1.0 Introduction
The advent and rise of motorization has pushed the traditional modes of travel, like, walk and bicycle, to the point where they again require community support to survive. The situation has become worse due to biased transportation policies against non-motorized vehicles, sprawl of cities and cultural resistance of masses. The subsequent increase in motorized mobility has resulted in more expenditure for the provision of facilities and operation; in increased environment pollution and congestion and in less use of local resources and skills culminating in unemployment. People visualize the use of motorized vehicles as an indicator of affluence and non-motorized modes as poor man’s vehicle. The provision of motorized access has not been found satisfactory for CBD, high-density areas and areas on outskirts with low-density. In such conditions the use of NMVs is found to be most effective and efficient. These modes use local resources and skills and produce negligible pollution. Therefore, the reliance on multi-mode transportation will provide the sustainable and efficient urban transportation system in complex and heterogeneous traffic conditions of developing countries (DCs).

This paper further discusses the different aspects related to the need and issues in multi-mode planning and the policies for NMV promotion, automobile restrictions and land use planning. Finally a policy framework for sustainable transportation system is being suggested.

2.0 Need of multi-mode planning
The object of providing transportation facilities is not only to increase mobility, but, also to fulfill the economic, social and ecological obligations towards society along with increasing accessibility. These are briefly discussed below:

2.1 Economic Aspects
The present planning process has resulted in relatively more costlier transportation, 5 to 20 percent of monthly income, for urban poor (Gupta 1986, Jacob et al 1980, Khisty 1993, Pendakur 1984) and a subsidized transportation for motorised users (Goodland 1994, Komaroff et al 1993, Nelson 1995, Pendakur et al 1995). The increase in commuting distance has also increased these expenditures. The comparative resource requirements for material, energy, space, fuel, construction etc. has been found to be 6 to 60 times more for motorised facilities than for non-motorized facilities (Bawa and Bansal 1984, Goodland 1994, Litman 1996 d, Nelson 1995, Pendakur et al 1995, Pettinga 1996 b, Replego 1984). The motor congestion cost for US has been reported as $300 billion per year by Goodland (1994) and as $100 billion or more by Komaroff et al (1993). For DCs it is reported as $1.4 million per day for Bangkok or as 44 working days equivalent to 10 percent increase in GDP of Thailand (Zegras and Birk 1994) or as 240 working days per annum for India (Sharma 1986). The accident cost is reported as $363 billion per year for US (1990 $) and as Rs25.125 million (1984 Rs) for India (Gupta 1986).

2.2 Social Aspect
Walking enables direct contact with the people and environment (Polus et al 1983) without requiring a costly set of facilities and can fit in all land use development forms. In fact it is the basis of any commuting. For longer commuting distances the bicycle can be used. While formulating the investment plan the high ratio of pedestrians and peddlers relative to vehicles should be considered. It will lead to the provision of horizontal and vertical transportation equity (Litman 1996d) i.e. equal opportunities at each level of mode use and society, as well as, among different levels. This can be done by inter-
nalizing the external costs (congestion, pollution, parking etc.) of motorized use (Litman 1996a). The various sources estimate the social cost varying between $64 billion per year to $860 billion per year (most inclusive) (Hanson 1993). The computation of social speed considering annual cost, monthly income, hours worked and external costs show reduction in the average speed of bicycle by 6.67 percent, whereas, it is 70 percent for car (Pendakur et al 1995). Social speed is defined as:

"The social speed takes into consideration the time that individuals spend earning the money needed to cover the costs of each mode. When this time is accounted for, actual time savings offered by cars becomes considerably reduced; additionally, when external costs are factored in, the average social speed for bicycles compares favourably with that for cars."

