large, fully independent, private construction companies being created in China is not likely in the near future due mainly to the competition and experience of the SOEs. However the reality is that the large SOEs are, in many cases, operating according to the same market principles and forces as a completely private company and enjoy substantial private ownership through share holdings.

Generally contracts are competitively bid as regular price contracts based on bills of quantities, and the winning SOE then sublets to smaller subcontractors. Occasionally SOE contractors may be awarded a contract through a negotiated agreement with the bank funding the project, but this is only for a very small portion of the projects. If private money is being used through a concessionaire contract the concessionaire may elect to use a particular contractor or the contractor may be part of the concessionaires venture.

The supervision team at project level comprises provincial government staff led by the Chief Engineer who, on the initial expressway projects, was sent from the central MOC. Now the site managers tend to be all provincial staff. The site staff is authorized to make on-site decisions and to issue instructions. They have design engineers available to guide supervision staff and apparently there are few design issues that delay progress. The contracts have dispute resolution provisions that include adjudication, through an individual adjudicator or dispute review boards (DRBs) followed by arbitration as the next step. Due to the Chinese culture that encourages a team approach to resolving problems, disputes are generally resolved rapidly and at site level. Apparently it is considered a failure on behalf of the project team if a dispute were ever to get to arbitration<sup>43</sup> and the actual use of the adjudicator or DRBs on highway projects has not generally not been necessary due to the intent of all parties to resolve issues as they occur. DRBs have been used in other construction sectors in China, particularly on hydro power projects with a high level of success.

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<sup>43</sup> Source: Interview with the China Communication Construction Company Limited – a contractor. (CCCC) May 31, 2007 and the China Association of International Contractors June 1, 2007.

### ***Building Manpower Capacity***

China enjoys wide manpower resources from the many central and provincial SOEs and it was only up to the mid/late 90s that the capacity was considered to be insufficient to meet the demands of the expressway program. The Chinese road industry rapidly learned from their international joint venture partners, and MOC reports that it is now unusual to require the assistance of the international road building community on expressways<sup>44</sup>. The process by which large SOEs win expressway bids in the provinces and then hire smaller SOEs and private subcontractors to complete specific sections or supply particular trades on the project has rapidly developed the supply chain for manpower in the industry. One leading Chinese contractor<sup>45</sup> reported that the manpower capacity of their own organization was strengthened by building on the social resources of smaller companies which they integrated into the larger company as they worked in particular provinces. There are technical colleges and professional schools where some higher caliber labor can be trained.

Skilled operators for plant and equipment have been trained initially by the international machine manufacturing companies who, when selling plant and equipment to Chinese companies, arranged to either train operators in their own country and/or send trainers to China with their equipment to work alongside the trainee operators.

There has never been a shortage of high-caliber civil engineers in China. The profession is highly regarded in the community and salaries are higher than the average for other professions. There is great competition for students entering universities, particularly certain institutions, and the interest in civil engineering has been defined as “hot”<sup>46</sup>.

The institutional changes in China, described above, combined with a specific expressway program linked to the government’s overall economic policy and easier access to credit, has provided the opportunity for a steady growth in the creation of SMEs, private firms and shareholder-owned companies. Prospective entrepreneurs have the ability to assess business opportunities and predict potential revenue compared with required resource investment more reliably. The government has also established through SETC/SAMC, possible more accessible avenues for financing

### ***Building Equipment Capacity***

At the beginning of the expressway expansion most high-tech and sophisticated construction equipment and plant were imported. Entrepreneurs in China then obtained the specifications for the machinery and began manufacturing their own, sometimes in joint venture arrangements with foreign manufacturers. These initial ventures did not result in a high-quality product, but over time the quality improved and now China is exporting plant and equipment. Plant hire companies have developed, particularly for sophisticated equipment such as pavers, tunneling equipment and batching plants. These companies were created by either private entrepreneurs or SOEs as the benefits of the orchestrated expressway plans became evident and the confidence level increased to encourage the business decision to purchase equipment. These companies have now grown and are well established.

### ***Materials Capacity***

At the beginning of the expressway program there was a possibility of a shortage of some materials such as cement, but businessmen becoming aware of the potential rewards have invested in new manufacturing plants. These companies are generally still SOEs. The only construction material that needs to be imported is bitumen and occasionally some very specific high-tech steel.

### ***Regulations and Associations***

The ‘responsibility system’ mentioned earlier introduced market mechanisms into the construction industry, a

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<sup>44</sup> Source: Interview with MOC on May 31, 2007

<sup>45</sup> Source: Interview with CCCC May 31, 2007

<sup>46</sup> Source: Interview with CCCC May 31, 2007

process that is continuing. These have included<sup>47</sup>:

- Diversifying ownership of construction enterprises.
- Deregulating employment in the construction industry to allow companies to hire and fire or downsize to reflect the actual market conditions.
- Deregulating building materials supply so that manufacturing or supply are based, not on central policy, but on demand.
- Diversifying the business scope of construction enterprises.
- Using bidding procedures to allocate construction work.
- Bringing the construction industry under the unified administration of the Ministry of Construction (MOCn) and its local agencies.
- Further privatizing the state-owned construction enterprises.
- Separating field operations from management.

Despite differences in opinion within Chinese leadership about the pace and controls required for these reforms or even whether the reforms should be discarded, the CCP at the 14<sup>th</sup> Party Congress in 1992<sup>48</sup> committed itself to all reforms and to the movement towards a socialist market system in China. Subsequent debate focused on the pace of reform as opposed to whether reforms should be abandoned.

In 1996 a Construction Law was prepared by the central, provincial and municipal governments to unify all issues such as qualifications for entry into the construction industry, procurement, delivery of works, construction supervision, safety and quality, legal liability, market regulations and procedures in construction projects. The law integrates all existing construction related regulations issued from different sources and was intended to govern all activities in the construction industry. It was enacted in November, 1997 and put in effect in March 1998.

Up to 2003 competitive bidding had been recommended but was not mandatory. This changed in May 2003 when “Measures on Tenders and Bids for Contracts for Construction Projects” became effective<sup>49</sup>. These measures provide procedural and substantive requirements for the tendering, bidding, opening of sealed tenders, evaluation of tenders, declaration of winning tenders and the awarding of contracts. It is a process that is mandatory for the selection of a contractor for all projects where the size falls within the scope set up by the Rules on Standards of the Scope and Size of Construction Projects for Tenders<sup>50</sup>.

Transparency International reported in May 2004 that “China is leading the way in introducing international best practice into its tendering and project management anti-corruption systems”<sup>51</sup>. China has also recently (2004) introduced blacklisting measures for any companies found to be guilty of bribery or corrupt practices<sup>52</sup>.

The construction industry in China is now regulated by MOCn, which applies and monitors regulations and legislation relevant to the industry. It checks the qualifications of construction companies when they bid for projects; monitors and administers the licensing law; and monitors the construction process and administration of projects. The Ministry monitors all procurement procedures and reviews the qualifications

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<sup>47</sup> Source: Lu You-Jie *Construction Practice in China, Part I and II*

<sup>48</sup> The debates between 1991- 92, leading up to the 14<sup>th</sup> party conference, were particularly divided between party leadership due to the announcement of the Soviet Communist Party in 1991 that it was abandoning its monopoly of power and then the subsequent attempted coup in Moscow. This led some Chinese leaders to argue that ideological ideas should be strengthened and economic reforms dropped while others (particularly Deng Xiaoping) argued that it would be more important to proceed steadily with reforms to bolster the legitimacy of the CCP.

<sup>49</sup> Measures were issued jointly by State Development Planning Commission, MOC, Min of Railways, Min of Information Industry, Min of Water Resources, Civil Aviation Administration of China.

<sup>50</sup> Source: China Law and Policy April 4, 2003 – a publication of O’Melveny & Myers LLP

<sup>51</sup> Neill Stansbury, Project Director for Construction Engineering at Transparency International while attending a recent anti-corruption mission to Beijing

<sup>52</sup> Press release, Transparency International, May 13, 2004

of all the players in the design, bidding, pricing, quality control and construction stages of projects. Its department of human resources analyzes the qualifications of individuals. From these reviews it collates relevant information and data which it shares with the industry through its website and through its contacts with the various construction trade associations. There are counterparts to each of MOCn's departments in the industry and all of these associations were initially established by the Government, although now they are considered to be self-sufficient. MOCn has vigorous exchanges about the industry's regulations with the trade associations and if there appear to be major problems with any of the regulations or if they can be enhanced, MOCn arranges to incorporate the appropriate changes. MOCn reports that the various trade associations now share responsibility for self-regulating the industry and the quality of enterprises is being delegated and entrusted to the associations.

### ***Funding Restructuring***

Before the adoption of reform and opening of China to the outside world, the financing of road construction was controlled through the provincial governments. They were the sole investment body and decided on the scale and structure of every project. The investment in roads was limited, since it depended on government appropriation and all funds, equipment, materials and labor were allocated by the provincial governments.

At the beginning of the expressway planning in the 1980s China began to source road construction from loans provided by local banks with interest payments, instead of appropriating funds without interest payments. In 1983 the country established "The Construction Fund of Energy and Transport" and in 1984 the State Council issued major policies to provide sources of funding for the construction of highways. These included:

- An increase in the standard maintenance "fee", a generic charge to vehicle owners collected by the provincial transport authorities to be used for road maintenance, improvement of technology, management and new road construction.
- A levy or "fee" on the purchase of all cars, which was collected by central government and placed into a fund ready for disbursement to the provincial governments as part of their overall financing needs for the expressways.
- The right to charge a toll fee. This was implemented by the provincial governments who could charge tolls after they had constructed the expressway.
- The central government assisted the road program in the remote, poor provinces by supplying specific commodities to the road construction workers to complement their wages, such as cotton and cloth.
- Toll rights could be transferred. This permitted the provincial governments to sell a section of road to a concessionaire, often international, who in turn could issue bonds and trade on international and local stock exchanges to raise money.

Other rules and regulations were established to strengthen road financing such as<sup>53</sup>:

- Company Law
- Law on foreign capital enterprises
- Law on Chinese-foreign contractual joint ventures
- Guarantee Law
- Regulations on vehicle purchase tax
- Regulation on management of financing abroad
- Regulation on management of enterprises' bonds
- Regulation on tolls on highways, bridges and tunneling by loan
- Regulation on management of the road maintenance fee
- Securities Law

From the early 1990s China continued with a combined investment system which included investment by central government, local government, social (i.e. non-government) capital and foreign capital and using the

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<sup>53</sup> Source: Road Financing in China at <http://www.unescap.org>

principle of “build with a loan and repay through charging tolls”. In 1998 the Government created a fresh source of funding by establishing a special fund for infrastructure construction by issuing state bonds.

The major financial sources for expressway funding are:

- (a) Bank loans from local financial institutions, which can be divided into two types and comprise approximately 40% of expressway funding:
  - National strategic loans from the China Development Bank and
  - Commercial loans, mainly from the Industrial and Commercial Bank of China, the Construction Bank of China, the Bank of Communications and the Bank of China (all state-owned)
- (b) Local (provincial) government mainly through the maintenance fee
- (c) Overseas financial support from international financial institutions such as the World Bank (WB) and Asian Development Bank (ADB)
- (d) Central government from the automobile purchase tax and the bonds. The automobile purchase tax now generates some RMB 50 billion (about \$6.6 billion) per year and the amount that is contributed to an expressway project from this fund has now increased from 10% to 20% of the projected cost. Before a provincial government can go to the central government for this percentage, it needs to have in place funding for at least 30% of the project’s anticipated cost as equity capital.
- (e) Private sources of financing are possible, but there are no national laws to govern the use of these funds. The only regulation issued by MOC has been the right to transfer operation rights as a concessionaire. In 2001 the SDPC issued an “encouragement” for the use of private capital in road construction. A National Circular (or measure) was issued to encourage private capital holdings in concessions for operating toll highways. In 2003 the State Council issued a policy lifting the ban on the use of private money in areas which had previously been forbidden. The local governments have also issued similar incentives for the use of private funds, but private capital is primarily employed through the ownership of shares in toll operations.

Currently approximately 60% of the expressway toll roads are built and managed by the provincial governments. The remaining 40% of expressways tolls have either been developed under BOT conditions by a concessionaire or the provincial governments have initially coordinated the construction of the highway and then sold a section to a concessionaire to operate and maintain. These investment concessionaires companies are normally funded and managed by overseas entities who issue their company shares on international stock exchanges.

BOT contracts have been used in China, but there is no legal structure to support the BOT concessionaires. There has been anecdotal information provided that indicates that in one case a concessionaire had a contract to build the road and then operate it, but after completion of the road the provincial government allocated the management to another company with no legal recourse for the initial company. In another case a concessionaire built a road with a certain projected traffic flow and revenue, but after the road was completed the provincial government built another road parallel to the concessionaire’s, which seriously reduced his revenue and again with no legal recourse for his losses. This lack of legal protection has resulted in the view by some investors and construction organizations, that BOT arrangements are risky and they are not supported. There are currently no international companies entering the BOT market in China. However, China is currently reviewing other possible options including PFI.

## **Lessons Learned**

The case study on China identifies specific lessons that may be useful for helping India with capacity building of its own road construction industry. These are set out below:

- Develop a good effective master plan for an integrated highway network and link it through regular economic plans, such as the five-year programs used in China. By creating a reliable plan stakeholders in the industry will have a better understanding of their potential revenue and what level of investment is



required. It also provides substance for creating business plans for entrepreneurial ventures that require capital investment.

- Ensure that the plan is formulated mainly by the provincial governments, since they will be responsible for administering the construction process.
- The central administration should be responsible to ensure that the local plans are integrated fully with the national plan and that at provincial boundaries the alignments are coordinated to the satisfaction of both provinces.
- If possible attempt to have simultaneous implementation of expressway construction by all relevant provinces. China succeeded through all 31 provinces and municipalities and experienced the opportunity of rapid expansion and completion of the network with immediate economic benefits that helped to provide funding for further expansion.
- Greenfield development is the fastest and most productive method of constructing a new national network due to the lack of interference from existing networks. Apparently land acquisition in China for the expressways has not proved too great an obstacle, since the land is considered to be nationally owned and providing adequate and timely relocation is assured, the required land is made available.
- Critically identify all areas where the capacity of the road industry is inadequate or weak and take steps to help.
  - The government of China understood that the international contractors who undertake mainly large scale and technically complicated projects brought to their Chinese counterparts advanced technology, improved management techniques and modern, high-tech equipment. China recognized that the experience of its home road construction industry in almost all disciplines --design, procurement, type of contract, financing alternatives, construction, contract management and operations-- was not adequate to meet the needs of the expressway program. It therefore invited the international construction community to help through competitive bidding. It established the requirement that any international contractor was to joint venture with a local contractor, and by the late 90s the industry had developed such a wealth of technological and management transfer that it is now capable of completing the expressway program with its own resources.
  - The supply chain within the industry was initially based on the abundance of small and large SOEs, collectives and brigades. These were not efficient. They were operated as a social program rather than as a business and many suffered from bloated pay rolls, redundant construction, and incompetent management. China recognized the need for economic development and introduced and implemented new policies with major institutional reforms that obliged the SOEs to operate on a corporate basis. Each SOE was to be independent of the central or provincial government and be self-supporting.
  - Institutional changes were also made to ownership opportunities, and development of private enterprises was encouraged, together with private investment in public companies through the purchase of shares. This changed the face of the construction industry, since now efficiency and profitability encouraged investment of private funds.
- Implement appropriate regulations and legislation to support and enable the overall policies to be implemented. Also ensure that the appropriate agencies are established to administer the new policies and ensure that this is a dynamic process, allowing for adjustments as the reforms progress.
- Support and encourage the growth of trade associations who can help self-regulate the industry and share information within and between stakeholders in the industry. This is particularly important for creating databases of contractors, subcontractors, specialized subcontractors, material suppliers and plant/equipment rental companies. When large prime contractors, either international contractors or large SOEs, tender for a project they should be able to depend on a strong and reasonably regulated infrastructure within the construction industry of subcontractors and suppliers, since most of the primes depend on the ability to perform as management contractors rather than importing all their own people. A database of industry performers provides others with the ability to find suitable associates and partners

with whom to link to bid a project and then complete the work successfully.

- Establish one organization that may be an amalgam of a series of trade associations as “spokesman for the industry”.
- Be open to different types of contractual arrangements such as turnkey and BOT, but ensure that the correct legal protection is established. BOTs in China have not been generally successful and both the MOC and the contractors recognize that the reason is the lack of an adequate legal framework. This may be amended as China continues to recognize issues that restrict its expansion plans.
- Private concessionaire “operation and maintenance only” arrangements are valuable for distributing financial burdens and risks. The trucking industry complains that toll rates are too high and it is inconvenient to have to stop to pay every few kilometers. In response the Government is reviewing options to lower the rates and simplify the payment process. Consideration is even being given to buying back concessionaire agreements prior to the completion of the contractual maintenance period, so that some toll booths may be removed.
- Rapid and effective completion of projects is essential to ensure that the road asset base provides economic benefits as quickly as possible. Central and provincial governments ensure that the projects are managed on a team basis with all participants committed to the completion of a quality product on time and to budget. Appropriate staff is allocated to the project to ensure that timely design and contractual decisions can be made. Project staff are authorized to issue directions and instructions without second guessing from other management levels.
- China does not believe in confrontational management and understands the need to resolve disputes quickly due to the negative impact that it has on the progress of the project and its acceptance into the national asset base. They do, however, recognize that it is vital to have reliable and respected dispute resolution mechanisms within the contract. It is generally considered that site personnel have failed in their administrative duties if disputes cannot be resolved at project level. If a dispute needs to be forwarded to higher levels of resolution, the recommendations of the adjudicators/DRB are normally respected. Adjudication provisions are included in the conditions of contract but on road construction there is seldom cause for their use, due to the overwhelming desire by all parties to negotiate an agreement to avoid delays. DRBs have been used successfully in different forms of construction in China, particularly hydro schemes.
- Ensure that there are clear and transparent legislative and regulatory systems established for the industry. These should not be overly complex and the industry should be provided with the responsibility to exercise self-regulation where possible through its trade associations. Ensure there is open dialogue between government and industry concerning regulations, particularly during major policy or institutional reform.

