

**IDENTIFICATION OF
STAKEHOLDERS IN HIGHWAY SECTOR FOR HUMAN
RESOURCE DEVELOPMENT**

INDEX

	Page No.
INTRODUCTION	2-6
CHAPTER- 1: DEVELOPMENT OF HIGHWAYS SECTOR	7-15
CHAPTER-2 : STATUS OF HIGHWAYS SECTOR	16-20
CHAPTER-3: PLANNING AND FUNDING ORGANIZATIONS	21-29
CHAPTER-4: IMPEMETATION ORGANIZATIONS	30- 33
CHAPTER-5: CONTRACTORS, CONCESSIONAIRES, CONSULTANTS, AND MANUFACTURERS	34-37
CHAPTER -6: RESEARCH ORGANIZATIONS	38-43
CHAPTER-7: TRAINING AND SKILL DEVELOPMENT AGENCIES	44-46
CHAPTER-8: AGENCIES FOR TESTING OF MATERIAL	47-50
CHAPTER-9: FACILITATORY, COMPLIMENTRY, AND REGULATORY AGENCIES	51-53
CHAPTER -10: ORGANIZATIONAL REQUIREMENTS	54-61
CHAPTER-11: HUMAN RESOURCE DEVELOPMENT & MANAGEMENT	62-67
REFERENCES	
ABBREVIATIONS	68-69

IDENTIFICATION OF STAKEHOLDERS IN HIGHWAY SECTOR FOR HUMAN RESOURCE DEVELOPMENT

INTRODUCTION

Human resource is the productive power in human beings. Unlike the material resources, human resources are the participants as also the beneficiaries of economic development. In that sense, human resources figure both on the demand side as well as supply side of the production of goods and services. On demand side, goods and services produced are used by human beings for general amelioration of quality of life like alleviation of poverty, improving health, improved access to market etc. On supply side, human resources and capital form the essential ingredients of production system which transform the natural and physical resources into goods and services by developing infrastructure.

In past, road sector projects were executed in small reaches with limited technology application. Human resources were developed by non-formal and informal, on job transfer of knowledge by hands on training. This training was imparted by master craftsman who had acquired skills and knowledge of the trade by way of his long experience on the job and from his mentors. With rapid advancement in the field of technology, to meet the challenges posed by national development policies, human resources need to be developed in a more structured fashion to create a net surplus of capability over capability required to meet the challenges effectively and efficiently. Assessment of human resources for Highway sector in future will be based on projections of urbanization, port development, connectivity corridors etc. Macro level forecasts at national, regional or state level for human resources for highway sector are needed for planning education pedagogy and

training facilities, decision making for highway infrastructure development in matters of choice of technology, prioritization of sector development etc. Micro forecasts at enterprise level are needed primarily for planning, recruitment, and training in accordance with the development plans of enterprise.

Highway sector is serving the public at large, lies mainly in Public sector domain with government or its agencies acting as major players and funded by public exchequer. Government organizations like State PWDs, Rural Engineering Organization etc. need to meet the challenges in the field of technology, quality, specifications, and higher level of financial prudence required in project execution. Limitation of funds for highway development forced the public organizations to involve private sectors as major partners in the highway sector development. Contractors, project management consultants, planning consultants, design consultants, supervisors, third party quality assurance consultants are new players who are now well entrenched and become indispensable to the execution of any major highway project. Capability deficit of organizations is thus compensated by transferring and sharing the competence with those who possess it.

The present document seeks to explore the expanse, width and depth of Highway Sector and players contributing to its growth and development. Like any other infrastructure sector, expanse, width and depth of Highway Sector envelopes Various stake holders, their organizations, professionals working under them, policies governing their evolutions so far and likely future configurations, technology interventions, development of new and innovative instruments for project delivery, safety and environmental concern to name a few. Such identification of highway sector and its agencies, it is expected, will give a clear idea to the readers as to the issues

which the highway sector has to grapple with at policy level, macro and micro management level with a view to devising strategy for the development of human resources for meeting present and future challenges. It will be a kind of exploratory document, opening the field to the other players/professionals to act upon.

In Chapter 1, the development of Highway Sector from the beginning of last century has been described. In order to give boost to Highway Sector, various long term Road Development Plans were prepared. These plans including the latest Plan for the year 2001-2021 are described. In Chapter 2, the overall status of Highway Sector has been given, briefly describing different categories of roads including Expressways, National Highways, State Highways, Major District Roads, Rural Roads and other roads. Thereafter, the stakeholders in the Highway Sector have been identified.

In Chapter 3, brief details about planning and funding organizations for the Highway Sector have been given. In Chapter 4, main Organizations for implementation of highway projects have been described. Chapter 5 deals with contractors, concessionaires, consultants and manufacturers involved in this sector. Research Institutions and Organizations dealing with Human Resource Development (HRD)/Training /Skill Development are dealt in Chapter 7. Human Resource aspect necessary for Quality Control and Testing of Materials has been dealt in Chapter 8.

Besides main stakeholders, there are several organizations which are connected with Highway Sector. These are broadly covered under the categories of Facilitator, Complementary and Regulatory agencies and are dealt in Chapter 9.

The stakeholders of Highway Sector are required to be reviewed critically to ascertain organizational requirements as brought out in Chapter 10. In order

to evolve the strategies for re-organization, the changes already initiated in the country needs to be looked into. Therefore, a separate documentation on re-organizational requirements of stakeholders will be helpful in understanding the requirement of HRD.

The comprehensive requirements of HRD of stakeholders, professionals and workmen involved in the Highway Sector have been brought out in Chapter 11. A separate document is being developed on this subject by the IRC committee on HRD. The training of professionals and workmen is necessary for HRD. It is considered desirable to develop standard modules for training of professionals and separate document is being developed on this subject. The details of existing training facilities for testing of materials are being compiled which will be helpful to the organizations and individuals to use these facilities. Thus, by and large, several aspects connected with HRD in the Highway Sector have been included in this document for guiding and enlightening the readers as well as, to be of help to the Highway Sector in meeting future challenges.

CHAPTER- 1

DEVELOPMENT OF HIGHWAY SECTOR

1. Early twentieth century:

1.1 During the earlier twentieth century, the worsening condition of roads was a matter of public concern, which found expression in the deliberations of the Council of States. Following a debate in the Council, the Government of India appointed a committee called Road Development Plan committee in 1927. The recommendations of this committee, popularly known as Jayakar Committee was emphatic regarding inadequacy of Indian Road System and the Committee urged that further development of the road system was desirable for general welfare and movement of men and material. Pursuant to recommendations of the Jayakar Committee, the Central Road Fund (CRF) was constituted in 1929 as a non-lapsable fund, the revenue of CRF was derived out of the proceeds from Customs and Excise duties levied on petrol.

1.2 In 1930 at Government level, the Office of the Special Chief Engineer was created with a small staff to administer the newly constituted Central Road Fund and to advise the Government of India generally in all matters concerning road development. Later, it became the Office of the Consulting Engineer (Roads) to the Govt. of India and was expanded in 1935 and again during the World War II. Further, as per the Jayakar Committee's recommendations, Indian Roads Congress (IRC) was established in 1934, as a body of professional highway engineers, to oversee development and set standards and procedures for road development in the country. The formation of the IRC set the pace for the Road Development in the country.

1.3 The realization that a balanced road system was a vital prerequisite to the post-war economic development of the country impelled the Central Government to convene a Conference of all the State Chief Engineers at Nagpur in December, 1943 to make proposals for a comprehensive plan of road development for India. Their report (commonly known as the Nagpur Plan) represents the first integrated Road Plan for India. On 1.4.1947 the Government of India assumed responsibility for the development and maintenance of certain important roads and provisionally categorized these roads as National Highways. In 1956, the Govt. of India enacted the National Highway Act 1956, and the then existing National Highways were declared statutorily as National Highways.

2. First Road Development Plan—1943-1961 (Nagpur Plan)

2.1 The World War II saw rapid growth in road traffic and transportation, but the lack of commensurate maintenance caused deterioration in condition of roads. The first attempt to unify road system on all India basis was initiated in 1943 when the First Road Development Plan, popularly known as 'Nagpur Plan' on a uniform pattern was formulated to serve the needs of the country. The road connectivity targets set for the Nagpur Plan were as follows:

- (a) In highly developed agricultural area, no village will be more than five miles from a "main road" and the average distance will be less than two miles in most cases.
- (b) In non-agricultural areas, no village will be more than 20 miles from a "main road".

2.2 The roads were divided into five categories: - (i) National Highways, (ii) State Highways, (iii) Major District Roads, (iv) Other District Roads and (v) Village Roads. In the above classification, National Highways, State Highways and Major District Roads constitute 'Main Roads', whereas Other District Roads and Village Roads constitute 'Rural Roads'.

2.3 Major factors governing selection of road alignment and construction were identified as under:

- (a) Need of semi-developed and underdeveloped areas including forests and agricultural areas.
- (b) Location of administrative headquarters, places of pilgrimage, health resorts, tourist centres, universities etc.
- (c) Location of industries, commercial centres, big railway junctions, ports etc.
- (d) Strategic needs of the country.

3. Second Road Development Plan—1961-1981 (Bombay Plan)

3.1 Even though targets of Nagpur Plan were significantly achieved by 1961, the road system remained deficient and inadequate to meet the country's transport demand. The changed economic, industrial and agricultural scenario of a newly independent country justified a review of road requirements. The preparation of second Road Development Plan on all India basis was started in 1958. The Chief Engineers of various states

adopted this plan as Twenty year Road Development Plan (1961-81) popularly known as Bombay Plan.

3.2 In Bombay Plan, the connectivity targets were further raised. It envisaged that no village should be more than 1.5 miles from any road in developed agricultural areas, 3 miles from any road in semi-developed areas and 5 miles from any road in under-developed areas. The Bombay Plan framed a scheme of priorities which included among others, provision of missing bridges, improvement of road surface to at least single lane black topped specification for National and State Highways, widening of main roads in vicinity of large towns to two-lanes or more and provision of two-lane roads on major arterial routes. The overall objective of Bombay Plan was to raise density of road mileage from 26 to 52 miles per 100 sq.miles of area. This target was set, taking into account level of expected development and needs of rural and urban areas.

4. Third Road Development Plan—1981-2001(Lucknow Plan)

4.1 Eighth and Ninth decades of last century saw fast growth in road transport, with introduction of contemporary heavy and light vehicles, having features and specifications, matching with anywhere in the world. Departing from the earlier linear approach, Lucknow Plan was evolved on the basis of extensive research work. This plan not only addressed to the revised connectivity targets but also included issues pertaining to highway construction and maintenance technology, material and changes in the design concepts. Some salient features of this Plan considering the research findings incorporated therein were as follows.

- a) New forms of fuel were introduced, which include alcohol-petrol mixtures, LPG and liquid fuel from coal.
- b) Alternative binders were introduced, which include lime-fly ash-concrete, lean cement concrete, soil-lime, coal tar, tar-bitumen blends, etc.
- c) Highway maintenance and design study initiated by Ministry of Shipping & Transport. This study in turn led to World Bank HDM-III Model.
- d) Geometric design standards were revised.
- e) Data on traffic flows, commodity movement, and passenger travel was considered essential for road planning.
- f) Economic evaluation in the rural road schemes was emphasized such as increase in agricultural produce; marketability of perishable items, education, health etc.

- g) Introduction of latest instruments, like radar speed meters, measurement of skid resistance from vehicle mounted fifth wheel and towed trailers.
- h) Growing importance of research to obtain optimal solutions to planning, design and construction was recognized.
- i) Adequate funds should be earmarked for road development.

4.2 Lucknow Plan covered following requirements as governing criteria for the road network planning and developments.

- a) Social infrastructure to connect rural, hilly, tribal and backward areas with administrative, market, health and educational centres
- b) Security and Strategic requirements
- c) Need for effecting fuel economy through provision of good roads, better maintenance and bypasses to avoid congested areas.
- d) Requirements for non-mechanized traffic in urban areas.

4.3 This Plan also provided a new direction as to how States could prepare their own perspective plans for road development keeping in view differences in land use pattern, population, terrain, potential for economic development and social infrastructure needs to achieve a balanced road network.

5. Economic reforms and entry of new players

5.1 During eighties economic reforms were introduced in the country, which led to considerable enhancement of capital flow into highway sector with bigger size project packages. This change in turn led to international lending agencies like the World Bank, the Asian Development Bank, OECF and JBIC stepping in to provide loan assistance for road projects. The entry of private sector was facilitated by liberalized economic policies of government. These were defining moments in the growth of highway sector and contracting industry.

The State PWDs were hitherto charged with the responsibility of construction of roads including the National Highways in the respective States. These State PWDs were not exposed to the contemporary state of construction methodology, plant and equipment, techniques etc. Therefore, it was considered prudent to take measures, which would be of contemporary nature and akin to the best anywhere in the world. This led to certain changes in the institutional arrangements for execution of highway projects as follows.

- a) Engagement of consultants for project preparation and construction supervision
- b) Packaging of large size road contracts
- c) Entry of foreign contactors, and
- d) State of Art road construction technology, contemporary plant and equipment, and increased mechanization.

5.2 The National Highways Authority of India was constituted in 1988 for execution of works on National Highways entrusted to it by the Central Government to provide the major link between metros and overall connectivity of the country.

