TRANSPORTATION PLANNING AND MANAGEMENT ISSUES FOR NEW MILLENNIUM

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INTRODUCTION

Developmental programmes initiated through successive Five year plans have provided necessary impetus for rapid industrialisation and economic activities, particularly in urban centres throughout India, leading to an unprecedented growth and increase in number of urban areas as shown in Table 1. Urbanisation is a companion to the developmental process and is inevitable in all the developing countries including India (Study Group 1987). In the words of the study group on Alternative Systems of Urban Transport (1987), " ...If India is to achieve its objective of becoming a modern and industrial country, urbanisation is essential...". The expanding cities and the growing mobility of the population and goods have created greater demand for transportation facility between cities as well as within the cities.

Table 1 : Urban Centres in India

Census Year	Class-I	Class-II	Class-III	Class-IV	Class-V	Class-VI	Urban Pop, Mn. (%)
1971	148	173	558	827	623	147	109.1(19.9)
1981	216	270	738	1053	739	229	159.4(23.3)
1991	300	345	947	1167	740	197	217.2(25.7)

Source : Census of India, 1991

Transportation serves to facilitate the efficient movement of goods and services, to meet the individual's need for effective mobility, to promote the national defense, and to sustain and improve the local, regional, state, and national economies. To this end, a basic level of transportation should be available to all citizens. Transportation needs of citizens may be served by different modes, but road transport, with its door to door service and with in the reach and access to all sections of the people plays an indisputable part in the total transportation system. The trends in transportation among two principal modes are shown in Table 2. It can be seen that the share of rail is coming down drastically over decades.

Table 2 : Rail-Road Share (Percentage)

Year	Freight			Passenger		
	Rail	Road	Total	Rail	Road	Total
1966	68.9	31.1	100	38.0	62.0	100
1985	41.5	58.5	100	19.8	80.2	100
1995	27.0	73.0	100	12.0	88.0	100

Source : Planning Commission Documents

A close examination of highway based vehicular growth from Table 3 indicates that the growth of personalised vehicles, especially the two wheelers in the country is almost in geometric progression. This is mainly due to inadequate supply, lack of planning and organisation of higher capacity public transport. It is also observed that the vehicle population has dramatically shot up particularly after the 1980's. A resurgent economy, increasing industrialisation and growing per capita incomes in the urban areas are some of the contributory factors of this phenomenal growth.

Table 3 : Vehicle Population (1000) on Indian Roads

Year	2 –Wh.	3 Wh.	Cars	LCV	HCV	Bus
1971	576	30	683	42	301	94
1981	2704	143	1160	114	440	154
1991	14200	610	3013	310	1101	331
1996	22977	1338	4334	560	1383	471
% growth	17.1%	16.6%	8.1%	10.7%	6.7%	**6.5%**

However a point to note here is that in the multimodal environment, no particular mode can be considered in isolation because of competitive and complimentary nature of different transport modes, but the planning is to be on totality or based on the systems approach with each mode considered as a subsystem and stage wise optimisation at local and global levels is called for. The resultant system is expected to provide a safe, energy-efficient, environmentally sound, and economically competitive service. The national transportation system should involve all forms of transportation in an interconnected manner, including existing and the future scenario. The objective should be to provide accessibility as well as mobility while striving to reduce congestion, energy consumption, and pollution.

ROAD DEVELOPMENT PLANS

Transport plans are prepared at different levels, the hierarchy being:

- National Transport Plan
- Regional Transport Plan (State or Region)
- Local Transport Plan (District / Mandal / City region)

National Transportation Plan

The National Transport Plans were attempted by three 20-year plans, viz. Nagpur Plan (1943-1963), Bombay Plan (1961-1981) and Lucknow plan (1981-2001). These are aggregate or macro level plans, classifying the road system into a functional hierarchy. These plans worked out the total length of road network for the country on the basis of certain accessibility criteria for town and villages, depending upon the extent of development of the region.

The targeted and realised road lengths during 3 road development plans are summarised in Table 4. It is evident that the important high order components (NHs and SHs) of the network suffered and remained deficient in contrast to the overall road development programme during the first two plan periods. Targets fixed in Lucknow plan have largely remained unfilled and there has been a considerable shortfall against the plan target of 66,000 km of NHs, the achievement had been 34,058 km, while very little progress has been made in construction of 2000 km of Expressways. The public sector expenditure on road sector has been on a declining proportion of the total National Public sector plan expenditure i.e. 6.9 percent in first five year plan to 3.0 percent in eighth plan. These long-term plans provided general guidelines, but the implementation of these plans was hampered due to shortage of funds.