2.3 Ecological Aspect

The increased use of motorised modes has affected the ecological settings. Road transport causes 70-86 percent of the total air borne pollutants (Zebras and Birk 1994, Pendakur 1996), of which passenger vehicle account for 45 percent of CO emission, 16 percent of NOx emission and 25 percent of Volatile Organic Compounds (Komanoff et al 1993). The street level pollution in Bangkok City is found equivalent to smoking of 9 cigarettes a day (Pendakur 1996). The health and productive cost from motor vehicle noise is estimated at $22 billion per year (1990 $) for US (Komanoff et al 1993). The use of pedestrian scheme in central area of Chester, England resulted in 68-80 percent reduction in emissions and more than 50 percent reduction in noise on pedestrian roads (Chiquetto 1997). It is therefore, clear that NMVs contribute very less (in fact negligible) to the air and noise pollution (Litman 1998, Goodland 1994, Bawa and Bansal 1981, Wentinck 1980).

On the front of energy consumption it has been found that the energy consumed by bicycle is almost one-tenth part of what is consumed by the motorised modes (Bawa and Bansal 1981, Hook 1995, Komanoff et al 1993, Lin et al 1993, Litman 1998, Pendakur et al 1995, Pettinga 1996 b, Sharma 1986, Wentinck 1980). The shift from automobile-driver (0.5 percent) and Park-and-Ride (10 percent) to Bike-and-Ride can save gasoline consumption from 78 million to 153 million liter per year (Reploge 1984).

2.4 Accessibility Aspect

The accessibility has to be discussed on two aspects: monetary and facility. The provision of mass transit facilities alone has been found deficient because of predefined-prefix routes and larger spacing between them. Paratrains or NMVs can overcome these deficiencies (Shimazaki et al 1994). A study shows that the provision of public transport with walk and bicycle access can save around 44 percent in the total cost of vehicle use, out of which one-third can go to the society and rest to the user household as benefits (Litman 1996b). In fact it can expand their potential market area at a very low cost. Such access is invaluable in adopting transit system to the emergent suburbanized, polycentric metropolitan land use pattern (Reploge 1993). Another aspect related to accessibility is efficiency. In the heterogeneous traffic conditions, the operating efficiency of bicycles is found better relative to MV (Gibbons 1991, Koike 1991). Walkways and bicycle ways can handle capacities far higher than the typical automobile freeways, bikeways handling hourly passenger volume per meter lane around 2.5 times that of car freeway (Bawa and Bansal 1981, Goodland 1994, Khisty 1993, Litman 1996d, Reploge 1991).

Therefore, for availing economic, ecological and social benefits of walk and bicycle, these should be integrated with motorized modes. This requires greater attention and assistance from local governments in providing NMV facilities (Antonakos 1995, Epperson 1995, Nelson 1995, Pendakur 1996, Reploge 1993 and 1991, Zebras and Birk 1994). At the same time it is required to provide enough consideration to the issues listed next, which can make the transportation system by itself sustainable.

3.0 Issues in multi-mode planning

The discussion done so far categorically leads one to the following issues:

a) Urban Poor
b) Land Use
c) Resources Available
d) Environment Aspects
e) Transportation Efficiency
f) Transportation Equity
g) Cultural Resistance

The population of urban poor in the developing countries is increasing at a rate of 2.5 percent per annum and has increased by 23 percent in the last twenty-five years (Khisty 1993). Therefore, the provision of transportation facilities satisfying their needs should remain the top priority. One non-transportation solution to existing condition is the planning of location of residence and work place. The land use planning has to be such that it minimizes the transportation needs between the above two locations. This can be achieved only through the compact land use planning. Another important point is the use of locally available skills and resources, which will reduce the cost of provision and operation of facilities. This will also reduce the environmental costs and social costs. The use of NMV will make the system more efficient, free of occasional congestion and delays and will provide equity and affordable accessibility to the masses and remote areas. But to achieve it socially also, it requires the removal of cultural resistance against them (Neves 1996). For achieving the above points various policies are suggested and are listed in the following section.
4.0 Policies in multi-mode use

The provision of a more sustainable transportation system requires reduction in single occupancy vehicles and the increased use of multi-mode system. In this regard different authors have propagated various policies. Some of these have been briefed below.

