

Parameters for the National Mission on Sustainable Habitat (NMSH) –
Report of the Sub-Committee on Urban Transport

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MANDATE

Under the National Action Plan for Climate Change, the National Mission on Sustainable Habitat has been launched to cover various aspects which inter alia include better urban planning and modal shift to public transport. Regarding Urban Transport, the objectives of the National Mission on Sustainable Habitat (NMSH) are “To address the issue of mitigating climate change by taking appropriate action with respect to the transport sector such as evolving integrated land use and transportation plans, achieving a modal shift from private to public mode of transportation, encouraging the use of non-motorised transport, improving fuel efficiency, and encouraging use of alternate fuels, etc. To evolve strategies for adaptation in terms of realignment and relocation, design standards and planning for roads, rail and other infrastructure to cope with warming and climate change”.

As a first step towards implementation of the Mission, MoUD has constituted a sub-committee for formulation of draft National Sustainable Habitat parameters on urban transport under the chairmanship Shri S.K Lohia, OSD (UT) and E.O. JS, MoUD. The terms of reference of this sub-committee is to propose National Sustainable Habitat parameters for urban transport that specially address the following:

- Development of Norms integrating measures related to Taxation, Parking and Congestion Charges, Public Carriage specifications and Service Norms to encourage public transportation.
- Development of norms for Pedestrianization /Cycling.
- Development of model regulations pertaining to registration of diesel propelled personal vehicles as per NSMH.

- Model Regulations for integrating Transport Planning (CMP) with Master Plans.
- Adoption of model regulations /norms by various States/UTs.

RATIONALE FOR NMSH PARAMETERS FOR URBAN TRANSPORT

The transport sector plays a crucial role in energy use and emission of GHGs. In 2004, transport energy use amounted to 26 per cent of world energy use and the transport sector was responsible for about 23 per cent of the GHG emissions (International Energy Agency, (IEA) 2006). The 1990-2002 growth rate of energy consumption in the transport sector was the highest among all the end-use sectors. Each gallon of gasoline when burnt, pumps 28 pounds of CO₂ into the atmosphere. In India, transport which includes road, rail, aviation and navigation has been a major contributor to GHG emissions. According to a report prepared by the Ministry of Environment and Forests (MoEF) in 1994, the transport sector was responsible for 12 per cent of the country's total energy related CO₂ emissions (i.e. 679.47 million tonnes of CO₂). Thus, it is necessary to initiate measures that, inter alia, help in reducing fossil fuel consumption and consequently GHG emissions.

Integrated Energy Policy (IEP,) 2006 states that no economic substitutes are obvious for the transport sector at least till 2031-32. Therefore, energy efficiency of vehicles, use of mass transport, pedestrianisation, cycling and transport demand management measures have to get high priority. Among transport sub sectors, road transport is the main source of CO₂ emissions which accounts for 90 per cent of total transport sector emissions. Considering this, the emphasis in this mission is mainly on measures to reduce emissions from operation of road transport. From an energy conservation perspective, public transport makes the most optimum use of the available road space and fuel by transporting the maximum number of people per unit of road space and

passenger kms/litre. Public transport causes less environmental damage in terms of air and noise pollution, optimization of road space, increased per unit throughput and reduction in traffic congestion, as compared to personal vehicles. Studies show that energy consumption in motorized individual passenger traffic is up to ten times as high as consumption in a well organized and demand-oriented public transport system. The same holds for green house gas emissions. A recent study of 52 cities, mainly in developed countries, shows a strong correlation between modal split in cities and emissions.

However, a rapid growth in motorization in most cities is causing the relative share of buses to decline. This is because of the following major factors:

- Poor quality of public transport service; although it is low cost, it is often overcrowded, dirty, unreliable, polluting and has security and safety issues.
- Poor access to bus services and service quality.
- Poor image of bus and public transport.
- Improper planning and provisioning of infrastructure facilities.
- Improper route planning, issue of permits without any survey or scientific data.
- Lack of multi modal integration and passenger information systems,
- Institutional and regulatory issues
- Lack of integration of land use and transport planning.

The transport sector GHG emissions are expected to soar if it follows the path of the highly motorised nations without integrated land-use transport policies in place.

This will require accelerated urban reform, improved urban structure (for example, to protect mass transit rights of way in the early stages of development) and urban road traffic (for example, to implement effective traffic restraint) together with innovative transport demand management and access and mobility planning to support the main social and economic activities that take place in a city.

The composition of vehicle population in India is skewed towards personal transport. The share of buses in all vehicles excluding trucks declined from 15.18 per cent in 1950-51 to 1.1 per cent in 2003-04 while the personalized mode of transportation has increased from 62 per cent in 1950-51 to 93.78 per cent in 2003-04. The bulk of increase is seen in two wheelers. India is expected to have a population of 236 million two wheelers in 2035 up from 35.8 million in 2005 which, reflects a large increase. This forecast for cars is likely to be exceeded with the availability of extremely affordable Rs.1 lakh car in the market from 2008-09.

The National Urban Transport Policy (NUTP 2006) has set the national guidelines for action framework for urban transport in cities. It has laid major emphasis on promoting investments in public transport in Indian cities as well as measures that make its use more attractive than in the past. Towards this end, the policy states that the central government would encourage all state capitals as well as other cities with a population of more than one million to start planning for high capacity public transport systems, and promote shift from personal modes of transportation to public modes of transportation. It provides for integrated land use and transport plans in cities, coordinated planning for urban transport, people oriented equitable allocation of road space, capital support in the form of equity participation and or viability gap funding, innovative financing, dedicated urban transport funds, non-motorised transport, car restraint measures, clean fuel and vehicle technology, private sector

participation, and pilot projects in cities to establish models of best practices. All these together define the ambit of the habitat Parameters for urban transport.

The habitat Parameters also take note of the ongoing reform based JNNURM programme that has been also designed to achieve the NUTP principles in the urban transport sector. This has created opportunities for institutional reforms for public transport management and implementation, non-motorised transport, reduction in vehicles miles traveled, and car restraint measures among others. India has also adopted integrated energy policy that establishes linkage between transport and energy. Also air quality management policies and emissions standards have created opportunities for clean and efficient transportation.

Indian cities in grip of rapid motorization face the challenge of meeting clean air targets to protect public health, strengthen energy security and mitigate climate impacts of growing motorization. This multiple burden of risks demands active and aggressive policy response. **The environmental imperatives of the national habitat Parameters for urban transport are as follows:**

- **Public health:** Some of the worst cases of outdoor air pollution are found in Indian cities. More than a half of Indian cities have critical levels of particulates, while a third have hopped from low to moderately high levels of nitrogen dioxides. Even medium and small sized towns and cities are witnessing phenomenal spurt in pollution as severe as or more than any mega city. Only a few mega cities where action has started show some improvement in air quality but in most cases the particulate levels are still unacceptably high.
- **Vehicles pose a special problem:** As vehicle emissions take place in the breathing zone of people, they contribute significantly to human exposure. The WHO, in its report of 2005, Health effects of transport-

related air pollution, weighed in that epidemiological evidence for the adverse health effects of exposure to transport-related air pollution is increasing that needs to be quantified. A large number of studies are now available that show exposure to vehicle exhaust causes significant increase in respiratory symptoms and lung function impairment, cancer and plethora of other ailments. Indian evidences have also begun to emerge. Roadside exposure is maximum that make walkers and cyclists the most vulnerable. Studies from Health Effect Institute show that people living and active upto 500 meters from road side are most vulnerable to vehicular pollution. In cities like Delhi as much as 55 per cent of the population lives in this influence zone. This combined with the fact that as much as a quarter to more than half of all trips in Indian cities is walk trips increase health risk for people.

- **Transport and energy security:** Transportation policies will have to address energy security challenge. Vehicles in India currently use up nearly half of petroleum products. The future increase in fuel consumption in the road transport sector will largely be driven by light-duty vehicles, mainly cars growing at an annual average growth of 10 per cent by 2030. Cars will burn up nearly the same amounts of total energy consumed by the entire transport sector today, even though heavy-duty vehicles will splurge the most. This is unaffordable as nearly 85 per cent of our crude oil needs will be imported at exorbitant rates by 2030.
- **Transport and climate:** Vehicles are also responsible for increasing heat trapping gases. Among all oil-consuming sectors, CO₂ emissions from transport are increasing at the fastest rate – at more than 6 per cent per annum. This is daunting for any national combat plan for climate. Planning for climate mitigation in the transport sector will have to be combined with adaptation strategies as well. Transport infrastructure and

design of cities are important to develop resilience of the transport infrastructure to fence against extreme climatic events. As we have seen how vulnerable the transport sector has been to extreme weather events like Mumbai flood. Similar issues were observed in Delhi during the rainy months of 2009. Mobility plans will have to reflect these new challenges and evaluate the impacts of climate vagaries on transportation systems and access, options for design adaptation and potential costs.

