NMT Inclusive Planning and Design

Anvita Arora, PhD
MD and CEO, Innovative Transport Solutions, TBIU, IIT Delhi
Chandigarh
May 24, 2013
Modal Shares in Delhi

<table>
<thead>
<tr>
<th>MODE</th>
<th>% of PERSON TRIPS</th>
<th>WITH WALK TRIPS (2007-08)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR/TAXI</td>
<td>9.09</td>
<td></td>
</tr>
<tr>
<td>2W</td>
<td>14.07</td>
<td>23</td>
</tr>
<tr>
<td>AUTO RICKSHAW</td>
<td>2.36</td>
<td></td>
</tr>
<tr>
<td>BUS</td>
<td>27.12</td>
<td></td>
</tr>
<tr>
<td>METRO</td>
<td>2.66</td>
<td></td>
</tr>
<tr>
<td>TRAIN (IR)</td>
<td>0.42</td>
<td>33</td>
</tr>
<tr>
<td>BICYCLE</td>
<td>4.46</td>
<td></td>
</tr>
<tr>
<td>CYCLE RICKSHAW</td>
<td>5.16</td>
<td></td>
</tr>
<tr>
<td>WALK</td>
<td>34.67</td>
<td>44</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TOTAL TRIPS/DAY</td>
<td>219.87 LAKH</td>
<td>100</td>
</tr>
</tbody>
</table>

35% own bicycles in Delhi – 4.5% use them! Why? How many people own bicycles in Chandigarh?
Pedestrians + As Many as 20 Types of Vehicles
Who is Walking?
Who is Cycling?
Where are they on the road?
Why should we look at NMT?

- Urbanization has far exceeded the carrying capacity of the cities.
- Ongoing and clear modal shift from the non-polluting modes of walking, cycling and cycle rickshaws to polluting motorised two and three wheelers and cars.
- Increasing motorization leading to congestion and pollution.
- Since the perceived problem of congestion was lack of space for cars, the transport engineering solution has been to provide more space to cars.
- Thus cities create a self-reinforcing process of ever more cars requiring ever more road space.
The vicious cycle

more car traffic

shift from pedestrian to car traffic

car traffic

land use for roads

emissions, noise, accidents

traffic increase

reduced attraction of pedestrian and bicycle traffic and reduced access to public transport

increased distances
- within residential areas
- to workplaces
- to leisure areas

= need for more transportation
Transit and NMT oriented development is efficient use of space
NMT inclusive Planning – Where do you need it?

Schools

3 km buffer around schools of Sec. and Sr. Sec schools. (Schools marked from Eicher City Map, Edition 2)

The Catchment area of education based trips.

Source: Dr. Geetam Tiwari/TRIPP/IIT Delhi
Trips origin: slums

- Distributions of JJ Clusters in Delhi
- There is direct relation between the density of these poor households and the number of cycle trips origin.

Source: Dr. Geetam Tiwari/TRIPP/IIT Delhi
NMT trips destination: shops, MLU, CSC, DC, Wholesale areas

- major Commercial Centres, District Centres, -18%
- Shops / Mixed Land Use and Wholesale areas - 23%
- These are spread all over urban area as major destination for poor urban workers using cycles for up to 20km per day

Source: Dr. Geetam Tiwari / TRIPP/IIT Delhi

Figure 4.17: Shows locations of major Commercial Centres, District Centres, Shops / Mixed Land Use and Wholesale areas.
NMT destination: manufacturing areas and govt. offices

- 21% of cycle work-trips have factory destination and travel up to 10 km in a day

- About 35% have offices (Govt. and Pvt.) as their destination and travelling up to 10 km per day

Source: Dr. Geetam Tiwari /TRIPP/IIT Delhi
Transition / Feeder Mode: Bus Depots, ISBT, transport centers, railway and metro stations

- **Modal shift**: 15% bus commuters (owning cycles) are travel 5km or less

- **Park and Ride**: 57% people walk more than 500m, many use private or para transit modes to reach mass transport stations. Some of these trips can shift to bicycles. This would reduce travel time by 33%.

- **Bicycle transfer**: By allowing bicycles to be carried on public transportation can reduce parking problems at stations and traffic congestion on feeder roads. (Intercity buses / HCBS / EMU services)

Source: Dr. Geetam Tiwari / TRIPP / IIT Delhi
NMT inclusive Planning – How can we make it work?

- As long as cyclists and pedestrians are treated as second rate or even as non-existent, walking and cycling will continue to decrease → Show on the road that you take them seriously
- Lack of status is only an obvious consequence of existing planning policies → Make planning policies NMT inclusive
- People will not start to walk and cycle because of environmental awareness, but only if it is a safe and practical solution for their transport needs → Cater for their needs
The public space tells you who has priority
(City-centre Popayán)

10.5 m: 1.25 8.00 1.25

(City-centre Bogotá)

10.5 m: 3.50 2.75 4.25 Wide footpath
Street Design Logic
Equitable and Adequate Space Allocation

- Carriageway Design with Separate MV and NMV Lanes where required
- Adequately Wide Footpaths for Pedestrians
- Provide for Public Transport: Bus Stops and Bus Bays
- Provide for Para-transport: Stands for Cycle-rickshaws, Auto-Rickshaws and Taxis
- Streamline Parking and Loading-unloading Activities
- Provide Designated Spaces for Hawkers
Safety

- Intersection Design to minimize conflict between users
- Traffic Calming
- Efficient Street-lighting
- Provide for Police and Emergency Vehicles
- Road Markings, Signage and Way-finding Systems
Access to the Disabled