The main drawbacks in the plans are summarised:

- Demand for passenger and goods travel by different modes of travel was not explicitly determined for horizon year and no attempt was made to find optimal modal mix. Road planning was in isolation.
- The passenger and commodity flow network can be evolved only if the zones of generation and attraction are identified and the quantum of flow between the demarcated zones is assigned.

Table 4 : Targeted Road Lengths (Km) under 20-year Road Development Plans

Road Type	Nagpur Plan (1943-1963)		Bombay Plan (1961-1981)		Lucknow Plan (1981-2001)	
	Target	Achieved	Target	Achieved	Target	Achieved 1995
NH	33,395	22,636	51,500	31,737	66,000	34,257
SH	86,825	62,052	1,12,650	95,491	1,45,000	1,34,085
MDR	80,145	1,13,485	2,41,400	1,53,000	3,00,000	4,49,233
ODR	1,33,580	1,11,961	2,89,680	9,12,684	21,89,000	11,08,476
VR	1,98,355	3,98,990	3,62,100			
Total	**5,32,300**	**7,09,122**	**10,57,330**	**11,92,912**	**27,00,000**	**17,26,051**
Density Km/sq.km	16	22	32	36	82	

An ideal national transportation plan should divide the entire country in to suitable traffic zones for predicting the generation and attraction of traffic after identifying the policies and objectives within the framework of national economic development plan (Kadiyali, 1998). Both passenger and freight trips generated at each zone and attracted to each zone are to be predicted with suitable modelling technique. These trips are to be distributed between zones and among different modes of travel. Mode wise trips are to be assigned to the existing as well as to the proposed future network to identify the missing links and then to evaluate alternative strategies so as to obtain optimal solution.

Regional Transport Plan

A region is a middle level area differentiation between the national level and the local level. While road transport plans are prepared in the country at the state level, there has been hardly any effort to prepare comprehensive transport plans involving all modes at the state level.

Local Level Plans

Local level plans deal with a small area, such as district, a town or city. Little effort has gone in preparation of district level transportation plans. Transportation plans for cities and towns are commonly undertaken in the country.

Transport problems of urban areas are complex and need special treatment. In India, a good amount of expertise has been developed in preparing comprehensive transport plans for larger cities. Of late, awareness is growing to develop some simple methods for preparing plans for medium and small cities. Transport plans for cities are generally formulated according to 4 stage Urban Transport Planning Process (UTPP).

NTPC RECOMMENDATIONS AND THEIR RELEVANCE

National Transport Policy Committee (NTPC), popularly known as Pandey Committee (1980) is the first scientific exercise to look into the total transportation scenario for the country. Based on resource cost and expected development, it has come out with modal shares between road and rail, which, however, didn't occur as per expectations. As seen in Table 2, the rail-road share both in passengers and goods is far different from the NTPC estimates. However, the committee has recommended a set of actions, which are relevant for today and tomorrow as well.

The Committee had also concluded that :

- In the foreseeable future, bus transport will continue to be the principal means of inter city moments, priority should, therefore be given to strength and optimise bus service.
- Every effort should be made to divert traffic from personalised modes of motor transport to the public transport system.
- In the metropolitan cities, road-based transport systems are not likely to meet future demands. Thus generation of the existing suburban rail facilities and providing new electrified services are essential.
- In urban locations, intermediate public transport should be patronised.
- Proper transport management methods are essential to deal with urban transport. The moment of pedestrians, cyclists and public transport buses should be given priority.
- A single transport authority should be set up in metropolitan cities to deal with all modes of transport.

ISSUES IN HIGHWAY PLANNING

Highways are normally referred to communication networks at rural and regional level and accordingly are classified as Expressways to Village roads. The hierarchy of roads is expected to fulfil the requirements of mobility, connectivity and accessibility. In spite of hierarchical system of roads contemplated, there appears to be lack of demarcation for the roads that are supposed to provide mobility or accessibility and almost everywhere their functions are mixed forcing the roads not to fulfil any requirement in totality. This is resulting in sub-optimisation and chaotic conditions. At this stage, it is felt that the following issues need to be brought out that require critical discussion for arriving at appropriate solutions. The main issues include:

- Criteria for decision making in the creation of hierarchy of roads.
- Subjective and objective viewpoints in decision making.
- Creation of data base.
- Creation of new roads / rehabilitation of existing roads.