Pendakur (1996) emphasizes that the new policy regime should foster economic efficiency, social equity and ecological sustainability and should include them in the investment and regulatory policy. The sustainable urban transportation planning and policy formulation should be such that it propagates the idea of 'feet first, pedal next and motor may be'. It is shown in Fig.1.

An integration policy, as reported by Pettinga (1996a), and as adopted by Eindhoven Transport Region works on the principle of integrating cycle network, car network and public transport network through combination (simultaneous implementation), cooperation (working together) and coordination (geared to one another). The policy echoes:

"The restriction of (the growth of) motoring and the simulation of the use of environmentally friendly sound modes of transport, such as bicycling and public transport."

Pettinga (1996b) also advocates the incorporation of public participation in the decision making, at different stages of policy formulation, especially from the special users of different modes or their organizations. This will take the planning in the right direction and will make the infrastructure more users oriented.

Almost same policy is reported by Neves (1996), which is being implemented in Rio de Janerio, Brazil, as 'Bike-Policy'. This works on the combination of two complementary actions: to demonstrate viable techniques and to work to change cultural attitudes. The planning should be done with social marketing through research analysis and survey project.

A bicycle-transit integration policy is put forward by Doolittle and Porter (1994), which says:

"The setting within which a bicycle programme is developed and operated has a large impact on its ultimate success. This setting is determined by the transit system's service area characteristics, regulatory constraints and community involvement. These factors will influence whether a programme is adopted, what its scope becomes and the level of programme acceptance from the users, other transit riders, the community at large and operating personnel and management."

Some other policies suggested by authors for multi-mode planning have been the use of NMVs for short distance commuting, such as, for accessing transit facilities and the incorporation of factors like cohesion, directness, attractiveness, safety and comfort in framing network policies. This will improve the interconnectivities among land uses by correcting social and environment inefficiencies (Antonakos 1995, Hillman 1998, Nelson 1995, Ohrn 1976, Pettinga 1996a and b, Replogle 1993, Report TWU-20 1995, Sarkar 1993, Midgley 1994, Wentink 1980).

The strategies supportive to above policies are enlisted in Table 1. At macrolevel the provision of bicycle facilities, automobile restrictions, pedestrian facilities, mixed land use planning and telecommuting, taken in order, are relied more for promotion of the multi-mode transportation system. A microlevel the relative importance and acceptability of various components of above facilities are considered. These are discussed in the following paragraphs.

Promotion of NMVs

In the research area of bicycle promotion and integration, the provision of parking spaces in public spaces (Tanaboriboon and Ying 1993) and of exclusive lanes (Tanaboriboon et al 1995) in central areas (for Shanghai bicyclists), the promotional activities like bike to work week (Hunter and Huang 1995) are found important. This is indicated in Table 2. Bike lane or route is weighted more as compared to wide curb lane and bike path (Antonakos 1995, Moritz 1997, Taylor and Mahamassani 1996). Similarly bicycle lockers and guarded parking are found to encourage bicycling (Feldman 1981, Taylor and Mahamassani 1996).

Among pedestrian facilities, signalized crossings are found most convenient to use but underpass and overpass are rated most safe and marginally more superior than other facilities in Beijing (Tanaboriboon and Jing 1994). The presence of vendors and vending stalls on sidewalks, type of walking surface, inappropriate installation of traffic signals, signs and telephone booths are found to cause hindrance to pedestrian movements (Tanaboriboon and Guyano 1991). The above facts are endorsed in Table 3.