#### **D. Malaysia Case Study**

##### **History of Highway Development**

The foundation of the modern road infrastructure in



Malaysia was a network of cart roads constructed by the British Administration in 1824. The advent of motorcars required the upgrading of roads to accommodate the change from bullock carts to cars and trucks. By Independence in 1957 the peninsula of

Malaysia was served by the North South trunk road that acted as a main artery. In the early 1970s road travel

was mainly by Federal roads but as the number of cars increased, major ports and airports opened and the population increased in major cities and towns in Malaysia, the Federal roads became overcrowded and new highways were required. The government initially considered widening existing roads but this caused substantial social problems with land acquisition. Alternative plans were considered and the government elected to develop a 'greenfield' expressway network to underpin their economic development. Several short expressways were built between 1974 and 1979, but by 1980 the government had initiated the "Look East Policy", which involved a new broad economic policy that involved opening the doors to foreign contractors to undertake mega-projects. At this time the construction industry saw phenomenal growth which was supported by the National Development Policy and the First, Second and Third Outline Perspective Plans for the periods from 1981 to 2010. The new policy was also reflected in Malaysia's five-year plans. As part of the policy it was recognized that a well developed and integrated infrastructure and utilities network including transportation, telecommunication, water supply and sewerage was an essential pre-condition for continued high economic growth.

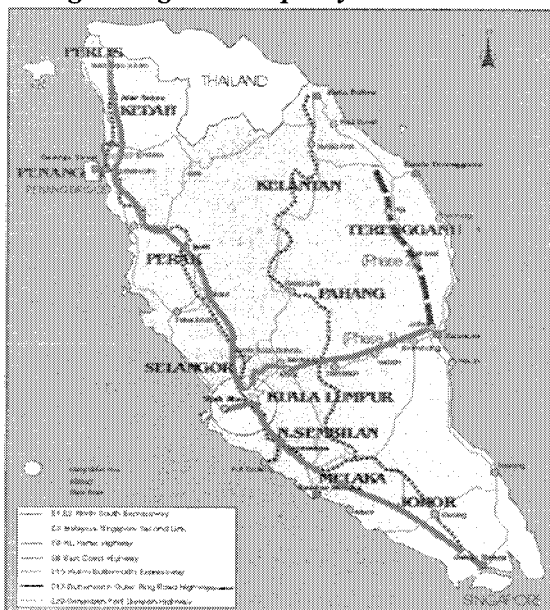


The first mega project for the expressway development plan was the 848 km North South Toll expressway which was started in 1980 as a greenfield project independent of the original North South trunk road. The expressway network continued to be developed to connect all major cities and conurbations with a current total length of 1,192 km. It is now considered the best expressway network in Southeast Asia and third in Asia after Japan and China. Two of the expressways form part of the Asian Highway Network, an international project between Asian

nations to develop their interconnecting highway systems<sup>54</sup>. While the expressway expansion was occurring, the length of the overall Malaysian road network increased from 61,294 km in 1995 to 73,403 km in 2002.

### How was it Achieved?

#### ***Building Management Capacity***



To understand the unique characteristics of the Malaysian road construction industry it is useful to review the history of its development. Construction activities in Malaysia can be traced to the British Administration (1786 – 1957). Discovery of large deposits of alluvial tin stimulated the initial construction boom with the need to transport the material from mines to ports. Laborers from China and India were brought in to work the tin mines, rubber and cocoa plantations and these nationals have formed many of the present day construction companies<sup>55</sup>. In the early days contractors would be either individuals or small groups of people offering their services and working under the direction of an architect or engineer in the employment of the client. There were few general or main contractors. The subcontracting system which is still currently used, grew from these early practices from which subcontractors were hired and organized by main contractors who bid for and obtained projects and subsequently sublet parts

<sup>54</sup> Source: Malaysian Expressway System at <http://www.answers.com/topic/malaysian-expressway-system>

<sup>55</sup> Source: Master Builder's Association of Malaysia

of the contracts and packages. Construction companies in the post-independence (Merdeka) days (1957) tended to be family dominated and were characterized as “clannish, paternalistic, thrifty, risky, hardworking and practiced the apprentice systems”<sup>56</sup>. The majority of contractors in the road industry were Chinese engineers, who in the 1970s applied their entrepreneurial initiative in becoming contractors and buying imported equipment.

Also at this time the Government consisted of three dominant political parties, each representing one of the three ethnic groups: United Malays National Organization (UMNO) for the Bumiputras (National Malays), Malaysia Indian Conference (MIC) for the Indians, and the Malaysian Chinese Association (MCA) for the Chinese. These parties became involved with ownership of business enterprises including road construction companies. In the late 90s the political parties suffered major financial losses due to the Asian economic crisis and the Government’s investment arm, Khazanah Nasional Berhad, stepped in to help and acquired the political parties’ companies. These companies are still operating and are known as Government Linked Companies (GLC). Both the smaller private contractors and the GLCs played instrumental parts in building the capacity of the road construction industry.

Once the decision was made to develop the highway network through greenfield expressways, there was a need for the Malaysian government to enact the appropriate policy changes to allow the plan to be implemented. First there was a need to identify which government agency was to supervise the work. After consideration it was decided to establish a new organization within the Ministry of Works with the sole mandate to supervise and implement the design, construction and management of the expressways and to administer the toll fees and issue contracts as deemed relevant to its operations. In 1980 this organization, the Malaysian Highway Authority (MHA), was established as a constitutional organization through the passage of the law “The Malaysian Highway Authority Incorporation Act”. All other roads remained under the supervision of the Ministry of Works or state and local authorities.

At that time MHA was staffed by engineers who were mainly experienced only with the design of rural roads and not large contracts. To assist MHA, engineers and international design consultants from Japan (JICA), Italy (ANAS) and the UK were invited to Malaysia to help MHA build their capacity in design and implementation. It was accepted that international contractors were vital to fulfil Malaysia’s expansion plans and the “Look East Policy” had already resulted in an influx of foreign contractors into the country for all forms of construction. These contractors had opened the eyes of local contractors to new construction technology and construction management techniques for delivering projects on time or ahead of schedule. The foreign contractors were recognized as “technologically more advanced, financially strong and had easy access to financial facilities”<sup>57</sup>. They were invited by the Government for the implementation of such mega-projects as the North-South Expressway (NSE). The international consultants recommended that to ensure the international contractors had a comfort level with entering the market, recognized internationally accepted conditions of contract should be used. FIDIC was therefore adopted, which also had the advantage of introducing the domestic contractors to the type of contracts being used globally. To ensure that the Employer, i.e. MHA, fully understood contract management according to FIDIC, the “Engineer’s” position was filled by international consultants (mainly from the UK).

NSE was an 848 km expressway which connected Singapore to Thailand through Malaysia. The project was started in 1980 using standard bill-of-quantity type contracts, but in the early 80s public funding was restricted through economic difficulties. The Prime Minister believed that the project was so vital that it could not be delayed and he personally encouraged the immediate use of private participation.

In 1980 the Government launched its “corporatization policy” and in 1983 MHA organized an international open competition to invite consortia to submit proposals to complete the remaining 514 km of expressway on a privatized BOT basis. Six groups applied for pre-qualification but only three were accepted. Out of these

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<sup>56</sup> Source: Literature from Master Builder’s Association of Malaysia 2006

<sup>57</sup> Source: Master Builders’ Association of Malaysia

three only two were considered to have sufficient substance for consideration and finally the concession agreement was signed between the government and PLUS. PLUS Bhd was to be fully responsible for financing, construction, maintenance and operation of the expressway. This initial privatization of the expressways was initiated with full support from the Government, particularly the prime minister, who due to the determination to succeed with the proposed road network plans provided assistance in whatever way possible to launch the first privatized expressway. This assistance included:

- The acquisition and payment for right-of-way land with no involvement of the contractor.
- Ensuring that most private companies would have access to appropriate financing.
- Guarantees for anticipated traffic flows and projected revenue.
- Protecting foreign exchange fluctuations.

At the time the contract was awarded to PLUS, the expressway was already fully designed, with the alignment identified and the drawings prepared. However, the international design consultants who were part of the concessionaire were provided the opportunity to review the drawings and contract details and to amend or “optimize” the drawings to achieve savings or improve technical quality. The recommendations ultimately made by PLUS were effective and resulted in substantial cost savings, and their input provided substantial learning opportunities for the MHA design team<sup>58</sup>.

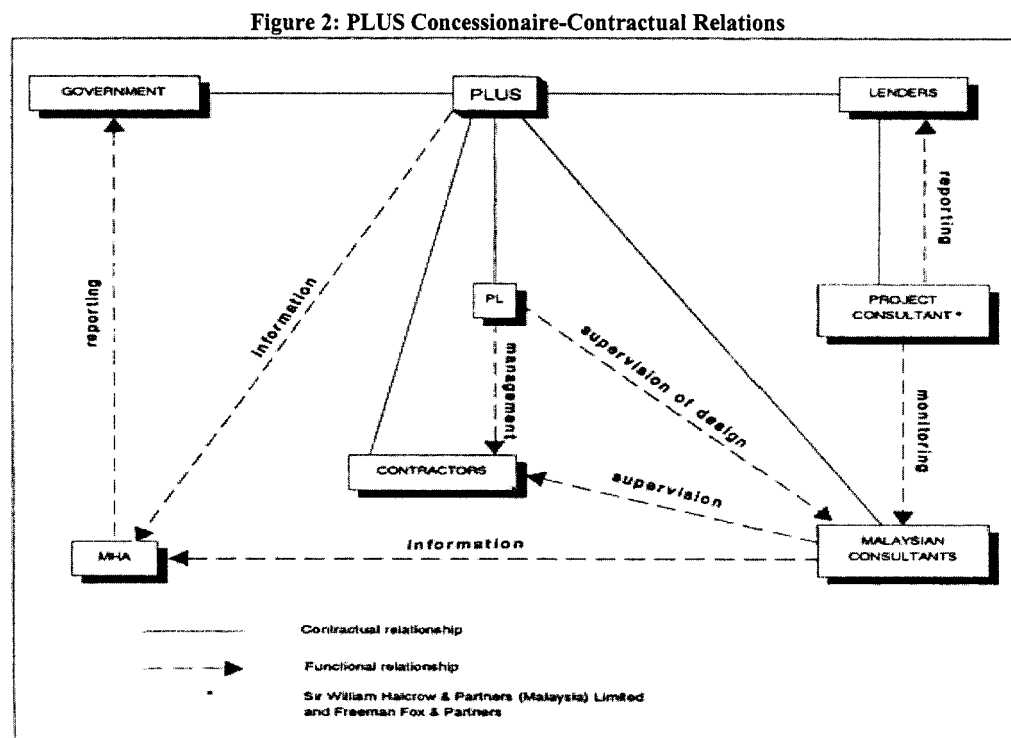


Figure 2 demonstrates the contractual relationship between the various players in the PLUS consortium, which included lenders, international project consultants, Malaysian consultants, project managers, and international and domestic contractors. Due to the inexperience of the local players, PLUS was guided by a group of French and UK consultants. The lenders comprised approximately 45 local banks, who were encouraged by the Government to raise 4.3 billion ringgits (\$1.3 billion). The lead project consultants were

<sup>58</sup> An example of design improvement was provided during an interview with UEM on June 4, 2007 as: “In the original plans a 15 km viaduct had been designed which was complex and expensive but during optimization this was re-designed and the need for the viaduct was eliminated resulting in substantial cost savings.”

provided from international design firms and were responsible for optimizing the NSE design and preparing revised drawings. Malaysian consultants were established as the design supervisors and were allocated to each section of the project to provide on-site contact for the contractors to respond to any potential design problems. The domestic consultants were given the authority to make decisions at site level with the support of the international design team. The consultants, both domestic and international, had two responsibilities, quantity and quality. The Project Manager (“PL” in Figure 2) was a team of experienced managers led by international contract management engineers who were responsible for time and money. In FIDIC terminology they would have been the “Engineer”, with the “Employer” being the concessionaire senior management.

The main Malaysian contractor within PLUS, and the key driving force behind the consortium, was United Engineering of Malaysia (UEM), which at the time was owned by the UMNO political party. They partnered with international contractors who primarily brought technical and management staff to the team to share their knowledge and practice of advanced technology and improved management techniques, while UEM completed the coordination of the actual work.

The final award of the contract was delayed for two years due to challenges from other political parties who questioned the level of government support that was being provided to the concessionaire and also criticized the level of projected revenues, which were considered by some to be too favorable to PLUS. This delay provided PLUS with time to consider how they would administer the project with optimum use of local contractors. The main consideration was that NSE should be used for building the capacity of the smaller Malaysian road contractors. There were at this time a number of smaller contractors, mainly Chinese, who had the capability to implement all the work required on a road project (earthworks, drainage, paving, bridges etc.) and it was decided to subdivide NSE into 40 main contracts, with some sections having lengths as short as 15 km, which could be competitively bid and completed by the domestic contractors without overloading their resources. PLUS also recognized that the major problem for smaller contractors was cash flow, and in order to specifically assist the domestic contractors with mobilization, they agreed to provide, with the correct bonds, an advance payment of 15% of the contract value. To counter the lack of employment prospects for the Bumiputra (the indigenous Malays) the Government had introduced an affirmative action program for employment and PLUS reflected this requirement in all construction contracts by requiring that a minimum of 30% of the labor was to be Bumiputra.

Each of the contracts contained dispute resolution provisions that if disputes arose within the team, the parties would first go to adjudication and if this failed to arbitration. During all 40 contracts there was not one disagreement that even went to adjudication. The main reason for this was that it was the mandate of the project manager that any issue that “irritated” the contractor had to be contemporaneously resolved primarily by site staff.<sup>59</sup> Nationally there is not a mandatory provision for adjudication. There is, however, a pending Construction Industry Payment and Adjudication Act. Some in the industry believe that there is not really a need for such an act. But the industry leaders are now saying that the “apparent calm at the surface does not mean there is no serious undercurrent beneath”<sup>60</sup> and that the Act is vital.

It should be noted that right-of-way issues and possession of the site, major causes of delay and frustration to contractors in India, were not a problem on NSE. The line of the corridor for the expressway had been finalized long before the contracting work started and all land acquisition had been completed prior to PLUS starting.

From the early 80s the Malaysian government had understood that if money was spent in construction it would flow directly through the people and improve the economy of the country. After the initial NSE contract further development of the expressway network continued with similar BOT arrangements, although

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<sup>59</sup> Source: Interview with UEM on June 4, 2007

<sup>60</sup> Source: Presentation by Sr. Noushad Ali Naseem Ameer Ali, President of the Institute of Malaysia and Chair of the Construction Industry Working Group on Payment. November 2006

MHA adopted a different approach to the awards, due to the lessons learned from MHA's first concessionaire experience. These changes included:

- The Government would give no guarantees on traffic projections.
- The land acquisition was still coordinated by MHA but the compensation was to be paid by the concessionaire.
- Almost all risks were to be carried by the concessionaire.
- No foreign exchange protections were provided.
- All design drawings and specifications were to be prepared by the concessionaire.

Currently there are 21 concessionaire agreements operating in Malaysia. The PLUS concessionaire known as the "PLUS Expressway Berhad" is rated as the largest highway concessionaire company in Malaysia, the largest listed toll expressway operator in Southeast Asia, and the eighth largest in the world.<sup>61</sup> The initial PLUS project is recognized as having spawned a large number of contractors and increased the capacity of the road construction industry. It has also resulted in "growing" pains; for example, inexperienced contractors under-priced contracts when bidding then, having won, faced major problems of implementation.

The principles of BOT continued to be used until the late 90s, when the Asian economic depression occurred, at which time it was difficult to raise loans for further private highway construction schemes. Private financing of the expressways then stopped and the Government, eager to use road building to ease the problems of the recession, continued with the construction of expressways through conventional priced contracts. This continued until 2006, at which time MHA began to explore possible private finance initiative (PFI) schemes, which they are currently testing.

Malaysia has recognized that moving from public ownership to full privatization, as they did in the early 80s, together with the speed that the privatization policy was implemented, resulted in a number of high-profile problems. These problems included cost overruns, poor construction for which the contractors had been paid, and concessionaires who were not financially and technically qualified to undertake major projects<sup>62</sup>. Malaysia recognizes that PFI is the most successful and prolific part of the UK government's PPP policy since the early 1990s and they now consider that PFI is a viable alternative between public ownership at one end and full privatization at the other.

### ***Industry Structure***

The road industry structure has not required such a huge institutional change as occurred in China, since even before the development of the expressway program there was a substantial supply chain of contractors, specialist subcontractors, and material suppliers. Generally these were small and relatively unsophisticated. The majority of the construction companies had been privately developed by the Chinese from the early days of economic development in the 19<sup>th</sup> century. Over time the three major political parties developed ownership of companies including construction enterprises. Today thanks mainly to NSE there is a strong network and supply chain within the industry. There are both large and small private contractors, large GLC, private specialized subcontractors, equipment rental companies and a solid support mechanism of domestic consultants. As described earlier, the politically owned companies were acquired by the government investment arm in the late 90s and became "linked" to the Government. This means that they are expected to operate independently, but the Government will use them for specific projects without competitive bidding and they in turn may subcontract sections of a project to smaller private contractors. Expressway projects have been competitively bid between concessionaires by MHA. All other roads are competitively bid by the respective Ministry of Works (MoW), state governments or local authorities, and in such cases GLCs are considered to be just another competitor. The use of international contractors still occurs in many Malaysian construction sectors, but since the completion of NSE MHA reports that the use of international contractors

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<sup>61</sup> Source: Malaysian Expressway System at <http://www.answers.com/topic/malaysian-expressway-system>

<sup>62</sup> Source: Article "From privatization to PFI" by Chew Seng Kok and Izhar Ismail (partners in Malaysian consultant firms). April 24, 2006

for road construction has not been necessary, since the capacity of their home industry has increased dramatically. In fact the capacity is greater than the demand and Malaysian highway contractors are now finding alternative markets internationally.