The authors feel that there should not be uniform criteria for different types of roads, when deciding the feasibility. While those roads meant for mobility may have to pay for themselves, such roads meant for accessibility may have to be provided with funding from general revenue as a social welfare measure. The intermediatory level of roads is to be decided with a balanced view on revenue-welfare continuum.

It is quite often surprising to see certain projects made feasible by one Government, while the same project is inviable with a changed Government. This is clearly an example of subjective judgement in project appraisal, which should be totally avoided. All the projects must be decided with an objective view giving relevant standardised parameters for comparison.

Last but not the least, to decide whether the nation should go for new linkages or strengthen the existing system is too complex an issue; with both having their own merits and shortcomings. While the creation of new linkages in the form of virgin roads may provide impetus for economic growth, strengthening of existing system may prevent large amounts of economic losses through savings in road user costs. At this juncture, it is relevant to conclude that each project is to be decided based on its merit and there should not be a common yardstick in judging the projects.

PLANNING AND MANAGEMENT OF URBAN TRANSPORTATION

The character and nature of Travel Demand at Urban level is quite different to that of highways. With high population densities, higher vehicle ownership, concentrated peak hour travel and associated pollution and accident scenario, the urban travel demand is to be tackled with care and caution. Large variations in income levels and associated *status* result in conflicting interests (requirements) that dominate the urban scenario making the urban transport planning complex. This situation calls for a scientific and cautious approach in urban transport planning and management. As is the practice in most of the countries, the concept of Multi Year Program Plans (MYPP) - Transportation System Management (TSM) approach is a must for solving the above problem. While the MYPP gives a set of plans for different time periods till the horizon year that are detailed as well perspective in nature. The TSM aims at giving a set of low capital intensive and tailor made solutions for location specific problems, at the same time encouraging the high occupancy and mass transit. It is worth mentioning here that the plans prepared for a city may serve only as a guide with respect to the techniques used and resultant impacts. Therefor, it is needless to say that plans are to be generated keeping in view the requirements, aspirations and acceptance of the people involved in metropolitan cities. Each plan prepared shall have citizen participation and a systematic feedback mechanism for making corrective actions for prepared plans as and when required.

The activity based approach will be a step toward a new generation transportation planning methodologies that can fully address the wide range of transportation planning options, comprehensively evaluate their impacts, and they aid in public involvement by showing how each planning option could affect the every day lives of urban residents. The critical basis of the activity based approach to travel demand modelling is that individuals' activity, travel patterns are a result of their time use decisions within a continuous time domain (Bhat and Koppelman, 1999).

A new approach to implementing TSM has resulted in strategic Management (TRB, 1983). Strategic management is a set of activities undertaken to provide an efficient, problem oriented framework for planning, designing, evaluating and implementing low cost TSM projects.

MEASURES FOR SAFE AND CONDUCIVE TRAVEL

Road Safety

Road accidents are the unfortunate by-product of modern transportation. Although improvements were achieved through the application of road accident counter measures in various sectors, one of the most consistently successful and cost effective areas of investment has been the field of road planning and traffic engineering (TRL, 1994). Present planning and design practices may, unintentionally, be creating situations that will produce road safety problems in the future. For assessing the accident potential and safety performance in the case of new road schemes as well as improvement and rehabilitation of existing roads, a system of road safety audit (safety checking) should be evolved and carried out and should form an integral part of highway planning, design, construction and maintenance. Road safety audits are intended to ensure that adverse features are not introduced unintentionally into a highway scheme. If they cannot be avoided, or it would be uneconomic to remove them, the safety check should ensure that appropriate remedial action is taken to minimise the likelihood of accidents. Since mid seventies a traffic safety checklist has been included in the town planning of residential areas of Helsinki, the capital of Finland. Results of the study show that the checklist has had a positive effect on traffic safety in the residential areas (Salmivaara, 1997).