Japan and Europe have been on the forefront in providing the NMV facilities. They have put in more resources for the provision of such facilities, accorded priority to the cyclists at the crossings and provided secured bicycle storage facilities or bicycle rentals very near to the stations. Various other measu-
Trasporti Europei

Table 1 Strategies for increasing NMV share

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Strategy</th>
<th>Author(s)</th>
</tr>
</thead>
</table>

Table 2 Preference for improvement of bicycle transport in Shanghai

<table>
<thead>
<tr>
<th>Improvement measure</th>
<th>Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
</tr>
<tr>
<td>1. Increase number of exclusive lanes for bicycles in the central area</td>
<td>742</td>
</tr>
<tr>
<td>2. Increase number of parking spaces in the public spaces</td>
<td>724</td>
</tr>
<tr>
<td>3. Improve the safety aspect of bicycle</td>
<td>351</td>
</tr>
<tr>
<td>4. Reinforce the traffic consciousness of bicycle users to ensure safety and efficient flows of traffic</td>
<td>274</td>
</tr>
<tr>
<td>5. Provide central parking in the residential area</td>
<td>170</td>
</tr>
<tr>
<td>6. Reduce the price of bicycles</td>
<td>74</td>
</tr>
<tr>
<td>7. Control bicycle traffic in city center</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>2360</td>
</tr>
</tbody>
</table>

Table 3 Evaluation of pedestrian crossing facilities in Beijing

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Weighted average score for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signalized crossing</td>
<td>3.85</td>
</tr>
<tr>
<td>Overpass</td>
<td>4.57</td>
</tr>
<tr>
<td>Underpass</td>
<td>3.55</td>
</tr>
<tr>
<td>Convenience in using</td>
<td>3.09</td>
</tr>
<tr>
<td>Safety aspect</td>
<td>3.13</td>
</tr>
<tr>
<td>Faster crossing time</td>
<td>3.13</td>
</tr>
<tr>
<td>Condition of supporting facilities</td>
<td>3.09</td>
</tr>
<tr>
<td>Appearance</td>
<td>3.13</td>
</tr>
</tbody>
</table>

Note: a score of 1 means "poor" and a score of 6 means "excellent"
res suggested or implemented have been the reduction or elimination of taxes or tariffs on bicycles, facilitating credit for bike purchase, subsidizing bike assembly plants and research, installment purchase of bikes and incentives for bike use.

Controlling Automobile

In the case of automobile restrictions the most sighted example is of Singapore. The scheme comprised of strategies, like, area licensing, zone restrictions, high vehicle license fee, time restrictions, park-and-ride schemes, and car pooling and parking policy (Holland and Watson 1977). The provision of bus lane (Bendixson 1973) and discounted pasess are found to produce high inclination towards the use of public transport. The emergency ride home services, parking prices, shifting of working hours to coincide with transit schedule and enhanced day care service produce moderate to less inclination towards public transport (Black et al 1992).

A large set of strategies for reducing the share of single occupancy vehicles (SOV) and privatized vehicles are implemented in Singapore, Japan and Europe. Some other are bid for eligibility certificate to purchase a car, purchase of parking space, weekend cars and electronic road pricing, traffic calming processes and high cost of automobile use. Europe and USA have relied more upon the integrated use of bicycle with transit in the form of bike-on-rail, bike-on-bus and bike-and-ride systems. Developing countries like Jakarta and Mexico have also used measures like relying on HOV travel during peak hours and a five days a week driving, respectively.

Mixed Land Use Planning:

Rice (1977), Cervero (1996), Handy (1996a,b), Khisty (1993) and Dimitriou (1993) have studied the effects of varying urban form (density and spatial pattern) and land use activities on transportation investment and service requirements. The substantial variability in mode uses supports the hypothesis of effect of urban form on transportation mode requirements. The neighbourhood density have stronger influence than mixed land uses on all commuting mode choices, except for walking and bicycling, for which the absence of density of neighbourhood shops is found a better predictor than residential density. The study of traditional, early modern and late modern urban form, specific to strolling and walk to store trips, suggests that certain aspects of urban form play an important role in encouraging walk to a destination but the saving in travel after substitution is likely to be small. The pedestrian environment also creates effects on the choice of walking. The findings point towards considering the effect of city size, land use and activities in an area on the mode choices. It also suggests of devising a developmental approach, which will match settlements and community size, will use the appropriate transportation technology (i.e. transport hierarchy) and will distribute the urban transport modes according to the speed bands, in which they are more prominent.