- **Equity and transportation planning:** The poor are not the minority but represent the majority in Indian cities. More than quarter of the urban population is poor based on what they spend and the bottom majority earns less than US\$1.8. Their access to transportation modes determines the diversity of livelihood choices in cities. Any kind of exclusion will not only enhance chronic urban poverty but will also undermine informal services that support city's economy and undermine economic growth. Equity therefore will have to be the defining parameter of transport planning and growth. Poor are more vulnerable to public health and climate impacts. Socio economic indicators to assess the impact of the evolving transportation regime on the urban poor and public transport users need to be integrated with transportation policies. More than half of the people living in a city do not drive cars are too poor, too young or old, disabled or just unwilling.

The travel pattern of the poor is intrinsically linked with the close urban form and is built around short trip distances that are walkable. If this is disturbed with urban sprawl then the transportation regime for the poor can become increasingly unaffordable, difficult, with the risk of limiting their livelihood options. Cities should be planned for the urban majority. This poses a serious equity challenge.

1.1 Approach needed

A multipronged approach is needed to ensure that the policy mandates of the NMSH are reflected in urban transport planning.

Increase access -- integrate land-use with transportation planning. People need to reach their destination with ease, but the degree of ease with which people gain access to different modes of transport to reach their destination with minimum environmental and health damages determine the sustainability of transportation regime in cities. If cities are compact with short travel trips and comfortable and dense network of walking, cycling and public transport, more people will chose to walk, bus or pedal. Most Indian cities are densely built with mixed land use that reduce journey distances, enable pedestrian traffic, and allow effective use of public transport. Studies show that more than 40 to 50 per cent of the daily trips in many of our cities have distances less than 5km – that are catered to by walking cycling, and low cost-high frequency para-transit. But neglect of these modes and non-motorised network, poor quality public transport is limiting the sustainable options for the urban majority as well.

Sprawl oriented land-use policies, density control are encouraging longer travel distances and locking up more emissions and fuel use as a rebound effect. Road engineering interventions once made cannot be changed easily but it will permanently decide the design of the network and influence travel choices of people. Road design must not increase dependence on and usage of personal vehicles. That is possible only if cities are built on the basis of well integrated public transport, walking, cycling and clean and fuel efficient vehicle technology. Cities should increase densification along transport corridors to bring close largest possible number of destinations to work, residence, schools,

public services, etc, to the public transport nodes and stations. But densification and mixed land use approaches will also require proper planning.

Focus on people not vehicles: Rapidly growing problem of mobility crisis can be solved only if cities are able to upscale the mobility solutions – extensive network of public transport, non-motorised transport and equally stringent measure to discourage personal vehicles. System design should focus on carrying maximum people not vehicles. This will require significant shift in policy approach and implementation strategies and demand enormous regulatory capacity in all cities of India.

Cities already have advantages in the current commuting practices. Indian cities still have high share of commuting trips -- anywhere between 16-57 per cent – as walk trips. Similarly, public transport carries more than half of commuting trips in many cities; The immediate policy thrust should be to protect this ridership and reverse the steady decline in these sustainable modes already noticed in cities. Indian cities will have to set targets to reverse these trends and increase the public transport share to at least 80 per cent.

Increase share of walking and cycling: Pedestrian and cycling policies are even more important today when cities are planning massive augmentation of public transport. Metro, bus rapid transit system, buses cannot work optimally if these are not supported with a good pedestrian network. Any attempt to improve the share of public transport will lead to correspondent increase in walking and roads will have to be planned with more walking space. Yet walkways are most ill designed, encroached and least protected. Wilbur Smith study for the Ministry of Urban Development has found that the percentage of the road with pedestrian footpaths runs hardly in 30 per cent in most cities. The current engineering guidelines for pedestrian facilities are old and inadequate. Similar fate awaits the bicycles that despite being prominent in many cities.

Increase public safety: Road accidents in the country claim more than 80,000 lives every year, mostly pedestrians, cyclists or pavement dwellers. The pedestrian's right to safe and free passage has become a casualty. A recent joint study of University of Michigan and Indian Institute of Technology, Delhi, shows that road traffic fatalities have been increasing at about 8 per cent annually for the last ten years. The National Urban Transport Policy acknowledges that cycling and walking have to share the same right of way with motorized modes and it increases risks. But these concerns are still neglected in road designs in most cities.

Prevent trade-offs between efficiency and toxic emissions: Public health and energy security goals cannot be met in cities if vehicles continue to meet poor emissions standards and are not subject to any fuel economy standards. Five to ten year lag in emissions standards, uncontrolled dieselization (with cheap and unclean diesel) can further aggravate public health and energy impacts. To reduce exposure to vehicular pollution emissions will have to be cut at source. And to cut energy use per unit of vehicles, fuel economy standards should be set.

Reduce dependence on personal vehicles and eliminate hidden subsidies: Personal vehicles occupy more road space, carry fewer people, pollute more, and edge out pedestrians, cyclists, and public transport. But the current policies perpetrates hidden subsidy to car usage as the cost of using up scarce and valuable urban space for circulation and parking and their harmful effect on environment are not recovered through proper pricing and taxes. Cars of personal use are under-taxed in Indian cities that incite more shift to personal modes. This trend will have to be reversed to promote usage of public transport and non-motorised transport.

Protect urban commons, green areas and open spaces: Transport infrastructure is devouring urban commons and green spaces affecting liveability of cities. For instance, in cities like Delhi road network has already used up 21 per cent of the urban space. The current demand for land for car parking is estimated to have locked up nearly 10 per cent of Delhi's urbanized area whereas forest area in Delhi is only 11 per cent. Erosion of urban commons and green lungs can seriously affect liveability of cities.

Thus the multi-dimensional policy goals can be addressed in cities only through a well integrated strategy with clear milestones, more appropriately defined policy tools and indicators, and empowered and unified institutions. Cities need more appropriately defined policy tools and indicators, and empowered and unified institutions. This regulatory shift is absolutely essential as massive investments have begun in urban and road infrastructures. As stated earlier, road engineering interventions once made cannot be changed easily but it will permanently decide the design of the network and influence travel choices of people. Road design must not increase dependence on and usage of personal vehicles. That is possible only if cities are built on the basis of public transport, walking cycling and clean and fuel efficient vehicle technology.

To make habitats sustainable, urban transport planning should lead to better natural environment, better social environment and improved accessibility.

- Increased access
- Increased sustainable mobility choices
- Increased public safety
- Increased public transport and NMT usage
- Reduced rates of vehicle-km travelled (VKT) and energy consumption

- Improve energy security and reduced greenhouse gas emissions
- Improved ambient air quality, reduce exposure to harmful pollutants & secure public health
- Preservation of farmland and open space
- Improved equity in growth

PRINCIPLES FOR NMHS PARAMETERS

Based on the postulates of the NMSH and the NUTP the following 8 primary principles to ensure a sustainable approach in urban transport Planning for the country have been structured:

1. **Walk:** Develop neighbourhoods that promote walking.
2. **Cycle:** Prioritize cycle networks.
3. **Connect:** Create dense networks of streets and paths.
4. **Transit:** Support high quality transit.
5. **Density, Diversity and Compactness:** Optimize density and match transit capacity; Create compact regions with short commutes.
6. **Shift:** Shift from unsustainable mobility to sustainable modes by using technology, regulating road use, parking and fiscal measures.
7. **Urban Transport Fund:** Institutionalise fiscal and funding mechanisms to ensure financial sustainability of investments in public transport and non-motorised transport.
8. **Impact Assessment:** evaluation and assessment measures to effectively measure impacts of urban transport policies and projects.

1.2 Walk: Develop neighbourhoods that promote walking

Walking is the most universal form of transport. All trips, especially public transport trips, begin and end with walk trips, however short or long they may be. Walking is a zero-emission mode of transport that needs to be the primary focus of a sustainable habitat policy. The primary goals of this principle are

- Emphasize pedestrian safety, comfort and convenience on all streets, old and new.
- Encourage street-level activity and create places to relax.
- Create a living environment that promotes a walk + transit based lifestyle.