***Building Manpower Capacity***

The NSE privatized highway project involved considerable technology transfer from foreign to local builders, especially in tunneling, bridge construction, slope management, paving technologies, road safety engineering, project management, and flood management.

The transfer of technology for increasing the capacity of skilled labor was achieved by using international equipment suppliers to supply equipment and training. For example, a Japanese contractor was used for some of the concrete pavement and certain equipment and training was imported from France. The principal contractors' civil engineers at the time were supplied by the Chinese, who were considered to be very hard-working and efficient. Their capacity was increased by their interaction with the international consultants. Civil engineering is also held in high regard in Malaysia, and with the excitement of the construction growth there is a reasonable supply of new civil engineers.

***Building Equipment Capacity***

Initially international contractors brought sophisticated and high-tech equipment and plant to Malaysia. Local contractors then began purchasing the equipment they required and plant hire companies have been established. Unlike China, however, the need for such equipment did not spawn the growth of home manufacturing companies and currently most equipment is still imported.

***Materials Capacity***

The supply of materials has generally not been a problem in Malaysia. The cement industry, entrepreneurial in character, recognized the potential of the NSE and increased its manufacturing capacity. In fact the Government, also realizing the potential of NSE for increasing economic growth, dictated that a certain percentage of the NSE (30%) had to be concrete pavement. This supported the national cement industry. The contractors were responsible for identifying sources of aggregate along the line of projects and they successfully achieved the development of quarries for use on NSE and other projects. The supply of rebar was also not an issue. Bitumen was the only material that had to be imported.

***Regulations and Associations***

All regulations and licensing for companies and individuals in the Malaysian construction industry are conducted through the Government's Construction Industry Development Board (CIDB). They also establish the required regulations and legislation for all phases of the construction process, including design, procurement, award, construction and management. CIDB<sup>63</sup> was established in 1996 with specific visionary goals (Figure 3). They work closely with the trade associations and organizations that have been established in Malaysia, primarily by the private industry. The Malaysian Master Builder's Association has become the recognized voice of the Malaysian construction industry and has dubbed itself "the prime mover of the nation".

**Figure 3: CIDB's Vision**

**Vision**  
*"The Malaysian Construction Industry shall be a world class, innovative, and knowledgeable global solution provider."*

**Mission**  
*"Together we develop the Malaysian Construction Industry towards global competitiveness".*

**Objectives**  
*"Develop our national construction industry as the major contributor to the national economy and be able to produce quality construction product, in line with value spent and responsive towards the nation's needs."*

CIDB organizes training seminars, workshops, and national and international symposiums to aid the industry to continue to develop its capacity and knowledge. It collects and publishes construction industry data for the

<sup>63</sup>Source: CIDB website at <http://ww3.cidb.gov.my/corporate/mission/index-en.html>



benefit of the industry and others, making all information available through the internet or through publications.

### ***Funding Restructuring***

Malaysia has relied on BOT forms of financing for the major section of the toll road network. To provide the appropriate legal framework to permit the concessionaire groups to operate, the Private Management Act was approved in 1981. According to the MHA this is the only legislation that has been required for the implementation of their highway program other than the act that incorporated them.

There still remain a number of highways that are required to satisfy the needs of the overall Malaysia Highway Network Plan, which has been developed by the Highway Planning Unit under the MoW. Road construction and maintenance is managed by four different entities; (a) federal roads by the MoW (b) Toll roads by the MHA, which is itself a department within the MoW, (c) state roads by the state governments; and (d) local and rural roads by the local authorities, including Kuala Lumpur. The budget for this work is contained in the Five-Year Economic Development Plan and even if the intended highways are to be privatized, funds are still allocated within the budget for support. No other restructuring has been considered necessary.

### **Lessons Learned**

The Malaysia case study offers several lessons learned that are relevant to India:

- It is vital to have a good, integrated master highway network plan. The Government recognizes that a well developed and integrated infrastructure and utilities network, including transportation, telecommunications, water supply and sewerage, is an essential pre-condition for continued high economic growth.
- It is also vital to develop a dependable industry infrastructure with a recognized network of contractors, subcontractors, specialized subcontractors, material suppliers and equipment suppliers. The majority of larger contractors now classify themselves as mainly management contractors, who rely on the ability to subcontract out specialized and distinct sections of their contracts. (As a side note Malaysian contractors realize that the role of management contractor has created major problems when they move into international markets. They bid the work in the same way as if at home and then find that the supply chain does not exist – this is particularly the case in India<sup>64</sup>). The master plan provides a framework within which the industry can channel possible capital for entrepreneurial ventures into different sectors of the supply chain. This data is important for developing their business plans and for applying for financing.
- Any changes in policy required to implement the expressway plan need to be recognized early and action taken to establish the appropriate policies. These policies must be supported from the highest level in government. (In the case of Malaysia the prime minister was instrumental in the success of the expressway implementation.)
- Accountability and management must be clearly designated. Malaysia considered that the expressway toll system was so vital to its economic development that it decided that a separate agency would need to be established to manage the expansion.
- Malaysia has found that the BOT system of contract has allowed them to grow quickly and effectively, but moving from full public ownership at one end to full privatization at the other resulted in some major problems. They also encountered a reduction in the ability to expand the network after the financial crisis of the late 1990s created difficulties for private financing. They now believe that, instead of turning over responsibility for a project entirely to the private sector with the Government acting as a regulator, the private sector can provide services normally provided by the Government but with the Government still carrying overall responsibility for ensuring that acceptable service is delivered to the public. They are, therefore, now exploring possibilities of alternative PFI arrangements.
- The drawback or criticism of basing the expressway on tolls has been that the locals, particularly those

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<sup>64</sup> Source: CIDB study on “Malaysia’s drive to export professional and contractor services”, May 3, 2007

around Kuala Lumpur, find the payment of tolls to be irritating and many feel expensive.

- Malaysia recognized the opportunities to build the capacity of other industries as they developed the expressways and stipulated on the first project that 30% of the pavement had to be continuous reinforced concrete pavement, which supported their cement industry as well as being the first use of this technique in SE Asia.
- There is a need for all agencies to support the government policies, and action needs to be taken in situations where policies are ignored.
- Industry regulations and legislation have to be appropriate but not too cumbersome. There should be a government body that administers the regulations, but this organization should be in regular communication with the industry, provide training, advice and support to the industry, and collate and distribute relevant data connected with the industry.
- Project level staff are accountable for successful completion of projects and they should have the authority to make decisions. Lack of decision making is seen as one of the major reasons for project delay and completion on time is considered to be essential for adding the new road to the asset base of the country as quickly as possible. Failure impacts the country's overall economic development.
- In Malaysia there has been a belief that dispute resolution mechanisms are not really needed, due to the culture of the people where they openly discuss issues and resolve them as the project proceeds. They now believe, however, that this "calm" conceals some major issues below the surface and a new Act on adjudication has been prepared for implementation.
- The capacity of the road construction industry is effectively increased by the creation of trade associations who can help with self-regulation, training and the sharing of information within the industry. The Master Builders Association of Malaysia has become the main independent voice for the road industry.
- An overall lesson can be summed up by the following comment made by the Master Builders Association of Malaysia, which is very relevant to India at this stage in their development:

*"To consolidate the competitiveness in the domestic market the six fundamental elements of the construction industry -- namely manpower; material resources; plant, equipment and tools; finance; technology; and management- plus supportive and influencing factors, namely experience; education and training; continuing professional and technical development; teamwork approach; research and development; and professionalism-- will have to operate and work in harmony at the right time; with the right combination; and in the right place to reach a high degree of efficiency and productivity, so that projects will be completed within the shortest possible time, at the lowest possible cost, and with the highest quality. The traditional approach of separated procurement, where designers would develop and complete the design, offers little opportunity for the contractors, specialist subcontractors and suppliers to propose changes or suggest alternative construction methods. As the objectives of different players are diverse and at times conflicting, players are often placed in an adversarial role and adopt a defensive attitude when dealing with other parties. The global trend of closer integration of construction activities and smart partnering among various industry players has resulted in the Design Build contracts and Build Operate and Transfer contracts gaining popularity. This is attributed to the fact that the segregation of design and construction in the traditional approach could result in mistakes in the design stage which require changes and rectification at the construction stage, leading to project delay and cost overruns due to re-works, resulting in wasted time and resources."*

## **F. Case Study on The French Road Construction Industry**

The French road construction industry has dramatically improved its capacity during the last decade, thanks to government infrastructure policies coupled with strong internal reforms mooted by the construction industry itself. New challenges ahead concern the strategy and the performance of the French road construction sector in the national as well as global market in the near future.

### **Key Issues of the French Construction Industry in the Last Decade and Today**

#### Concessions and Diversification

Among the key issues of the French construction sector in the last decade, a crucial issue has been how to muster enough financial strength to match the investments needed in major infrastructure concessions.

Another issue has been the need to diversify to meet the wide scope of domestic demand for infrastructure: construction of buildings, water supply, tunnels, electrical and energy works, railway works, roads and bridges. The globalization of economies and the international demand for infrastructure have led medium and large construction firms to form large conglomerates such as the Vinci Group (world leader in construction) and the Bouygues Group (second largest group in the world) or the Eiffage group (currently the sixth largest group in the world).

#### Size of the Industry

In 2005, the French construction industry was ranked as second major world exporter after the United States, in term of turnover abroad, and was expected to reach the US level in 2006 with a growth of 14%, representing a global turnover of about \$31 billion (€23 billion).

**Table 3: The Ten Largest Construction Groups in Europe and their Turnover 2005-2006**

Firm	Global turnover 2005		Global Turnover 2006		Growth 05-06 (€ reference)
	€ billion	\$ billion	€ billion	\$ billion	
1. Vinci (France)	19.4	26.8	25.6	33.5	32%
2. Bouygues (France)	16.1	20.1	19.0	24.9	18%
3. Hochtief (Germany)	12.0	17.0	15.5	20.3	29%
4. Eiffage (France)*	8.4	10.5	15.4*	20.2	83%*
5. Groupe ACS (Spain)	11.9	14.9	14.1	18.5	18%
6. Skansa (Sweden)	11.3	15.0	13.6	17.8	20%
7. Strabag (Austria)	9.1	11.4	10.5	13.8	15%
8. Ferrovial (Spain)	8.3	10.4	12.3	16.2	48%
9. Balfour Beatty (UK)	8.0	10.0	9.5	12.5	19%
10. AMEC (UK)	4.6	5.8	5.3	6.9	14%

- after acquisition of SyV
- Source : Le Moniteur Records, 2007. Figures in US\$ billion @ €1.00 = \$1.25 in 2005 and \$1.31 in 2006

The French construction industry comprises about 8,000 firms, employing over 300,000 persons, half of whom are over 40. Some 30,000 staff are due to retire in the next three years. In 2006, the industry's turnover totaled \$48.5 billion (€37 billion Euros), growing 6.5% from 2005 to 2006 and 10% to 2007 (expected). More than half of this turnover comes from operations abroad with the following clients:

**Table 4: French Construction Services Delivered Abroad, by Country (% of total)**

North America	23.9%	USA	17.8%	Canada	6.1%		
Latin America	2.3%						
Western Europe	21.8%	UK	8.6%	Germany	8.2%	Belgium	5.0%
Central Europe	12.1%	Hungary	5.2%	Czech Rep.	4.9%	Poland	2.0%
Southern Europe	8.8%	Spain	4.7%	Portugal	2.1%	Italy	2.0%
Rest of Europe	10.2%						
North Africa	4.5%	Morocco	2.0%	Algeria	1.5%	Tunisia	1.0%
Sub Saharian Africa	7.6%						
Asia	6.3%						
Other countries	2.5%						

### Government Policies Implemented to Improve the Road Construction Sector Capacity

#### Public Programs and Decentralization Policy

The capacity building of the French construction industry has received substantial support from major public programs, developed as part of continuous five-year master plans set up by DATAR (*Direction de l'Aménagement du Territoire*), a central government agency in charge of infrastructure programming, with branches in the regions:

Expressways (*Autoroutes*) programs with PPP-PFI concessionaires in the 70s and 80s

- COFIROUTE (Compagnie Financière des Autoroutes :A10; A11) 70s
- SANEF (Société des Autoroutes du Nord et de l'Est de la France)70s-80s
- AREA (Autoroutes du Rhône et des Alpes) 70s-80s
- APRR (Autoroutes Paris – Rhin- Rhône: A34) 80s
- ASF (Autoroutes du Sud de la France: A6; A8; A9) 70s

High-Speed Trains (TGV) railway sections : *Lignes à Grande Vitesse* (LGV): 80s and 90s

- LGV East to Europe 2007
- LGV Paris-Lyon 80s
- LGV Lyon-Marseilles 90s

Tunnel programs

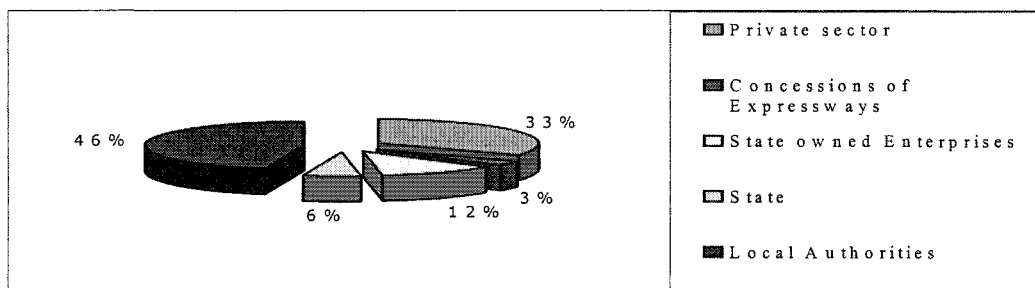
- Tunnel under the Channel (1975-1981)
- Mont Blanc tunnel (across the Alps to Italy)
- Fréjus Tunnel (across the Alps to Italy)
- Lyon - Turin tunnel (across the Alps to Italy)

Canals and connecting canals with the main European rivers:

- Rhine – Rhône canal
- Seine North canal to start in 2007

Decentralization policies have been implemented during the last decade (90s) and large budgets were transferred to the regions, along with a clear push towards privatization of road maintenance. These initiatives resulted in a larger market for road construction works:

Breakdown of Turnover by Type of Client



Stronger Government Support on Operational Issues

Supportive actions have been taken by the Government in terms of procurement (*Code des Marchés Publics*), dispute resolution, more streamlined payment of invoices, labor protection and training, legal framework, and stronger commitment towards quality-safety-environment issues. For example, when large conglomerates started to execute major infrastructure contracts, disputes were frequent and led to expensive compensation to contractors, until the Government (Ministry of Infrastructure and Transport) decided to improve the procurement procedures and invited contractors to participate in projects at an earlier stage. Moreover, a quality assurance plan, required from contractors when bidding and before the start of works, was made mandatory to ensure full compliance with quality, safety and environmental standards during execution of the contract.

### Project Financing

In order to finance the master plans a specific financing agency was created: the French Transport Infrastructure Financing Agency (in French "*Agence de Financement des Infrastructures de Transport de France*" or AFIFT). In 2007, this agency is financing €2.17 billion or roughly \$2.9 billion of investment for two motorway sections, one canal, three high-speed railway lines. The budget for the 2008-2013 period is planned to reach €7 billion (\$9.3 billion). Moreover, a large state-owned financing agency called the "*Caisse des Depots et Consignations*" (CDC) is implementing a special fund dedicated to transport and energy infrastructure. It will be lending €2 billion in connection with the emerging asset management market in Europe. This financial market is considered less risky but more attractive in financial yield than the usual stock and bond markets. CDC is posing a serious challenge to existing international funds such as Australian Macquarie, ABN Investment or HSBC Investment.

A major part of the financial resources come from the recent privatization of motorway concessions, where shares in equity owned by the French State were sold to European, Australian, and Canadian joint ventures including the Vinci and Eiffage groups, with other main Spanish construction groups.

### PPP Framework

A strong effort is now being made to improve the concessions --PPP contracts and systems largely influenced by the British concessions groups, which are very active in Europe and leading the competition, and partnership/joint ventures which are taking place within the European Union. These PPP contracts/systems have been encouraged by a three-year old Law (N°2004-559 signed on June 17<sup>th</sup>, 2004) on "*Contrats de partenariat*" or partnership contracts. This Law concerns either partnership contracts between the State or state-owned enterprises ("*Etablissements Publics*") and a private partner or partnership contracts between local authorities ("*Collectivités Territoriales*") and a private partner. This law mentions clearly the contracting out approach in favor of the private partner which becomes the client, partly finances the project, sets up tenders for works or services, and operates the project. This is comparable to BOT and DBFOT systems.