The study by Robinson et al (1980) provides a comparative assessment of the potential of different policies supposed to produce shift from automobiles or increase the share of NMVs. The following order of hierarchy has the potential of producing shift from automobile:

1. Compact land use
2. Congestion fee
3. Fuel price increase
4. Pedestrian facilities
5. Bicycle facilities

The policies can have the potential of increasing share of walking and bicycling if taken in the following order of hierarchy:

1. Compact land use
2. Pedestrian or bicycle facilities, respectively
3. Congestion fee
4. Fuel price increase
5. Bicycle or pedestrian facilities, respectively.

The implication of transportation sustainability criterion, like, economic efficiency, equity, environmental impacts and land use patterns becomes more clearer in the light of the facts mentioned now. Replogle (1984) has reported that park-and-ride lot in US costs at $3640 per automobile space, whereas, secure bicycling parking costs at $50 to 500 per space, both excluding land costs. The operating and maintenance cost in the two cases is $150 or more per year and few dollars to about $70 per year, respectively. The Chicago Area Transportation study reveals that the installation of secure bicycle parking at rail stations would reduce hydrocarbon emissions (in tons) at a public cost of $311/ton ($0.34/kg) compared with $96415/ton ($106/kg) for an express park and ride service, $21495/ton ($237/kg) for a feeder bus service and $3937/ton ($4.34/kg) for a commuter rail carpool matching service. Similarly the saving in fuel and gasoline will be 75 gal (285 L) per year for each shift from park and ride to bike and ride and will be 400 gal (1500 L) for each shift from automobile user to bike and ride. This may amount to 153 million liter per year to 78 million liter per year for a shift of 10 percent and 0.50 percent respectively.

The various facts discussed intend to reduce the share of SOVs and privatized vehicles and to increase the share of walk, bicycle and public transport. This will help in reducing the level of congestion and environment pollution and will make the urban transportation system environmentally and socially more accessible. This will also conserve the foreign exchange, increase the employment potential and make use of locally available resources and skills. This all requires the formulation of sustainable transportation policy framework and is discussed in the next section.

5.0 Policy framework

A policy framework for an integrated and sustainable urban
transportation planning should be able to deal with the sustainability criterion, like, economic efficiency, transportation equity, environmental impacts and land use patterns. This requires satisfaction of certain issues as listed in previous sections. The main emphasis in policy formulation should be given to the promotion and inclusion of NMVs at each and every step of transportation planning. This will help in the following:

- In providing the interconnectivities to different regions of the city or area.
- In reducing the ecological, social and economic ill effects associated with the automobile dependence.
- In correcting the inefficiencies resulting in transportation inequity.

The consideration to NMV inclusion and the subsequent preferential treatment has to be implemented in all the three phases of transportation planning starting from conceiving of the formulation and implementation of policies. The three phases are:

- Regulatory Policy Phase
- Investment Policy Phase
- Enforcement Policy Phase

The sustainable urban transportation planning spectrum dealing with sustainability criterion, issues and policy phases has been shown in Fig. 2.

Regulatory Policy Formulation

Fig. 3 shows the steps in the formulation of regulatory policy. The inclusion of NMV should be done from the very initial stage of policy formulation i.e. identification of problem and study of area needs. Its constituents are shown in Fig.4. The inventory of facility provision and their usage (i.e. traffic counts) should include NMVs along with MVs. The state of environment in the present conditions should be checked and their standards should be formulated. The needs of an area should be examined in the initial steps only and should emphasize on NMVs. The steps in forecasting are shown in Fig.5. The trips supposed to be generated and the subsequent modal split should incorporate the NMVs. The economics should give due consideration to the NMV facilities and their operation. The pollution load reduction should meet the standards. Fig. 6 outlines the process for the selection of final plan. While deciding upon the short and long duration alternate plans, it is advisable to rely on NMVs for the short distance commuting of up to a distance of 5.00 km. This may include the meeting of day-to-day requirements, banking, schooling and accessing transit facilities in large cities and metros. In the case of long distance commuting the use of non-transportation solutions like telecommuting should be considered. The experts in the research area and conversant with the study region should be consulted for consolidating the long list of policies in the preferential order. The final acceptance should be based on the results of the transportation survey, which deals with actual users and where the responses can be taken as the direct indicator of acceptance or
refusal of the policies or strategies. The next stage of system design is shown in Fig. 7. The design should be more encouraging and stimulating for NMV users. This only can help in producing the required results of promoting greener modes of travel like walk, bicycle and public transport. It deals with physical design and transportation and traffic system management. Fig. 8 provides steps required in the simultaneous economic, social and environmental preference evaluation of the selected plan.