6. Road Development Plan Vision: 2021

6.1 In the year 2001, the Indian Roads Congress, at the behest of the Ministry of Road Transport & Highways, prepared the “Road Development Plan Vision: 2021”. This document laid emphasis on the necessity of coordinated approach to develop an Integrated Transport Policy with optimal inter-modal mix and emphasis on safety, energy efficiency, energy conservation, environment protection and self-sustaining viable transport units. The document recognized development of road infrastructure as the key element to promote tourism and provide access to mining areas, power plants, ports etc.

6.2 The major issues emphasized in the document are as follows.

- a) Inadequate budgetary allocations for the Road Sector, and the need for mobilization of resources including toll financing and private sector participation.
- b) Increasing traffic volumes on main corridors requiring capacity augmentation (Expressways, 4-laning/6-laning with service lanes).
- c) Strengthening of pavement to cope with movement of heavy commercial vehicles particularly on National Highways and State Highways.
- d) Back-log of village accessibility, in spite of an impressive road network length, thus pointing to the need for preparing master plans at district level and undertaking massive programme of construction of Village Roads in accordance with such plans.

- e) Preservation of existing road assets, improving riding quality to provide better level-of-service to road users.
- f) Improving capacity of roads and other traffic management measures in urban areas.
- g) Capacity building in the highway departments, consultancy sector and construction industry for efficient implementation of the development programme.
- h) Promoting Research & Development activities.
- i) Incidence management and provision of wayside amenities on main roads to improve level-of-service to road users.
- j) Improving energy efficiency, road safety and mitigating adverse environmental impact.

6.3 The major recommendations of document Vision: 2021 are summarized as follows.

- (a) Development of 10,000 km Expressways by the year 2021 for unhindered and high speed movement of traffic, considering that many of the National Highway corridors where 4-laning is being done would get saturated in 5 to 10 years time.
- (b) Four/Six laning of 16,000 km of National Highways in the first decade covering mostly the NHDP and other essential segments and another 19,000 km in the second decade.
- (c) Accelerated efforts for bringing the entire National Highway network to minimum 2-lane standards which are required to be tackled in two parts (i) Upgrading existing sub-standard two lanes to proper two lane standards including strengthening of weak pavements, reconstruction / rehabilitation of weak or damaged bridges, hard shoulders and spot improvements in accident prone locations. The proposed targets were 20,000 km in the first decade and 24,000 km in the second decade. (ii) Widening single lane to two lanes by assigning priority to routes identified under Asian Highway Network and such other routes linking the adjoining countries and important rail heads, inland container depots, container freight stations etc. The proposed targets were 15,000 km in the first decade and 7,000 km in the second decade.

- (d) Planning of by-passes for the NH network in the form of peripheral expressways to interlink the highways radiating from the cities having population of more than 1 million.
- (e) Replacement of all existing railway level crossings on National Highways with road over / under bridges in a phased manner depending upon the traffic and number of gate closures.
- (f) The importance of pavement management systems (PMS) and bridge management system (BMS) for assessment of maintenance needs of highways and various financing options for maintenance of highways, e.g. introduction of road user tariff to provide dedicated funds for maintenance and deposition of the proceeds therein from an autonomous road fund, establishment of board of management to administer the road fund, creation of an autonomous highway authority administered by a board for organization and management of the road network, increase in private investments for maintenance contract management.
- (g) Provision of proper wayside amenities as an integral part of the highway network.
- (h) Expansion of the National Highways network to a total length of 80,000 km.
- (i) Provision of funds for maintenance and repair of National Highways as per the actual requirements.
- (j) Four-laning of about 3,000 km of State Highways in the first decade and another 7,000 km in the second decade.
- (k) Two-laning of State Highways including strengthening and widening of bridges and culverts for 35,000 km in the first decade and 60,000 km in the second decade.
- (l) Expansion of the secondary road system so as to have overall length of 1,60,000 km of State Highways and 3,20,000 km of Major District Roads.
- (m) The targets for providing basic access of villages proposed were,
i) Villages with population above 1000 --Year 2003; ii) Villages with population 500-1000 --Year 2007 and iii) Village with population below 500--Year 2010.

(n) Necessity to develop the urban infrastructure, such as urban expressways, ring roads bypasses and flyovers, truck terminals and transport Nagars, bus terminals, bus-ways, cycle tracks, drainage system, and application of Intelligent Transport System (ITS).

6.3 This Plan further expands the horizon of earlier development plans after making an objective assessment of likely future development in highway sector in all the conceivable areas like investment policies, highway planning and management, construction technologies, new highway materials, development of new highway project procurement and execution instruments, traffic and transportation, safety, environment, management etc. The document is reflecting the urgent need for the high speed connectivity identified corridors of expressways apart from upgrading the existing network of national highways and other lower hierarchy roads. Maintenance of highway assets is given due recognition by assigning importance to PMS and BMS to work out assessment of maintenance needs of highways and a strategy to finance maintenance works. Provision of way side amenities is also brought within the overall net work development. Document also mentions about the importance of corridor management involving land management, tackling of safety hazards and traffic bottlenecks, control on overloading of vehicles, incidence management, pavement riding quality. For this purpose, the document recommended promulgation of comprehensive legislation by the Centre and the State Governments for efficient land and traffic management including effective control on ribbon development and encroachments. Setting up of a single Highway Authority was also recommended for not only construction and maintenance of roads / bridges but also for management of road land and traffic.

6.4. The document lays emphasis on preparation of long term plan covering following aspects

(a) For R&D in the highway sector it is necessary to identify the thrust areas which hold potential for application under Indian conditions. Proper dissemination of research findings, demonstration projects have been recommended to overcome the reluctance on the part of the highway engineers to adopt new techniques.

(b). Focus has been drawn regarding the importance of strategies for mobilization of funds by tapping all possible sources, viz. public, private and foreign as also proper management of dedicated highway development plan

(i.e. from levy of cess on petrol and high speed diesel) including devising of clear rules for allocation and accountability and proper monitoring system.

(c). It is necessary to give importance to the aspect of capacity building and human resource development in the sector including development of construction technology, implementation of quality systems, environment preservation, highway safety and energy conservation.

7.1 The scope and extent of highway sector in the last seven decades have expanded from providing a given target connectivity level of roads to the population centres to a complex gamut of schemes covering social, economical, ecological & environmental issues apart from the engineering and technology issues concerning the highway sector. It is necessary that status of highway sector in our country is reviewed to ascertain and workout strategies for future. The stakeholders are to be identified to ascertain their capacity and capability requirements. Having ascertained this, the strategies for their HRD should be evolved and implemented.

CHAPTER 2

STATUS OF HIGHWAY SECTOR

1. Introduction

1.1 Ever since road development plans were initiated, major emphasis of all such plans has been to enhance and augment the road density in the country by setting higher and higher targets for road connectivity. In the first plan the target was set for creating a density of 26 miles of road /100 Sqmiles of area which was increased to 52 miles of road/100Sqmiles of area in the second plan. In fourth road development plan, entire villages of the country are targeted to be connected by road by 2010. For identifying and monitoring these connectivity targets, a road hierarchy system was conceptualized in the First Road Development Plan initiated in 1943 which still continues and is retained for the purpose of identification of any road in the road hierarchy system in the country.

1.2 According to this system roads are divided into five categories i.e. (i) National Highways, (ii) State Highways, (iii) Major District Roads, (iv) Other District Roads and (v) Village Roads. In this classification, National Highways, State Highways and Major District Roads constitute 'Main Roads', whereas Other District Roads and Village Roads constitute 'Rural Roads'. With the passage of time other road categories like 'Urban Roads' 'Peripheral Expressways' 'Expressways' were added for the purpose of creating distinct identification based on their functionality. Strategy for setting the road connectivity targets under different road development plans however more or less were based on the this hierarchy system of road network. Roads and highways as physical entity running through length and breadth of the country are described under this hierarchy in following paras:

2. Expressways

2.1 Fourth Road Development Plan initiated in the year 2001 introduced expressways as distinct category. This plan envisaged development of 10,000 km of Expressways by the year 2021 for unhindered and high speed movement of traffic, considering that many of the National Highway corridors would get saturated with passage of time.

3. National Highways

3.1 The National Highways have grown from 21440 Km as on in 1947 to 66590 Km by the end of Tenth Plan period in 2006. The National Highways comprise only 2% of total length of roads, but carries over 40% of the total

traffic across the length and breadth of the country. The development and maintenance of National Highways are implemented on agency basis. The PWDs of State Governments of Union Territories, the National Highways Authority of India (NHAI) and Border Roads Organization (BRO) are the main implementation agencies.

3.2 Out of total network of National Highways 43705 km were entrusted to the States Government/Union Territories for the stretches passing through respective States. The NHAI was entrusted with 16,117 km of National Highway included in various phases of National Highway Development Project (NHDP) and other important National Highways. Besides, 5,512 km of National Highways in difficult border areas were given to Border Roads Organization.

4. State Highways and Major District Roads

4.1 State Highways (SHs) and Major District Roads (MDRs) constitute the secondary system of road transportation in the country. The SHs provide linkages with the National Highways, district headquarters of States and important towns, tourist centres and minor ports. Their total length stands at about 1,28,000 km. Major District Roads run within the district connecting areas of production with markets, connecting the rural areas to the district headquarters and to State Highways and National Highways. Their length is about 4,70,000 km. These roads also carry medium to heavy traffic. It is assessed that this secondary system of roads carries about 40 percent of the total road traffic, although they constitute only about 13 percent of the total road length. They are major carriers of road traffic within the States and some interstate traffic. By acting as linkages between the rural and urban areas, the State Highways and Major District Roads contribute significantly to the rural economy as also to the industrial development of the country by enabling movement of industrial raw materials and products from and to the interior of the country.

4.2 Though the size of the network comprising SHs and MDRs is good, the quality of roads is not as per the standards set for these categories of roads. Their present condition and stage of development varies widely from State to State. The status of MDRs is particularly very bad. The main reason for this state of affairs is that the funds for the development of this secondary system are inadequate. While reasonable funds have been made available for the National Highways and the Rural Roads, somehow the secondary system of roads has not been receiving the desired attention in the matter of financial allocations in relation to requirements. The result is that there are

several deficiencies in the existing SHs and MDRs such as (i) inadequate width of carriageway in relation to traffic demand (ii) Weak pavement and bridges (iii) Congested stretches of SHs and MDRs passing through cities/towns (iv) Poor safety features and road geometrics and inadequate formation width in hilly and mountainous region (v) Missing links and bridges and (vi) Several railway level crossings requiring for replacement with ROB/RUB.

4.3. The existing road network is under severe strain due to traffic growth, overloading of vehicles and inadequacy of funds for road maintenance. A broad assessment shows that over 50 percent of SHs and MDRs network has poor riding quality. Losses due to poor condition of these roads would be around Rs. 6000 crore per annum. Besides, their premature failure results in huge rehabilitation and reconstruction costs implying infusion of avoidable plan funds at accelerated intervals.

5. Rural roads

5.1. India is essentially a rural oriented economy with 74% of its population living in its villages. In the year 2000, it was estimated that about 330,000 out of its 825,000 villages and habitations were without any all-weather road access. This very much affected the life of the people living in villages. The rural road connectivity is a key component of rural development by promoting access to economic and social services and thereby generating increased agricultural income and productive employment opportunities. A major thrust for development of rural road was given at the beginning of Fifth Five Year Plan in 1974, when it was made a part of Minimum Needs Programme (MNP). In 1996, MNP merged with Basic Minimum Services (BMS) programme. Still the development of Rural Roads did not receive any significant impetus upto the year 2000. The implementation mechanism to achieve the targets of village population connectivity as envisaged in the Fourth Road Development Plan is largely through the Central Government scheme launched in the year 2000, popularly known as Pradhan Mantri Gram Sadak Yojana (PMGSY). This scheme was launched with full funding from Central Government. The Rural Roads included under PMGSY cover categories known as Other District Roads (ODR) and Village Roads (VR). The ODRs serve the rural areas of production and providing them with outlet to market centres, blocks, tehsil and main roads. The VRs connect villages and group of villages with each other or to market centres and with nearest road of higher category. PMGSY envisages development of all weather roads, which are negotiable during all seasons with some permitted

interruptions, i.e. cross drainage structures in which duration of overflow or interruptions shall not exceed 12 hours for ODR and 24 hours for VR.

5.2. Rural road network required for providing 'basic access' to all villages is termed as Core Network. Basic access is defined as one all weather road access from each village to nearby market. It comprises of 'Through Routes' and 'Link Routes'. The through routes are the ones, which collect traffic from several link roads and lead it to market centres, District Road or State Highway or National Highway. The link routes are the roads connecting a single habitation to through roads. The spirit and objective of PMGSY is to provide good all weather road connectivity to unconnected habitations in rural areas. Provision of new connectivity is given priority compared to up-gradation works.

6. Other Roads: The Other Roads, which have significance in their own way in providing connectivity to important locations and also for facilitating access to adjoining areas etc., are Forest Roads, Roads in Border Areas, Roads providing connectivity to dams /reservoirs and power stations (especially hydro-power stations), road connectivity within important dedicated areas such as Special Economic Zones (SEZ), etc. The financing of such roads is done under several schemes of the Central Govt. and the State Govt. The responsibility of development and maintenance of these roads vests with the concerned authorities in the Central and the State Govts.