## Internal Reforms Put Through by the French Construction Industry to Improve its Capacity

### Steps taken by the industry

The following three steps have been taken in the last decade:

- Emergence of conglomerates with huge concentration of capacity through merger and acquisition
- Diversification strategies of main French contractors (specialization to meet larger demand)
- Improvement of performance and productivity (by introduction of SAP-type workflow systems, training of staff, research and development)

Construction of transport infrastructure is more demanding than decades ago, and this requires changes in methods, organization, management and attitudes in the construction industry. In order to thrive in a larger but more competitive construction market the industry has resorted to a variety of measures including:

- Enlargement of expertise base to match the technological progress on methods and materials
- Be more pragmatic, flexible and innovative to match the pressure of competition
- Growing effort in Research and Development to match complexity of works
- Cost reduction & productivity to match the competition on prices
- Evolution of services including PPP-PFI/DBOT contracts to match the emerging PPP culture

In parallel the influence of professional associations such as the National Public Works Federation (*Fédération Nationale des Travaux Publics* --FNTP) was strengthened to give them leverage in negotiations with institutions and local authorities (Web site is : [www.fntp.fr](http://www.fntp.fr)). This included the reemergence of strong engineering firm associations such as FIDIC (SYNTEC) and the International department of FNTP, such as SEFI, as well as the Confederation of Associations (CICA). Actions in the media led to the creation of an important editor specialized in the construction industry: *Le Moniteur* Group (Websites are : [www.editionsdumoniteur.com](http://www.editionsdumoniteur.com) and [www.lemoniteur-expert.com](http://www.lemoniteur-expert.com)).

## Key Issues and Strategy of the Construction Industry in the Past and Near Future

### Strategic Trends

The main strategic trends observed during the last few years in France's road construction sector are the following:

- Acquisition of road construction firms in Central and Eastern Europe (EU enlargement)
- Strong lobbying at the European Institutions to take part in the 30 top prior projects (2007-20)
- Concession contracts at the international level (bridges : Masan Bay in Korea and Rion in Greece)

It is interesting to observe that other large European construction groups have followed much the same strategy with external expansion based on acquisition of other road construction firms in their own country and in Central Europe. Central European countries which recently joined European Union have been granted heavy subsidies to upgrade their transport infrastructure, creating opportunities for the road construction firm to make reasonable profit with limited risks.

### Industry Pride

Road construction is a key economic activity in France. More than a million km of roads need to be maintained and upgraded and the road construction business, therefore, is considered to be a worthy and promising profession in the near future. Moreover, the French road construction industry is at the cutting edge of technology and innovation and the French construction firms are present worldwide, especially in the niche segments of road construction. The industry still attracts talented professionals, creates significant numbers of jobs, and there is a perceptible sense of pride within the industry, which has been very healthy for its growth.

### Challenges Ahead

However, the challenges ahead for the industry are also significant and can be summed up by various key issues and strategy:

- Keeping a high level of performance with competition from emerging economies like China and Turkey
- Hiring and training young staff to cope with retirement of qualified seniors among the staff
- Innovative services to cope with a reduction of public investment in infrastructure and demanding clients
- Taking into consideration environmental compliance requirements in spite of overall construction cost reduction objectives
- Attracting qualified young civil engineers into the road construction field

The main actions currently being taken by the construction industry are aimed at meeting the challenges mentioned above, but one of the most crucial ones is hiring and training staff in order to reduce the industry's shortage of manpower. The strategy for hiring and keeping qualified staff appears to be driven in four directions:

- Large and costly publicity campaigns in the media to promote the construction industry's image
- Increase of wages of 30% in the five last years (while inflation rates were under 2%)
- Partnerships with technical institutes and colleges, active support of civil engineering colleges
- Promotion of women in the industry aiming at an overall 20% participation rate (up from today's 10%)

A total of 150,000 staff are likely to be hired in 2007, among whom 10% will be executives.

Three major groups Vinci, Bouygues and Eiffage will hire 22,000 staff in 2007 (15% of the above total). These figures should be compared with the total manpower of the French construction industry (including construction of buildings):

- 1.33 million people, or 8.3% of the total French work force of 16 million
- Overall break-down of the work force is : 71% qualified workers, 20% technicians, 9% executives

- The three biggest conglomerates employ: Vinci: 77,000, Bouygues: 59,000, Eiffage: 55,000; (+12% is hired)

A new trend derived from studies made by social and economic think tanks is now influencing the construction industry, setting up optimistic expectations for the near future. The emerging key issue is sustainable development related to environmental issues and climate change concerns, including:

- Energy savings with new materials for pavements and recycling of existing pavements
- Recycling of dirt and industrial waste products into road pavement materials
- Reduction of costs on bituminous products with new technologies using organic substitutes
- Reduction of noise pollution with new materials for pavements, including gums/latex.

## Capacity Enhancement of Human Resources in the Road Sector

### Increasing Numbers and Improving Quality: Technical Education and Training

#### 1. Context

1. The Indian government plans a quantum jump in allocations for the road sector at both national and state levels. Apart from government-financed construction activities, there is now a policy in place to encourage private-sector financing in roads. This is throwing up many challenges in the sector – one of them being the human resources gap in terms of sheer numbers as well as skills. Skills are now required not only in technical designs but also in project management and financial, legal, social and environmental aspects. There is a shortage of skilled staff at all levels including skilled labor, equipment operators, supervisors, and junior and senior engineers with the contractors, consultants and government. The problem is compounded by the flight of civil engineering graduates to other professions. The gap in human resources is emerging as a critical issue from the studies on investment climate as well as operations and implementation, undertaken as part of this analytical activity of the Bank.

2. A couple of decades back a good road engineer was to be found only in the government sector, i.e. in the MoSRTTH or in the State PWDs. They used to be involved with all types of duties, right from planning to designing, procurement and implementing. Over the last two decades this has slowly come to change with the multilateral funding flowing into the sector. There has been a gradual shift in the way the road construction services are delivered. Outsourcing first started in the form of contracting works and slowly developed to include contracting out designing and supervision services. We have today a full-fledged system where design, construction and supervision are all mostly done by the private sector. The MoSTRH, NHA and the State Road Agencies need to act only as clients and purchasers of the services. But this change in role of the government agencies has yet to percolate down to its staff at all levels and ranks.

3. NHA is a prime example of the outsourcing model. The expectations from the road engineer in the government and in the consultancy sector are becoming more demanding. The jump in project and contract sizes is adding further complexities. While the government agencies dealing with roads are facing the challenge of rational planning, project identification and development, efficient and transparent contract procurement, administration, operation and management of roads to provide good quality of service to road users, the contractors are facing difficulties in getting skilled workers, equipment operators and quality construction managers. Consultants are also facing shortage of experienced and skilled personnel for design and engineering for undertaking feasibility studies and preparation of detailed project reports and for supervising projects during construction.

4. Capacity enhancements in terms of numbers and quality are the main need of the country at this hour. Technical education and training of various stakeholder personnel in the road sector leaves a lot to be desired and it is now posing one of the formidable challenges to meet the needs of several ambitious programs announced by the government. It is, therefore, imperative that the central and the state governments attach high priority to bridging the needs for human resources in the road sector.

#### 2. Existing Arrangements for Technical Education and Training:

##### 2.1 *What is the Current Scenario in Technical Education?*

5. In India the primary sources of skilled manpower have been the engineering colleges and deemed universities which award technical degrees. The Institution of Engineers also based on tests award memberships to its institute which is considered equivalent to a bachelor's degree. Apart from the Indian Institutes of Technology (seven in number), which are considered on par with the best international



universities, the country as per the AICTE web site has about 1,350 recognized engineering colleges, with a capacity to produce about 450,000 graduate engineers. About 400 colleges of these also have post-graduate/masters programs. It is surprising to note that only 30-40% of these colleges offer civil engineering courses at graduate to postgraduate levels. The average class size of a graduate course works out to about 45 and a PG class is about 35. Many engineering colleges have reportedly closed down their civil engineering departments in the past decade. Similar is the situation with the diploma-awarding institutes and polytechnic colleges. There are about 1,250 such institutes, of which about 40% produce civil engineering related diploma students having a capacity to produce about 21,000 students (the class size again works out to about 45). Considering the above institutes to be producing fully skilled manpower, the trade skills requirements for semi-skilled persons are fulfilled by the Industrial Training Institutes (ITI). About 1,500-1,600 such ITI in India impart civil engineering-related trade skills annually, producing about 20,000 semi-skilled manpower, i.e. technicians, masons, carpenters and mechanics. Apart from the above skilled and semi-skilled persons, the road construction industry requires a good amount of unskilled labor whose availability is also very erratic and unpredictable. Many of them are agricultural laborers, who prefer to return to the field during the harvesting and sowing seasons. The scarcity of labor is clearly brought out by the fact that contractors in southern India have to get laborers from Nepal and many northern states at a much higher price.

**Figure 4: Technical and Vocational Education in India**

The further training opportunities that the government/allied sector provides to help people develop or supplement their job skills include:

- **Industrial Training Institutes (ITIs)** established to train people for skilled blue-collar trades. However ITIs in general have not been performing well and a majority of graduates have failed to secure formal sector jobs. The reasons for the same are as follows:
  - ◊ Much of the training provided in the ITIs is for skills for which there is little demand. The curriculum has not been revised for many years. One reason for the lack of attention to market requirements is the lack of involvement by industry in the management of the ITIs.
  - ◊ The transfer of skills too needs improvement and the testing process needs to be made more reliable. There is a widespread perception amongst employers that students obtain certificates even though the actual skills acquired are very poor.
  - ◊ The facilities and infrastructure in most ITIs are inadequate.
  - ◊ There is a shortage of suitably trained faculty in most ITIs.
  - ◊ There is hardly any follow-up of the trainees.
- **Vocational Colleges:** There are three types of vocationally oriented colleges where students attend classes directly (polytechnical colleges, community polytechnics, community colleges)
- **Apprenticeships:** Central and state governments sponsor apprenticeship programs for graduates of ITIs, college, universities, and post primary technical/vocational schools run by the Ministry of Education. The government's program is known as the Student Apprenticeship Training Scheme (SATS). Educational institutions such as ITIs are responsible for placing the students in industry
- **Distance Learning:** The Indira Gandhi National Open University (IGNOU) is the central Open University for the country, with over 120 million registered students (business administration and information technology are its most popular courses). There also are 11 affiliated state open universities, which enjoy considerable freedom to offer courses in local languages and utilize diverse media delivery systems

6. Of the civil engineers produced above, how many continue in the profession of civil engineering and further how many actually join the road sector? This is a hard question to answer. Many who join the sector leave after only a couple of years, to seek greener pastures since the working conditions at site for road engineers are probably not very good and the emoluments are perceived as not commensurate with the problems one faces. Are the numbers who choose to stay sufficient to meet the road sector's needs? The main report points out that this is not so and this is also borne out by recent press articles in newspapers and infrastructure magazines cited by senior managers from contractors and consultants. Many of the good civil engineers also move to the middle-eastern and south-east Asian countries for better prospects. The situation seems to be improving, but this change is not fast enough in comparison with the huge needs of the sector. Studies done for certain specific states indicate that the

quality of graduates from the engineering and other technical institutes is very poor for mainly two reasons – (i) lack of faculty to teach the students; and (ii) a big disconnect between the curricula and the real needs of the industry.

7. The next issue is the quality of human resources in contracting, consulting and the government agencies, which is also grossly inadequate on all fronts. The system does not reward training and constant upgrading of skills. Due to the shortage in numbers of persons, the present pool is overstretched and is therefore not able to

find time for upgrading their skills. Also there seems to be a lack of incentives in the government sector for such training and upgrading of skills. Promotions and annual pay hikes are all seniority based and there seems to be no credit for performance or skills. Similarly, the consultants and contractors are also not offered incentives to upgrade the skills of their young and energetic staff to take up bigger responsibilities. To make up the numbers, there is a need to attract fresh engineers to the sector but they need a bit of orientation/freshmen training at the cost of the sector (either the private or the public sector which plans to employ them). Similarly, use of retired government engineers for about 10 years post-retirement makes eminent sense but only after re-training them to meet the actual design/site supervision needs.

**2.2 What Facilities Are Currently Available in The Road Sector for Training Engineers?**

8. The National Institute for Training of Highway Engineers (NITHE): Training in the road sector made a significant beginning only in 1983, when the MoSRTTH established NITHE as an apex institution for training of road engineers. It is a collaborative institute of the central and state governments. A brief activity profile of NITHE is given below.

**Box 1: NITHE**

An apex institution of excellence for training of road engineers – both at entry level and during the service.

Mission: Bring efficiency and value for money into planning, design, construction and maintenance of roads in the country and inculcate leadership quality, professionalism and commitment to excellence among the road engineers.

Initiative of MoSRTTH.

Established in 1983. Campus in NOIDA. Collaborative institute of the Central and State Governments. Organizes training for government, contractors and consultants at both national and state levels, also conducts programs in various states (inset right). Also imparts training to road engineers from SAARC and African countries. Has an excellent infrastructure: lecture halls, seminar halls, auditorium, hostel, Board room, office block, canteen, recreation facilities, library, computer lab, soil testing lab, staff quarters (spread over an area of around 10 acres)

**Programs conducted in various states**

State	Number of Programs
Bihar	13
Himachal Pradesh	12
Orissa	8
Rajasthan	6
Tamil Nadu	6
Kerala	6
Maharashtra	7
Haryana	12
Punjab	8
West Bengal	3
Karnataka	4
Assam	2
Uttar Pradesh	1
Gujarat	1
Madhya Pradesh	1
Jammu & Kashmir	1
Andhra Pradesh	1

**123 Programs**

**Types of Training Courses**

- Foundation Courses (for newly recruited Engineers)
- Refresher Courses
- Orientation Courses
- Specialized Areas of Road Engineering
- Contract Management
- Road Management and Administration Programs
- Management Development Programs

**Mode of Training**

- Lectures
- Case studies
- Group discussions
- Multimedia presentations
- Site visits & Field attachments
- Laboratory practice
- Software packages
- Video films

9. Currently it runs about 60-70 programs and trains about 1,500 engineers (against the need for about 6,000 professionals). It is grossly underutilized by the government. It also needs to have some core faculty – possibly both from the academic institutions, retired and working government engineers of repute, and some private sector engineering and other experts.

10. Central Road Research Institute (CRRI) has also been playing a commendable role in training road engineers. Their focus is on quality control, use of innovative materials and specifications, designing of pavements, bridges and traffic studies.

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11. *National Institute of Construction Management and Research (NICMAR)* is a leading educational Institute established by the Indian construction industry. It is recognized by GOI as a Scientific and Industrial Research Organization - SIRO. Major academic programs of the Institute were started with technical assistance from UNDP and academic inputs from the faculty of Loughborough, UK and the Indian Institute of Management, Ahmedabad. NICMAR has its own centers in Pune, Delhi, Hyderabad, Nepal and Dubai. It can organize continuing, short-term and distance education programs to facilitate training of working professionals and other persons interested in development of skills. It offers full-time courses on construction and management.

<b>Box 2: National Academy of Construction (Hyderabad) – A Model Agency for Training in Construction</b>	
<b>Initiative:</b>	Government of Andhra Pradesh set up the Academy in 1998 as a Society; managed by a Board of Governors chaired by the Chief Minister, Andhra Pradesh.
<b>Mission:</b>	Improving efficiency and productivity of the Indian Construction Industry
<b>Core Activity:</b>	Training of workmen, supervisors, managers, contractors and engineers in the field of construction.
<b>Funding:</b>	0.25 percent (recently reduced to 0.10 percent) deduction from the bill payments of contractors in the state.
<b>Objectives:</b>	<ul style="list-style-type: none"> <li>(i) Basic skill training for general/specialized construction trades</li> <li>(ii) Upgrading of skills in contract management practices of government, corporate and contractors' managers.</li> <li>(iii) Quality supervision, stores management and surveying.</li> <li>(iv) Training of Trainers</li> </ul>
<b>Methodology:</b>	<ul style="list-style-type: none"> <li>(i) Structured courses for training (theory and practice)</li> <li>(ii) Group discussions</li> <li>(iii) Workshops, seminars, conferences, symposia</li> <li>(iv) On-job experience, visits to project sites</li> </ul>
<b>Constituents:</b>	<ul style="list-style-type: none"> <li>(i) Construction Technicians Training Institute (CTTI)</li> <li>(ii) Construction Industry Staff College (CISC)</li> <li>(iii) Transport Infrastructure Training Institute (TITI)</li> <li>(iv) Contractors Development Institute (CDI)</li> <li>(v) Construction Methods and Materials Research Institute (CMRI)</li> <li>(vi) Institute of Architecture &amp; Design (IAD)</li> <li>(vii) Housing Development Institute (HDI)</li> <li>(viii) Water &amp; Rural Development Institute (WRDI)</li> </ul>
<b>Faculty:</b>	Both core and guest faculty
<b>Infrastructure:</b>	Spread over an area of 167 acres (land allotted by the state government), the Campus has a very good infrastructure consisting of class rooms, workshops, auditorium, seminar halls, office block, Board room, hostel, canteen, recreation facilities, shopping center, & exhibition halls

12. *National Academy of Construction, Hyderabad:* This is a model training center for the construction industry at the state level. Details are given in the box above. It was set up with the objective of training and skill upgrading of workers, supervisors and contractors in the construction industry. Actual training started in 2002. Apart from the government, leading contractors are playing a key role in supporting the Academy. It is a center of excellence for training of workers/supervisors in the construction sector at the state level.

13. *Other Institutions:* There are a number of other training centers and academic institutions in the country. The Administrative Staff College of India and the National Institute of Financial Management (NIFM), Faridabad, provide training in project procurement and financial management, including contract law and dispute resolution mechanisms. The Construction Industry Development Council (CIDC) has also been active not only in training construction workers but also in providing training in construction management, contract

law, arbitration and dispute resolution. The Indira Gandhi National Open University (IGNOU) offers courses through distance education in (among other things) construction management, civil engineering, and rehabilitation and resettlement.

14. Considering the immense training needs of the road sector, it is felt that there needs to be many more clones of NAC, NICMAR and NIFM at least at the regional levels. There is a lack of a lead training institute in this sector, which on a periodic basis would review the content of the various training courses offered across the country and suggest upgrading in line with the emerging needs of the sector. It is also noticed that the training provisions made in the externally aided projects are not even half utilized during the course of the project and remain undisbursed. There seems to be a lack of interest as well as bureaucratic delays on part of the governments involved to use this source of funding.