Walking needs emphasis because:

- **Walking is a critical for success of public transport:** Each public transport trip requires two walk trips. If investments made in developing high quality public transport systems are to be efficiently utilized, pedestrian access to public transport has to be prioritized. Good walking environment encourages people to walk longer to reach public transport. This enhances the feasibility of mass rapid transit like BRT and Metro Rail. Pedestrian connections play a fundamental role of modal integration. Footpaths form important linkage needed for effective transfers between different modes of public transport.
- **Walking will reduce vehicle use for short distance commuting:** A significant number of trips are short distance trips that are under 3km. These include trips to access essential services like education, local shopping, leisure trips within neighbourhoods and job centres. Good pedestrian facilities with appropriate design based on weather conditions reduce dependence on motor-vehicles for such short trips.

- **Walking and urban poor:** India's urban poor are too poor to even afford a bus ride for daily commuting. Often the only option for them is to walk. Many others are captive public transport/para transit users who are dependent on walk to access public transport. This poses a serious equity challenge. Mobility of more than half of the people in all of our cities can be severely compromised if walkways lose viability.
- **Walking enhances urbanity, lifestyle, and health:** The World Health Organization (WHO) is now making an explicit link between walking and health status of the community. Walking for at least 30min each day reduces health risks associated with sedentary lifestyle. Streets bind people and communities. Walking is the best way of enjoying street level activity. This is why high streets across the world have great walking environment to encourage economic activity.
- **Walking demands safe environment:** Road injuries/fatalities are not accidents (unfortunate incident that happens unexpectedly and unintentionally) but the results of individual and institutional negligence and, primarily, of a system of neglect of vulnerable users. Mobility networks need to be built in a way that people are able to move around cities freely without the risks of being killed incidentally. It is a harrowing experience to walk in an Indian city. Road crashes in the country claim more than 118,000¹ lives every year, mostly pedestrians, cyclists or pavement dwellers. The pedestrian's right to safe and free passage has become a casualty.

1 Accidental Deaths & Suicides in India – 2009, National crime records bureau, Ministry of Home Affairs, Government of India

1.2.1 Walkability Parameters

1.2.1.1 *For pedestrian safety, comfort and convenience on all streets:*

- Street design must facilitate pedestrians to remain at ground level with comfortable and safe access and minimum detours from the most direct path.
- A continuous unobstructed footpath on each side of all streets with ROW wider than 12m. Minimum width of footpath shall be 2m in addition to space for trees/greenery/vending spaces and surface utilities. Width of footpath shall be determined based on pedestrian volume and have to be wider than 2m wherever required.
- Intermittent buffers, bollards and other physical elements should be used to protect footpaths from encroachment by motor vehicle parking. However, such elements should not form a barrier, such as continuous railings, that constrain access to pedestrians. Active enforcement is required to protect encroachment of footpaths.
- At least 125 trees per km for streets with ROW smaller than 12m. At least 125 trees per km per footpath on streets with ROW greater than 12m. Spacing of trees at no place should be greater than 12m except at intersections.
- On streets with ROW of 18m or less, if pedestrian traffic is greater than 8000 per hour in both directions together, the entire ROW should be notified for pedestrianization. Streets may be considered for pedestrianization even if pedestrian traffic is lower than 8000 per hour depending on the potential to improve economic activity and/or safety and convenience.

- Elevation over the carriageway at all times should be <150 mm and adequate cross slope for storm water runoff. The elevation should be low enough for pedestrians to step onto and off of the footpath easily.
- All pedestrian facilities should be barrier free for universal access by all persons with reduced mobility including those with hearing and visual impairments.
- At least 5 safe street-level crossing opportunities per kilometer of street with 250m being maximum spacing between two crossings. Depending on context, these crossings may be signalized and/or traffic calmed (through raising crosswalk over street level by 150mm) to reduce vehicular speed.
- Pedestrian refuge with a minimum width of 1m at each street crossing location after crossing 7m of one way motor vehicle carriageway or 10m of two way motor vehicle carriageway at non signalized mid-block crossings. Pedestrian refuge width may be expanded to 1.75m where possible to accommodate a bicycle.
- If separated by heavy traffic roads appropriate and safe surface level crossings should be provided. Grade separated structures (foot-over-bridges and pedestrian-subways) should be avoided to prevent unnecessary detours to reach destinations.
- Limit speed on urban arterial roads and sub-arterial streets to 50kmph and on collector and local streets to 30kmph. Street design should be used as a means of limiting speed where possible aided by enforcement in the case of higher speed limit.

- Traffic calming of all streets with ROW of 12m or less through narrowing of driveway and meandering path with use of trees, islands and street furniture. Speed should be limited to 20km/hr by design.
- Highways within urban areas should be avoided since they disrupt pedestrian activity and disconnect neighbourhoods. Where present in core areas, they must be considered urban arterial streets and designed as per Standard Guidelines for Urban Streets (UTTIPEC, DDA, Delhi).
- If grade-separated pedestrian crossings are unavoidable due to presence of highways in peripheral zones of urban areas, then such crossings structures should be frequent. There must be at least 4 crossing opportunities per kilometer in areas with development at edges. Every crossing should be universally accessible.
- Final road level should be fixed for all streets in the city. When repaving roads, previous layers must be scraped such that final road level remains the same. Footpath level should never be more than 150mm above adjoining carriageway level.

1.2.1.2 To create active streets for pedestrian security and enjoyment

- Primary pedestrian access for buildings from the main street, with location as per shortest walking distance from nearest bus-stop. Vehicular / service access should be from secondary street wherever access to building is possible from multiple streets.
- The main building facade should face the street, located on the property line without setback or with active use within set back and transparent edge that contribute to street safety. Commercial frontages

should have facades with minimum 50% transparency (untinted) to facilitate visual surveillance of streets.

- Compound walls, if present, should be transparent above a height of 100cm. High security government buildings may apply for exemption.
- Vending spaces should be marked in addition and adjacent to the walking path, especially along high pedestrian volume areas to activate the street and make it safe. Space to be planned for utilities including drinking water kiosks and toilets so that the walking space is enhanced but not compromised.

1.2.2 Indicators for Measurement

- Adoption of urban street design standards for the metropolitan area that include safe pedestrian infrastructure design standards.
- Total length of 12+ m streets with unobstructed footpaths as a percentage of the total length of streets in the city.
- % of length of streets smaller 12m ROW with at least 125 trees per km.
- % of length of streets wider than 12m ROW with at least 125 trees per km per footpath for which they provide continuous shade.
- % of streets with total carriageway >10m which have 5 or more traffic calmed or signalized crossings per km.
- % of intersections that have pedestrian crossings and refuges in all directions.

1.2.3 Methods

- Emphasize pedestrian safety, comfort and convenience through design of all transportation and urban planning/ urban design projects. (ULB Public Works/Civil Engineering Department).
- Encourage street-level activity and create places to relax (ULB Town Planning Department, ULB Building Approvals Department, ULB Public Works/Civil Engineering Department)
- Device retrofitting and redevelopment strategies to attain these goals. Create dedicated institutions for implementation, monitoring and auditing.
- Limit speed on sub-arterial and local streets to permissible levels through physical design. Enforcement of speed limit where limit is more than 30kmph through active enforcement.
- Restrict private vehicle oriented infrastructure investments to improve overall ambient air quality for pedestrians.
- Pedestrian plans should be made mandatory and conditional to infrastructure funding in cities.
- Approval and clearance of all road projects should make adherence to pedestrian guidelines mandatory: The Parameters to prioritise the provision of pedestrian, cycling and public transport infrastructure should be made the basis of approving road projects.
- Approving agencies will have to standardise formats for submission of project details and make it available for public scrutiny.
- Road safety audits as per standards are needed at different stages – preliminary design stage; post completion of preliminary design; de-

tailed engineering design on a per km basis; construction stage; and pre-opening stage.

- Walkways and multi-modal integration: Management of the ‘last mile,’ that is mostly a walk trip, facilitates transfers from origin to public transport nodes. Without such facilities public transport systems will function at a sub-optimal level.
- Zero tolerance policy for road casualties: Pedestrianisation cannot work if the modal conflict between pedestrians and motorized traffic is not minimized. Only this can enhance safety and walkability. Also city authorities should have powers to restrict traffic volume in targeted areas at peak time.
- Harmonise laws to protect pedestrians: Indian cities need a comprehensive road users act. The state governments in consultation with the union government should initiate a process for enactment of a legislation that will comprehensively address targeted pedestrianisation, mandatory implementation of important engineering guidelines for walkways, traffic volume reduction measures, improvement of street scape, maintaining the integrity of the pedestrian pathways and strongly enforcing penalty on motorists for encroaching into pedestrian space and otherwise violating pedestrian and rights.

1.3 Cycle: Prioritize cycle networks

Cycling has several benefits to the individual, to the environment, and to cities and can be a major contributor to making urbanization sustainable in our cities.