7. Stakeholders of Highway Sector

7.1 Broadly speaking, stakeholders of highway sector will comprise of all those individuals, groups and organizations who have interest in the growth and success of this sector and who have vested interest in it in as much they are involved in some way in the implementation of projects and affected by the results of assessment or evaluation of such projects. They may include individuals, developers, experts, professionals, agencies and organizations that have knowledge and can lend that experience and information they possess to the general understanding of issues concerning highway sector. For the purpose of their identification, stakeholders have been classified under different groups comprising of (a) Government agencies (b) Semi-government/ autonomous agencies (c) Private agencies comprising of contractors, consultants and others like suppliers of machines, plants, equipments, material, technology, skilled labour and products etc. Other stake holders who are playing the role of supplying the needed technological, competence related and other enabling inputs for efficient, effective and successful planning and execution of highway projects like R&

D organizations, Training organizations have also been classified under the above mentioned groups. Besides, several other organizations have facilitating, complementary or regulatory role for the Highway Sector. In order to have comprehensive view of HRD requirements in Highway sector; the role played by stakeholders and other organizations have been described in different chapters so that necessity of HRD for Highway Sector can be understood in a broad perspective.

CHAPTER 3

PLANNING AND FUNDING ORGANIZATIONS

1. Introduction

1.1 Highway projects being highly capital intensive with long gestation period and low rate of returns, have largely remained within the domain of government funding. Government therefore is the largest and biggest stakeholder in the planning, designing and implementation of highway projects. With the growth of highway network, the complexity of network development has increased phenomenally from the earlier simple public exchequer funding and execution of work to the present multitudinous and multifarious aspects involving (a) government policies concerning land acquisition, environment, ecology; investment for bridging the gap between demand placed by the highway sector and resource availability, (b) highway planning covering road network, road side amenities and information system development, (c) construction technologies with emphasis on low carbon foot print and green technology development, (d) new highway materials, specifications and code of practice, (e) new execution instruments in the light of emergence of international players in financing and execution of projects, (f) traffic and transportation system, parking management, multi-modal system and (g) safety and environment involving road side aesthetics, traffic canalization, highway landscaping, road safety, pedestrian facilities, noise and pollution etc.

2. Planning Commission of India

2.1. The Planning Commission was set up by a Resolution of the Government of India in March 1950 in pursuance of declared objectives of the Government to promote a rapid rise in the standard of living of the people by efficient exploitation of the resources of the country, increasing production and offering opportunities to all for employment in the service of the community. The Planning Commission was given the responsibility of making assessment of all resources of the country, augmenting deficient resources, formulating plans for the most effective and balanced utilization of resources and determining priorities. For the first eight Five Year Plans (i.e. from 1951 to 1997 including interim Annual Plans between 1966 and 1969, and between 1990-91 and 1991-92) the emphasis was on a growing public sector with massive investments in basic and heavy industries. Since the launch of the Ninth Plan in 1997, the emphasis on the public sector has become less

pronounced and the current thinking on planning in the country, in general, is that it should increasingly be of facilitating nature.

2.2. The Prime Minister is the Chairman of the Planning Commission, which works under the overall guidance of the National Development Council. The Deputy Chairman and the full time Members of the Commission, as a composite body, provide advice and guidance to the subject Divisions for the formulation of Five Year Plans, Annual Plans, State Plans, Monitoring Plan Programmes, Projects and Schemes. The 1950 resolution setting up the Planning Commission outlined its functions as follows:

- a) Make an assessment of the material, capital and human resources of the country, including technical personnel, and investigate the possibilities of augmenting such of these resources as are found to be deficient in relation to the nation's requirement;
- b) Formulate a Plan for the most effective and balanced utilization of country's resources;
- c) Determination of priorities, define the stages in which the Plan should be carried out and propose the allocation of resources for the due completion of each state;
- d) Indicate the factors which are tending to retard economic development, and determine the conditions which, in view of the current social and political situation, should be established for the successful execution of the Plan;
- e) Determine the nature of the machinery which will be necessary for securing the successful implementation of each stage of the Plan in all its aspects;
- f) Appraise from time to time the progress achieved in the execution of each stage of the Plan and recommend the adjustments of policy and measures that such appraisal may show to be necessary; and
- g) Make such interim or ancillary recommendations as appear to it to be appropriate either for facilitating the discharge of the duties assigned to it, or on a consideration of prevailing economic conditions, current policies, measures and development programmes or on an examination of such specific problems as may be referred to if for advice by Central or State Governments.

2.3. Planning Commission plays an integrative role in the development of a holistic approach to the policy formulation in critical areas of human and economic development including the highway infrastructure. With the emergency of severe constraints on available budgetary resources, the resource allocation system between the States and Ministries of the Central Government is under strain. This requires the Planning Commission to play a mediatory and facilitating role, keeping in view the best interest of all concerned. It has to ensure smooth management of the change and help in creating a culture of high productivity and efficiency in the Government. The

key to efficient utilization of resources lies in the creation of appropriate self-managed organization at all levels. In this area, Planning Commission attempts to play a systems change role and provide guidance within the Government for developing better systems. In order to spread the gains of experience more widely, Planning Commission also plays an information dissemination role.

3. Central and State Governments

The Governments at the Central and the State levels are responsible for development and maintenance of highway network in the country. Whereas the Central Government is primarily responsible for development and maintenance of National Highway Network in the country, the State Governments and the Union Territories are responsible for the development and maintenance of various categories of State Roads. The Right of Way (ROW), i.e. the land acquired for the highways, is accordingly vested with the concerned Governments at the Central and State levels. However, besides being responsible for financing of the development and maintenance of National Highway Network in the country, the Central Government also provides funds for the State Roads under various schemes. Therefore, the financing of Highway project and maintenance of existing highways is by and large from Government funds both under Plan and Non-Plan. New ways of funding by cess and through public private participation are also being followed for Highway projects. Thus planning, funding and execution of Highway projects, is by and large responsibility of the Central and the State Governments. Centre Government deals with Highway sector at planning, budgeting and funding level. This role is performed by Ministry of Shipping, Road Transport and Highways, Department of Rural Development under the Ministry of Rural Development and the National Rural Roads Development Agency (NRRDA) under the Ministry of Rural Development.

4. Ministry of Shipping, Road Transport and Highways

4.1. In 1930, the Office of the Special Chief Engineer was created with a small staff to administer the then newly constituted Central Road Fund and to advise the Government of India generally in all matters concerning road development. Later, it became the Office of the Consulting Engineer (Roads) to the Govt. of India and was expanded in 1935 and again during World War II. The realization that a balanced road system was a vital prerequisite to the post-war economic development of the country impelled the Central Government to convene a Conference of all State Chief

Engineers at Nagpur in December, 1943 to make proposals for a comprehensive plan of road development for India. As already brought out in Chapter 1, this report is known as the Nagpur Plan and it is the first integrated Road Plan for our country.

4.2. The National Highways came into being on 1.4.1947 when the Government of India assumed responsibility for the development and maintenance of certain roads provisionally named as National Highways. In 1956, the Govt. of India enacted the National Highway Act 1956, and the then existing National Highways were declared statutorily as National Highways. In the process of implementation of the various recommendations of the Nagpur Plan and as a result of the Central Government assuming complete financial responsibility for the maintenance and development of a system of roads accepted by them as National Highways, the Office of the Consulting Engineer (Road Development) to the Government of India was expanded and came to be known as the Roads Wing of the Ministry of Shipping and Transport. In 1966, the head of the Organization was designated as the Director General (Road Development) and Additional Secretary to the Government of India. This post was upgraded later to the rank of Special Secretary. The erstwhile Ministry of Shipping and Transport is presently called Ministry of Shipping, Road Transport & Highways.

4.3 The Department of Road Transport & Highways of this Ministry came into being during 1999-2000, and it has two wings, viz. the Roads Wing and the Road Transport Wing. The Roads Wing is concerned mainly with matters relating to following subjects.

- (a) Advising Govt. on all general policy matters relating to Highways;
- (b) Development and maintenance of roads declared as National Highways;
- (c) Administration of the Central Road Fund and allocate it equitably to the various States/UTs for works approved by the Government of India pertaining to State roads other than rural roads;
- (d) Provide funds for selected State roads including bridges on inter-State or roads of economic importance;
- (e) Securing balanced development of roads and road transport and to co-ordinate with other systems of transport, principally railways;
- (f) Development / updating of Specifications and Standards for Roads and Bridges;
- (g) Research on Roads.

- (h) Improve the technical knowledge and experience of the highway engineering personnel by sponsoring the training of engineers in India and abroad.
- (i) Disseminating information on standards and modern engineering techniques, and by encouraging the study of road economics and administration;
- (j) Advise other Central Government Ministries (Defence, External Affairs, etc.) on all matters concerning roads and to advise similarly the State Governments; and
- (k) Function generally as a repository of technical, statistical and administrative information on all matters concerning roads and bridges.

4.4 Roads Wing performs its above mentioned functions governed, directed and assisted by the following Acts, Rules and Regulations.

- (a) The National Highways Act, 1956;
- (b) The National Highways (Temporary Bridges) Rules, 1964;
- (c) The National Highways Authority of India Act, 1988;
- (d) The National Highways (Collection of fees by any Person for the Use of Section of National Highways/Permanent Bridge/Temporary Bridge on National Highways) Rules, 1997;
- (e) The National Highways (Rate of fee) Rules, 1997
- (f) The National Highways (Fees for the use of National Highways section and Permanent Bridge - Public Funded Project) Rules, 1997;
- (g) The National Highways (Manner of Depositing the amount by the Central Govt. with the Competent Authority for Acquisition of land) Rules, 1998;
- (h) The Central Road Fund Act, 2000;
- (i) The Control of National Highways (Land & Traffic) Act, 2002;
- (j) The National Highways Tribunal (Procedure) Rules, 2003;
- (k) The National Highways Tribunal (Procedure for appointment as Presiding officer of the Tribunal) Rules, 2003;
- (l) The National Highways Tribunal (Procedure for investigation of misbehavior or incapacity of Presiding Officer) Rules, 2003;
- (m) The National Highways Tribunal (Financial and Administrative Powers) Rules, 2004;
- (n) The National Highways Tribunal (Salaries, allowances and other Terms and Conditions of Service of Presiding Officer) Rules, 2005;
- (o) The National Highways Tribunal (Salaries, allowances and other Terms and Conditions of Service of the Officers and employees) Rules, 2005;

- (p) Guidelines for formulation of State sector Road Development Programme under Central Road Fund;
- (q) Guidelines for Centrally Sponsored Schemes of State Roads of Inter-State Connectivity and Economic Importance;
- (r) National Highways Administration Rules, 2004;
- (s) Standard Bidding Documents - published by the Indian Roads Congress;
- (t) Compendium/Specifications published by the Indian Roads Congress.

5. Department of Rural Development, Ministry of Rural Development:

5.1. In October 1974, the Department of Rural Development came into existence as a part of Ministry of Food and Agriculture. On 18th August 1979, the Department of Rural Development was elevated to the status of a new Ministry of Rural Reconstruction. That Ministry was renamed as Ministry of Rural Development on 23rd January 1982. In January 1985, the Ministry of Rural Development was again converted into a Department under the Ministry of Agriculture and Rural Development which was later rechristened as Ministry of Agriculture in September 1985. On July 5, 1991 the Department was upgraded as Ministry of Rural Development. Another Department viz. Department of Wasteland Development was created under this Ministry on 2nd July 1992. In March 1995, the Ministry was renamed as the Ministry of Rural Areas and Employment with three departments namely Department of Rural Employment and Poverty Alleviation, Rural Development and Wasteland Development.

5.2. Again, in 1999 Ministry of Rural Areas and Employment was renamed as Ministry of Rural Development. This Ministry has been acting as a catalyst effecting the change in rural areas through the implementation of wide spectrum of programmes which are aimed at poverty alleviation, employment generation, infrastructure development and social security. Over the years, with the experience gained, in the implementation of the programmes and in response to the felt needs of the poor, several programmes have been modified and new programmes have been introduced. This Ministry's main objective is to alleviate rural poverty and ensure improved quality of life for the rural population especially those below the poverty line. These objectives are achieved through formulation, development and implementation of programmes relating to various spheres of rural life and activities, from income generation to environmental replenishment.

5.3. The Department of Rural Development implements schemes for generation of self employment and wage employment, provision of housing and minor irrigation assets to rural poor, social assistance to the destitute and Rural Roads. Apart from this, the Department provides the support services and other quality inputs such as assistance for strengthening of DRDA Administration, Panchayati raj institutions, training & research, human resource development, development of voluntary action etc. for the proper implementation of the programme. The major programme of the Department of Rural Development includes Pradhan Mantri Gram Sadak Yojana, (PMGSY).

6. National Rural Roads Development Agency

6.1. The National Rural Roads Development Agency (NRRDA) was established in January, 2002 to extend support to the programme through advice on technical specifications, project appraisal, quality monitoring and management of monitoring systems in respect of Rural Roads. The agency has been conceived as a compact, professional and multi-disciplinary body to provide requisite technical and management support to the Ministry of Rural Development and to the State Governments for effective implementation of the Pradhan Mantri Gram Sadak Yojana (PMGSY) programme.