### Way Forward

#### 3.1 Proposed Action Plan for Capacity Enhancement of Human Resources in the Road Sector

15. Given below is a suggested sequence of activities which could be adopted by the Government and the other stakeholders to move forward to deal with the grim situation on the human resources front, which lacks numbers as well as the requisite quality to deliver the road construction services as per the Government's ambitious plans.

**Table 5: Action Plan for Enhancing Human Resources Capacity in the Road Sector**

	Action Plan	Action by	Time Horizon	Indicator
1.	Formulate policy and strategy for road sector to attract more engineers and professionals and train the existing personnel.	MOSRTH in consultation with MORD, state road agencies, AICTE and CIDC/CII/FICCI	Immediate	Policy document approved by the government by December, 2007 and widely disseminated (put on website)
2.	Training needs assessment	Central and state governments	Immediate	5-year training plan prepared for all road agencies by Sep 2008
	• Road agencies			
	• Contractors, consultants	CIDC/CII	Immediate	5-year training plan prepared for contractors, consultants by Sep 2008
3.	Enhanced role of NITHE – as the main coordinator for training in the road sector in the country.	MOSRTH, MORD, state governments and NITHE	Ongoing activity	Increase in programs (i) by 50% in 2007-08 (ii) by 150% in 2008-09 (iii) by 250% in 2009-10 over the target achieved in 2006-07
4.	Setting up regional level training centers for construction workers (on the lines of NAC) and supervisors of road agencies	State governments in consultation with NAC Hyderabad and CIDC	Medium term	At least two more centers established by 2009-10  At least five more centers established by 2011-12
5.	Enhanced role of Construction Industry Development Council in training	State governments and CIDC	Ongoing activity	At least five more states benefit from CIDC by 2009-10 At least twelve more states benefit from CIDC by 2011-12
6.	Preparation of a comprehensive document indicating areas of training, course contents for road agencies	IRC in consultation with NITHE	Immediate	A booklet published by April 2008
Immediate < 12 months; Short term: 1-2 years; Medium term = 2-5 years				

### 3.2 *Technical Education & Training Policy & Strategy - Needs Assessment*

16. We recommend that the MoSRTTH,, in consultation with the Ministry of Rural Development, state governments and construction/consultant industry associations, takes the lead in formulating a training policy and strategy for the road sector in India. Such a strategy might cover:

- (i) *All stakeholders:* Road agencies, contractors, consultants, equipment operators, construction workers
- (ii) *Various levels:* Senior, middle, junior; managers, technical specialists
- (iii) *Different periods of career:* From the time of entry to retirement
- (iv) *Various phases of project cycle:* From identification and planning to design, construction, operation and maintenance management.
- (v) *Different aspects:* Project management, quality assurance, legal, contract administration, dispute resolution, public/private partnership approaches, social and environment aspects, safety.
- (vi) *Training of trainers:* Creating core faculty of trainers, providing them with training materials.
- (vii) *System of incentives:* In evaluating construction and consultancy bids, weight should be attached to such workforce and site engineers who hold competency certificates from accredited training institutions in the construction sector. Likewise promotions and wage increments to officers at various levels in the government road agencies should take training into account.
- (viii) *On-site training:* Training at projects which are of show case nature.
- (ix) *Study tours:* Both within India and abroad. Should cover officers both technical and administrative belonging to the road agencies and a fair share at all levels (junior, middle and senior).
- (x) *Financing strategies:* Both government budget and private sector. Funds for training should be seen as a percentage of project costs.
- (xi) *Institutional framework:* Strengthening and networking of existing training and academic institutions, collaboration with international agencies.

17. The government simultaneously needs to arrange a comprehensive assessment of skills and numbers of human resources of all road agencies responsible for delivery of the various programs in respect of different categories of roads. While undertaking this exercise, attention should also be focused on training of supervisors and junior engineers, who have so far largely been bypassed from skill enhancement. Such an exercise be carried out by professional agencies. Skills in road agencies would include financial and management aspects and some familiarity with legal aspects and regulatory framework. A 5-year training program (short term to long term courses) for the various levels of staff in the road agencies in every state should be drawn up.

18. The associations/federations of contractors and consultants should take similar initiatives to identify skill upgrading needs for their personnel including construction workers and equipment operators. The Construction Industry Development Council can serve as the umbrella agency for this purpose.

19. Based on some approximate figures of people working in the road agencies (NH, SH and RR) and assuming that certified re-training (duration of at least 15 days) of the government engineers at least every five years is a necessity, the strategy should think of ways of expanding the training capacity and the number of government road engineers trained annually to about 15,000. Similarly the private sector professionals in the road construction industry have to provide for skill upgrading and training for about 20,000-25,000 people annually.

### 3.3 *Planning for Technical Education and Training*

20. Based on the needs assessment done and policy/strategy adopted for training, a detailed action plan needs to be developed for increasing the number of skilled and semi-skilled people as well as training and upgrading of the existing workforce. The plan should methodically cover the various skills and levels.

21. *Undergraduate/Graduate/Postgraduate Level entry:* As was mentioned in our main report and also coming out of discussion and interviews, the road sector needs to increase its intake by at least twice the current numbers. How can this be done? The government and the industry associations of the road sector

should give some serious thought to this immediately i.e. ways to bring back civil engineering to its original glory.

22. *Induction Training:* At the entry level, every staff member should be given a comprehensive orientation course on various responsibilities/duties expected in the organization. Such training may include visits to prestigious project sites. NITHE has been supporting these programs. The newly recruited engineers could also be attached to IIMs, IITs, for some tailor-made management courses. Another option would be to impart freshmen training as is done in some countries at the cost of the sector (financed either by the private firms who induct them or buy the government for the professionals selected by them).

23. *In-service Training:* Training and skill enhancement has to be a continuous exercise. Therefore, the training plan for each road agency, etc. should include periodic training of all in-service staff at various levels, so that they stay abreast of the latest know-how and state-of-art technologies. The requirement for specialization and skill development of officers of the road agencies in core processes of planning, design, preparation of sound DPR, project development and financial appraisal for BOT projects, social and environment concerns, traffic studies, contract management, etc. should receive regular attention. The training plan should include study tours of projects in India and abroad by a group of officers from different states and the central government. There are instances in countries such as China where it is reported that people were sent en-masse for training for a year before embarking upon a new national program. This could be done for India also.

24. *Training of contractors' managers, workers, and equipment operators:* Training efforts directed at

**Figure 5: Rural Development Ministry has its 17.50 billion plan ready :**

With Government realizing the need for imparting employable skills to the working population, the Ministry of Rural Development has prepared an ambitious blueprint for skill development of about 2.5 million strictly for rural Below Poverty Line youths, with an investment of about Rs 17.50 billion over the next five years. The proposal, which has already been vetted by the Planning Commission, plans skill development of rural youths through short-duration, demand-driven courses.

The ministry has proposed a PPP model, under which it provides the entire or majority of the training cost. The industries will have to meet two conditions to access these funds. First, more than 80 per cent of the trainees will have to come from rural BPL families. Second, the funds will be released only on the basis of placement of rural BPL persons trained under the project. Thus, the training organization will have to ensure more than 80 per cent placement for the trained persons.

Based on consultations with several industry organizations, the ministry has estimated a per capita training cost of Rs 7,500 per annum. This would mean a budget of Rs 1,750 crore at Rs 350 crore per year over the next five years. (Indian Express)

contractors' staff must be an essential part of the contract agreement. The Government should support the construction industry in strengthening the existing training centers or ITIs, etc. in various states. Gradually, the construction industry would develop the critical mass of trained workmen, equipment operators to become self-sustaining.

25. *Training of consultants' engineers, surveyors, and contract specialists:* For personnel of consultants also, training and skill enhancement has to be a continuous exercise. They can easily utilise facilities created by the government in

addition to their own in-house training arrangements.

### 3.4 Funding

26. Sufficient funds must be budgeted by the various stakeholders (government, contractors and consultants) for training of staff. The quality of output of the skilled staff and efficient delivery of project would more than offset the expenditure incurred towards the training. Even assuming Rs 25,000 per head as the training expenses for about 40,000 persons, the total requirement over the next five years works out to about 0.2% of the Plan outlay for the road sector. Annual budgetary provision for such a magnitude should be made for training of government and non-government skilled and semi-skilled staff, and the private sector should chip in through some PPP model. A novel method for PPP method has been proposed by the Rural Development Ministry for training below poverty line persons for skills with an outlay of about Rs17.5 billion.

46. As has been done in AP, where NAC was set up and is successfully running, the road agencies of the central and state governments should consider making a provision of 0.2 percent of the project cost in each estimate towards training of staff, so as to cover course fees, travel to training centers, per diem allowance and expenses of training institutions in imparting training to the recipients/beneficiaries.

#### **4. Delivery of the Action Plan**

##### ***4.1 Attracting More Persons to the Field of Civil Engineering***

47. Planning and implementing strategies for improving the number of road engineers and attracting more people to the sector have to be discussed. Bringing back civil engineering to its original glory, through massive marketing/road shows in engineering colleges, polytechnics and ITI by elaborating on the challenges and market size of the sector, needs to be really thought about. It is hoped that the increased demand and attractiveness of the civil engineering profession will automatically create situations where the number of places in existing institutions will be increased, while at the same time more colleges will start offering the course.

48. It is suggested that the Indian Roads Congress take a proactive part in devising the course curricula of various road engineering topics in consultation with academia and the construction industry for students pursuing undergraduate and graduate studies in civil engineering. Such curricula should then be submitted to AICTE for approval and formal adoption by IITs, NITs and other engineering institutions in the country. Students pursuing the graduate/undergraduate courses should also be exposed to project sites by the government involving the academic institutions to increase their awareness.

49. The private sector firms and industry associations can also help in attracting more talent to their workforce by (i) professionalizing the management; (ii) offering stock options after a certain period of loyalty to the company (like the IT sector firms); (iii) and introducing emoluments at par with competing sectors like IT, finance and other infrastructure sectors. Sponsoring candidates in the final year by the private sector is another way of attracting them, wherein they can work on live projects as part of their theses.

50. Another option will be to attract back to India the trained road persons, skilled and semi-skilled. To some extent the market can be relied upon to stimulate this reverse flow into India, but the public and private sectors may wish to start the ball rolling by marketing the road sector's need for internationally experienced Indians.

##### ***4.2 Leveraging Use of Existing Institutions for Increasing Training/Skill Upgrading***

51. The strategy should be to include all educational/research institutions like IIMs, IITs, and IISC as facilitating training agencies, along with the existing road sector-specific training institutions already in place and discussed previously. Financing institutions also need to get involved because of the emphasis to be given to PPP approaches.

52. Box 3 gives an illustrative list of such centers. In order to synergise with the existing training centers in various sectors relating to construction, the NAC has created eight constituent units in association with national partners. For instance, the NICMAR (National Institute of Construction Management and Research) is supporting the NAC in running the Construction Industry Staff College for advanced courses in construction and project management. The NAC has also been recently involved in providing assistance to other states (Chhattisgarh, Tamil Nadu, NE States, etc.) in establishing training facilities for certain construction trades. The NAC Hyderabad itself needs to become a focal agency for the entire southern region of our country. Such synergies should be further developed. Further, the NAC and NITHE should work jointly in certain areas of training for engineers in the road agencies, consultants and contractors. NITHE and NAC should also take up the role of mentoring for state-level training centers to build up and strengthen their capacity.

#### **4.3 *Creating New Centers of Training***

53. To meet the growing demands of the road sector alone, there is an urgent need to set up at least 4-5 Construction Training Centers in various regions of the country along the model of AP, which has created the NAC. These centers can be set up through the joint efforts of the government and the contracting industry. Some of the major ITIs (Industrial Training Institutes) could be considered as one of the options to initiate the process. These institutes have been demonstrating not only the know-how but also the show-how of workmanship in the trades assigned to them. The CIDC could be entrusted with the task of coming up with a comprehensive proposal and action plan for this purpose, wherein all the road construction trades are brought under a formal training environment through these new and existing institutions.

#### **4.4 *Incentivizing Training and Collaboration with International Organizations***

54. The GOI has recently mandated compulsory training of officers belonging to the Indian Administrative Service and ACRs and promotions are linked to satisfactory completion of training. Similar steps are understood to be brought in place for officers of the Central Government belonging to other services. This is a step in the right direction. The state governments may also wish to consider similar steps being taken for encouraging and motivating their engineers to undergo training in relevant disciplines of their area of responsibility.

55. Officers at both senior and junior level should also be exposed to best international practices by enabling them to visit prestigious projects within the country and abroad. The external financing agencies like the World Bank, ADB and other international forums can provide support in this direction. NITHE can be mandated to organize such study tours with the support of the central and state governments. For this, the NITHE can make some standing arrangements with international organizations, such as TRL, UK; TRB, USA; FHWA, USA; ACTIM, France; IRF, Geneva; World Roads Congress, Paris; NAASRA, Australia; ILO Training Center, Turin (Italy) and similar organizations in Japan, China, Sweden, Italy, Germany, etc.

#### **4.5 *Setting up Chairs for Special Areas***

56. There is a need to develop independent think tanks and academicians on various aspects such as promoting PPP approaches in financing of road projects, innovative construction technologies, road safety, use of marginal materials, environmental and social issues. The Government and the construction industry need to consider funding positions in institutions like IITs, IIMs, NITs, NCAER, IPA, and SPAs. Eminent persons in road and traffic-related disciplines need to get institutional support in this endeavor.

#### **4.6 *Distance Learning***

57. There is need to prepare standard training materials for various areas of training required for the road engineers, which can also be imparted through distance learning mechanisms. Such possibilities could be explored through international agencies also. Telecasting, web-casting and other electronic means like video conferencing should be used to impart good quality road engineering education. The NITHE should take the lead with the help of the MOSRTH to prepare suitable packages/modules for this purpose. The NITHE is already starting to build up its library, documentation of project study reports, implementation experiences, video films. It is suggested that the MOSRTH, MORD, and state governments continue to extend their support in this direction. This can provide an excellent opportunity to Post-Graduate and Ph.D students undertaking research work to utilize these documents and data available.

#### **4.7 *Other Measures***

58. The Indian Roads Congress should also prepare a complete directory of experts in the country in various disciplines of the road engineering and management that can be used by the training centers as Guest Faculty.

59. The Indian Roads Congress should also prepare a series of manuals and illustrated handouts for various construction components of roads and bridges for use of road agencies, contractors and consultants. Such documents should be made available in both English and the local language. Over time, such steps would help



improve governance in the sector, as communities and users would start putting pressure through social audits.

60. Some mechanism in consultation with the Director General, Employment and Training, GOI needs to be in place for accreditation of agencies imparting training to supervisors, equipment operators and construction workers, so that the competency certificates awarded by such agencies get recognition in job placement

### **Box 3: Possible Institutions for Training in Road Sector**

#### **A. Possible Institutions for skill enhancement of road agencies**

1. NITHE
2. CRRRI
3. Financial Institutions (IDFC, IL&FS, HUDCO, SBI Caps, CRISIL)
4. IITs (Delhi, Kanpur, Kharagpur, Bombay, Madras, Guwahati, Roorkee)
5. IIMs (Ahmedabad, Lucknow, Kolkata, Bangalore, Indore)
6. Selected NITs and other Engineering & Technology Institutes
7. CPWD Training Institute, Ghaziabad, UP
8. Administrative Staff College of India, Hyderabad
9. Engineering Staff College of India, Hyderabad
10. National Institute of Financial Management, Faridabad
11. Narsee Monjee Institute of Management Studies, Mumbai
12. Survey Training Institute, Survey of India, Hyderabad
13. Management Development Program, XLRI, Jamshedpur
14. State Training Institutions
  - (i) Assam Administrative Staff College, Guwahati
  - (ii) Anna Institute of Management, Chennai
  - (iii) Administrative Training Institute, Kolkata
  - (iv) Administrative Training Institute, Mysore
  - (v) Himachal Pradesh Institute of Public Administration, Shimla
  - (vi) RCVP Noronha Academy of Administration and Management, Bhopal
  - (vii) HCM Rajasthan State Institute of Public Administration, Jaipur
  - (viii) Administrative Training Institute, Aizawl
  - (ix) Administrative Training Institute, Naharlagun (Arunachal Pradesh)
  - (x) Shri Krishna Institute of Public Administration, Ranchi
  - (xi) Yashwant Rao Chavan Academy of Development Administration, Pune
  - (xii) Accounts and Administrative Training Institute, Gangtok
  - (xiii) Uttarakhand Academy of Administration, Nainital
  - (xiv) Administrative Training Institute, Patna
  - (xv) Engineering Staff College, Nashik
15. Road Research Centers such as GERI, Vadodara; MERI, Nashik; HRS, Chennai; Road Research Lab, Guwahati; Road Research Center, Trivandrum, Road Research Center, Lucknow.
16. NICMAR, Pune and Delhi.

#### **B. Possible Institutions for Training of Supervisors, Workers/Machine Operators**

1. National Academy of Construction, Hyderabad
2. Training Centers of the Construction Industry Development Council
3. NICMAR, Pune and Delhi
4. Selected Industrial Training Institutes (ITIs) & polytechnics in states (supported by NAC/CIDC)
5. Equipment Manufacturers and Equipment Bank

## Areas for Training

40. There are several areas for training in the roads sector to which the stakeholders in the road sector should be exposed. The area of training will differ for road agencies and level of staff (supervisors, junior level, middle level and senior level engineers), contractors, consultants, equipment operators and construction workers and will also depend upon the category of roads, terrain condition, urban and non-urban roads, cash construction contracts, BOT contracts, etc. The Indian Roads Congress should take the lead in consultation with NITHE and NAC, Hyderabad to prepare a comprehensive document identifying areas of training for:

- Government Engineers at senior, middle and junior level
- Government Supervisors, Surveyors, Overseers, Junior Engineers
- Contractors Managers, Engineers
- Consultants Surveyors, Engineers, Contract Specialists, Quantity Surveyors, Soil and Material Laboratory Technicians, Traffic and Safety Specialists, Social and Environment Experts, etc.
- Construction Workers (skilled, semi-skilled and unskilled)
- Equipment Operators

43. This document should also provide brief course content for each topic of training and indicative duration for various levels of staff. Box 4 below provides an indicative course content for training of government officers in public-private partnerships in the roads sector and Box 5 for training of consultant officers in construction supervision during project implementation.