After walk, cycle is the second most accessible mode of transport for urban poor. Urban middle class and rich are discouraged from cycling because it is perceived as being uncomfortable, dangerous, and low in status. These issues can be countered by

- Design and management of streets that emphasize cyclist safety, comfort and convenience
- Provision of secure parking for cycles at transit stations, all public spaces, and commercial & institutional buildings.
- Promotion, implementation and effective management of public cycle sharing schemes

Further, it is essential to promote and facilitate the use of non-motorized vehicles (rickshaws and hand carts), passenger, freight, and vending, across the city.

Cycling should be encouraged because:

Reach and effectiveness of Public Transport can be improved: Since cycling as a feeder mode can be 3 to 4 times faster than walking, the catchment area of public transport stops thus can become 9 to 16 times larger. By smart planning one can build an integrated cycling and public transport system.

Cycling can counter congestion: In urban conditions, bicycles use between a third to fifth of the space occupied by a motor-car. Attractive cycling conditions will help to moderate people's aspirations to own and use a private car and current car owners may be tempted to substitute a part of their trips by bicycles.

Cycling can improve road safety: Arguably, cyclists are vulnerable road users. But enhancing the cycling conditions, including taking measures to mitigate the number and speed of motor vehicles and to reduce risk at intersections,

combined with a substantial increase of bicycle use will improve cyclists' road safety. 'Cycling promotion' and 'improving road safety' can result in a self-reinforcing interaction of these two policies; the so-called 'safety by numbers' effect.

Cycling can make cities more attractive. Cycling is often a preferred mode to enjoy the city, especially by tourists. The slower pace than motor vehicles and ease with which one can stop and start allows people to enjoy various facets of the city. The promotion of cycling can help in a paradigm shift from motor-vehicle oriented to people oriented transport planning.

Cycling contributes to improving air quality and mitigating climate change: Motorized trips contribute substantially to air quality problems (like SO₂, NO_x, PM) and the climate problem (CO₂). Higher use of bicycles will result in reduced pollution and climate change, thereby providing better living environment for all.

Noise reduction. Motorized transport is also the cause of the noisy environment in large parts of our cities and it remains worthwhile to try and prevent this problem by promoting the use of non motorized modes of transport like cycling, and measures to discourage and restrict car use in sensitive urban areas.

Improved physical health. One of the (many) downsides of motorized transport is its enhancement of a sedentary lifestyle. Cycling commuters have (on average) a substantial better physical health than commuters using other modes².

² According to a Lancet study "Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport" by James Woodcock, Prof. Mohan and Dr. Tiwari, 2009, shifting to more active travel modes by 2030 would decrease the burden of heart diseases by 25%, diabetes by 17%, road fatalities by 69% and depression by 7% in the city of Delhi.

1.3.1 Parameters

- Dedicated and physically segregated bicycle tracks with width of 2m or more, one in each direction, should be provided on all streets with total motor vehicle carriageway larger than 10m (not ROW) after providing adequately sized footpaths in each direction based on pedestrian traffic.
- Streets with motor vehicle carriageway smaller than 10m (not ROW) need not have cycle tracks but should be traffic calmed through design (maximum motor-vehicle speed under 30 km/h) for safe cycling.
- At least 5 safe street crossing per km for bicycles with spacing between two crossings not more than 250m.
- Citywide cycle network of segregated lanes or traffic calmed streets that provides access to at least 80% of built plots (should tend to 100%).
- At least one cycle sharing system with $\geq 5,000$ cycles and automated payment in cities with a population of over 5 lakhs (benchmark census year 2011). Ridership of the system should be in excess of 1000 trips per bicycle per year.
- Elevation of segregated cycle track above the carriageway (e.g. <150 mm) that allows for storm water runoff.

1.3.2 Indicators for measurement

- Adoption of urban street design standards for the metropolitan area that include safe cycle (and cycle-rickshaw, if present) infrastructure design standards.

- % of total length of streets with motor vehicle carriageway of 10 m and more that have dedicated and segregated cycle tracks
- % of total length of streets with motor-vehicle carriageway of 10 m or more, equipped with cycle tracks to standards.
- % of total length of streets with at least 5 safe street crossing per km for bicycles with spacing between two crossings not more than 250m.
- Presence of at least one functioning bicycle sharing system with more than 5000 bicycles with at 1000 trips per bicycle per year if city population is larger than 5 lakhs.
- % of built plots accessible through citywide cycle network of segregated lanes or traffic calmed streets

1.3.3 Methods:

To ensure that we retain and increase the modal shares of cycling we need to:

- Establish a dedicated unit for planning and audit of NMT facilities under UMTAs and urban local bodies. It should have the power to direct the implementation side engineering team of the urban local body.
- Design streets that emphasize cyclist safety, comfort and convenience
- Provide secure parking for cycles at transit stations, all public spaces, and commercial and institutional buildings.
- Promote, implement and continue promotion of public cycle sharing schemes
- Promote and facilitate use of non-motorized vehicles (rickshaws and hand carts), passenger as well as freight, across the city.

1.4 Connect: Create dense networks of streets and paths

Indian cities, like most old cities in the world, were created with a dense network of streets that allowed excellent connectivity for pedestrians and cyclists. The average block surrounded by public access streets was under 1 hectare with block circumference of 400m or less. As cities grow and development happens at a frantic pace, the urban fabric in the periphery and suburbs of Indian cities, especially direct connectivity, is deteriorating very fast. Routes are getting circuitous for pedestrians and cyclists as well as motorized vehicles because of widely spaced streets that have poor interconnections.

- Public transport usage, especially in new growth areas, is greatly reduced because of poor access by walk.
- Cycle trips length increases for no increase in physical distance between two points thereby discouraging cycling for what could have been a short commute.
- People prefer motor vehicles because of the above reasons.
- The sparsely spaced streets, wide as they might be, are getting overloaded with traffic because of lack of alternate routes and dependence on motor vehicles.

There is a need to retain the fabric of core of our cities while we expand our cities due to growth in population. The goal of this principle is to:

- Create dense street networks that are highly permeable to pedestrians, bicycles and public transport

- Create pedestrian-priority streets with optimum ROW to encourage non-motorized travel
- Disperse high traffic volumes over multiple parallel human-scale streets rather than concentrating traffic on fewer major arterial streets

1.4.1 Parameters

- Area of blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 ha. In existing built-up areas, statutory planning to be done for breaking up blocks with an area of more than 2 Ha, to provide publicly accessible pedestrian thoroughfare.
- No new development allowed until local street grid is put in place which subdivides land into blocks of no more than 2 Ha.
- Vehicle access network should be set on a grid with no side exceeding (C/C) 250m with additional public access pedestrian thoroughfares cutting through the block, where possible.
- No urban streets with one way undivided motor vehicle carriageway width of over 10m

1.4.2 Indicators for Measurement

- Number of intersections of public pedestrian and cyclist network per square kilometre. Benchmark is at least 50 intersections per square km
- Existence of statutory provision for creating public access through large blocks
- % of street with carriageway width for one way motor-vehicle traffic of over 10m

1.5 Transit: Support high quality transit

Public transit can offer rapid and affordable mobility for all, especially in large cities. At present, most Indian cities have half or more of all motorized trips by a combination of public transport and para transit. With growing incomes and deteriorating quality of public transport, people are shifting to private motor vehicles. The increase in private motor vehicles, while improving individual comfort and mobility, ends up causing congestion and pollution, ironically diminishing collective quality of life in the city.

The only solution for the rapid and efficient mobility for all is to create high quality public transportation. The goal of this principle is

- Ensure frequent, fast, reliable and affordable public transport network across the city.
- Minimize the number of transfers needed for most passengers. Provide an integrated multi-modal system and ensure seamless integration at the physical infrastructure, information and fare levels.
- Prioritize integration of public transport, para transit and NMT modes over private modes.
- Wherever possible, locate public transport stations, homes, jobs and services within walking distance of each other
- Maximize public transport capacity in developed areas and along growth corridors

In cities across the world, buses form the primary mode of public transport, even where extensive rail systems exist. Buses are flexible and can reach closer to the residences as well as places of work, education, shopping and recreation.

Bus service can become inefficient when stuck in traffic. High demand corridors (>2000 passengers per hour per direction) should be converted into high-quality Bus Rapid Transit System (BRTS) corridors as part of a city wide network. Rail systems, such as Metro Rail, should be considered only when present demand is more than 15000 passengers per hour per direction and future demand is forecast to go beyond 30000 passengers per hour per direction.