6.2. The National Rural Roads Development Agency was set up primarily with the following objectives:

- a) To discuss with different Technical Agencies and arrive at appropriate Designs and Specifications of Rural Roads and, thereafter, to assist the Ministry of Rural Development in prescribing the Designs and Specifications of Rural Roads, including Bridges and Culverts.
- b) To determine the tasks to be performed by the Principal Technical Agencies and State Technical Agencies.
- c) To appoint reputed Technical Institutions as Principal Technical Agencies and State Technical Agencies to perform the tasks to be entrusted to them.
- d) To render assistance to States or Union Territories in preparing District Rural Roads Plans.
- e) To scrutinize or arrange to scrutinize the proposals received from States and Union Territories for consideration by the Ministry of Rural Development.
- f) To oversee and inspect or arrange to inspect through Independent Monitors, the execution of the road-works cleared by the Ministry and

being implemented by States or Union Territories through their Executing Agencies.

- g) To appoint serving or retired Engineers, Academicians, Administrators and other Agencies, with experience in Rural Roads, as Independent Monitors to ensure proper execution of road works by the State Agencies.
- h) To monitor the progress of the road-works with particular reference to time frame for completion, Technical Specifications, Project Appraisal and Quality Control methods.
- i) To set up an “On-line Management and Monitoring System”, incorporating both intranet and internet-based system, for obtaining updated information to facilitate a ready viewing and screening of data.
- j) To send periodic reports to the Ministry of Rural Development on the progress of implementation of road works by the States or Union Territories.
- k) To monitor the planning for and plantation of fruit bearing and other suitable trees on both sides of the rural roads undertaken by the States or Union Territories, under the Pradhan Mantri Gram Sadak Yojana.
- l) To monitor the expenditure incurred by the States or Union Territories in implementation of the Pradhan Mantri Gram Sadak Yojana, with reference to the funds released by Ministry of Rural Development through expenditure reports obtained from the States or Union Territories and through 'On-line Management and Monitoring System.
- m) To take up Research activities relating to Rural Roads, including execution of Pilot Projects.
- n) To study and Evaluate different Technologies in respect of Rural Roads and to take up pilot projects involving different technologies.
- o) To enter into collaboration with Institutions, Agencies or Bodies of repute, both national and international, in respect of Rural Roads.
- p) To arrange suitable Training Programme for officers of the Ministry as well as the State Governments or Union Territories concerned with the implementation of the Rural Roads Programme in reputed institutions.
- q) To Advise on measures to improve the Quality and Cost-norms of the Rural Roads.
- r) To publish books, literature, take up or arrange for production of publicity material, print, audio or audio-visual in respect of the Pradhan Mantri Gram Sadak Yojana.
- s) To organize and sponsor Workshops and Seminars in respect of Rural Roads.
- t) To purchase, lease and hire equipment or machinery required in the construction of Rural Roads.

7. State Planning Departments:

7.1. Except for the National Highways and Central Government funded schemes, all Roads and Highways are within the purview of State Governments. The proposals are framed by the State Public Works Departments and other Departments dealing with highways and comprehensive proposal for Highways Sector is framed by the State Planning Departments. These proposals are part of State Plan. The annual physical and financial targets are prepared on the basis of already approved Five Year Plans, depending upon the status of roads and nature of requirements. The funding of such proposal is done through Planning Commission Government of India and revenue generated by the State Governments.

7.2. The State Planning Department have vital role to play as it decide about priorities and allocation of funds. Thus State Highways, MDRs, ODRs and Village Roads are controlled by State Planning Department of State Governments. The exception to this is Rural Roads which are dealt under Central Government funded schemes.

8. The State Rural Road Development Agency (SRRDA)

8.1. The State Rural Road Development Agency (SRRDA) is responsible for Rural Roads. They have a distinct legal status under Registration of Societies Act. Preferably this agency should have a nodal or coordinating role for entire rural sector in state, which receive fund for PMGSY programme. The functions of agency in relation to PMGSY include:

- a) Rural road planning and sectoral coordination.
- b) Management of funds.
- c) Preparation and submission of annual proposals.
- d) Work management
- e) Contract management
- f) Financial management
- g) Quality management
- h) Maintenance management

8.2. The SRRDA has to appoint a Financial Controller, to oversee operationalization of Rural Road accounting system. Agency shall maintain centralized accounts, which will be accessed by Programme Implementing Units (PIU) and Financial Controller's primary responsibility would be enforcement of accounting standards and arranging auditing thereof.

CHAPTER 4

IMPLEMENTING ORGANIZATIONS

1. Introduction.

1.1. The Highway development programmes are implemented through a number of Government and semi-government organizations. These organizations are responsible for preparation of estimates, getting the estimates approved from the funding agencies, processing for deciding consultancy and contracting agencies and thereafter ensuring implementation of road development projects. Some of these agencies work exclusively for roads whereas other agencies deal with buildings and roads

2. National Highways Authority of India

2.1. The National Highways Authority of India (NHAI) was constituted by an act of Parliament, the National Highways Authority of India Act, 1988. It is responsible for the development, maintenance and management of National Highways entrusted to it and for matters connected or incidental thereto. The Authority was operationalized in February, 1995 with the appointment of full time Chairman and other Members. NHAI is mandated to implement National Highways Development Project (NHDP) which is India's largest ever highway project with World class roads for uninterrupted traffic flow and enhanced safety of road users.

2.2. In 1999, the NHDP (Phase I & II) was launched, covering a length of nearly 14,000 km at an Estimated Cost of Rs. 54,000 crore (at 1999 prices) and in 2005 NHDP (Phase III) was launched for upgradation and 4 laning of 10,000 km of selected high-density corridors of National Highways at an Estimated Cost of Rs. 55,000 crore (at 2005 prices).

2.3. NHAI is shifting its emphasis from hitherto followed 'Construction Contracts' to 'Build, Operate, Transfer (BOT) Contracts' on toll basis as per the Government mandate to develop projects from NHDP-Phase III onwards. This programme is estimated to cost about Rs. 2,36,000 crore. Under NHDP Phase- IV, stretches of about 20,000 km of NHs are envisaged to be improved to 2-lane standards with paved shoulders. For the NHDP Phase-V, Government has approved the proposals for 6-laning of 6500 km of selected stretches of existing 4-lane on Design, Build, Finance and Operate (DBFO) basis. For NHDP Phase –VI, the Government has approved

the proposal for the development of 1000 km of access controlled four/6 lane divided Expressways on BOT basis.

3. Border Roads Organization

3.1. The Border Roads Organization (BRO) is a road construction executive force, integral to and in support of the Army. It started operations in May 1960 with just two projects, Project Tusker (renamed Project Vartak) in the east and Project Beacon in the west. It has now grown into a 13-project executive force, supported by a well-organized recruiting / training centre and two well-equipped base workshops for overhaul of plant / equipment and two Engineer Store Depots for inventory management.

3.2. The BRO has not only linked the border areas of the north and north-east with the rest of the country, but also contributed to the execution of road works in Bihar, Maharashtra, Karnataka, Rajasthan, Andhra Pradesh, Andaman and Nicobar Islands, Uttarakhand and Chhattisgarh and the North – East Region.

3.3. The BRO constructs and maintains roads in the border areas, classified as General Staff (GS) roads, in keeping with Defence requirements. Besides GS roads, BRO also executes Agency Works, which are entrusted to it by other Central government ministries and departments. Works entrusted by public sector undertakings, state governments and other semi-government organizations are executed as Deposit Works. Over the years, the BRO has diversified into the construction of airfields, permanent steel and pre-stressed concrete bridges and accommodation projects.

3.4. The BRO has been playing a vital role in construction and maintenance of roads under their charge. They have acquired special expertise and field experience of working in difficult areas and rugged terrain, particularly in the NE Region. Sometimes, they also need support of the State Governments to ensure availability of land and environment and forest clearances for roads entrusted to them.

4. Central Public Works Department

4.1. The Central Public Works Department (CPWD), a 150-year-old institution, is the principal agency responsible for creating assets for various ministries and departments of the Government of India (except Railways, Defence, Communication, Atomic Energy, Airports Authority of India and All India Radio). In July 1854, CPWD came into existence as a central agency meant for carrying out all public works. However, it was in 1930, that the CPWD got organized into its existing structure. Over the years, the CPWD has executed wide variety of civil works ranging from building

residential accommodation and office complexes to roads, bridges and border fencing, not only in the country but also in neighbouring countries of South Asia.

4.2 CPWD has well documented Manuals, Specifications, Schedule of Rates, Accounts Codes etc. which are updated from time to time, and are used extensively by various construction agencies in the country, be it in the public or the private sector.

4.3. CPWD is under the administrative control of the Ministry of Urban Development (MoUD) and acts as the chief professional advisor to Ministry of Urban Development in all matters concerned with public works. It is also the principal adviser to the Government of India on all technical matters related to civil, electrical and mechanical engineering, horticulture and architecture works.

4.4. CPWD is associated with implementation of some of the projects under PMGSY in the State of Bihar and also in the implementation of some of the roads in border areas in eastern and western sector.

5. State Public Works Departments

5.1. The critical role in execution of road projects rests with the Public Works Departments (PWDs) in the States. They also implement Works on National Highways on ground except the segments of National Highways entrusted to Border Roads Organization and to NHAI. The State PWDs are responsible for policy, planning, construction and maintenance of state roads. The State PWDs are performing extremely vital role in provision of road infrastructure on the ground. However, they need to be reoriented to the needs of current emphasis on private sector participation and implementation of large scale projects with available assistance from the multilateral funding agencies like the World Bank, the Asian Development Bank and the Japanese Bank for International Cooperation.

5.2. Several States have already taken the initiative of reviewing their current procedures, strengths and weaknesses in the existing system. Some of the States like Andhra Pradesh, Gujarat, Karnataka, Orissa, Rajasthan, TamilNadu, Uttar Pradesh, etc. have completed institutional development strategy studies. Many other States have also initiated the process. The account codes and works manuals of the State PWDs need review in the light of procedural changes made at the Central level to keep pace with the latest emerging technologies. There should be proper synchronization of the workings of the procedures and systems at the Central and State levels

6. Rural Engineering Organizations in the States

6.1. Each state government has to identify a suitable agency having a presence in all districts and having established competence in executing time bound road construction work. These agencies are designated as Executing Agencies. These could be PWD/ Rural Engineering Services/ Rural Engineering Organizations/ Rural Works Departments/ Zila Parishads/ Panchayati Raj Institutions, which have been in existence for sometime having experience, expertise and manpower. Each state government has to nominate department as Nodal Department, which shall have overall responsibility for implementation of PMGSY in the particular state.

6.2. There is no uniformity of organizations handling the programme of rural roads and different practices are being adopted in different States. In some States, the entire responsibility of construction, maintenance as well as planning lies with the district level bodies like Zilla Parishads and Block Level Panchayat Samities under the administrative control of Rural Development Departments, while in other States such functions are carried out by local bodies only in respect of Village Roads and Community Development Roads (Non-Plan Roads, etc.). In some States, the entire subject of District Roads, including Major District Roads, is left to District Administration like Zilla Parishads including their planning through District Planning and Development Councils (DPDCs). In some States, not having established Zilla Parishads, all aspects of roads are dealt with by the PWDs or Rural Engineering Organizations (REOs). In many States, planning functions are carried out by the PWD even though survey, design, construction and maintenance of rural roads are under the control of Zilla Parishads.

6.3. There is need for uniformity of approach in planning, construction and maintenance of rural road programme having regard to different terrain, climatic and socio-economic environment. Where necessary, Zilla Parishads should be supported with technical assistance by PWDs. While construction works may be carried out by the PWDs / REOs, maintenance functions may be entrusted to local bodies, which should be provided with adequate funds and supported with technical assistance and training of manpower. This would require upgrading the quality of technical inputs in the organizations handling the work of rural roads.

CHAPTER 5

CONTRACTORS, CONCESSIONAIRES, CONSULTANTS, AND MANUFACTURERS

1. Introduction

1.1. The growth in the Highway Sector in the Country in the post 1990s period , particularly the National Highways, combined with the innovative funding mechanisms in the wake of the constraints of the Government budgetary allocations, have witnessed emergence of multitude of Private Organizations. The focus has now gradually shifted from the concept of age old prevalent system of executing works through Engineer-Procure Construct (EPC) Contracts through budgetary allocations to implementation of more and more projects on Build-Operate-Transfer (BOT) basis through Public-Private Partnership (PPP) mode. Private agencies in the highway sector like contractors, project consultants, planning consultants, design consultants, supervisors, third party quality assurance consultants are new players who are now well entrenched and have become indispensable from the stage of planning to execution of any major highway project. These private players are performing a vital role in that they are supplementing the efforts of government organizations. They have over the years have emerged as new competence centres who are willing to offer their services for monetary considerations. This Chapter focuses discussions on the key private sector agencies in this evolving and changing scenario.

2. Contractors

2.1. For ages, the Contracting industry in the highway sector remained in a nascent state. As recently as in the eighties of the last Century, it was still functioning under the concept where the clients were the reverent Lords on whose whims and fancies the industry functioned. Industry members were individuals of meager resources and not up-to-date with the technology and know-how. With a few exceptions, and that too for the ones involved in construction of bridge structures, most members of the industry were small to medium size units whose annual turnover was in terms of a few crore rupees. They were unorganized, had little resources and infrastructure and were operating mostly at local levels. Their interaction was confined to lower level functionaries like Sub Divisional Officers and Executive Engineers and in some cases up to the Superintendent Engineers. Chief

Engineers used to be super bosses beyond reach for most members of the industry. The size of the projects was limited to a few crore rupees and involved only individual / scattered components of the road structures, viz. earthwork, collection/transportation of road materials and labour charges for doing individual items of work. The work never involved construction of the road in its entirety. Most members of the Industry used to boast ownership of a few units of equipments like Graders, Excavators, Road Rollers and the like. Hardly any qualified technical personnel used to be on the rolls of the Industry members.