### **Box 4: Public Private Partnerships in Roads Sector: Indicative Course Contents**

- Commercialization principles, road user charges, tolls
- BOT Models (Toll-based, Annuity based), shadow tolls, DBFO
- Allocation and management of risks in PPP projects, project financing
- Financial engineering, commercial dynamics of projects, financial closure
- Model Concession Agreements: technical, financial and legal aspects
- Manuals of standards and specifications
- Other Project Agreements: construction agreement, O&M agreement, shareholders' agreement, agreement with lenders, insurance cover
- Differences between cash construction contracts and BOT contracts
- Regulatory aspects, duties of Independent Engineer
- Conditions Precedent: land acquisition, environment and social concerns, utilities shifting
- Case studies (national and international)

### **Box 5: Construction Supervision (Project Implementation): Indicative Course Contents**

- Contract documents: FIDIC, SBD, COPA
- Role of Employer, Engineer and Contractor, Contract Administration
- Encumbrances at site, social and environment concerns
- Specifications and standards
- Quality control, testing procedures, recording of results
- Quantity measurements and checks, recording of measurements
- Variation Orders, fixing of rates
- Liquidated Damages, Updating of Program, Extension of time
- Determination of Contract
- Dispute Resolution Mechanisms
- Processing of IPCs and Final Payments
- Supervision during Defect Liability Period

### **5.1 Possible Areas for Skill Enhancement in Roads Sector**

44. An indicative list of possible areas for skill enhancement in the roads sector is given below:

1. Current issues in road sector development, financing and administration.
2. Feasibility reports and detailed project reports (DPRs) for road projects, case studies.
3. Project management by road agencies and supervision consultants, case studies.
4. Contract administration and procurement procedures
  - FIDIC conditions
  - Standard bidding documents.
5. Public private partnerships (PPP) in the roads sector, BOT and its variants, special-purpose vehicles (SPVs), financial structuring, experiences in Center and states, case studies.
6. Model Concession Agreement for PPP projects.

7. Cost-benefit and commercial analysis of road projects, case studies. Road user costs, quantifying benefits of augmenting road capacity.
8. Concept of tolls, willingness to pay, open and closed systems of tolls, design of toll complexes, electronic toll collection.
9. Energy, safety and environment issues in roads sector. Environment management plan. Land acquisition and resettlement and rehabilitation policies for roads.
10. Engineering measures for improving road safety, road signs, pavement markings, crash barriers. Road safety measures at construction sites.
11. Road legislation: NH Act, NHAI Act, Control of National Highways (Land & Traffic) Act, CRF Act, States Highways Act, Motor Vehicles Act.
12. Pavement design – flexible and rigid pavements, national/international practices, case studies.
13. Construction and maintenance of flexible pavements.
14. Construction and maintenance of rigid pavements.
15. Design and construction of high embankments, ground improvement techniques, case studies.
16. Soil reinforcement structures – design and construction, case studies.
17. Geo-technical and landslide investigations for road projects; case studies.
18. Geometric design of roads of different categories – national/international practices, case studies.
19. Bridge standards and design of foundations, substructures, superstructures, bridge design softwares, STAAD, etc., case studies.
20. PMGSY – planning, design, construction and maintenance, guidelines of NRRDA.
21. Modern trends in design and construction of flyovers and interchanges; case studies.
22. Advance analysis and design of bridges.
23. Maintenance of roads – planning, norms, financing and institutional issues. Concept of road assets.
24. Maintenance of roads – technical aspects, operational capacity issues and performance based maintenance contracts.
25. Road maintenance management systems, pavement evaluation techniques, PMS, HDM-4, HDM-III.
26. Bridge inspection and diagnosis of distresses observed, performance evaluation, rehabilitation and strengthening of bridges, bridge management system (BMS).
27. Corridor management; engineering and non-engineering aspects, service to road users, overloading control.
28. Planning, design and operation of expressways.
29. Hill roads: special needs and characteristics.
30. Urban roads: special needs and characteristics.
31. Dispute Resolution Mechanism in contracts.
32. Quality control tests in field and laboratories, soil and material characteristics.
33. Axle load, traffic data, O-D traffic surveys, traffic forecasting techniques.
34. New materials and construction technologies.
35. Topographical surveys, total station equipment, satellite imagery, remote sensing.
36. Land and estate management of ROW, control on ribbon development.
37. Construction equipment and its management for road projects.
38. World Bank and ADB guidelines and procedures for road projects.
39. Use of IT, GIS and GPS in road sector.
40. Specifications for road and bridge works (MOSRTH and MORD).
41. Standard Data Book (MOSRTH and MORD).
42. Stress management, organizational behavior, managerial skills.
43. Team working, values, work culture, art of living.
44. Communication skills, interpersonal relations, leadership

## Research, Development and Technology Initiatives in the Road Sector

### Existing Scenario

1. India's early development planners clearly recognized the need for national research and development in all branches of science and technology. The establishment of the chain of National Laboratories under the Council of Scientific and Industrial Research (CSIR) was a major step in this direction. The Central Road Research Institute was one such laboratory set up for the road sector in the early 1950s in New Delhi. The CRRI has been doing pioneering service to the road engineering profession (Box 6). Its major activities cover basic research, applied research, dissemination of research findings and providing technical underpinning to the Indian Roads Congress in evolving national standards and codes of practice.

2. Regional research centers, such as Highways Research Station (HRS), Chennai, Maharashtra Engineering Research Institute (MERI), Nashik, and Gujarat Engineering Research Institute (GERI), Vadodara and Research Laboratories which have been set up by several state governments, as well as the Structural Engineering Research Center, Chennai, that are engaged in both basic and applied research in coordination with the apex institution (CRRI). The R&D centers in the private sector notably IOC, Bharat Petroleum, Hindustan Petroleum, ACC, etc. are also contributing significantly in their niche areas. IITs, NITs, Engineering colleges, School of Planning and Architecture (Department of Transport Planning) are also undertaking R&D work in several areas of the road sector.

3. The basic purpose of research in the road sector can be summarized as incorporation of technology innovations for:

- achieving cost-efficiencies, speed in construction, increased durability and performance,
- providing technical underpinning to evolving standards, and
- developing a pool of scientists and engineers with knowledge of latest developments around the globe.

4. A major push to the R&D effort in the road sector was given by the MOSRTH in early 1980s. Several research schemes (Box 7) relating to roads, bridges, traffic and safety have been sanctioned and projects entrusted not only to the CRRI but also to other research centers and academic institutions spread throughout the country.

5. The National Rural Roads Development Agency (NRRDA) and the NHAI have also pushed several schemes in the recent past. Similarly, the Directorate General for Border Roads has accumulated much experience in construction of roads in difficult terrain and snow-bound areas. The Department of Science and Technology also sponsors research schemes to their laboratories and other academic institutions.

6. All these research projects more than paid off in bringing cost-efficiencies and providing foundation for determining solutions to problems that would not have been possible otherwise. The Indian Roads Congress has an apex body – the Highway Research Board, under the chairmanship of Director General, Road Development and Special Secretary to the GOI, to guide the country on R&D needs. It identifies new research areas, monitors progress and disseminates the findings.

7. However, despite these measures, there is a long time lag between research findings and application on the ground. Moreover, the level of R&D in the road sector is painfully low in relation to the level of investments on road development being made by the central and state governments. The total expenditure in R&D including IT-related activities by the MOSRTH and the CRRI combined is estimated to be around Rs.1,350 million or \$30 million (50 percent of this is in staff salary and office establishment) in the entire Tenth Five Year Plan (2002-07) against an estimated expenditure of around Rs.600 billion on road development in the country during the same period. This implies that the expenditure in R&D in the road sector is merely 0.25 percent of the investments. In the developed countries, a minimum of 1.00 percent of road investments is allocated for R&D.

**Box 6: Central Road Research Institute, New Delhi**  
(An apex institution for research in Road Sector)

**Established:** 1952 as National Laboratory under CSIR

**Mandate:** Explore emerging areas in road sector, provide guidance to road profession, support, development of cost-effective standards and specifications of roads of various categories

**Research Areas**

Road Development Planning and Management  
Traffic Engineering Safety and Environment  
Pavement Engineering and Materials  
Geotechnical and Natural Hazards  
Bridge Engineering and Management  
Instrumentation

**Beneficiaries**

Government Road Organizations  
Indian Roads Congress (IRC)  
Contracting and Consultancy Sector  
Oil Companies, Cement Manufacturers  
Testing Equipment Manufacturers

**Landmark Achievements**

Road user cost study (input to World Bank HDM-III, HDM-4)  
Land slide mitigation strategies (hill regions)  
Consolidation of marine clay (coastal belts)  
Soil stabilization techniques  
Pavement deterioration prediction models  
Use of fly ash and other industrial waste in roads  
Road Safety Audits, Traffic Management Measures  
Non-destructive testing of bridges  
Road Condition Evaluation Devices, Bump Integrator  
CC block pavement in deserts and mountains  
Training Road Engineers (10,000 so far)

**Current Activities**

Road Information System  
Slope protection strategies in hills  
Maximizing use of marginal/waste material  
Engineering safety measures  
Highway Capacity Manual for Indian Conditions  
Refining pavement condition prediction models  
Diagnostics of distressed bridges  
Pilot testing of innovative materials  
Skill enhancement of road professionals

**Spectrum of Activities**

- Basic Research
- Applied Research
  - Sponsored
  - Collaborative
- Technical Services
- Principal Technical Agency, PMGSY
- Testing, Calibration
- Skill Enhancement
- Think Tank of IRC

**International Collaboration**

- Transportation Research Board, USA
- Transport Research Laboratory, UK
- Australian Road Research Board, Australia
- LCPC, France
- PIARC (World Roads Congress), Paris
- International Road Federation (IRF), Geneva
- CSIR, South Africa

**Support Infrastructure**

- Good Size Campus
- Wide pool of talented Scientists and Engineers
- Support Staff
- World Class Testing Equipment and Labs
- Test Tracks
- Library
- Computer/Data Center
- Software Packages (inhouse and international)
- Seminar Halls & Hostels

### **Box 7: Major Research Projects Sponsored by the MOSRTH**

#### **(i) Roads**

- Evaluation of locally available materials.
- Road user cost study as input to HDM-III, HDM-4 developed by the World Bank (an appraisal tool for road projects)
- Computer-aided design for high embankments
- Pavement performance studies of existing/new pavement section
- Choice of bituminous pavement surfaces in different regions
- Developing guidelines for Road Maintenance Management Systems
- Use of geogrids in improving pavement performance.

#### **(ii) Bridges**

- Rational methods of estimating resistance of soil around well foundation, and estimating design discharge.
- Corrosion monitoring of bridges in marine environment
- Seismic design of bridges
- Instrumentation of bridges to monitor rate of distress with time
- Computer software for design of superstructures

#### **(iii) Traffic and Safety**

- Spectrum of axle loads on roads in different regions
- Road Safety Audit Methodology
- Manual of Safety Engineering Measures
- Guidelines for traffic calming measures on roads
- Evolving design and standard drawings of intersections on highways

(These projects have immensely contributed to the planning and design of road projects in a cost-effective manner and evolving solutions to our own situations.)

### **The Imperative**

8. The various road development programs launched by the Government throughout the country involve several project complexities and varying conditions of soil, terrain and climate. Users' expectations and promoting projects through public-private financing mechanisms are leading the government to shift from prescribing input-based specifications to performance-based standards. Design and build construction contracts are also on the anvil. These developments would imply breaking of barriers to innovation by providing opportunities to developers and contractors to introduce innovative materials, specifications and technologies to satisfy requirements of performance and durability on the one hand and achieving life-cycle cost savings on the other. There is need for simultaneous development of construction methods and equipment to achieve fast construction and reduced environment damage. While our R&D effort in the last 10-15 years have seen many advances ,knowledge gaps persist in certain areas and need to be addressed.

### **Research & Development Vision and Policy**

9. R&D vision and policy needs to be developed for the next 10-15 years by the Highway Research Board (HRB) with the support of the central and state governments, to serve as a solid foundation to evolve durable and cost-effective solutions in the road sector. Such a vision should cover:

- institutional framework and formulation of R&D strategies by MOSRTH, MORD and state governments.
- identification of thrust areas relevant to Indian conditions,
- financing strategies,
- enhanced utilization and strengthening of academia (engineering, technology and science institutions),
- lab to land transfer, pilot projects on ground,
- monitoring of performance of new materials, specifications and technologies,

- knowledge pooling through networking and twinning with national and international R&D centers and academic institutions,
- creating a band of dedicated researchers and scientists,
- monitoring of research projects sponsored by the government.

### **Current Needs**

10. Some time back the Highway Research Board of the IRC undertook an exercise to identify major thrust areas in the road sector covering pavements, bridges, traffic and safety related schemes and geotechnical areas. Keeping in view the current emphasis on promoting private-sector financing for capacity augmentation of main highways, design-and-build construction projects with government financing and on achieving connectivity to unconnected communities under the PMGSY program with government funding and loan assistance by NABARD, World Bank and Asian Development Bank, it is necessary to accelerate such R&D and technology activities as have direct relevance to the needs of the road agencies and the road users in achieving speedy construction and bringing in cost-efficiencies; and increasing performance and durability of new materials and specifications. Box 8 gives a snap shot of some of the quick-win thrust areas for applied research, proposed for immediate pursuit by the government. There are some more areas of research that would also need to be considered. These are given in paragraph 22.

### **Institutional Framework**

11. As brought out earlier, the MOSRTH has been playing a catalytic role in pushing up the R&D effort in the road sector. However, it is time that the Ministry of Rural Development (MORD) and the state governments should also enhance their support in this endeavor. The government would do well to formulate a comprehensive R&D strategy with the support of the HRB and duly consulting all the stakeholders in the road sector. Figure 6 suggests a broad institutional framework which could be adopted in the future.

12. At the national level, the CRRI has served as an apex institution for carrying out research work. It needs to strengthen and enhance its role and mandate for basic, applied and sponsored research. The CRRI needs to continue as a center of excellence. It may formulate a business plan for the next 10 years in due consultation with the MOSRTH, MORD, MOS&T and HRB. It needs to carry a major burden of high-end research and coordinating with other regional research centers and laboratories set up by the state governments. As brought out earlier, IITs, NITs, engineering colleges, School of Planning & Architecture (Department of Transportation) New Delhi have also been undertaking research schemes in the sector. These are veritable think tanks and need to be harnessed to support our research centers. The researchers pursuing their Ph.D work in such institutions would be an important pool (Box 9 for illustration of involving academic institutions in technology initiatives and preparing base documents for road standards/codes of practice).

**Box 8: Quick-Win Thrust Areas for Research, Development and Technology Innovations and Reducing Knowledge Gap in the Road Sector in India**

**A. Areas relevant to PPP and government-funded projects on main highways**

1. Use of innovative materials to increase performance and durability
2. Determining design service volumes at various levels of service for 2-lane, 4-lane and 6-lane roads.
  - with/without paved shoulders
  - with/without service roadsin both urban and non-urban areas.
3. Specifications and standards for paved shoulders for 2-lane, 4-lane and 6-lane highways.
4. Accelerated bridge construction technologies to achieve faster construction (precasting techniques, concrete-steel superstructures, etc.). Also evolve standard designs.
5. Condition assessment of existing bridges and distress diagnostics of superstructures, substructures and foundations of bridges.
6. Evolving models for determining rate of deterioration of road pavements and riding quality with time, traffic and weather (including rural roads). Develop non-destructive evaluation techniques.
7. Evolving bio-engineering and other measures for improving slope stability in hills (including rural roads).
8. Evolving cost-effective protection works on roads in hills (including rural roads).
9. Refining traffic forecasting techniques on inter-city and urban roads.
10. Setting up Permanent Traffic Count Stations on the main road network (Say one station for every 500 km of NH/SH). Use of automatic traffic counting techniques.
11. Periodic axle load spectrum surveys at strategic locations on national highways/state highways to determine trends of overloading. Use of weigh-in-motion equipment.
12. Develop performance-based road management systems (including rural roads).
13. Blending/stabilization techniques to maximize use of locally available and marginal materials. (Pilot projects to be undertaken throughout the country).
14. Highway cost-allocation study of different categories of vehicles considering their relative impact on use of road space and damage to road pavement (to evolve rational user charges for recovery of road costs).
15. Design of safer Heavy Vehicles (lighter truck bodies; in-built safety elements).