1.5.1 Parameters

1.5.1.1 For Access

- High quality and high frequency rapid public transport within 800m (10-15 minute walking distance) of all residences in areas over 175 persons / ha of built area (* refer to service level benchmarks for urban transport).
- Facilitation of access to para-transit within 300m walking distance.
- One or more high capacity, high speed transit corridor with dedicated transit lines within walking distance for 80 per cent of the population (* refer for details to 'Approach to funding and structuring mass rapid transit systems mode choices, 12th 5year plan working group')
- Deploy public bus service where present demand for public transport on any given corridor is greater than 1000 passengers per hour per direction.
- Create Bus Rapid Transit System where demand (existing or potential for base year) is greater than 4000 passengers per hour per direction³. Develop modular design for growth in demand. Bus Rapid Transit Systems can be designed for up to a demand of 45000 passengers per hour per direction.

³ Bus Rapid Transit System should be considered for demand greater than 2000 passengers per hour per direction

- Develop metro rail system only if demand (existing or potential for base year) exceeds 15000 passengers per hour per direction on given corridor.
- All public facilities (institutional/ educational/ cultural etc) should be accessible by public transport within 400m walking distance

1.5.1.2 For Integration

- All public transport nodes (intersection of two public transit corridors/routes) should accommodate para-transit facilities. Inter modal integration of formal public transport, para transit and cycle sharing should be within 200m from each other.
- All public transport modes (including para transit and cycle sharing) to have integrated fare collection and passenger information.
- Share of formal and informal public transport and NMT (excluding walk) shall be 80% of all vehicular trips.

1.5.2 Indicators for Measurement

- % of residents within 800m (10 minute walking distance) of high quality public transport stations
- Ridership statistics for public transport
- % mode share of public transport and para transit versus private vehicles
- % of buses that adhere to Urban Bus Specification
- % of stops with frequency of service >15 buses per hour (* refer SLB for public transport)

1.6 Density, Diversity and Compactness

“Higher the density, lower is the per capita infrastructure cost” – This is an important urban development mantra to remember for the lower income countries urbanizing at a fast rate. Low urban densities tend to go together with a high level of reliance on private cars and with low roles for public transport, walking and cycling.

High density offers the opportunity for average trip lengths to be short and to promote a high level of accessibility for non-motorized modes of transport, to foster successful, economically viable public transport, and to enable cities to have low levels of energy use per person in transport.

High density alone does however not guarantee the success of public transport. To realize the potential of public transport in dense and compact cities Transit Oriented Development needs to be consciously incorporated in city planning.

Transit-Oriented Development (TOD) is generally characterized by compact, mixed use development near new or existing public transportation infrastructure that provides housing, employment, entertainment and civic functions within walking distance of transit. Pedestrian-oriented design features of TODs are essential to encourage residents and workers to drive their cars less and ride public transit more. TOD can also be a significant source of non-farebox revenue for the participating transport agency.

The goals of this set of principles are

- Provide easy, convenient and fast public transport access to the maximum number of people through densification and enhanced connectivity. To facilitate this, highest possible densities (as per context) and enhanced

street connectivity networks should be planned around transit stations/
Stops.

- Maximize transit systems capacities, reliability and accessibility.
- development density should be matched to the carrying capacity of the maximized transit + NMT System, car traffic capacity excluded from the calculation.
- Preservation, reuse and infill of existing areas balanced with dense areas of new growth should be used to create compact regions.
- An optimal mix of housing, commercial uses, incomes and services should be planned at the neighbourhood level
- a variety of parks and public spaces should be provided
- The hierarchy and intensity of mixed use should be planned based on Street Hierarchy and Level of Public Transport Service.
- New development should occur in areas adjacent to and within existing urbanized areas.
- Development patterns should be matched with sustainable transport options to minimize commuting times and distances.
- New FSI allowances above current caps can be taxed or otherwise monetized to fund infrastructure while increased future property taxes could fund operation and maintenance of the systems.

1.6.1 Parameters

1.6.1.1 For *Densification*

- Maximize inhabitant densities, through increase in permissible FSI where appropriate, within 800m (5-minute trip by bicycle) of a transit station, to match the area's peak commute transit + NMT capacity (For mix of use & income, refer Mixed Use Section)
- 175 persons per Ha of developed area should be treated as a minimum standard for an urban density that begins to be transit supportive. If higher densities than are desired within the 800m transit catchment, densification strategies should be holistically evaluated and planned for, based on local need and context.
- In case FSI bonuses are used as a TOD tool, they must specify minimum Density requirements with a desirable mix of uses as well as residential unit types and sizes, in order to ensure the required densities and desirable mix of incomes/uses.
- High intensity land uses such as office towers, apartments and large commercial establishments should only be located where direct access to high-quality transit services is available.

1.6.1.2 For *Diversity (mixed land use)*

- 95% of residences should have daily needs retail, parks, primary schools and recreational areas accessible within 400m walking distance.
- 95% residences should have access to employment and public and institutional services by public transport or bicycle or walk or combination of two or more.

- At least 85% of all streets in the city have mixed use development.
- Through policy, design and monitoring mechanisms, at least 20% of all residential units to be occupied by economical weaker sections in each Transit Oriented Development Zone 800m from Transit Stations (5-minute trip by bicycle distance).
- At least 30% residential and 30% commercial/institutional in every TOD Zone within 800m of Transit Stations (5-minute trip by bicycle).

1.6.1.3 For Compactness

- Development Plans (and their revisions) to always ensure that 2/3rds of the projected growth in population of metropolitan region is housed within existing developed lands. Enhance capacity of transport as well as non-transport utilities.
- Densification through redevelopment/ infill of existing Urban Areas is to be prioritized over urban expansion through acquisition or opening of land for development in peripheral sub-urban /agricultural /environmentally sensitive lands.
- New development in peripheral zone should be allowed only if it abuts existing developed areas with density of 175 inhabitants/Ha.
- Metropolitan region should be notified as 6 times the area of core city area (with developed lands with density of 175 inhabitants/Ha) in case of land bound cities and 4 times in case of coastal cities. Metropolitan region boundary should be redefined after every five years based on development patterns.

1.6.2 Indicators for measurement

- Percentage of population living at densities greater than 175 Persons per Hectare (* refer SLB for urban transport).
- Ratio of transit area density versus density elsewhere
- Percentage of developed versus undeveloped land within the development area boundary
- percentage of land area zoned for mixed use that specifically combines residential land use with commercial, institutional, or other public land uses
- percentage of residential parcels that are located within 400m from at least 1 public open recreational facility
- Per capita green/open space provision within existing development
- Percentage of public amenities within a 400m radius of high quality public transport
- Percentage of residents with satisfactory neighbourhood shopping within 400m travel distance
- Percentage of residents with at least two schools within 2km travel distance.

1.6.3 Methods:

To ensure Density, Diversity and Compactness of all Transit Oriented Developments, we need to:

- Have UMTA work integrally and in complete coordination with the Planning Authorities and ULBs of the city to ensure that

transportation, landuse and infrastructure planning and investments are coordinated and implemented in an integrated way.

- GIS databases for the city should be utilized for TOD planning if available. Dynamic Landuse-Transport models for the city may be developed to test various scenarios for growth and civic investments.
- A matrix of TOD implementation tools based on city type and local context need to be developed. Strategies should enable adequate customization at the Local Planning level by implementing municipalities, without compromising the principles of Transit Orientated Development. For effective TOD, high density is more important than increased FSI, the latter being a tool that can be used for redevelopment of low density neighbourhoods existing along transit stations.

1.7 Shift: Shift to sustainable modes by using technology, regulating road use, parking and fiscal measures

The terminology of “Shift” comes from the “avoid-shift-improve” approach which is a globally accepted set of instruments to combat the transport impact on the environment. The “shift” instrument seeks to improve trip efficiency by advocating a modal shift from the most energy consuming mode (cars) towards more environmentally friendly modes like public transport and non-motorized transport. This can be achieved by a putting together a series of disincentives for car use, both spatial (like parking control) and fiscal (like levies on car and fuels and their use – congestion charging – etc); and incentives for use of public transport – again both spatial and fiscal.

Globally, cities are combining good public transport with direct disincentives for personal vehicles usage to reduce pollution, and free up road space. Cities are charging for parking, adding high premium to car ownership; increasing dues on cars for entering busy areas; only allowing a fraction of them on roads at a time; or just not allowing them in the city centre. They are also giving people more options to cars. People are more sensitive to the direct cost of driving and this forces them to take decision to reduce car usage and move to alternatives. Parking controls, parking pricing along with well designed taxes are effectively used as the first generation disincentives.