2.2. Gradually, with the liberalization of the Indian economy towards the end of the last century, medium to large size projects came into vogue. Clients started inviting bids for bigger projects, of say up to Rs. 100 crore, on similar lines as that of developed countries. Keeping pace with the development and to utilize the growing opportunities, the Indian Construction industry also transformed itself both in size and capacity; but it was still not large enough to cope with the demand and requirements of such bigger projects. To begin with, the pre-qualification (PQ) criteria were beyond most of the members of the industry. Very survival necessitated innovative measures. This forced most members of the industry to have joint ventures between themselves and with the foreign companies. Cost of constructions of road work in the developed countries being many fold as compared to that of India, foreign companies could fulfill the PQ criteria quite easily although their overall size and work experiences in many cases was only marginally higher than their Indian counterparts. Foreign companies exploited the situation to their advantage and more often than not just lent their names as Joint Venture partners. They seldom involved themselves with actual construction activities and their presence in the country was confined to a few functionaries. This passive presence of the foreign partners forced the Indian counterparts to man and manage the bigger size projects by themselves albeit under the overall umbrella of the foreign partners. This gave opportunity to the Indian industry members to grow by leaps and bounds and muster enough resources and upgrade themselves technologically to cope with bigger size projects. Bigger size projects also necessitated inculcation of corporate culture, management of projects professionally and delivery of quality products. Opening up of the Indian economy also enabled the Industry to acquire / import modern construction equipments at competitive cost, gain know-how more easily and above all transform themselves from family owned and oriented individuals to private limited companies employing thousands of work force and Engineers. Many members of the industry are now owners of key

construction equipments like graders, excavators, compaction rollers, concrete batching plants, hot mix plants numbering in hundreds. Their yearly turnovers in most cases have leap forged 10 times in the last 10 years. They are now able to undertake projects of any size and are also spreading their wing overseas. Such phenomenal rise of the Indian construction industry in such a short time is unparalleled.

2.3. At present, the National Highways Builders Federation (NHBF) is the single largest body representing highway builders in the country. The NHBF represents 52 companies associated with the construction of highways.

3. Developers and Concessionaires

3.1. The Concessionaires for BOT Projects are required to generally dispense the overall role of a developer/entrepreneur. They are responsible for development and maintenance of the project stretch during the currency of the Concession to the stipulated service level. In the present day Concession Agreements being executed for mega sized National Highway Projects, mainly included under NHDP Phases; the Concessionaire is also being made responsible for facilitation of Operation.

3.2. Financial Institutions are involved for funding developer and concessionaire. Some of the financial institutions which are actively involved in highway development are ILFS, IDFC, IIFC and NABARD

4. Consultants

4.1. The consultancy profession in the field of roads and bridges has grown and a number of domestic firms have graduated to international stature. Besides, international firms from abroad are forming joint ventures with domestic firms or have established their own subsidiary units in India with majority of domestic professionals. Not only large firms but even medium size firms are now equipped with latest state-of-art survey instruments and laboratory testing equipments and many of them have on their roaster experienced surveyors, material engineers and laboratory technicians.

4.2. There are two nodal organizations for promotion of consultancy; one is Consultancy Development Centre (CDC) an autonomous body set up by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India. They provide skill up-gradation to consultants, including running a post graduate programme

leading to Masters in Consultancy Management in collaboration with BITS-Pilani, a deemed university. The second organization is Consulting Engineers Association of India (CEAI) which is set up by the professional consultants, both individual and Institutional. CEAI is the member association of FIDIC in India. They conduct Training and Seminars for promotion of consultants. Consultancy has different dimensions and scope of work under consultancy includes planning, design, traffic and transport studies, Quality Control, and supervision etc.

5. Tools, Plants & Equipment Manufacturer/supplier

The policy of the Government for facilitating use of sophisticated machinery in the highway sector in the wake of intensive mechanization in development and maintenance activities through measures such as exemption of import custom duty etc. and also exemptions from custom and excise duties being granted in case of the projects funded by the World Bank and Asian Development Bank, has given a boost to the domestic equipment manufacturing industry.

6. Material and Product manufacturer/supplier:

The cement and steel manufacturing companies, refineries producing bitumen / modified bitumen and bituminous products etc., suppliers / manufacturers of various patented products such as bridge expansion joints, bridge bearings etc., companies supplying / manufacturing various equipments / devices pertaining to Traffic and Transportation Systems such as Weigh-in-Motion systems, Automatic Traffic Counters – cum – Classifiers, Crash Barriers, Delineators, Impact Attenuating Devices, Signs and Markings etc., also play a very prominent and important role in the development of highway network

CHAPTER 6

RESEARCH ORGANIZATIONS

1. Introduction:

As described earlier, after introduction of economic reforms and need for developing highway sector in a big way there is shared perception that emphasis requires paradigm shift from the linear approach to a more coordinated approach within overall ambit of integrated transport policy with optimal inter-modal mix and emphasis on safety, energy efficiency and conservation, environment protection, self sustaining and viable transport units. Fourth Road Development Plan in its formulations addressed to multifaceted concern of highway sector covering diverse areas like capacity building in highway departments, consultancy sector and construction industry, incidence management, improving energy efficiency, private sector financing of projects with equity based profit and risk sharing. This has led to creation and participation of numbers of stakeholders who are engaged in supplying the needed competency based inputs to enable the principal highway agencies to take decisions more objectively and implement projects on a more scientific analysis with strengthened knowledge and skill capabilities. This chapter accordingly covers stakeholders from the field of R& D Organizations.

1.2. The Highway Research Board (HRB) of the Indian Roads Congress serves as the Forward Looking Group for research in the road sector and needs strengthening and support of the government. The HRB has identified thrust areas of research in various fields of the highway sector like roads, bridges, traffic and transportation, geo-technical, etc.

2. Council of Scientific & Industrial Research (CSIR)

2.1. The Council of Scientific & Industrial Research (CSIR), the premier industrial R&D organization in India, was constituted in 1942 by a resolution of the then Central Legislative Assembly. It is an autonomous body registered under the Registration of Societies Act of 1860. CSIR aims to provide industrial competitiveness, social welfare, strong S&T base for strategic sectors and advancement of fundamental knowledge. The Strategic

Road Map designed for CSIR as it stepped into the new Millennium envisaged:

- a) Re-engineering the organizational structure;
- b) Linking research to market space;
- c) Mobilizing and Optimizing the resource base;
- d) Creating an enabling infrastructure; and
- e) Investing in high quality science that will be the harbinger of future technologies.

2.2. The Government of India has also announced a new Science and Technology Policy 2003 in the early years of the new century. It presents Science and Technology with a human face and emphasizes realities such as facing open, global competition; need for examining social, economic and environmental consequences of S&T; and, aggressive international benchmarking and innovation. It advocates strong support for basic research. It emphasizes manpower build-up and retention as important challenges. It advocates dynamism in S&T governance, through the participation of scientists and technologies.

2.3. Today CSIR is recognized as one of the worlds largest publicly funded R&D organization having linkages to academia, R&D organizations and industry. CSIR's network of 38 laboratories not only knit India into a giant network that impacts and add quality to the life of each and every Indian but CSIR is also party to the prestigious Global Research Alliance with objective of applying global knowledge pool for global good through global funding. CSIR's R&D portfolio embraces areas as diverse as Highways, Structural Engineering, Aerospace, Biotechnology, Chemicals, etc. The R&D organizations under the aegis of CSIR involved primarily in R&D related to Highway sector are Central Road Research Institute (CRRI), New Delhi, Central Electrochemical Research Institute (CECRI), Karaikudi and Structural Engineering Research Centre (SERC), Chennai.

3. Central Road Research Institute, New Delhi

3.1. The Central Road Research Institute (CRRI) was the Laboratory set up under CSIR for the road sector in the early 1950's in New Delhi. The major activities of CRRI cover basic research, applied research, dissemination of research findings related to highway engineering.

3.2. The important research areas of the CRRI are:

- a) Road Development Planning and Management
- b) Traffic Engineering Safety and Environment
- c) Engineering Safety and Environment
- d) Pavement Engineering and Materials
- e) Geotechnical and Natural Hazards
- f) Bridge Engineering and Management
- g) Instrumentation

3.3. The beneficiaries of the research work of the CRRI are:

- a) Government Road Organizations
- b) Indian Roads Congress (IRC)
- c) Contracting and Consultancy Sector
- d) Oil Companies, Cement Manufacturers
- e) Testing Equipment Manufacturers

3.4. The major landmark achievements of the CRRI have been:

- a) Road user cost study (input to World Bank HDM-III, HDM-4)
- b) Land slide mitigation strategies (hill regions)
- c) Consolidation of marine clay (coastal belts)
- d) Soil stabilization techniques
- e) Pavement deterioration prediction models
- f) Use of flyash and other industrial waste in roads
- g) Road Safety Audits, Traffic Management Measures
- h) Non destructive testing of bridges
- i) Road Condition Evaluation Devices, Bump Integrator
- j) CC block pavement in deserts and mountains

3.5. Following are some of the activities currently undertaken by the CRRI.

- a) Road Information System
- b) Slope protection strategies in hills
- c) Maximizing use of marginal/waste material
- d) Engineering safety measures
- e) Highway Capacity Manual for Indian Conditions
- f) Refining pavement condition prediction models
- g) Diagnostics of distressed bridges
- h) Pilot testing of innovative materials
- i) Skill enhancement of highway professionals

3.6. The CRRI has networking arrangements with several international organizations to enhance their quality of output. The major ones with whom the CRRI has such arrangements are:

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

4. The Structural Engineering Research Centre (SERC), Chennai

4.1. The Structural Engineering Research Centre (SERC), Chennai has facilities and expertise for the analysis, design and testing of structures and structural components. Services of SERC are being extensively taken by the Central and State Governments and public and private sector undertakings. Scientists of SERC serve on many national and international committees and the Center is recognized at the national and international levels as a leading research institution in the field of structural engineering. SERC has recently been certified as ISO:9001 quality institution.

4.2. SERC acts as a clearing house for the latest available knowledge and develops know-how on design and construction of all types of structures. It undertakes application-oriented research in all aspects of structural engineering – both design and construction, including rehabilitation of structures. It also provides design consultancy services, including proof checking, to organizations in the public and private sectors for developing a variety of structural designs. SERC also organizes specialized courses on structural engineering for the benefit of practicing engineers to familiarize them with the latest developments in analysis, design and construction.

4.3. Major Facilities available at SERC include heavy testing, structural dynamics, experimental stress analysis, construction engineering, concrete composites and fatigue testing laboratories, computer centre and Tower Testing Research Station. The Centre has also been publishing the Journal of Structural Engineering since 1973, to participate, promote and disseminate research in Structural Engineering.

5. Central Electrochemical Research Institute, Karaikudi

5.1. The Central Electrochemical Research Institute (CECRI) was established in 1953. It represents the largest research establishment for electrochemistry

in South Asia, Headquartered at Karaikudi, CECRI has extension centers in Chennai, Mandapam and Tuticorin

5.2. The institute works on all facets of electrochemical science and technology: Corrosion Science and Engineering, Electrochemical Materials Science, Functional Materials and Nanoscale Electrochemistry, Electrochemical Power Sources, Electrochemical Pollution Control, Electrochemical, Electrodeposition and Electrocatalysis, Electrometallurgy, Industrial Metal Finishing, and Computer Networking and Instrumentation. CECRI runs several projects in collaboration with laboratories from within and outside India.

5.3. In the year 2004, CECRI was selected as one of the nodal laboratories for R&D on hydrogen-based fuel cells under the New Millennium Indian Technology Leadership Initiative. Such a R&D program is seminal for the country since hydrogen has come to be seen as the ultimate fuel for the future. In a short span of two years, CECRI has developed and demonstrated self-sustainable polymer electrolyte fuel cell stacks for portable power applications, clearly establishing its capability to fructify a concept into the product. Based on this noteworthy contribution, prestigious clean energy projects for cutting-edge R&D on hydrogen-based fuel cells and next-generation lithium batteries have been awarded to CECRI during the eleventh five year plan.

5.4. The area of expertise of CECRI relevant to the highway sector are corrosion control in concrete bridge structures including their monitoring, condition survey of existing structures including assessment of their residual life based on corrosion, cathodic protection of foundations and sub structures, repair and rehabilitation of corrosion, cold applied reflective road marking paints, etc.

6. The Gujarat Engineering Research Institute (GERI), Vadodara

6.1. The Gujarat Engineering Research Institute (GERI), established in 1950, developed into a research division by 1957. It attained the status of a state research institute in 1960.

6.2. GERI had the distinction of being adjudged as one of the best research stations in the country, by Central Board of Irrigation and Power (CBIP) in the year 1989. The institute aims at providing research and development inputs to the activities of Gujarat State in the fields of Water Resources and Roads and Buildings. The activities of the institute are centered around investigation and testing, research and development, consultancy and training in various areas listed earlier. The institute extends its activities to both Government and Public/Private sector bodies

6.3. The R&D activities related to the highway sector undertaken in the institute are soil mechanics, foundation engineering, geo-textile and reinforced soil, non-destructive testing of concrete, fibre reinforced concrete, geo-physical and seismological investigations, flexible pavement, traffic and transportation, etc.