For convenience, the safety checklists have been compiled under a number of headings, relating to the planning, design and operation of highways and to the improvement of accident black spots (TRL, 1994). These are:

Checklist A : Land use / Physical Planning
Checklist B : Network Planning
Checklist C : Highway Design
Checklist D : Countermeasures related activity.

Planners and Engineers of the schemes should, of course, be encouraged to carry out their own informal checks using the checklists just to ensure they have covered most key issues before submitting the scheme for approval. Highway planners and engineers with experience of road safety work best do the safety checks. Those doing the final formal checking should not have been involved in the planning and / or design of the scheme, unless this is completely unavoidable.

Highway Safety Improvement Program (HSIP)

Highway safety professionals have long recognised the need for an organised approach to the correction of highway safety problems. The safety aspects of highways are handled by maintaining an effective Highway Safety Improvement Program (HSIP). HSIP emphasis the application of procedures to enhance highway safety efforts at the state and local levels. The objectives of these procedures are the efficient use and allocation of available resources and the improvement of techniques for data collection, analysis and evaluation. It consists of the following three components:

- Planning
- Implementation
- Evaluation

Planning includes various processes for collecting and maintaining a record of accident, traffic, and highway data; for analysing available data to identify highway locations of features determined to be hazardous on the basis of accident experience or potential; for conducting engineering studies of hazardous locations and features to develop proposed highway safety improvements and for establishing priorities for implementing proposed safety improvements. Implementation includes a process for programming and implementing safety improvements, while Evaluation includes a process for determining the effect that safety improvements have in reducing the number and severity of accidents and potential accidents. Note that safety improvements should be planned, then implemented and finally evaluated.

Road Safety Councils

In industrialised countries the multi disciplinary nature of the traffic safety problem is now accepted and a large number of organisations are involved in the efforts to improve road safety (TRL, 1994). Each takes the necessary actions within its respective area of responsibility. Such efforts are normally co-ordinated, so that they can have maximum effect.

In India, by contrast, road safety responsibilities are often more confused and very little co-ordination occurs. The problem can only be tackled effectively through co-ordinated action aimed at reducing the deficiencies in each of the main areas affecting road safety. It is often beneficial to have a National Road Safety Council (NRSC) to co-ordinate and promote road safety matters nationally and Sate Road Safety committees (SRSC) / district road safety committees (DRSC) / city road safety committees to carryout similar activities at local levels. All key Government and relevant Non -

Government organisations should be represented on the NRSC / SRSC / DRSC etc. and members should meet regularly e.g. every month to discuss road safety activities.

There is a need to earmark separate **road safety fund** both at the Centre and the states, local bodies for specific road safety schemes. These schemes are like improvement of accident prone sections, at grade intersections, embankments, traffic control devices, wayside amenities, highway patrolling scheme, urban road safety, R&D measures and publicity campaign.

Air Pollution Control

Transportation is a source of many environmental disturbances and risks, some of which are not well understood or recognised by the public because their most serious consequences may not become evident for years. Emissions from transportation vehicles may be leading to gradual changes in biological diversity and ecosystem functions on a regional or national scale.

Environmental disturbances due to transportation that have lasting and adverse consequences are to be the subject of public policies and programs to curb them. Left untreated, their adverse consequences may worsen, causing serious environmental problems for future generations. The environmental effect of transportation was addressed as part of broad concepts of "Sustainable Transportation", "Sustainable communities" and "sustainable cities". Repolgle 1991; Roseland, 1992; Whitelagg, 1993; OECD, 1995; World Bank 1996). A recent report by the World Bank (1996, 4-6) defines sustainable transportation as embodying three main components:

- The economic and financial component
- The environmental and ecological component
- The social component

The goal of sustainable transportation is to ensure progress in each of these areas by making more strategic and deliberate rather than incremental and adhoc transportation investment and regulatory decisions. Thus, efforts to control the environmental effects of highway transportation must be considered in light of the vital functions i.e. enabling a level of personal mobility and supporting the industry and the national economy through multiple options for moving goods and services, that it serves.

The possibility of a growing transportation sector contributing to lasting environmental changes is troubling. Two general approaches are available for achieving emission limitations over time (TRB SR 251 1997). One is to encourage changes in travel behaviour to reduce motor vehicle use and therefore fuel use. The other is to foster changes in transportation technologies to favour those that use less petroleum and emit less green house gases. These two approaches may be complementary.