The goals of this principle are to

- Disincentivize private motor vehicle use, especially during peak hours.
- Incentivize use of public transport, para transit and NMT modes.
- Limit and price parking to discourage driving in high density/intensity urban areas
- Adjust car use fees by time of day and density of destination area
- Use network and time based congestion tax as a means of controlling number of vehicles on streets and accomplish free flow of traffic, thereby reducing emissions.
- Use tax measures to disincentivise private modes and tap revenue for creation of UTF
- Use UTF for subsidizing public transport and promoting NMT use.

- Use technology (ITS) for demand management and efficient implementation/enforcement of above measures as well as capturing data for further planning.

1.7.1 Parking policy for reducing travel demand

Parking Management strategies are aimed at encouraging more efficient use of existing parking facilities, reduce parking demand and shift travel to HOV modes. Smart management of parking helps to ensure access to local businesses, and provides access for visitors to regional and neighbourhood attractions without encroachment on valuable public spaces. The provision of parking for personal motorized vehicles cannot be considered as a matter of public good. Individual user of personal vehicle should pay for the use of the space for parking. Parking facilities – underground, surface, and multilevel parking – are provided at an enormous cost. This uses up a lot of public money and cheap/free lands. If the public agencies are responsible for funding these structures or providing land as part of their share in a public-private partnership, this will amount to subsidy for the rich car users. This is against the principle of equity. Therefore, the ‘user pays’ principle should govern the pricing of parking.

- Parking is a consumer commodity, not a legal right. Private Vehicle must be parked on ‘a fully-paid owned or rented’ space. No subsidized parking is to be provided in public spaces. User must pay full cost of parking facility based on land opportunity cost, capital cost, O&M costs and temporal demand.
- Parking Management is to be used as a demand management tool – to decrease use of private vehicles and thus reduce overall demand of parking, and shift travel to public transport, para-transport & non-motorized modes.

- Spaces already designated for parking must be utilized to highest efficiency and financial viability. New parking facilities may be developed as a multi-use shared amenity, to increase efficiency in use of space, time and finances.
- To ensure accessibility to maximum number of people, parking for para-transport / feeder modes/ NMT is to be prioritized and subsidized. In areas designated for private parking, short term parkers must be prioritized over long-term parkers, in order to maximize turnover and enable economic vibrancy.

1.7.2 Parameters

- Eliminate long-term street parking to ease congestion
- Limit off-street parking ratios in job centres with access to public transport to 0.2 spaces per worker
- Remove all parking-space minimums for residential buildings and establish citywide parking-space maximums consistent with targets for private car use.
- Institute a congestion-management system that limits car use in key urban and employment districts at peak traffic hours
- Charge tolls for use of overloaded roads and bridges and use this toll fee collection to support public transport.
- All commercial areas need parking charges by time of day and location to ensure high turnover.

1.7.3 Indicators of Measurement

- Percentage of on-street parking that is charged (should tend to 100%)
- Average off-street parking requirement for an average residential unit (should tend to 0%)
- Ratio of parking required within 1km of a transit node versus all other areas
- Number of on-street parking spaces converted to public transport and NMT
- Number of cars parked in a manner that encroaches on standard footpaths

1.7.4 Methods for Parking Strategy as a Modal-Shift measure

To implement Parking Management as a TDM and modal shift Strategy, a 3 tier Parking Management strategy:

Tier I: Design-based Parking Management Strategies:

- Reclaim street space, especially footpaths and cycle-tracks, from car parking for other needed public uses such as cycling lanes, cycle-rickshaw stands, para-transport/TSR stands, widened sidewalks, hawker zones or multi-utility zones.
- Differentially provide for “Short-Term” and “Long term” Parking of private modes, including private buses, cars, 2-wheelers, cycles, etc.
- Parking and Pedestrianization to go hand in hand – provide “Park Once-and-Walk”/ “Park Once and Ride”/ Shared Parking facilities in busy areas.

- Provide “Short-Term” and “Long term” parking for Public Transport, Para-transport and Freight vehicles, including the following:
- Curb Spillover Parking of large commercial or public facilities.
- Unbundling of Parking and Provision of Shared Facilities in all new developments or redevelopment areas or areas where infill is possible.
- Mandatory % of cycles, 2-wheelers and shuttle buses to be part of ECS requirements for all private and public development projects.
- Park-and-Ride Facilities for private modes ONLY at Terminal MRTS Stations or major Multimodal Interchanges, but not at other stations.

Tier II: Pricing-based Parking Management Strategies:

- True Pricing of Parking to be charged on a ‘user pays’ principle.
- Variable Time-based Pricing, as per market demand
- Parking Management District concept may be implemented.
- Curb Spillover Parking Impact.
- Unbundling of Parking Costs from Properties and provision of consolidated shared parking options.
- Coordinated Off-Street and On-Street Pricing (customized to commercial and residential areas).
- Strict penalty for violation of parking regulations and walkway encroachment.

Tier III: TOD-based Parking Management Strategies:

- Provide parking caps in TOD Zones based on walking and cycling distance from MRTS Stations. This is in addition to the overall pricing criteria to be implemented as part of Tier-II Strategies.
- Substantially replace ECS with cycle, para-transport and HOV parking in high PTAL zones
- Cycle, para-transport and HOV Parking to be mandated as part of ECS requirements.
- Enlist non-permissible uses within the TOD zones – that are car-dependent and non-ridership generating, consume large amounts of land, result in extremely low density development, or create environments that are “unfriendly” to pedestrians.
- Encourage transit supportive uses near stations, which are high pedestrian generators that directly promote greater transit ridership and opportunities for multi-purpose trips.
- Shared Parking Facility Standards
- All TIER-I and TIER-II Strategies continue to apply in TOD Zones
- Incentivize Employer Based TDM Strategies
- Part of the earnings/revenue from parking to be ploughed back for public transport and NMT improvement.

1.8 Urban Transport Fund

The creation of a dedicated Urban Transport Fund (UTF) is an important reform proposed by the MoUD to make transport investments sustainable and use levies on private vehicles to subsidise public transport and non-motorised

transport. The following issues should be kept in mind in the structuring of the UTF.

- Urban transport financial resources should be pooled within an urban transport fund administered by the strategic transport authority at the municipal or metropolitan level.
- Financing arrangements might be structured to secure more effective integration both within the sector and between sectors.
- Private sector financing for transport infrastructure should be raised through competitive tendering of concessions that may be supported by public contributions as long as these have been subject to proper cost benefit analysis.
- Intergovernmental transfers should normally be made to the fund and should be structured in such a way as to avoid distorting the efficient allocation of resources within the transport sector at the local level.
- When allocating funds to urban transport, the relationship between transport policy and other sector policies, in particular housing, should be borne in mind.

1.8.1 Fiscal measures and UTF

Public transport crisis is getting further accentuated because of limited public finance to support it. Financing public transport remains a problem largely because cost recoveries are a challenge. A large part of the public transport is state funded though private investments in transport sector have also begun. But there is need for a strategic framework to enable the project to remain remunerative while meeting the social objectives. There is need for schemes that automatically earmarks tax proceeds for public transport. Otherwise,

sustained predictable financing of public transport becomes difficult. Even though many city governments have agreed to cost sharing arrangements with the private players, challenges remain. The subsidy burden to recover the cost of investments and operations has increased for the state governments.

It is important that the city governments actively find ways of forming public transport funds. But the fiscal measures will have to work on the principle of travel demand management principle that helps to reduce dependence on personal vehicles and also reduces vehicle kilometers traveled. Cities therefore, need a mix of fiscal measures to support public transport. There needs to be a clear policy to prioritize transportation investments into PT, IPT & NMT, and not in infrastructure for private modes.

- **Minimize taxation on public passenger transport vehicles and substantially increase on private vehicles:** Instead of encouraging bus transport with fiscal measures city governments impose higher taxes on buses compared to cars. It is often cheaper to travel in a two-wheeler than a bus. A 2004 World Bank study confirms higher tax burden on buses across the country. The total tax burden per vehicle km is 2.6 times higher for public transport buses than cars in India. At a time when city governments are scaling up investments in buses reducing or exempting taxes can help to lower both capital and operational costs bus transport.

Cities should increase the taxes on private vehicles, to fund the public transport transition. In this way, the loss of revenue on account of waiver on public transport buses can be offset and help to create dedicated fund to augment public transport facilities in the city. Tax policies need to be corrected to make bus transport economically more attractive. The state government should revise tax policies for a

minimizing/complete waiver of road and passenger tax on public transport buses. Increase taxes on personal vehicles for usage of urban roads, space and causing environmental damages. Cascade registration tax for owning more than one private vehicle. It can also be linked more transparently with fuel efficiency of the vehicles, fuel inefficient cars to pay more taxes.