7. The Highway Research Station, Chennai

The Highway Research Station (HRS), Chennai established in the year 1957, is engaged in applied research, in construction and maintenance of roads and bridges and traffic pattern. It has well-equipped laboratories for Soil and Foundation Engineering, Concrete and Structures, Bitumen and Aggregate and Traffic and Transportation.

8. The Maharashtra Engineering Research Institute (MERI), Nashik

The Maharashtra Engineering Research Institute (MERI), Nashik was established in the year 1959. The institute is headed by a Director General, equivalent to the post of Secretary in the State Government. MERI comprises of ten research divisions involved in various research and testing activities, which includes Highway Research Division also. The institute being a state level organization caters to the needs of projects under Irrigation and Public Works Department and Maharashtra Jeevan Pradhikaran (MJP) so also the problems of ports in Maharashtra. More than 250 technical and scientific staff are involved in the research and testing activities of the institute. Besides doing basic research in Civil Engineering, the institute mainly deals with the field problems or applied research work posed by various projects authorities within the state and also from other states.

9. Other Organizations involved in R&D related to Highway Sector

Besides the above organizations, Research Laboratories set up by several State Governments, the R&D centres 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 highway sector.

CHAPTER-7

TRAINING AND SKILL DEVELOPMENT AGENCIES

1. Introduction

1.1. One of the major area of concern highlighted in the 'Road Development Plan Vision: 2021' is relating to Capacity building in the highway departments, consultancy sector and construction industry for efficient implementation of the development programme. With ever increasing interaction and mutual dependence of various stakeholders viz. road agencies, contractors and consultants etc for the service and product delivery, there is all-round need to enhance, develop and up-date the skills not only in technical designs but also in project management, financial aspects, legal issues, social and environmental aspects. There is shortage of skilled staff at all levels including skilled labour, equipment operators, and supervisors, engineers with the government, contractors and consultants. Exposures to international scenario and expectation of world standard products from the highway agencies have made the highway sector more demanding on its professionals. The jump in the project size has further added to the complexities of tasks involved. The road agencies dealing with the 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. Declared emphasis on the execution of project through BOT, DBFO route in the fourth road development plan, require re-orientation of highway engineers who were groomed in the earlier government contract procurement system. 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 DPRs and for supervision of projects during construction. Training need of highway sector stakeholder is therefore of imminent urgency. Realizing this, various training and skill development programme are being run all over the country by various research institutions, training institutes, central and state government departments, autonomous bodies and big construction firms. A few of prime training institutions are described in this chapter.

2. National Institute for Training of Highway Engineers, NOIDA

2.1. National Institute for Training of Highway Engineers (NITHE) is a registered Society under the administrative control of the Department. It is a collaborative body of both Central and state governments and was set up in the year 1983 with the objective of fulfilling the long felt need for training of Highway Engineers in the country, both at the entry level and during the service period. The broad activities of National Institute for Training of Highway Engineers (NITHE) consist of the following.

- a) Training of freshly recruited Highway Engineers.
- b) Conducting Refresher Courses for Senior and Middle Level Engineers.
- c) Short duration technical and management development courses for Senior Level Engineers.
- d) Training in specialized areas and new trends in highway sector
- e) Development of training materials, training modules for domestic and foreign participants.

2.2. Since its inception, the NITHE has trained 16,000 Highway Engineers and Administrators involved in road development from India and abroad through more than 600 training programmes (upto December 2008). Participants are drawn from Ministry of Shipping, Road Transport and Highways, various state PWDs, Rural Engineering Organizations, Public Sector, Private Sector and NGOs involved in the field of Highway Engineering. Engineers from foreign government departments have participated in NITHE's International, SAARC and Technical Co-operation Scheme of Colombo Plan. It has also compiled a number of manuals useful for engineers and their organizations.

3. Training Programmes by Research Organizations and Educational Institutes.

Various organizations involved with R&D activities in the Highway Sector also offer short term training courses, e.g. CRRI, New Delhi, SERC, Chennai, etc. Besides specialized training programmes are also organized by the eminent Academic Institutes offering Civil Engineering courses, such as the IITs, IISc, Bangalore, etc.

4. Training Institutes attached with the Government Organizations

Major government organizations are either having their own training institutes or training of professionals in highway sector is imparted by the

training institutes run by the State Government. Central PWD is having its training institute situated at Ghaziabad and offers training courses to engineering professionals. For training of junior level and middle level professionals Regional Training Institutes are run by Central PWD at Delhi, Kolkata, Mumbai and Chennai. The Workmen Training Centres are also run at these places for the Workmen directly employed by Central PWD for maintenance. Uttar Pradesh PWD, have developed detailed curriculum on road construction technology and laboratory training covering class room and on-site training to its junior and senior engineers. Other states like Rajasthan have also developed and imparting training through state- run training institutes.

5. Construction Industry Development Council (CIDC)

For training of workmen and supervisors, CIDC has developed several training centres in the country. They have also initiated training Programmes directly at project sites. Besides, CIDC is coordinating with equipment manufacturers for training of equipment operators.

6. National Academy of Construction, Hyderabad

The National Academy of Construction (NAC), the only institute of its kind, and is supported by Government of Andhra Pradesh is doing yeomen's service both for training of workmen and professionals. It is funded by cess levied by State Government on construction contracts.

7. Training by contracting organizations

Contracting Organizations and their Associations are also conducting training Programmes at different places all over the country. Firms like L & T are one such contracting agency which has its training institute for workmen at Chennai.

CHAPTER-8

AGENCIES FOR TESTING OF MATERIAL

1. Introduction:

With the shifting emphasis of Government from the role of a ‘provider’ to ‘enabler and facilitator’ as reflected in the strategy set out for the first quarter of 21st century in Highway Development Plan IV, more and more numbers of Mega projects will be seen coming up in the country. All such projects require proper testing of materials which is a pre-requisite for attaining high quality of the work. This requires specialized material and product tests covering physical, chemical, ultrasonic, x-ray and various other types of tests which can not possibly be carried out in a site laboratory without adding high-costs on the project. Product and material testing are required not only for the purpose of obtaining final product of specified service standards, but also for the product and material development to support quality control, evaluation, research, development, trouble shooting and many other client organization’s need. These tests also require trained professionals, specialized in conducting the tests and interpreting the results. Therefore, the need arises for utilization of independent laboratories with facilities to conduct the tests as per IRC specifications and in controlled atmospheric conditions like temperature, humidity etc. Depending on specific requirements, owner of the projects may approve such testing laboratories and institutes for the work. These material and product testing laboratories may be in the Government sector, Semi-Government or Private sector. In case of laboratories in the private sector, however, the past record and reputation of the laboratory must invariably be given due consideration. The infrastructure set up for conducting the tests as per the prescribed standards in these laboratories can be inspected before they are short-listed for the projects.

2. National Accreditation Board for Testing and Calibration Laboratories (NABL)

2.1. National Accreditation Board for Testing and Calibration Laboratories (NABL) is an autonomous body under the aegis of Department of Science & Technology, Government of India, and is registered under the Societies Act. NABL has been established with the objective to provide Government, Industry Associations and Industry in general with a scheme for third-party

assessment of the quality and technical competence of testing and calibration laboratories. Government of India has authorized NABL as the sole accreditation body for Testing and Calibration laboratories.

2.2 In order to achieve this objective, NABL provides laboratory accreditation services to laboratories that are performing tests / calibrations in accordance with ISO/IEC 17025 and ISO 15189:2003 for medical laboratories. These services are offered in a non-discriminatory manner and are accessible to all testing and calibration laboratories in India and abroad, regardless of their ownership, legal status, size and degree of independence.

2.3. NABL has established its Accreditation System in accordance with ISO/IEC 17011:2004, which is followed internationally. In addition NABL has to also comply with the requirements of APLAC MR001, which requires the applicant and the accredited laboratories to take part in recognized Proficiency Testing Programmes in accordance with ISO/IEC Guide 43. An applicant laboratory has to satisfactorily participate in at least one Proficiency Testing programme, while the accredited laboratories are expected to cover the major scopes of accreditation in a cycle time of four years. NABL also satisfies the requirements of APLAC MR001. This distinction has brought additional responsibility on NABL and its accredited laboratories. Annual Surveillance is carried out to ensure that the accredited laboratories are continuing to comply the accreditation criteria. NABL and its accredited laboratories are also required to meet the new challenges arising out of requirements such as satisfactory participation in a recognized Proficiency Testing Programme and the requirement of estimating the Uncertainty in Measurements even by the testing laboratories.

3. BIS Laboratories

The network of eight BIS laboratories, spread throughout the country provide conformity testing of BIS certified products against relevant Indian Standards. Central Laboratory at Sahibabad (near Delhi) and the laboratories at Regional and some Branch Offices are engaged in testing primarily for operation of the BIS Certification Marks Scheme. The major areas covered under testing at the Central Laboratory are electrical, mechanical and chemical and under calibration, electrical and mechanical. Apart from Central Laboratory at Sahibabad , BIS have four regional laboratories at Mumbai, Kolkata, Chennai and Mohali and branch laboratories at Patna and

Guwahati. BIS also develop specifications of test equipment, offer calibration services and train testing personnel.

4. Independent Testing Laboratories

In order to conduct test of materials, independent Laboratories established in the private sector are playing a prominent role. Such Laboratories need accreditation by NABL and proper calibration of each and every equipment according to specific requirements. The Laboratory assistants who conduct tests must have required training. For any Laboratory, the track record of the past performance decides about its credibility.

5. Laboratories in Engineering Institutes and Research Organizations

Engineering Institutes and Research Organizations have their in-house laboratories which not only serve as teaching equipments for students and research scholars of the institutes but also undertake conducting tests on the material as received from the project sites which may be going in the near by areas. These organizations also help in developing Job Mix formulae, Design Mix for Concrete etc as per the requirement of projects.

6. Importance of Testing of materials and finished work at Project Sites.

At the construction project sites, in order to exercise proper quality control at each and every stage of construction, a testing laboratory is established at the site for routine tests. Materials like aggregates, sand etc are tested for quality after procurement. During construction process, various intermediate elements like kerb stones, beams etc are tested for their desired performance parameters. Thereafter, the finished works like compacted surfaces, concrete, etc. are to be tested before acceptance of work. The material testing laboratory is accordingly established as per the stage performance requirements set out in the contract agreement.

7. Availability of information about testing facilities & testing Laboratories

Whenever a project is started, it is necessary to critically review the requirement of Laboratory to be set up at the Project site. Besides setting of Laboratory at the project site, it is necessary to ascertain the requirement of testing facilities for the project and availability of such testing facilities in the vicinity. In order to help stakeholders, the available testing facilities with different accredited testing Laboratories is being compiled which will help professionals to take services of nearby Laboratories for required

specific tests. Therefore compilation of this information is to be initiated by IRC at national, regional and local level.

CHAPTER-9

FACILITATORY, COMPLEMENTARY, AND REGULATORY AGENCIES

1. Facilitating, Complementary and Regulatory Agencies are not direct stakeholders in the Highway Sector. The main sphere of working of these agencies is to complement and regulate the Highway sector related activities, and therefore their role, though indirect, but crucial to the project conceptualization and finally its implementation. To cite an example, land is required to be acquired to construct Highways in urban, rural or hill areas and calls for interaction and permission from land owning agencies. Project also requires clearances from the agencies in charge of environment and ecology of the land. In urban areas, comprehensive planning of all the services including roads is to be done by Urban Planning Agencies like Delhi Development Authority. Besides, at places, railway tracks, electrical overhead lines, canals etc. cross the road which calls for coordination with respective railways, electricity or irrigation agencies for the completion of Highway projects.

2. In urban areas, roads are part of total urban infrastructure development and accordingly, road schemes are prepared and implemented within the overall plan of city development. Sometimes, there is division of areas in the city between municipal council and improvement trust, which is a statutory body constituted with the specific purpose of promoting the development of city. These improvement trusts are multi-functional bodies, which perform an important coordinative role by bringing the representatives of large number of government agencies in the process of urban development under one roof. Road schemes in city areas need approval from such urban improvement trust or development authority. An expanded version of an urban improvement trust is Delhi Development Authority (DDA), which was set up in 1957 with a view to promoting and securing Delhi according to Master Plan as developed by it for twenty years period. Road construction schemes in Delhi are required to be approved by DDA. Schemes of bridges and flyovers are no exception. In Delhi, the approval of Delhi Urban Arts Commission is also necessary.

3. The 73rd Constitutional Amendment Act of 1993 envisioned a vibrant Panchayati Raj system, responsive to the needs and aspirations of the local community, where informed and inclusive participation of all citizens,

cutting across caste, class and gender, in the planning and administration ensured accountability of the system to the local community. The Act provides for creation of three tier system- gram panchayat at the village level, Janpad Panchayat at the block level and Zila Panchayat at district level, with power and functions contained in the Schedule appended to the Act like creation of financial commission for strengthening their financial position. These agencies though are not planning development bodies, but different State Governments can enact their own legislations to assign them functions relating to implementation of schemes of economic development and social justice like PMGSY and development of other rural connectivity schemes. For PMGSY, rural road planning, sectoral coordination, contract and financial management tasks are assigned to State Rural Road Development Agency (SRRDA) and receive fund from MORD for PMGSY programme.