- Access Ramps and Kerb Cuts
- At-grade Pedestrian Crossings
- Level Surfaces for Easy Navigation
- Warning Blocks and Auditory Signals at Intersections for the Blind
Improve Quality of Environment

• Landscaping and Public Art
• Dustbins and Composting Facilities for Solid Waste
• Providing Amenities for users such as Public Toilets, Benches, Dustbins and Other Street Furniture
• Restoring Historic Streetscapes & Opening-up Vistas to Landmarks
Utilities Planned Considering Future Needs

- Storm-water Drainage and Rainwater Harvesting
- Water Supply and Sewerage
- Electricity Distribution
- Telephone and Gas Lines
The Seven Zones of a Street
**Space Allocation**

**ROAD CHARACTERISTICS**
- Large Right-of-Way
- Large Volumes
- High Speeds

**STREET SECTION DESIGN**
- Segregate MV and NMV Lanes
- 2-Way NMV Lanes on both Sides
- Wide Footpaths and MUZs
Space Allocation

ROAD CHARACTERISTICS:
- Small Right-of-Way
- Large Volumes
- High Speeds

STREET SECTION DESIGN:
- Segregate MV and NMV Lanes
- 2-Way NMV Lanes on One Side
- Wide Footpaths and MUZs
Space Allocation

ROAD CHARACTERISTICS
- Very Small Right-of-Way
- Low Volumes
- Low Speeds

STREET SECTION DESIGN
- Shared MV and NMV Lanes
- Adequate Footpaths
- Small MUZs
Designing for Pedestrians and NMVs
Continuous Smooth Surfaces that allow for NMVs to Pass and accommodates two-way movement
Level Continuous Footpaths that are wide enough to accommodate all pedestrians & are Obstruction Free
Traffic Calming

- Traffic Calming measures need to be adopted especially on streets where NMV lanes have not been provided and at Intersections.
Protection of NMVs from Fast Traffic with MUZ

• NMV lanes are being misused where there is no MUZ to prevent Motor Vehicles to protect them
• The MUZ also accommodates parking, bus stops and paratransport stands in an organised manner
• The lack of and MUZ drastically reduces the impact of the NMV lanes
Signage, Road Markings and Signalling

- Proper Road Marking and Signage need to provided to identify NMV lanes, NMV Crossings and Pedestrian Crossings.
Designing – intersections
## Intersection Design

<table>
<thead>
<tr>
<th>Arterial Roads</th>
<th>Distributor Roads</th>
<th>Access Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arterial Roads</strong></td>
<td><strong>1. Roundabouts</strong></td>
<td><strong>1. Traffic calmed crossing</strong></td>
</tr>
<tr>
<td></td>
<td><strong>2. Signalized Crossings</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>3. Grade separated crossing for motor vehicles</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Distributor Roads</strong></td>
<td><strong>1. Roundabouts</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>2. Signalized Crossings</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Access Streets</strong></td>
<td><strong>1. Roundabout</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>2. Unsignalized/ Traffic Calmed Crossing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>1. Traffic calmed crossing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>2. Unsignalized/ Traffic Calmed Crossing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>1. Roundabout</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>2. Unsignalized/ Traffic Calmed Crossing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>1. Unsignalized/ Traffic Calmed Crossing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>2. Mini Roundabouts</strong></td>
<td></td>
</tr>
</tbody>
</table>
- Raised crossings at junctions to ensure safety of Pedestrians & Cyclists.
- No difference in levels for Pedestrians – Disable Friendly
- Reduction in Motor Vehicle speeds
Signalized Intersections

- Signal Plan (Reduce Delays, conflicts)
- Cycle/Pedestrian Storage (Cycle Boxes, Triangles)
- Free Left Turns (Pros and cons)
- Signal Masts
- Junction Lighting
Entrance and Exit

Marking at Junction:
• Cycle Box
• Painted Cycle Track
• Bus Lanes
• Pedestrian Crossings
Entrance and Exit

Marking at Roundabout:

• Lane Marking
• Common Area
Minor Intersections - Raised Crossing Details
Kerb-cuts for Barrier Free Movement

Kerb Cut

Warning Blocks
Bollards to Restrict Entry of Large Vehicles
Well Lit Footpaths and NMV Lanes

http://www.flickr.com/photos/beyonddc/4285732849/sizes/m/in/set-721576231181123457/
Cycle Rickshaw Stands

<table>
<thead>
<tr>
<th>FOOTPATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lvl +150mm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N.M.V LANE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lvl +50mm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MULTI-UTILITY ZONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lvl +150mm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M.V LANE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lvl ±0.00mm)</td>
</tr>
</tbody>
</table>

Cycle Rickshaw Stand

2000
2000
6000
10000
1500
R1500

135°
Bicycle Rental and Bike-Sharing Schemes
Amenities

Dustbins

Seating

Toilet
Street Vendors

- Need to be Organised by Providing Designated Street Vending Zones and Kiosks
- Serve as Eyes-on-the-street and MAKE STREETS SAFE
Conclusions

- Economic recession – we don’t have the money!
- Fuel prices – up and up
- Road accidents – unacceptable!
- Carbon emissions – a real threat
- Air pollution – passive smoking
- Equity – a democratic goal
- Congestion – the plague of our cities

The solution

WALKING AND CYCLING INCLUSIVE PLANNING

AND THE TIME TO ACT IS NOW!
Thank you