**Investment Policy Formulation**

The important aspect to be considered in the economic evaluation and formulation of investment policy is of 'social costs' and 'cross subsidies'. In the present policy framework the motorized users are enjoying subsidies at the cost of motorised non-users and occasional motorized users. These are termed as external or social cost and include costs related to accidents, congestion, air pollution, noise, water pollution, parking, energy use and land use impacts, imposed by user on the facility. These external costs have to be included in the computation of total cost of motorised use, thus providing relief to other users of the facility. The ways of doing this may be based on the total kilometer traveled or the time for which the facility has been in use or the charging of insurance premium on the basis of total kilometers traveled by the user.

Another aspect is the allocation of resources, not on the basis of influence, but on the basis of proportion of users of a type
of facility. This will certainly tilt the investment plans in the favour of NMV users, especially in the developing countries, where they outnumber the motorized users. The studies show that in these countries more than seventy percent uses walk as a mode of travel. The result of this can be seen in Japan and Europe, who have succeeded in reducing the congestion and environment pollution outside the rail stations. Revenues can also be generated by enforcing high license fee and registration fee, congestion taxes, parking fee etc. which indirectly will dissuade the motorised users. The above aspects are shown in Fig. 9.

### Figure 9: Investment policy formulation

**Enforcement Policy Phase**
The investment and regulatory policy will become effective, if and only if, the enforcement policy is functional and is free of influences, which is not the case with most of the developing countries. For the better enforcement and for getting the NMV favourable policies through, against the wishes of strong motorized lobby, a strong 'Political Will' is required. This can then take the support from administrative authorities, can use the technical know-how available with the country and can derive help from the media and non-government organizations (NGO), which can be used to highlight the merits of NMV use and the demerits of motorized use. These are visible in Fig. 10.

### Public Participation
One important aspect, which can certify in advance the success of selected plan, is the participation of public at different stages of policy formulation and finalisation. This is required because they are the ultimate users of the facilities to be provided on the finalization of the policy. Their participation can be made effective by inviting their perceptions at the time of studying the needs of the area in the problem identification stage, at the time of evaluating the acceptability of the policies in the plan selection stage through transportation surveys and by getting the feedback about the facilities which have been provided after the finalization of the policies. Their responses may also be valuable at the time of deciding about the revenue generating measures and policies, which can reduce the share of motorized use and increase the share of NMV use. Their cooperation and help will also be required in making the new policies and strategies acceptable to the masses. At this point the help of NGO and corporators or ward officers will be of great use.

Therefore, for a sustainable system planning and design, a careful, systematic and dynamic balancing of all the three phases of the system planning is required. This further requires balancing based on sustainability criterion. But at each and every stage of policy formulation, investment planning and enforcement programme, the inclusion of NMVs should not be forgotten. The new approach for economically efficient, sustainable urban transportation system, though based on set norms of planning and designing, requires the following structural and analytical changes:

1. All modes, including NMVs, should be included in the analysis.
2. The participation of public should be sought at the initial stage i.e needs of area study, at policy formulation stage regarding strategies, at the time of design of facilities and finally for evaluating the performance. Their participation will also be helpful in reducing the cultural prejudices against the inclusion of NMVs.
3. The policies selected should be such that they have the potential of reducing the share of single occupancy vehicles (SOV) and privatized vehicles or increasing the share of NMVs subsequently reducing the congestion and environment pollution.
4. Costs at macro level should include both the direct costs or sector costs and social costs.
5. All the subsidies - direct, indirect and cross (between sectors) are required to be analyzed, computed and included in the respective sector to which they apply. They should be recovered from the users of respective sectors.
6. A balancing of costs (public, private, direct or indirect) should be done against benefits relating to human beings (social benefits), economic and environment sector so as to achieve equity.
7. Though mobility has to be increased with the aim of decreasing travel time, the persons should be discouraged
to travel farther, suggesting other ways like, telecommuting, and should be encouraged to use NMVs for short distance commuting.