4. Electric generation, supply and distribution in different States are largely in Public Sector, with respective Electricity Boards controlling generation and transmission of electricity. In metropolitan areas, distribution system gradually is being transferred to private distribution agencies as a part of reforms brought about in electricity sector consequent to enactment of Electricity Act 2003. Different agencies operating in States, accordingly, as per the directives issued by the State Governments or Electricity Regulatory Commissions of the States are to be coordinated for shifting of electricity transmission lines coming in the ROW or laying of electrical transmission lines for lighting of highways especially in urban areas or along designated stretches of highway projects.

5. Municipal bodies, Jal Boards operating and controlling water supply, sewerage, drainage especially in city and metropolitan areas are to be interacted and permission obtained for shifting of utilities and for connecting road side drainage with the city drainage system. Telephone, internet, gas supply are other utilities which are found criss-crossing city-scape and are needed to be properly detailed into the road projects to avoid any disruption by way of un-intended cutting of cables, ducts or supply pipes.

6. With increasing need and urgency for preserving and enhancing natural environment for the subsistence of human life, Governments, the world over, are examining all development projects from environmental point of view, before allowing their execution. Under the Environment (Protection) Act, 1986, and the Forest (Conservation) Act 1980, Highway Projects require

approval from the Ministry of Environment and Forest, and detailed proposals are required to be prepared based on ground studies done by the experts for such approval. Principal environment regulatory agency in India is Ministry of Environment and Forest. It formulates policies and decides whether to allow the project to proceed or whether to alter or abandon it.

6.1. The key environmental legislations regulating the environmental aspects of a projects are (a) The Water (Prevention and Control of Pollution) Act, 1974 (b) The Air (Prevention and Control of Pollution) Act, 1974 (c) The Forest Act, 1927 (d) The Forest (Conservation) Act 1980 (e) The Wild Life (Protection) Act, 1972 (e) The Environment (Protection) Act, 1986. Ministry of Environment Forest, from time to time, issues notification under the provisions in the Environment (Protect) Act, 1986 specifying requirements in respect of Highway Projects like All Highway Projects costing Rs 50 crore or more shall not be undertaken unless they have been accorded Environmental clearance and others concerning requirement of public hearing for projects seeking environmental clearance, Coastal Regulation Zones etc. For any ecological sensitive area, if Ministry of Environment and Forest has appointed any other statutory authority for clearing the projects, such authority's clearance is also necessary, for the project in that area.

6.2. The steps required to be taken for obtaining Environmental clearance from Government of India include (a) Preliminary study of different alternative alignments from technical and environmental point of view (b) Preparing feasibility report and detailed EIA in respect of chosen alignment (c) Obtaining clearances from the concerned State Pollution Control Board (d) Submission of proposal to Ministry of Environment and Forest in required proforma along with documents like project report, EIA report as per IRC Publication No 104-1988, report of public hearing, clearance from State Pollution Control Board and recommendations from State Environment Department (e) Proposal for diversion of forest land ,if required (f) Presentation of Project to experts committee and preparation of EMP(Environment Management Plan).

CHAPTER -10

ORGANIZATIONAL REQUIREMENTS

1. Need for capacity building of Highway Sector organizations

1.1. For effective and efficient plan formulations and project implementation it is vital that there is congruity of purpose among all stakeholders. Convergence of their aims and objectives, however requires that the activities of all the varied functionaries working in different organizations, departments, agencies, institutes, laboratories etc are cumulatively found reinforcing the realization of road map prepared for the highway sector development. This calls for creating a synergy among various stakeholders associated with Highway Development, viz. the Planning and Funding agencies at the Government level, implementation agencies at the Govt. level and Contractors / Concessionaires/ Consultants / Independent Engineers/ Equipment manufacturers/ suppliers/manufacturers. This mutually reinforcing synergy is required for the promotion of a conducive environment and good work ethos. Fourth Road Development Plan has rightly laid emphasis on the capacity building of various stockholder organizations which among others include strengthening of decision support system by way of stronger data base development, specialization of professionals, re-engineering of organizations for sound decision making, synchronization of working in the organizational set up and development of skilled man power. The task involved though enormous but it is the need of the day so that the targets set forth are achieved in time without compromising on the quality front. Key areas requiring special attention of various stakeholders are described in following paras.

2. Government Organizations

2.1. Without getting into the organization specific analysis, based upon the analysis of pitfalls in achieving the targets set in various Road Development Plans and the experience gained from time to time, some of the key areas requiring focus of the various Government Organizations for improving and streamlining of the implementation of projects are as follows.

- (a) Outsourcing of professional expert services for the design and construction supervision of complex multi-disciplinary large sized

projects, large span / innovative bridges, environmental assessment studies, rehabilitation works, techno-economic analysis, etc. requiring special skills.

- (b) Peer review / proof consultancy for finalization of designs for complex mega projects.
- (c) Ensure that departmental officers do not become complacent and carry the feeling that they have very little role to play when professional consultancy services are procured through outsourcing so as to obviate post construction stage problems, audit queries, legislative questions, complaints, arbitration and litigation, etc.
- (d) Faster decision making process in the organization, decentralization of power, greater autonomy at functional and execution levels.
- (e) Promote conducive working atmosphere and professional pride amongst employees.
- (f) Right person for the assignment.
- (g) Continuation of the Officers assigned for the project without transferring them in between.
- (h) Depute officers for structured training courses periodically and specialized training courses for specific assignments.
- (i) Ensure long term commitment of consultants in the projects even beyond the project implementation period and defect liability period.
- (j) Systematize project record keeping and archive for future guidance. Evolve mechanism to ensure availability of consultant's records / documents even after the defects liability periods are over so that potential defects manifesting or disputes / claims arising for the project can be defended in various forums.
- (k) Encourage progressive use of information technology in all phases, i.e. project planning, designs, procurement of services, implementation and monitoring, operation and maintenance.
- (l) Inter-departmental co-ordination to resolve issues such as environmental clearance, land acquisition, utility shifting, encroachment removal, etc. during pre-construction phase.
- (m) Ensure timely payments to the consultants and contractors.
- (n) System of writing of Performance Appraisal Report (PAR) of the Consultant by the Employer's representative and submission at higher level upon project completion. Such reports to be attached to the dossier of the consultant in the organization for future reference.

- (o) Ensure that consultants indemnify the employer through professional performance guarantee against all claims, actions, damages, liability, litigation, etc. in connection with negligent acts, errors, omissions of the consultants.
- (p) Evolve appropriate guidelines and procedures for administration and management of consultancy services.
- (q) Evolve effective Dispute Resolution / Arbitration Mechanisms.

3. Contracting Industry

3.1. Contractors are the major partners in progress for both direct construction projects by the government and BOT projects through private entrepreneurs. In the nineties when the NHDP was launched by the Government there was a need felt for large size contracting firms/contractors to take up packages which involved modern mechanized construction system using plants, equipments, and standards of specifications matching with the world standards. Now that many of indigenous contractors have come of age and have developed expertise to undertake medium to major value project, there is need to evaluate their competence level to ensure that the firms are capable as regards their organizational and technical capabilities for undertaking the job and completing the same as per the required quality and speed delivery standards. For this purpose, Construction Industry Development Council (CIDC) set up by the Planning Commission, has instituted a system to grade the projects and contractors. This process, it is expected, will assist the consultants and clients in selecting proper contractor to execute the project.

3.2. With the increased emphasis on Projects through the channel of Public Private Partnership (PPP) which has led over the years to the creation of many innovative instruments like BOT, BOOT, BOO projects, the private equity partners like developers and contractors would be required to undertake additional role in the risk sharing of concession agreement. They will also be required to perform at global standard with due sensitization to the need for incorporation of Quality, Safety and Environment in their delivery standards. A close interaction between the government, industry, Academia, R&D institutions and CIDC will help further the cause of contractors and developers in highways sector. Skill up-gradation of different category of workers/ technicians/engineers to cover the gap

between their available skill standards and standards as demanded from them has become of absolute necessity and has to be undertaken by the government and industry in the right earnest. Conditions have to be created for healthy growth of the domestic contractors with possible state of art technology transfer in the field of construction management, plants and equipment by seeking support from foreign contractors.

4. Consultancy Sector

4.1. The burgeoning growth and development of the road network after economic reforms in 1990s and further spurred by the ambitious targets set by the fourth road development plan for the first quarter of 20th century has created an enormous demand on the quality technical professionals. The limited availability of suitable Technical Professionals in the field has posed serious problems for effective and timely implementation of projects on a sustainable basis. This demand–supply gap of quality highway professionals is found to have a cascading effect as manifested in adversely affecting the pace of overall decision making and implementation process. Therefore, there is need for the consultancy firms to join hands with the academic institutions and research institutions in the country to get their support in filling up the gap in provision of specialists.

4.2. Notwithstanding the concomitant professional growth with pace of development in the highway sector, weaknesses have also been experienced particularly in preparation of Detailed Project Reports. Not many firms have any system of internal audit by independent persons before the outputs are delivered to the clients.

4.3. The Consultants should ensure regular participation of the professionals employed with them in the skill upgradation programme organized by Consultancy Development Centre (CDC). CDC is putting in place an accreditation and grading system for consultants. This will assist the clients to make a considered decision in selection of consultants for their projects. Similarly they should also participate in the Trainings and seminars organized by Consulting Engineers Association of India (CEAI).

For proper selection of consultants, it is desirable to provide a quality cost based selection (QCBS) as promoted by FIDIC.

4.4. A system of quality assurance and quality audit for the consultants work including instituting a system of grading the firms and keeping a track record of their past performance need to be introduced. The specialized training in collaboration with academic institutions should be worked out for utilization by the consulting firms. There is need to encourage formation of

joint ventures with international firms for improvement of capabilities especially in emerging technologies where domestic expertise is still lacking. Some system of performance evaluation of consultants by some independent professional agencies could be considered.

4.5. There is also need for further growth of the consultancy sector. For this, some mechanism to consciously encourage small size and medium firms wanting to enter highway sector needs to be evolved.

4.6. There are instances of change in personnel by the consultants on one ground or the other, although most of the consultancy agreements specify that only in unavoidable circumstances, such as on health grounds, etc., replacements by equivalent or superior personnel could be allowed. There is requirement to ensure the continuation of originally proposed team in the interest of the project.

4.7. There is need for consultants to follow the code of ethics prescribed by the Consulting Engineers Association of India (CEAI) in letter and spirit.

With the increased role of consultants in highway development it is anticipated that consultancy sector will draft in competent professionals to take care of various activities involved, such as, project formulation, design, supervision, quality control, monitoring etc. In view of the prevailing shortage of experienced manpower, it would be prudent to develop and train personnel to take up consultancy as a profession. It would be necessary to debate the issue whether to send on deputation engineers from government department and state PWD's to consultancy companies.

5. Concessionaire firms

5.1. The Concessionaires themselves are not expected to possess in entirety the in-house technical capabilities for developing, operating, maintaining the highway sections for the fixed tenure of the concession period. They may be allowed to mobilize the expert services and satisfactorily demonstrate and manage the availability of such services for the duration of the Concession Period. The Concessionaires' may be allowed to pool up expertise (technical, financial, legal, etc.) of separate companies through contractual arrangements, etc. This would enable growth of the domestic knowledge based industries as a whole, promoting growth of separate individual companies/private institutions with dedicated expertise, rather than having single organization/company with multi-disciplinary expertise.

5.2. The Concession Agreements encourage promotion and use of innovative technologies/materials as generally they lay down performance criteria and final product requirements without getting into the finer technical nuances.

The Concessionaires should accordingly take this opportunity to introduce not only cost effective technologies/materials, but also try to promote more environment and ecology friendly constructions, with utilization of waste/marginal materials or industrial by-products and try to minimize depletion of natural reserves such as bitumen, aggregates etc. They would be expected to undertake innovative methods and scientific application of project management to formulate and complete the project in shortest possible time, in order to generate resources at the earliest. They should also demonstrate commitment for proper operation and maintenance services after the highway is open for commercial operations so that quality of service to road users is maintained, and provide satisfaction to the users

6. Domestic Equipment manufacturing Industry

6.1. The emphasis will be required to boost the local industry for manufacturing of highway equipment. Further, the concept of “Equipment Bank” in the private sector regarding leasing of equipments needs to be encouraged, and made available to the contracting agencies. The equipment manufacturers must also respond to meet the growing volume of works by increasing their levels of production and also manufacture new range of equipment of international standards suiting to current requirements.

6.2. There is necessity for developing low cost indigenous equipment and machinery for projects on lower category of roads such as Rural Roads etc., so that the projects could be implemented within reasonable costs and through smaller contractors. The equipment industry also needs to support the contractors with training of foremen and operators.

7. Need for the restructuring of Organizations

7.1. Prior to 1985, for improvement of National Highways, the then policy followed for the stage construction and labour intensive construction technology led to a thin spread of available meager financial resources over a larger length. Therefore, in the early period the projects were implemented mainly on small and medium sized contract packages, involving contractors of lesser capacity and with the equipments which were mainly road roller and hot mix plants supplied by the Government departments. However, for bridge works, comparatively bigger contractors were available but their equipment resources were quite limited. A major push in the direction of big size project package came in 1985 when for the first time, the Government of India, while seeking loan assistance for roads from the World Bank (WB) accepted to adopt International Competitive Bidding (ICB) procedures and FIDIC conditions of contract for the highway projects,

forming part of the loan package. In order to encourage modernization and mechanization, size of the projects was kept at Rs. 100 to Rs. 150 million at that time.