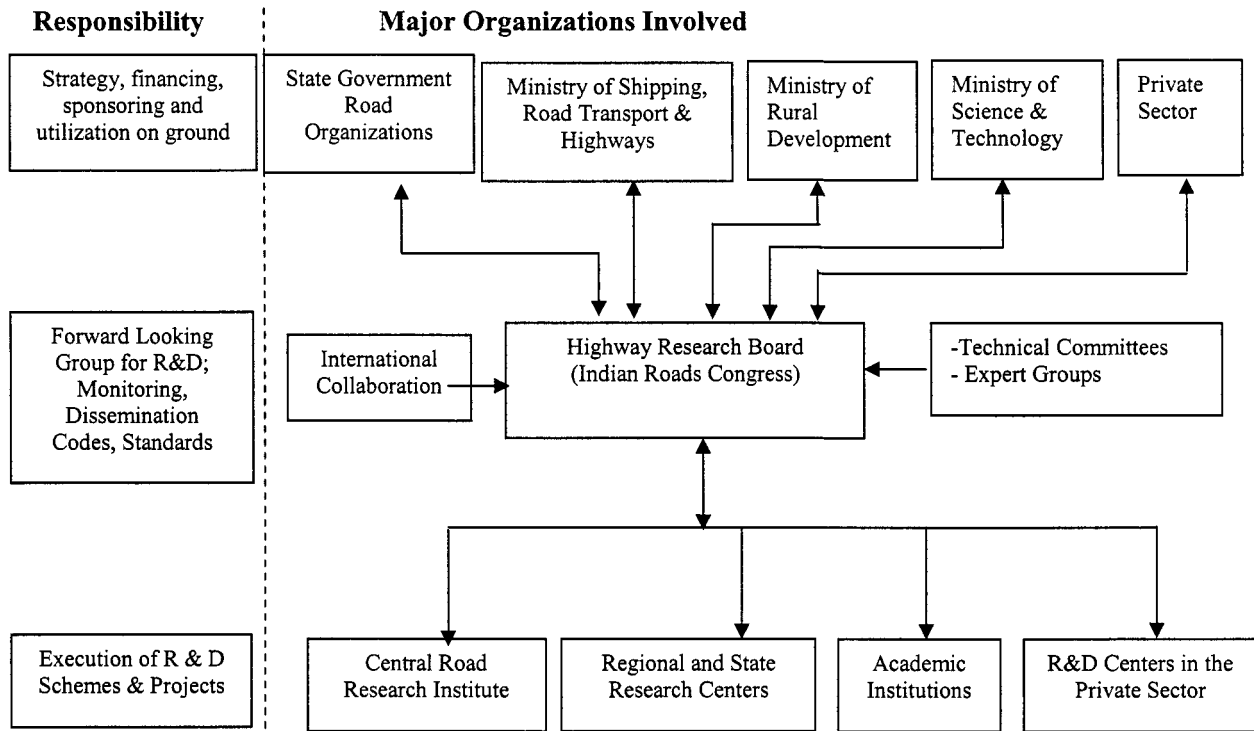
**B. Areas relevant to rural roads**

1. Identification of locally available materials at district level and determining their strength characteristics and promoting stabilization techniques
2. Use of soil cement, cement-blended granular material, brick ballast and other marginal materials
3. Use of thin bituminous surfacing layers, chip sealing and surface dressing
4. Monitor performance of bituminous pavements constructed under PMGSY.
5. Evolve low-cost water crossing structure designs.
6. Evolve low-cost drainage and erosion control measures.
7. Evolve designs for fabricating low-end technology equipment for construction and maintenance.

13. =The private sector has been playing a useful role in evolving innovative materials and additives to improve performance of existing materials and other areas of their interest. The HRB of the IRC is already ensuring their participation in its activities. Further enhanced participation should also be considered while developing the R&D vision and policy.



Figure 6: Institutional Framework for R&D in the Road Sector



**Box 9: Work on Development of Manual on Emulsion-based Chip Seals**  
 (An illustration of involving Academic Institutions in Technology Initiatives)

In response to the need for identifying factors that influence chip-seal design, to document design and construction practices and to delineate necessary testing and specifications, Colorado State University (USA) has been awarded a \$349,933, 30-month contract (NCHRP Project 14-17, FY 2006) to develop a manual for the design and construction practices of emulsion-based chip seals for pavement preservation. The Manual will be limited in scope to the application of chip seals to asphalt surface pavements and will be recommended for adoption by the AASHTO.

Source: TRB, USA: TR News No. 246 Sept.-Oct. 2006

14. The Indian Roads Congress and its Highway Research Board should become a proactive and vibrant institution in functioning as a true forward-looking group of Research, Development & Technology in the country for the road sector. The MOSRTH and MORD should provide financial support to the IRC in strengthening its activities to respond to the emerging needs. Box 10 gives a broad idea of the strengthening and augmentation of its current mandate.

15. The agencies engaged in carrying out research would also need to gear up to meet the enhanced requirements of the sector and improve respect to maintaining the time schedule for evolving solutions, with support from the government in demonstration, piloting and show casing the new technologies being developed by them. CSIR already has schemes for rewarding individuals for innovations. Similar awards could also be instituted by the private entrepreneurs entering the road sector.

#### **Box 10: Expectations from the Highway Research Board of IRC**

- (i) Continue identifying thrust areas for research in the sector.
- (ii) Streamline work of technical committees with base documents being prepared on the strength of research and knowledge inputs of universities, R&D centers and groups of experts. These should be time-bound activities, financed with government support.
- (iii) Enhance synergies between academia, research agencies, construction industry, consultants and road agencies.
- (iv) Support the research sponsoring agencies in monitoring of research centers, academic institutions, etc. Set up advisory and monitoring groups for specialized areas.
- (v) Undertake monitoring and evaluation of new materials, specifications and technologies with/without use of instrumentation during construction for monitoring performance and rate of deterioration with time.
- (vi) Create database on various facets of R&D and technology innovations. Arrange dissemination of research findings – publications, workshops, seminars so that research done by our think tanks does not remain confined to academic journals and research papers, but leads to policy formulation and development of standards and gets translated on ground.
- (vii) Generate an atmosphere of receptivity and acceptance for transfer and use of new materials and technologies from lab to land. Research should not be limited to review of international literature alone, but needs to take up laboratory trials and thereafter field pilot projects. NHDP, PMGSY and State Road Projects offer immense opportunities for field trials of promising topics of research.
- (viii) Arrange visits of various stakeholders in the road sector to technology demonstration projects within the country and abroad.

#### **Accreditation of Innovative Materials and Technologies**

16. The HRB should create a mechanism for accreditation of innovative materials and technologies for the road sector to promote their utilization on the ground. Side by side, codes of practice and specifications should be updated on a priority basis to incorporate the use of such materials and technologies, so that the time lag between research finding and application on the ground is reduced.

#### **Knowledge Management**

17. The IRC should strengthen its library and set up a center for data and knowledge in the road sector for facilitating development of database and information on various aspects of planning, design, construction, maintenance and management of roads. It should also establish a system of networking and twinning with national and international institutions engaged in research in the road sector and enter into global alliances, for example TRL, UK; ARRB, Australia; TRB and Research, Development and Technology Office FHWA, USA; LCPC and INRETS, France; CSIR, South Africa; and research institutes in China, Japan and Malaysia. CRRI, regional research centers and academic institutions also have been partnering with international institutions and these initiatives are proving useful.

#### **Financing Strategies**

18. Funds for research schemes should be provided by MOSRTH, MORD, MOS&T, NHAI, DGBR and state governments. The Industry (bitumen, cement, automobile industry and construction equipment manufacturers) is also contributing in their own niche areas. Perhaps, some tax incentives could be considered by the government to encourage their further support. The private sector may also be encouraged to identify research needs of their interest and sponsor schemes to the research centers having expertise in those areas. Once such technologies are proven useful for commercial application, some sort of technology rent could be paid to the research center to make the system more self-sustaining.

19. The multilateral and bilateral development agencies have supported the Government in the past through technical assistance in certain agreed thrust areas and such support needs to continue.

20. All in all, there is no dearth of funds in the road sector. The money spent on relevant research schemes and development of innovative technologies pays very rich dividends to the economy, as has been the experience worldwide.

### **Government Support**

21. The Government seems committed to promoting research, development and technology initiatives in the road sector. The Government's support is needed on several fronts to enable effective and time-bound implementation of the research schemes. Main areas are indicated below:

- Formulation of R&D strategy and policy in the road sector for the next 10-15 years
- Strengthening of the existing R&D centers in the country with latest research equipment for both basic and applied research;
- Forging collaboration with international research and knowledge centers.
- Making available project sites for field trials to promote lab to land transfer;
- Providing tax incentives to R&D centers in the private sector.
- Creating mechanisms to write off failures of trial technologies on the ground with no blame game but evolving lessons learnt for future projects;
- Evolving a transparent system of procuring R&D work from research and academic institutions on a cost-plus and time-bound basis, rather than through competitive bidding. A system of steering/expert groups at national level could be evolved for peer review of proposals and some interaction during implementation by the research agency (such a system existed in MOSRTH some time back and can easily be revived).
- Enabling and encouraging contractors and developers to use fruits of proven research to bring in cost-effective solutions without compromising on durability and performance. Contract conditions/documents can be reviewed, if necessary, for giving effect to such strategies.

### **Other Thrust Areas for R&D and Technology in the Road Sector**

22. Some of the key areas of further research could be:

#### *A. Structures related*

- Design criteria for crash barriers and railings
- Performance monitoring of bridges, flyovers, railway over-bridges and under-bridges, etc.
- Performance monitoring of expansion joints, bearings
- Develop guidelines for retrofitting of existing bridges.
- Construction technology of tunnels, provision of safety devices against fire, etc.

#### *B. Pavements related*

- Performance monitoring of concrete and flexible pavements (use of Accelerated Pavement Testing Facility and instrumentation during initial construction on the ground)
- Recycling techniques (hot/cold) of bituminous pavements. Evolve guidelines and specifications for promoting their use.
- Performance studies of stone matrix asphalt, micro-surfacing and develop specifications thereof.
- Development of high-performance bituminous pavements
- Development of higher performance and thinner surfacing mixtures with better skid resistance, improved fuel efficiency and improved noise reduction.
- Evolve methods for repairs/rehabilitation of cement concrete pavements.
- High-volume fly ash concrete technology
- Use of geosynthetics in pavement structures.
- Performance monitoring of reinforced earth structures and review of designs.

C. *Traffic and Safety related*

- Development of Road Capacity Manual for Indian traffic conditions in urban and non-urban areas.
- Review of passenger car unit factors in urban/non-urban areas.
- Use of smart materials and sensors to improve safety.
- Effect of raised median and curb height on road safety.
- Review warrants for provision of grade-separated interchanges in urban and non-urban areas.
- Review of geometric design standards to improve safety.

D. *Equipment related*

- Promote indigenous manufacture of equipment for recycling of bituminous pavements.

**Action Plan**

23. Table 6 gives an outline of the proposed Action Plan in the light of suggestions given here.

**Table 6: Proposed Action Plan for R&D in the Road Sector**

	<b>Action Plan</b>	<b>Action by</b>	<b>Time Horizon</b>	<b>Outcome Indicator</b>
1.	Formulate R&D vision and policy covering, inter alia <ul style="list-style-type: none"> <li>• Institutional framework</li> <li>• Identification of thrust areas</li> <li>• Financing strategies</li> <li>• Strengthen research centers and academic institutions</li> <li>• Monitoring of research work</li> <li>• Knowledge pool through national and international collaboration</li> <li>• Dissemination</li> <li>• Utilization on the ground</li> </ul>	MOSRTH in consultation with MORD, DGBR, NHAI, State Governments, DST, CRRI, IRC	Immediate	Policy document approved by the government by December 2007 and widely disseminated (put on website of the government)
2.	Enhanced role and strengthening of the Highway Research Board of the Indian Roads Congress	MOSRTH and IRC	Immediate to Short term	<ul style="list-style-type: none"> <li>• Workshop of stakeholders held to review HRB's mandate by Dec 2007</li> <li>• HRB's functions reviewed and revised mandate issued in 2008-09.</li> </ul>
3.	Strengthening of CRRI	MOS&T and CRRI in consultation with MOSRTH and MORD	Short term	<ul style="list-style-type: none"> <li>• Business Plan for next 10 years prepared by CRRI and published in 2008-09</li> </ul>
4.	Creation of Data and Knowledge Management Center in the IRC	IRC with the approval of MOSRTH	Short term	<ul style="list-style-type: none"> <li>• Data Center in operation in 2008-09</li> <li>• Links established with international collaborators</li> </ul>
5.	Accreditation of innovative materials (under the aegis of the HRB)	IRC with the approval of the MOSRTH, MORD	Immediate and on-going	<ul style="list-style-type: none"> <li>• A core group formed by Dec 2007, which scrutinizes the proposals and issue its findings as per guidelines</li> <li>• Guidelines for accreditation formulated and published by IRC by Dec 2007</li> </ul>
6.	Identification of priority schemes for research	HRB in consultation with MOSRTH/ MORD	Immediate	<ul style="list-style-type: none"> <li>• List of schemes published in IRC journal by December 2007</li> </ul>
Immediate < 12 months;                      Short term: 1-2 years                      Medium term = 2-5 years.				

## The Value Engineering Process

What is Value Engineering (VE)?

1. VE is a management tool which involves carrying out a reassessment of a design, proposal or process to seek out optimum value for both initial and long-term investment. VE has been widely practiced in the manufacturing industry but lately the construction industry in some developed countries has also adopted this tool, realizing its potential in optimizing project costs.
2. The VE process can be defined as a systematic application of recognized techniques by a multi-disciplinary team of industry experts to: (i) identify the function of each design feature or proposal; (ii) establish a worth or need for that proposal; (iii) generate alternatives; and (iv) recommend the best proposal to accomplish the project's objective, reliably and at the lowest life cycle cost (LCC), without compromising on the project objectives, safety, quality and socio-environmental aspects.
3. It has been often argued by designers that the process of VE is very similar to the basic design principle. However it is highly unlikely that we use this principle at all times during the normal design process. VE has many elements, such as functional analysis, creativity, innovation, estimation of lowest LCC and team work. Unless all of these elements are used, the process is not called VE.
4. The overarching goal of a VE study is to achieve the 'best value for money' and its objectives are to improve the quality, performance, efficiency, constructability, safety and environmental benefits within the least LCC.

The process of VE

5. VE is carried out mainly through a workshop, in which a selected multi-disciplinary team of industry experts, including contractors, consultants and employers, as well as active public interest groups, are invited to take part. The workshop is facilitated by a VE expert or leader of the VE team. During the workshop, the following agenda is followed:

- Information Phase
- Speculation Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

### *Information Phase*

6. In this phase, the design team presents the background, objective, design solutions with their intended function, cost estimates, risks, implementation schedule, and impacts of the proposed project to the audience. The prime objective of this phase is to give the participants an understanding of each design feature and its function.

### *Speculation Phase*

7. This phase is also called the creative phase. The team applies brainstorming techniques to develop good alternatives to the way the project is currently designed and the facilitator invites ideas from the participants on any aspects of the project or proposed design solutions. Each idea is noted down and a number is assigned to it. It is prohibited to judge or reject any idea in this phase. The list may include ideas that can be further developed, evaluated and used in the design.

### ***Evaluation Phase***

8. This phase of the workshop can also be called the analysis phase. The participants define the criteria and establish a weighted evaluation system to be used for evaluating ideas/alternatives prepared in the speculation phase. Ideas which are found to be impractical or not worthy of further study are discarded. Those ideas that represent the greatest potential for cost savings and value improvement are developed further in the next phase of the workshop.

### ***Development Phase***

9. During the development phase of the VE study, ideas listed and retained under the evaluation phase are further developed and expanded into workable solutions. Depending on the complexities of the project, this phase can either be taken up during the workshop or in a separate smaller group, which can include key members of the design team as well. Each idea and proposed alternative is developed by describing the recommended design change, advantages and disadvantages of the proposed recommendation, cost comparison and LCC calculations.

10. Each recommendation is presented with a brief narrative to compare the original design method to the proposed change. Sketches and design calculations, where appropriate, are also included in this part of the study.

### ***Presentation Phase***

11. This is the last phase of the VE Study, where the VE team presents its recommendations in the form of a written report. The report is presented to the Client and stakeholders, as well as the Design Team. The presentation includes the final recommendations, the justification and rationale of each proposed alternative and cost impacts. The report and the presentation should also include an implementation plan, which describes the process that the implementing agency must follow to implement any recommendations. In this phase a decision is made as to which VE proposals will be accepted for implementation and incorporation into the design documents.

## **Benefits of Value Engineering**

12. VE can be applied at various stages in a project including construction. However, the earlier it is applied, the higher are the returns. It has been established that the savings realized by undertaking VE exercises can be in the order of 10-15% of the originally designed project. VE process results in better informed decisions and encourages competitiveness by facilitating creativity and innovative design solutions. The Indian construction industry suffers from a lack of attention to design review and optimization, frequent design changes during construction, and a lack of client's capacity to review the design. In these circumstances, VE can be a brilliant tool to deal with this issue and can greatly improve the quality of our designs. Furthermore, the participation of selected public groups in the VE process gives comfort to the public in the project area, that their needs have been taken care of in the project design, and minimizes the risk of design changes resulting from public demands during project implementation.

13. At the planning stage of development, VE can help to review the program's goals and objectives, consider alternative approaches to the program, define performance indicators to monitor the program's success, and ascertain that the budgets are sufficient to carry out the proposed program. VE at the planning stage has very little impact on the schedule and redesign costs, and it increases the likelihood that project development will proceed with few changes.

14. At the design stage, VE has the maximum advantage. An independent review by industry experts during the VE workshop gives the assurance that all reasonable alternatives have been explored. The design gets confirmed and documented, and the possibility of surprises during construction reduces. The client also gets confidence that the 'best value for money' is being implemented in the project.

15. At the end of this annex are sample worksheets, which may be used during a VE workshop at the planning and design stage to record and evaluate ideas.

16. During the construction phase, VE is still possible through the use of a Value Engineering Change Proposals (VECP) clause in the contract. Such a clause is a contractual mechanism provided by Federal, state, and private businesses in the US. It gives a financial incentive to get contractors and subcontractors to reduce the cost of works, systems, supplies, and services for contracts in progress. To qualify as a VECP, a proposal must, at a minimum, require a change to a contract to be implemented and save money. It must lower the overall LCC, without degrading performance, reliability, maintenance, or safety. No obligation to accept a VECP is present and the risk for the contractor's development costs resides with the contractor.

17. After contract award, there is little reason for the contractor to reduce acquisition or life-cycle cost. Since profits are derived from the contract cost, reducing that cost should reduce the expected profit. However, the introduction of a VECP clause in the contract dramatically changes this situation. Contractors can be provided with monetary incentives to propose solutions that offer enhanced value to the owner, and share in the financial benefits realized. Clearly the owner must consider contractor-generated proposals very carefully, from a life-cycle perspective and a liability perspective. The evaluation of a VECP is treated similarly to any Variation Order during construction.