- **Rationalize and increase excise at the national level and the registration cost at the city level of diesel propelled private vehicles to neutralize the financial gain due to differential pricing of fuels:**

The government has continued to incur a huge revenue loss as it earns much less from excise on a litre of diesel used by cars, as opposed to petrol. Revenue losses will compound with increased share of diesel cars and SUVs. Excise duty on petrol is Rs 14.35 a litre and diesel at Rs 4.60 per litre. At the same time the under recovery of costs is also huge. According to official information on the product-wise under-recovery of public sector oil marketing companies, the losses in the month of May was as big as Rs 16.17 on every litre of diesel sold. It had even gone up to Rs 19 per litre. Diesel price accounts for around 60 per cent of the under-recovery or losses of the oil marketing. This can be mammoth on a nation-wide basis. Since government charges less taxes on diesel and it controls the prices by paying for the under recoveries the use of cheap diesel for luxury consumption in cars is not acceptable.

Cheap diesel is inciting increased use of diesel in cars. Even with the introduction of Bharat stage IV in April 2010, the quality of diesel available in the country cannot be termed 'clean'. According to WHO and other international regulatory and scientific agencies diesel particulates are probable human carcinogens. Studies in Europe show

even at the level of Bharat Stage III and IV the cancer potency of diesel emissions remains higher than the petrol emissions. This can be mitigated only with diesel fuel with 10 ppm sulphur used along with advanced particulate traps. Otherwise, increased use of diesel can add to the burden of particulate matter and nitrogen oxides, the two key pollutants of concern in Indian cities.

Cheaper diesel fuel also encourages bigger cars and SUVs, more driving and more fuel guzzling in the rebound. This defeats the objective of improving India's energy security. This also undercuts climate benefits expected from the more fuel efficient diesel cars because diesel fuel has higher carbon content than petrol. If more diesel is burnt, more heat-trapping CO₂ will escape. Also as diesel refining is more energy intensive CO₂ emissions can increase on a life cycle basis.

- **Advertisement revenue for public transport:** It is now well accepted that advertising on street furniture, public transport infrastructure can be used to help meet the financial shortfalls and generate substantial revenue. Advertising can be promoted on street furniture -- devices placed on public service amenities of the city like railway carriages, buses, metro trains, commercial passenger vehicles, bus shelters, metro shelters, public toilets and public garbage facilities, to name a few. Advertisement policies would need some key guiding principles. They must not pose as safety hazards; must not be counter to city aesthetics and avoid visual clutter. For safety, allow large size billboards at a significant distance from the traffic junctions and intersections. Ban billboards on pedestrian walkways and in placing billboards at significant distance from the right of way of any road. Large size billboards should be completely banned on major city

arterial roads etc etc. With all the safeguards and guidelines the cities can work to maximize the revenue gains, which can be used for city development.

- **Tap parking revenue:** Pricing of parking should be based on principle of ‘user pay’ reflecting the cost of the public good – precious urban space. Current parking rates in cities are low and act as a hidden subsidy to the car owners. Parking rates should be freed up and market driven. From periodic renewal of parking licenses parking revenue should be augmented and utilised to create a dedicated fund for public transport.
- **Congestion Charging should contribute to UTF:** Congestion charges can generate additional revenue for public transport. Congestion costs entail cost of delay to road users caused by the road/private vehicle users.
- **Fuel taxes:** Indian cities need to explore this strategy of imposing cess on fuels to generate revenue for urban transport funds. Delhi is the only instance where cess on fuel is being charged to generate dedicated fund for pollution control. For instance, the Air Ambience fee per litre of diesel sale in Delhi to create the Air Ambience fund to meet the cost of Delhi's clean air action plan. Similar moves can be made to tax transport – diesel and petrol -- in other cities as well.
- **Land Value Capture in TOD zones to fund public transport through the UTF mechanism:** Indian cities have already begun to look at ways to generate revenue from land-use densification. The beneficiaries of transport development are asked to contribute towards the cost of developing transport infrastructure (e.g. metro or BRT

corridors), often through enhanced property taxes, betterment levies or purchase of land development rights etc.

Capturing of land value gains for public investment is a new area of financing and is an opportunity for capital financing. It is important to include as a policy advisory both risks and regulatory safeguards for such approaches. Increased values and land speculation can potentially stifle development of affordable or mixed-income housing projects. This can result in a preference for developers to market projects in transit oriented developments to higher income households. This has the risk of urban transportation projects becoming heavily dependent on the real estate development. Therefore, regulations and safeguards must attach primacy to the urban transport component.

Cities should therefore frame inclusionary zoning regulations that will require that all new housing developments to include a portion of units as affordable housing. Also strong TDM measures should be in place before these strategies are enforced to increase public transport ridership. Zonal regulations and its stringent implementation should be made contingent to land based financing.

Also it is important to mention that the proposal to levy higher rate of property tax in designated areas close to the stations and corridor to capture the enhanced rental value will work only if the tax collection system is efficient, inventories are in place, parcel by parcel valuation is possible. If property tax coverage is poor then the ability to generate more revenue through this will be poor. Inadequate valuation can also lead to other tensions etc. Therefore, it is important to include this in policy advisory so that appropriate regulations and charging methods can be evolved.

The advisory should also include the fact that higher floor Space index should not be indiscriminately used for revenue collection. A detailed analysis is needed to see if other infrastructural services such as water supply, sanitation facilities, etc are available to cope with the increased demand. Also ensure TOD principles are adopted for densification. It is also important simultaneously to enforce travel demand management principles including parking caps etc to ensure that the community in the TOD zone is transit oriented.

1.9 Transport Impact Assessment

All cities are witnessing high proliferation of high impact buildings and construction projects. Traffic impacts of these projects will draw increasingly more attention in the future as these induce and attract additional traffic in the neighbourhood. It is important to note that the environment clearance regulations address these impacts. At present the environment clearance rules for buildings include traffic impact assessment. But its scrutiny and assessment is either very weak or nearly non-existent. The traffic impact assessment of the proposed project on the adjacent areas is largely left unaddressed.

This will have to be considered while granting permissions to projects like malls, commercial complexes, hotels etc. which are likely to create traffic congestion. This concern is further enhanced when multiple projects of similar nature that attract even more traffic are also granted permission in the same area. Thus, the cumulative impact of these constructions on the area's carrying capacity is hardly assessed in the environmental clearance process for building and construction projects.

1.9.1 Methods

- **Make traffic related clearances from competent authorities mandatory:** The EIA authorities will have to accord priority to this dimension of impact of buildings and ensure that buildings obtain consent from the designated authorities in the city and also develop and implement a traffic management and mitigation plan that obviates pressure on the neighbourhood, surrounding public spaces and roads. These should also fulfill the criteria of street design guidelines, guidelines for transit oriented development, fulfill the requirements of public transport connectivity, non-motorised transport approaches and so forth.

These should also align with the parking policy of the city and prevent parking spill over on the public spaces surrounding the project area.

- **Mitigation strategies for TIA must be addressed/ provided by project developer:** The project developers will have to provide details of strategies to be used for mitigating traffic impacts of the projects. These may include strategies such as creation of direct access/connections from a metro/ BRT stations for its visitors, provision of feeder vans and circulators, provision of on-site NMT and para-transit parking, etc. to mitigate the additional trips generated by the project.