7.2. The economic reforms introduced in 1991 gave further impetus to import of world-class road making equipment. The modifications of the MORT&H specifications facilitated the use of modern equipment. After Year 2000, there has been a growth in the usage of modern equipment in the road sector. The country has seen the change in thrust in respect of the use of equipment, born out of need. The evolution in technology for the road construction has resulted in the introduction of machines like Wet Mix Plants, Pavers for the construction of base course, etc. Cold and hot milling machines, cold and hot re-cycling machines have also been introduced to reduce the thickness of the road crust and to recycle the used material for the highway construction. On the maintenance aspects the mechanized construction have been introduced in the form of pot hole repairing machines, slurry sealing machines and sophisticated machines like kerb laying machines and line marking machines.

7.3. The methodology of construction has progressively shifted from labour intensive system in the pre economic reform period to the present day mechanized system. This has contributed to adoption of improved designs and specifications and speedier project implementation. However, this also demands adaptation of effective working environment and paradigm shift from prevalent institutional system of yesteryears to an institutional mechanism suiting the present day requirements. Further, with the Government's initiative to encourage implementation of more and more projects through private sector participation on Build-Operate-Transfer (BOT) mode, the roles of both Government organizations and private sector associated with development of highways have been redefined. In other words, in the light of modern technology, use of new specifications, machine oriented construction and different contracts for implementation, the implementation organizations need to be upgraded to the challenge of accelerated development works.

7.4. A review of strength and weakness of the existing procedures, rules and regulation, delegation of power, present method of implementation, forthcoming opportunities and threat from external environment may be taken up by the organizations with the aim to address and implement the needed reforms in these organizations.

8. Need for public awareness on highway projects

8.1. Generating public awareness and sensitizing them about the project benefits may enable encountering minimum resistance/bottlenecks from community level during project implementation and possibly may form a part of formal endeavour during project planning and report preparation stage although this may not be a training per se.

8.2. Initiation of this endeavour may perhaps be made by extending invitations to some of the NGOs associated with the welfare/development of the regions across the country to attend specific seminars/workshops/training programme tailor made for such topics, which may be made specific to a particular project also.

CHAPTER-11

HUMAN RESOURCE DEVELOPMENT AND MANAGEMENT

1. Introduction

1.1 At the turn of century, the highway sector in India is facing challenges, not witnessed at any time in the past. The highway sector is poised for fast development and it has already taken quantum jump with regard to availability of funds. Accordingly physical targets are being achieved with the expectation of international standards. All the stakeholders are aware of challenges ahead. However, the critical review of capability and capacity of different stakeholders very clearly reveal the hard fact that they need capacity building and re-structuring at the organizational level and enhancing professional capability and skills of individual working in different organizations dealing with highway sector. It is absolutely necessary that capabilities of human resources are enhanced, so that challenges ahead can be faced with full preparedness.

2. Role of Indian Roads Congress

2.1. The Indian Roads Congress (IRC) is the premier technical body of Highway Engineers in the country. The IRC was set up in December, 1934 on the recommendations of the Indian Road Development Committee known as Jayakar Committee set up by the Govt. of India with the objective of Road Development in India. As the activities of the IRC expanded, it was formally registered as a Society in 1937 under the Societies Registration Act of 1860. Over the years, the IRC has burgeoned and grown into a multi - dimensional multi faceted organization, devoted to the cause of better roads in the country.

2.2. The Congress provides a national forum for sharing of knowledge and pooling of experience on the entire range of subjects dealing with the construction and maintenance of roads and bridges, including technology, equipment, research, planning, finance, taxation, organization and all connected policy issues. In more specific terms, the objectives of the Congress are:

- (a) To promote and encourage the science and practice of building and maintenance of roads;

- (b) To provide a channel for the expression of collective opinion of its members regarding roads;
- (c) To promote the use of standard specifications and to propose specifications;
- (d) To advise regarding education, experiment and research connected with roads;
- (e) To hold periodical meetings, to discuss technical questions regarding roads;
- (f) To suggest legislation for the development, improvement and protection of roads;
- (g) To suggest improved methods of administration, planning, design, construction, operation, use and maintenance of roads;
- (h) To establish, furnish and maintain libraries and museums for furthering the science of road making;
- (i) To publish, or arrange for the publication of proceedings, journals, periodicals and other literature connected with the road sector.

2.3. In order to fulfill its objective to advice regarding education, experiments and research connected with roads, the IRC has to fulfill its objective in broader terms by showing a path to highway sector for education and research needed for its proper development. Thus the Human Resource Committee of the IRC has to develop such documents which will be helpful in capacity building of stakeholders and enhancing capacity and capability of individuals; from high level professionals to workers. The documents are also required to be developed to make available the information as regard availability of required information about anything connected with highway sector to those who need it.

3. Availability of Technical Professionals in the Sector

3.1. The present impetus of development in the Highway Sector is not adequately supported by the availability of Technical Professionals in the Sector, i.e. Engineers, Scientists, etc. This is perhaps the most disconcerting fact which may adversely affect the development of this sector in the country. Therefore, efforts are required for developing more number of experts in the Sector. With more lucrative job avenues opening up in the highway sector, the premier academic institutions should be sensitized and encouraged to induct more number of students in the discipline of Civil Engineering with particular emphasis to specializations such as Highway

Engg., Traffic and Transportation Engg., Structural Engg., Geotechnical Engg. etc.

3.2 The engineering and technical institutions are to be encouraged and incentives given for attracting students in Highway Engineering Profession. The association of these institutions is also required for providing training to the new entrants as well as in-service engineers.

4. Human Resource Development

4.1. To manage the Highway Sector in the context of today and tomorrow, it is necessary that capability of individuals particularly the professionals and workmen is enhanced to a degree as may be required by the continuously emerging and evolving technologies and techniques in the field of highways construction and maintenance works. It is only by such enhanced capabilities and capacities on continuous basis of those working in Highways Sector, the stakeholder organizations can be expected to face the challenges with efficiency and efficacy. It is to be realized that any organization finally depends for its growth and sustenance on those who make up the organization. For this purpose Human Resource Development (HRD) has to be given serious consideration and prominent place in organizational functioning.

4.2. It is a known fact that during modern times, there is unprecedented pace of spread of information through fast communication. Therefore, to be competitive, it is necessary to learn faster, more creatively and retention and transfer of such newly learned behaviors to meet organization's growth objectively. For fast emerging Highways Sector, it is necessary that performance oriented job delivery is ensured by each and every stakeholder. For that purpose, the knowledge about HRD is studied, spread and adopted by stake holder organizations of Highways Sector.

5. Training of Engineers and professionals

5.1. Appropriate training arrangements are required to be made for increasing the number of Highways Engineers and other professionals. It is also essential to create awareness among the highway engineers regarding the technological developments world over. The training needs, involving training in engineering disciplines, project management techniques, financial management, operation and management of highways, etc., should be imparted during entry in services, at job sites and through periodic in-service refresher courses. These are applicable for contractors and consultants also Training of engineers working in the highway sector is perhaps one of the most important area requiring attention. It has to be a continuous exercise.

To keep pace with technological developments, it is essential to keep abreast of good practices in planning, design, construction management and maintenance of road and bridge projects. All the concerned stakeholders both government and private, should formulate a training policy and decide on arrangements to network with the existing training institutions, i.e. NITHE, IITs, IIMs, CRRI, etc. for regular training of engineers at all levels. Such a policy should address the need for training at entry, on job-site, periodic in-service refresher courses and study leave/tours within the country or abroad to enhance their skills in various management and engineering aspects.

5.2. The National Institute for Training of Highway Engineers set up by the Government of India would need to play a vital role in training effort. NITHE should also come out with a comprehensive booklet indicating the various areas of training for different levels of highway engineers, duration and course contents and periodically update/modify the same as per the sectoral requirements depending upon the feedbacks obtained thereon. NITHE should also function as a repository of documentation of all major projects for future lessons learning and dissemination. NITHE may consider entering into MOUs with the international and national training / academic and research institutions to provide the institutional support. For augmenting the activities of NITHE all the departments dealing with roads should support the NITHE by sending adequate number of persons for training and also in financial terms by paying annual contribution.

5.3. There is a marked reluctance on part of many organizations, especially the State Government Organizations, to depute technical personnel for training mainly on the plea that they could not be spared on account of pressing necessities. However, a mechanism needs to be evolved to make periodic training programme a mandatory requirement for promotions, specific postings, etc. and if necessary the training programmes could be finalized well in time duly consulting the concerned higher level authorities and taken into account the eventualities and possible exigencies so that the person deputed for a specific training programme undergoes the same without fail.

5.4. Respective organizations must carry out a Training Need Analysis (TNA), of their employees taking into account the competence level required for the job and the employee data. Periodic training rosters should be prepared and needs to be followed for effective results. The human resource department of the organization must look at the training aspects as an important ingredient of their activity. In order to assist the organizers and individuals for training of their professionals, The IRC is in the process of

publishing a document and placing on its web site, for giving information about available training facilities and calendar of training programme being run by various institutions and organizations. This will help in selecting training required by professionals for their specialized needs.

6. Training and certification of supervisors and workmen

6.1 According to government estimate, included in the National Employment policy, around 457 million people in labour force need to acquire new skill standards or upgrade their skills. Current capacity of the government run technical vocational education training programme is only 2.5 million each year whereas 12.8 million work force is added every year. It is found that only 5% of youth between the age group of 20-24 possess vocational skills, while figure is 28% in Germany, 79% in Canada and 80% in Japan. Most of the labour force employed by the highway sector comes from un-organized sector whereas government programme are mostly focused on organized sector, making skill development and certification need for the highway sector a priority policy input area.

6.2. Training is therefore required at the cutting edge level of technicians, supervisory staff of road agencies and contractors' workers—both skilled and unskilled. The agencies like CIDC etc. may take the lead and two to three ITIs in each State may be identified where such training can be imparted. National Academy of Construction in Hyderabad is a very good initiative of the Government of Andhra Pradesh with the support of the Contractors. This is an example worthy of emulation by other States.

6.3. HRD Committee of IRC is developing a document dealing with issues involved for training and certification of workman. It will help in providing a smooth transition from un-trained worker to a trained and certified workman. The initiatives to be taken by various stakeholders are being specified to ensure bring about this change in a smooth manner. The whole environment in construction sector in general and highway sector in particular, will undergo a sea change when trained and certified workmen will be available for highway projects.

7. Funding for HRD

7.1. Funds should not be allowed to be a constraint. A small portion of the CRF can be earmarked for this purpose. This should be supplemented by providing a small percentage (say 0.25%) of the project cost for training of departmental personnel, both within the country and abroad. The Department of Road Transport & Highways in its policy circular issued in the year 2001 has stipulated that Training of Highway Engineers and

contribution of Professional Organizations like the Indian Roads Congress, NITHE, Indian National Group of International Association for Bridge and Structural Engineering (ING-IABSE), etc. should be considered for financing under CRF.

ABBREVIATIONS

BMS	Bridge Management System
BMS	Basic Minimum Services
BOT	Build-Operate-Transfer
BRO	Border Roads Organization
CCEA	Cabinet Committee on Economic Affairs
CDC	Consultancy Development Centre
CE	Chief Engineer
CEAI	Consulting Engineers Association of India
CIDC	Construction Industry Development Council
CPWD	Central Public Works Department
CRF	Central Road Fund
DBFO	Design Build Finance & Operate
DG(W)	Director General (CPWD)
ELO	Engineer Liaison Offices (MoSRTH)
FDI	Foreign Direct Investment
FIPB	Foreign Investment Promotion Board
FWD	Falling Weight Deflectometer
GBS	Gross Budgetary Support
GIS	Geographical Information System
GQ	Golden Quadrilateral (National Highway)
GS	General Staff
HDM	Highway Design Modeling
HR	Human Resource
IIM	Indian Institute of Management
IIT	Indian Institute of Technology
IRC	Indian Roads Congress
ITI	Industrial Training Institute
JBIC	Japan Bank for International Corporation
LPG	Liquefied Petroleum Gas
MCA	Model Concession Agreement
MDR	Major District Road
MNP	Minimum Needs Programme
MORD	Ministry of Rural Development
MoSRTH	Ministry of Shipping, Road Transport and Highways
MoU	Memorandum of Understanding
MoUD	Ministry of Urban Development
NS-EW	North South & East West
NGO	Non Government Organization
NHAI	National Highways Authority of India
NHDP	National Highways Development Project
NITHE	National Institute for Training of Highway Engineers
NQM	National Quality Monitors

NRRDA	National Rural Roads Development Agency
ODR	Other District Roads
PAR	Performance Appraisal Report
PIU	Programme Implementation Units
PMGSY	Pradhan Mantri Gram Sadak Yojana
PPP	Public Private Partnership
PWD	Public Works Department
QMS	Quality Monitoring System
R&D	Research & Development
REO	Rural Engineering Organizations
RMC	Road Management Corporation
RO	Regional Office
ROB	Road Over Bridge
RUB	Road Under Bridge
SAARC	South Asian Association for Regional Cooperation
SARDP-NE	Special Accelerated Road Development Programme for the North Eastern Region
SBD	Standard Bidding Document
SH	State Highway
SQM	State Quality Monitor
SRRDA	State Rural Road Development Agency
STA	State Technical Agency
VR	Village Road