### Success Stories

18. While VE concept has been around for decades, its use by the road industry has greatly increased in recent years. VE became popular after a 1995 Congressional regulation in US, mandating the use of VE on all Federal-aid highway projects of \$25 million or more. Three states California, Florida, and Washington were recognized by the Federal Highway Administration (FHWA) in 1999 for their "exceptional accomplishments in applying and promoting VE." California was the first state highway agency to demonstrate the benefits of VE, having started its program in 1969. From 1994 to 1999, California conducted more than 200 VE studies, resulting in over \$400 million in savings

19. A FHWA survey of 380 projects nationwide in 2001 showed that during the VE process, 1,058 alternatives were considered and approved, which resulted in a saving of about \$932 million. Similarly, the Oregon State Highway Department carried out VE on 40 highway projects, which yielded savings of \$2.5 million in four projects.

20. The Ontario Ministry of Transportation (MTO) completed its first VE study in 1995. Early successes on highway projects helped to expand the program. MTO now does VE studies on road standards and business processes as well as highway projects. Since 1998, accepted savings from the Ministry's VE program have exceeded \$150 million.

21. Since 1996, the UK Highways Agency has also adopted VE at key stages of scheme/project development. In the A2/M2 Cobham to J4 scheme, value engineering at works commitment stage achieved savings of 6%.

### Further references for Value Engineering

- The SAVE International – A Value Society <http://www.value-eng.org/>
- The Institute of Value Management, UK <http://www.ivm.org.uk/>
- The US Department of Transportation, The Federal Highway Administration
- <http://www.fhwa.dot.gov/ve/>
- American Association of State Highway and Transportation Officials
- <http://www.wsdot.wa.gov/eesc/design/aashtove/>
- Canadian Society of Value Analysis <http://www.scav-csva.org/>

Sample Worksheet for a Value Engineering Workshop at Planning Stage (Upgrading and Widening of SH 01)											
Idea No	Description	Cost (Present Value)					Est. Implementation Cost saving	O&M Cost saving	Total LCC Saving	Design Team's Remarks	Design Team Response
		Original Design Cost	Proposed Design Cost	Initial Cost Savings	Est. Implementation Cost saving	O&M Cost saving					
1	I live in a Village nearby and I do not think the road needs upgrading.	-	-	-	-	-	-	-	-	Widening is justified based on the present traffic volume count and the forecast traffic volume.	Idea rejected
2	Please verify your volume count.	-	-	-	-	-	-	-	-	-	Idea accepted
3	Instead of widening it to two lanes, widening to intermediate lane would be sufficient								--		Idea rejected
4	The proposed bypass at Village should be on the southern side of the village								++	The proposal was reviewed by the Design team but not found suitable on social and environmental impact aspects	Idea rejected
	Total Initial Cost Savings										
	Total Life Cycle Cost Savings										

Sample Worksheet for a Value Engineering Workshop at Design Stage (Upgrading and Widening of SH 01)											
Idea No	Description	Cost (Present Value)					Est. Implementation Cost saving	O&M Cost saving	Total LCC Saving	Design Team's Remarks	Design Team Response
		Original Design Cost	Proposed Design Cost	Initial Cost Savings	Est. Implementation Cost saving	O&M Cost saving					
1	The proposed layer of DBM can be reduced by at least 10 mm								++		Idea accepted
2	The culvert proposed at Km 23.10 is not required.								--		Idea rejected
3	Proposed 2m high embankment in the stretch from Km 13 to 18 is not required?								++		Idea accepted
4	Rather than the proposed wall near the school for noise barrier, please plant two rows of trees										Idea accepted
5	Reduce Paved shoulder width by 0.5m								++	Idea rejected on safety grounds	Idea rejected
	Total Initial Cost Savings										
	Total Life Cycle Cost Savings										




## Case Study: Road Agency Privatization – Actual Experience

### 1.0 Context

1. Attached below is a presentation made by Mr Keith Madelin of the actual experience of the process of corporatizing/privatizing the construction wing of the Shropshire County road agency. This is also available in the web site - [http://worldbank.org/transport/training/arms\\_01/madelin.pdf](http://worldbank.org/transport/training/arms_01/madelin.pdf)

**Privatization in Practice:**  
**The perspective of Direct Labor Organizations in the UK**

Keith Madelin  
School of Civil Engineering

  
THE UNIVERSITY  
OF BIRMINGHAM

**Background Conditions**

- Legal duty to maintain highways
- Post 1950s -Emphasis on new construction
- No consistency of standards
- Maintenance taken for granted

**1970 -Marshall Report**

First study of highway maintenance in UK

- Proposed Standards
- Advocated maintenance management
- Concerned about productivity of DLOs
- Recommended Training

### **Political Pressures**

- 1970s – Oil Crisis – costs increase
- Maintenance budgets reduced
- 1977 – National Road Maintenance Condition Survey

### **1981 -Legislation for Competition**

- No work by DLO without an estimate
- > £100,000 open competition
- > 5% profit to be achieved

### **No Work without an Estimate**

Each DLO had to set up a separate account

- Expenditure – labor costs, materials, plant, overheads.
- Income – from work estimates or from tenders, income has to be certified by client.
- Profit – 5% based on value of capital employed.

### **Minimum Profit Level**

Profit – 5% based on value of capital employed.

- Minimum profitability must be achieved over 3 year period
- Accounts audited by government auditors
- Failure to achieve profit resulted in closure of DLO by government unless explanation accepted

### **The Pressure Increases**

More work has to be won in competition

- 1982 – reduced to work >£50,000
- 1983 – reduced to work >£50,000 + 30% of <£50,000
- 1983 – National Code of Practice for maintenance
- 1986 – Audit Commission reports on maintenance

### **Action Taken – 1980s**

- Creation of DLO as business unit
- Client/Contractor roles established
- Aim to improve productivity
- Rationalise depots

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### **Action Taken – 1980s**

- Review conditions of employment
- Revise bonus payments
- Assess size of workforce
- Review plant and equipment needs

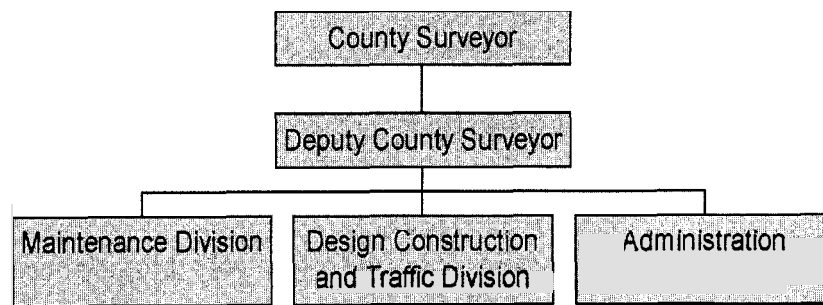
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### **Action Taken – 1980s**

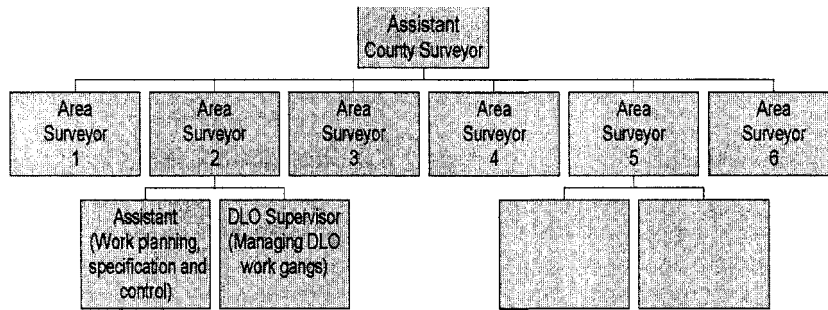
- Estimating unit established
- Improve financial information
- Discussions with Trade Unions
- Training and preparation

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### **Organization of Shropshire -1982**



## Organization of Maintenance Division 1982



## Responsibilities of Division -1982

- Identify maintenance need
- Advocate budget to politicians
- Allocate budget to areas
- Plan work program of DLO
- Supervise work
- Arrange for private contractors to assist
- Keep DLO employed

## Action Taken

### *Organizational change*

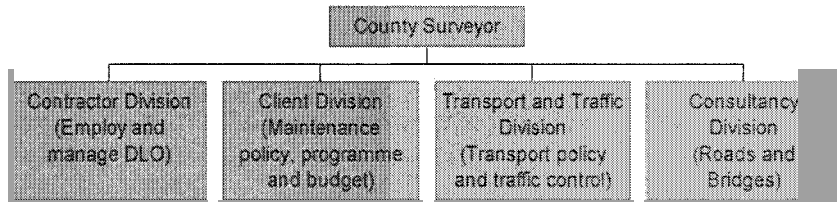
- Focused on Maintenance Division
- Separation of client and contractor roles

### *Procedural change*

- Adoption of Maintenance Code of Good Practice
- Introduction of needs based budgeting

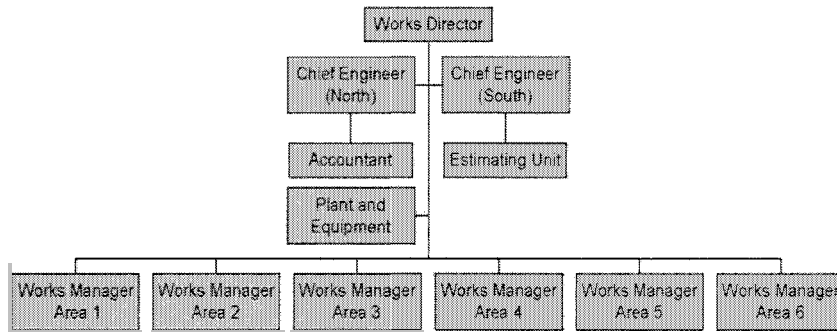
*Both changes are needed to be effective*

## Organizational Change

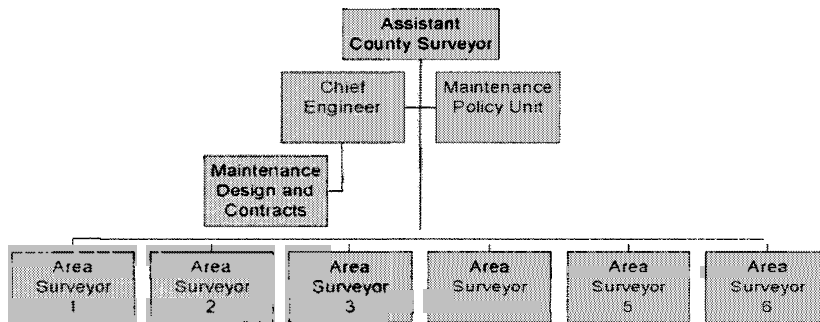


## Contractor Division

Phase 1



## Client Division



### **Role of Contractor Division**

- Employ and manage workforce
- Purchase and manage plant and equipment
- Provide estimates for client
- Undertake agreed maintenance tasks
- Improve skills and productivity
- Purchase materials
- Training and safety
- Keep accounts of income and expenditure

### **Role of Client Division**

- Develop a needs based maintenance management system
- Advise politicians of required budget
- Prepare specifications and contracts
- Procure the work using either public or private contractors
- Act as the focus for public contact

### **Results – Phase 1**

- Shropshire County Contracting created
- Turnover increased
- Work planning improved
- More use of sub-contractors
- 15-20% improved productivity
- Minimum profit levels exceeded

### **The Pressure Increases**

- 1987 – reduced to >£25,000 + 30% of <25,000
- 1988 – reduced to >£25,000 + 60% of <£25,000
- 1996 – 100% of ALL WORK

### **1990s -Other Changes**

- Citizen's Charter concept
- Public attitude surveys
- Customer expectations
- Enabling/procurement role for public sector
- Service provider role for private sector

### **Action Taken – 1990s**

- Move towards free standing business unit
- Strengthen client/contractor roles
- Critical review of overheads
- Continual improvements in productivity



### **Action Taken – 1990s**

- Re-define role of politicians
- Managers given power to manage
- Delegation of authority
- Performance targets set
- Payment linked to performance

### **Shropshire County Contracting**

- Preparation of Business Plan
- Understanding the competition
- Independent financial advice
- Emphasis on marketing
- Skills and flexibility of workforce

### **Annual Benefit of DLO**

Tenders won by DLO	£4,216,000
Next lowest private contractor	<u>£4,820,000</u>
Saving	£ 604,000
DLO profit	£ 100,000
Estimated effect of competition Created by DLO (5% lower cost)	<u>£ 300,000</u>
Total estimated saving (Worth 10% of budget)	£1,004,000

### SCC – Resources 1992

- Employees -375
- Plant and equipment – 600 items
- Depots – 8 No – value £3.2m
- Turnover -£17m pa

### SCC – Predictions for 1996

- Employees – down to 250
- Turnover –down to £8.2m pa

### SWOT Analysis

#### STRENGTHS

Quality  
Reputation  
Local knowledge

Profitable

#### OPPORTUNITIES

Alliances  
Other public services

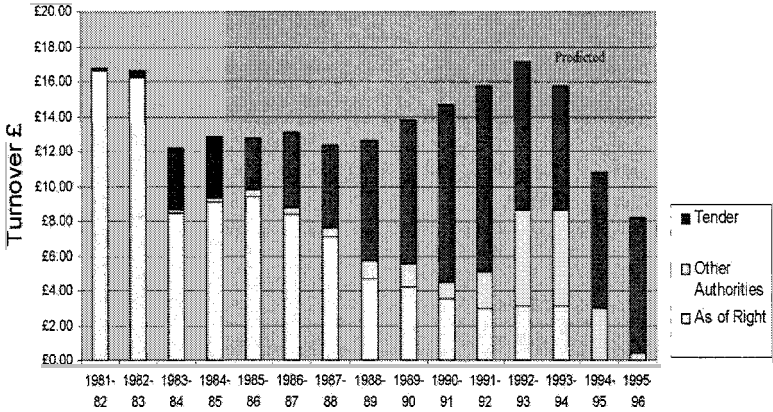
#### WEAKNESSES

Too dependent on County  
Market limited by law  
Public sector pay & conditions

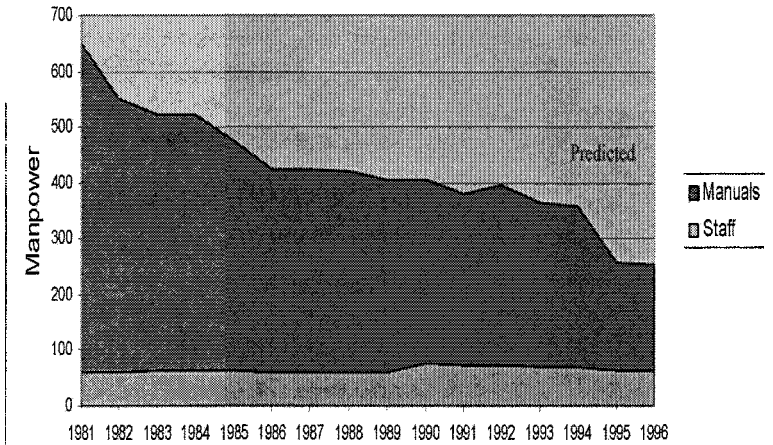
#### THREATS

Reduced County budget  
Extension of competition  
Withdrawal of Gov agency

### The Changing Client



### Reducing Manpower



### **Options for Change**

- Carry on and compete in a limited market  
*Manpower losses and profitability at risk, failure could result in forced takeover*
- Merge with other local DLOs  
*No local DLO would recognize the potential, no political will, manpower losses.*
- Explore privatization in a controlled way  
*Ability to influence choice of a partner*

### **Exploring Privatization**

- The results of the review shared with workforce and Trade Unions consulted
- Workforce agreed to explore privatization
- Representative task-force set up and given the freedom to meet with whom they wished
- Timescale established, client to proceed with draft contract documents

### **Packaging the Contract**

- All options had an impact on the client, therefore client also explores options
- Key issues were the scope, length and number of contracts
- Large all-purpose contract would keep DLO intact for a merger and facilitated better emergency cover
- Small contracts may give lower prices but are more difficult to supervise

### **Procurement Process**

- 5 year general contract for maintenance and minor construction work, extendable to 7 yrs on good performance
- Advertised and a long list of contractors chosen on basis of quality and financial standing
- Taskforce allowed to visit and appraise all contractors and privatized DLOs
- DLO continues to reduce manpower

### **Selecting a Short List**

- Politicians agreed that employee taskforce can input into process, and that privatization will only occur with employee approval
- Long listed contractors invited to seminar to discuss tender procedure
- Long listed contractors make presentations to client and taskforce
- Client and taskforce consult and identify preferred short list of 6, politicians approve

### **Tendering Procedure**

- Documents include typical quantities but are not guaranteed
- Depots, plant and equipment listed and made available for purchase or rent
- Labor details supplied and contractor must over the DLO employees
- DLO also tenders on same documents, both to benchmark the bids and also to keep option for DLO to win and continue

### **Financial Evaluation**

Three elements:

- Tender for works
- Payment for plant and equipment
- Any specified cost for taking over employees, including pension provision and conditions of service

### **Results**

- The lowest private bid was 10% above the DLO benchmark bid
- The politicians decided that 10% was within the risk they would carry for redundancy payments if the DLO continued in business
- Employees were strongly in favor of privatizing
- The best bid came from the contractor who was first choice for the employees

### **Final Decision**

- The contractor offered to takeover all of the workforce and managers, with minimal change
- Employees voted 95% in favour of privatizing with their preferred contractor
- Politicians agreed and transfer took place in April 1995
- *The client was not so happy since the cost of maintenance increased by 10%. No extra budget was allocated.*



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