8. The land use development plan should be drafted in liaison with the transportation planning authorities, so that the various requirements and impacts are known at the start only and their impacts can be reduced.

9. The planning should base itself on the local availability of resources and skills. This will help in generating employment and will reduce investment and outflow of foreign exchange.

The above changes for the efficient, equitable and sustainable system will require the following:

1. **Defining Environment Threshold**: Defining and establishing the environment standards for all pollution, like, air (especially for CO, CO2, NOx, SO2, SPM) and for noise, which will work as Environment Thresholds (ET) above which no user is allowed to degrade the environment.

2. **Defining Environment Capacity Threshold**: Redefining the congestion, not on the basis of load taking capacity of the facility, but on the basis of the time which a facility takes after use in rejuvenating itself to be well below the environment standards. This may be termed as environment capacity and the capacity of the facility upto which, this is possible can be termed as Environment Congestion Threshold (ECT).

3. **Defining Environment Accessibility**: No social dislocation and degradation should be allowed to achieve mobility and time saving. The system should be available to all without any biases and should reduce the dependence on imported gasoline based vehicle. An Environment Accessibility (EA) should be defined which may consider the factors related to facility environment and the access environment along with the social saving met due to the shifts towards greener modes like, walk, bicycle and High Occupancy Vehicles (HOV).

4. **Cost Recovery Threshold**: Setting up of Cost Recovery Threshold (CRT) on the basis of ability of the users, especially poor and economically weaker sections, to pay the transport costs. This will spread the system costs and benefits equitably.

5. **Political Will**: A political will to resist the influence of motorized industry in the policy making and for encouraging the increased use of NMVs, especially for short distance commuting, like accessing transit facilities.

6. **Media Support**: A media support for spreading the merits of NMV use to masses, which can help in reducing the cultural resistance against the adoption of NMVs.

7. **Encouragement and Prioritization** of non or less polluting modes like NMVs and HOVs, which are more used by the poor and economically weaker sections and thus providing them access to employment and also of non transportation solutions of transportation problems.

8.0 Conclusions

The economically efficient, equitable and sustainable urban transportation planning can be achieved by switching from complete automobile dependence to multi-mode transportation system, including NMVs. The use of these modes can reduce the investment requirements from sixth to sixtieth fraction of motorized requirement. The external cost component if accounted may be found to be equivalent to some of the small economies of the developing countries. At the household level, the shift from automobile dependence to multi-mode dependence can save 44 percent of these costs, out of which one-third goes to the society and two-third to the user household. They provide more capacities at a very less cost as compared to automobiles. For deriving the various benefits of NMV use, various push and pull policies have been suggested. The basic emphasis has been on the provision of facilities, the restriction on automobile use and on devising land use development approach matching settlement patterns, community size and transport technology.

The overall sustainable transportation planning should take care of various issues and sustainable criterion, simultaneously. A policy framework has been discussed under the three heads i.e. regulatory policy, investment policy and enforcement policy. The main emphasis has been on the inclusion of non-motorized modes and public participation at each step of policy formulation, if possible. It points out the requirement of balancing of costs and elimination of subsidies. In the process it highlights the need of defining various thresholds, like, environment threshold, environment capacity threshold, environment congestion threshold, environment accessibility and cost recovery threshold. Along this it indicates that the use of media and NGOs can help in reducing the cultural resistance against NMVs. But all of this ultimately requires the 'political will' without which the success looks like a remote possibility.

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