Innovations in Traffic Monitoring and Control

The three essential components of transportation are :

- Persons and/or goods that need to be transported;
- Motor vehicles; and
- The infrastructure

In the last two decades, there has been a co-ordination of the three subsystems through the communication, information and transportation revolution, and an attempt is being made to more people and goods by the right mode, in the right quantity, by the best available quality, to the right place at the right time. The interaction between the vehicle and infrastructure subsystems is being

investigated for a suitable 'control' system. Currently, there are a range of very large research programs going on: PROMETHEUS and DRNE in Europe, SSVS (Super Smart Vehicle System) in Japan, IVHS (Intelligent Vehicle Highway System) in the United States, all representing attempts to add different kinds of information and control functions to the vehicle infrastructure system.

Although ITS is currently in the experimental or limited real world application stage, the US DOT intends deploy ITS technology across the US in 75% of the largest metropolitan areas within the next 10 years. It is envisaged that ITS technology will reduce the congestion problem considerably.

IVHS can be used in TSM / TDM applications. It can improve the efficiency and traffic handling capacity of existing roadways, and can handle inherent safety limitations attributable to both human factors and the roadway system. The real time information provided by IVHS technologies can include the following :

- Location of reconstruction and maintenance activities
- Location of underused or overused facilities and services
- Identification of restricted or out of service facilities
- Identification of alternative routes, modes and services
- Identification of ride sharing and transit opportunities
- Monitoring and routing of heavy and hazardous shipments

ROLE OF GOVERNMENT AND LOCAL BODIES

Transportation sector is mainly controlled by the Government at different levels. While the National Highways are being planned, designed, constructed and maintained by Central Government, the other highways and roads come under the purview of State Governments and local bodies. It is sad to note that in spite of realising the importance of highway transportation and innovations in its technologies, the highway planning, design, construction and maintenance is still entrusted to general engineers, but not specialist engineers. In the present days of super specialisation and microlevel expertise in safe guarding one's health, the health of highways is not being treated on similar lines. Even in the area of traffic management the job is entrusted to police, who are not specially trained for the purpose, but only exposed to generalities. If this continues the much required development and sustenance of highways will be affected very badly. To say in nutshell, key positions in the sectors are to be manned by specialised cadre of engineers / planners at all levels and the rules of recruitment, if required, may be suitably amended by all concerns.

Several problems are man made, especially those concerning Landuse / zoning regulations particularly in Urban environment. The Landuse violations will create problems and damage the urban structure many a time, which require enormous efforts and resource while correcting. This calls for a strict compliance to Landuse / zoning regulations

The Government has to come out with a policy of mass transportation. It has to control the individual mobility by effective management of the use of High Occupancy Vehicles (HOV). Of late in India, it is not a pleasure to go on one's own vehicle, but are forced because of lack of adequate mass transportation facility. It is time to assess the consumer's requirements, preferences and behaviour in planning Mass Transit at urban and regional levels.

The Government policy and implementation should be transparent. It again needs a mention here that there shall be objectivity in defining policies, when the plans are transparent and convincing to the public that it is for their advantage, the people

support such policies whole heartedly. Citizen participation and public debate are must for large projects involving huge investments. Over and above there should be political will and commitment to plan and implement key projects.

Time and again on different platforms it has been discussed, resolved and re-resolved that there shall be traffic advisory boards at different levels and all issues concerned are to be referred to such a board whose decision shall be binding on all concerned departments connected with transportation. At regional level like state and districts, they exist for namesake as on today discussing some issues now and then, but there are no systematised and established procedures in translating discussions in to action plans. This is an area of concern in the urban environment as well. So, not only creation but also effective functioning of Traffic Advisory Boards and Unified Traffic Authorities at regional and urban levels, respectively, is a must.

To conclude, as on now, various issues concerning the planning and management of transport are known, many can be answered and actions taken. But unfortunately lack of clarity in the rules in vogue, scarcity of data base, hurry in some how coming with a plan document and subjectiveness in decision making are creating all the problems resulting in an near chaotic scenario in the transport sector. As suggested, political will, commitment to a policy, preparation of plans with adequate data and complete impact analysis, manning the key positions by the specialist cadre of engineers / planners will ease out the problem and the key infrastructure sector can perform its role in the economic development of the nation in the new millennium.

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