IMPLEMENTATION OF THE NMSH PARAMETERS

Effective implementation of the NMSH standard for urban transport requires several levels of interventions in the existing systems starting from institutional restructuring to data management and capacity building. The following sections list the the interventions suggested by this document:

1.10 Institutional Structure

There exist several institutional gaps that have become barriers to implementation of the plans and policies of sustainable transport. They are:

- Multiplicity of organizations involved in Urban Transport
- Lack of coordination among organizations involved in Urban Transport
- Lack of Transport Planning expertise in the organizations
- No accountability in ownership, performance, and maintenance transportation infrastructure and systems operations
- No single apex agency regulating, facilitating and integrating operations of different modes

The recommendations to address this gap are summarized in the table below:

Institutional	Programs/tools	Funding
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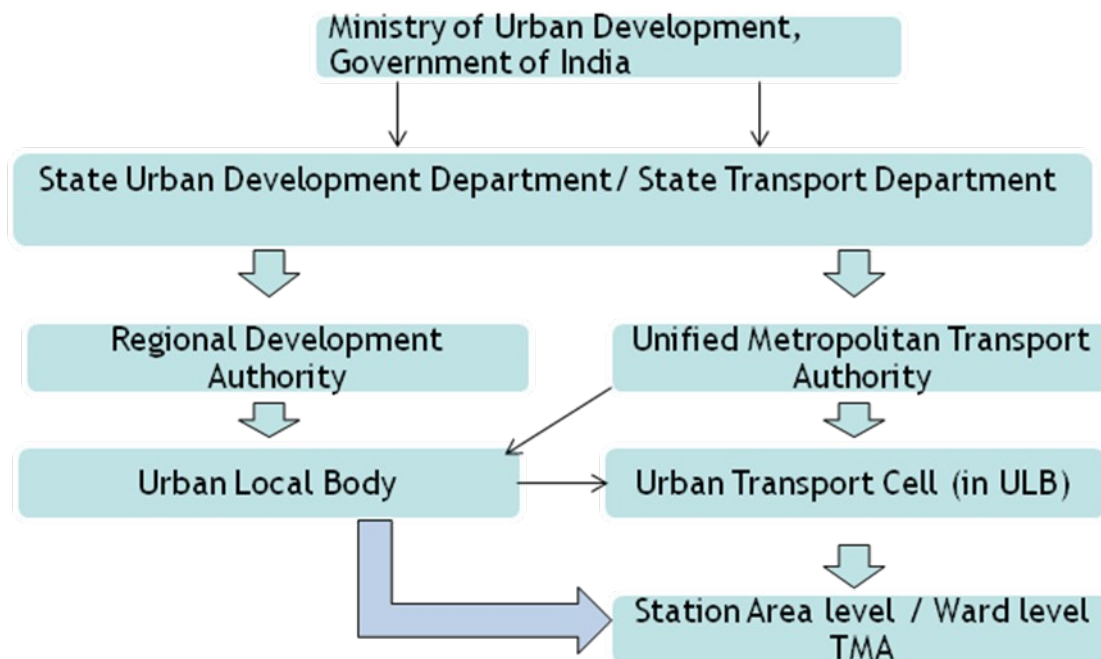
<ul style="list-style-type: none"> • Strengthening of UMTA and positioning on par with development authority • Establish and strengthen corporation/municipality transport departments 	<ul style="list-style-type: none"> • Creation of a statutory, implementable mobility plan by the UMTA. • Creation of Unified Formats for Project Submissions and Approval • Creation of Design and Project approval guidelines. • Development Control Regulations (DCR) • Station area plans (prepared locally but coordinated/approved by UMTA) 	<ul style="list-style-type: none"> • UMTA as a single window clearing house for evaluation and funding of transport projects. • Urban Transport Fund funded through fees on private vehicle purchase and use
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1.10.1 UMTA in the National Urban Development Hierarchy

Urban transport is a State subject. In order that the city is able to discharge its responsibility effectively, the state should empower the city with

- A dedicated authority
- legislative support,
- a policy for resource generation and
- trained UT professionals

The Proposed institutional Hierarchy to Strengthen the UMTAs is illustrated in the figure below:



1.10.2 Local Institution: Transport Management Associations

Transport Management Associations (TMAs) is a concept applicable to the ward level and Station Area level. Its goal is to improve the at ground implementation of sustainable transport initiatives.

Structure: TMA would be a non-profit, member-controlled organizations providing transportation services in a particular area (commercial district, mall, medical center or industrial park). Its institutional structure needs to be implemented by local or regional government for resource efficient land use patterns.

1.11 Programs/Tools

1.11.1 Station Area Plans

The goal of Station Area Planning is to focus growth around Public Transit nodes.

The components of Station Area Planning Process are as follows:

- Maximize ridership through appropriate development
- Generate meaningful community involvement
- Design streets for all users
- Create opportunities for affordable and accessible living
- Make great public spaces
- Manage parking effectively
- Capture the value of transit for financing infrastructure and affordable housing
- Maximize neighbourhood and station connectivity
- Ensure proper implementation
- Evaluate efficacy

1.11.2 Transfer of Development Rights

Transfer of Development Rights (TDR) means making available certain amount of additional built up area in lieu of the area relinquished or surrendered by the owner of the land, so that he can use extra built up area either himself or

transfer it to another in need of the extra built up area for an agreed sum of money.

TDR is used to:

- To minimize the time and enable a process for land acquisition especially for road widening, parks and play grounds, schools etc.
- TDRs should be very sparingly used, mainly for preservation purposes, and under very stringent conditions.
- Need for zonal planning (originating and receiving zones) to ensure that the zones have the requisite absorptive capacity for the additional FSI-linked TDRs as well as commensurate physical infrastructure.
- Should be used along with a **vacant land tax** to discourage land hoarding.

1.11.3 Mobility plan by the UMTA to be a part of Master Plan

The UMTA needs to create an implementable mobility plan which should be a part of the Master Plans prepared by the Development Authorities in cities. The Master Plan itself should be a dynamic document. To be implementable, a mobility plan must have the following characteristics:

- Supporting institutions must have the finance and capacity to implement it.
- The planning process must be participatory.
- The plan should be periodically updated and revised.

Under the current setup, the CDP –CMP is not a directly implementable plan. Hence, the UMTA should create a more strategic mobility plan. The

Development Plan must also take cognizance of the UMTA's mobility plan, and ensure that its transport and land use proposal is completely integrated with the mobility plan's transport and land use requirements.

1.11.4 UMTA as a single window clearing house of transport projects

UMTA needs to function as a single window clearing house for evaluation and funding of transport projects. The trend of neglect of urban transport and its decline can be directly attributed to fragmentation and diffusion of institutional responsibility. The UMTA should control funds for the city on urban transport related aspects. It should be a statutory body with full technical and financial powers.

This will ensure that all sanctioned projects for the city are

- Coherent and integrated
- Comprehensively covering all needs
- Well – prioritized in favour of Public Transport and NMT

1.12 Data management for implementation of NMSH Parameters

Monitoring of habitat standard and guidelines will require well designed and regular surveys and data generation at the city level on key indicators of mobility to assess the impact. Currently, there is no established practice of generating data on the requisite sets of indicators. Therefore, develop protocol for data generation and management on key indicators of sustainable transportation to assess and monitor the shift. Datasets on key indicators developed as part of the national habitat Parameters as well as service level benchmarking adopted by the MOUD to enhance the impact assessment should be developed based on regular surveys. This may include among others trends in vehicle kilometers traveled by mode, trip distances, fuel use by mode, changes in usage of different modes, performance indicators of public transport, NMT and IPT, Wide ranging indicators for system performance and so on are needed. Otherwise, introduction of public transport and other changes may not necessarily lead to reduction in personal vehicle usage and the absolute use of fuels and emissions if data is not available for corrective interventions. There are a variety of instrument and also infrastructure to collect data on various socio economic and transportation heads. Therefore, a common protocol for data bases and management may be developed to strengthen regulatory capacity.

1.13 Capacity building

The transition envisaged for Indian cities demands significant shift in policy and capacity building for sustainable urban transportation and mobility planning. This demands reorientation of regulatory and administrative framework,

technical capacity to design policies and build institutional capacities that are quite radically different from the conventional planning systems. Regulatory and implementing agencies require massive knowledge, skill building to conceive, implement, and monitor the programmes and projects. This will require training programmes, experience sharing platforms and pilot and demonstration projects and more trained professional in the system.

There is also a need to build strong constituency amongst the non-state actors to achieve sustainability goals. Support for training and orientation programmes for non-state actors especially NGOs and media and other stakeholders will be critical in changing the established values and strengthen their technical capacity and outreach capacity to create public demand for sustainable mobility and livable cities.

1.14 Roadmap for clean and fuel efficient vehicles

Transportation significantly influences the air quality and energy security of cities. This requires more stringent roadmap for clean fuels and technologies. The post 2010 emissions standards roadmap for the vehicles may be set for quicker introduction of Euro V/VI emissions standards. At the same time stringent fuel economy standards be expedited. As proposed by the low carbon growth report of the Planning Commission at least 2 to 3 per cent annual improvement in sales weighted fleet-wide fuel economy levels be achieved. A combination of emissions standards and fuel economy roadmap will help to influence the technology trajectory of vehicles including public transport vehicles. Fuel cost is a significant share of the operational costs of public transport buses in Indian cities.

Cities will also need market based mechanism to allow rapid transition to advanced and zero emissions technologies. Some cities have begun to give fiscal incentives to battery operated vehicles and for fuel switch. This needs a cohesive approach.

1.15 Reduce road based freight kilometers

Gradual shift of freight transport from railways to trucks is leading to more energy use in Indian transport. Also increased freight traffic on the highways that cut across cities is also adding to the air pollution load. Therefore, an action plan for freight transport be implemented that take steps to promote rail based freight transport and also improve truck operations and maintenance.