Multimodal Transportation
Emerging Thought, Trends & Practices
mul·ti·mod·al
/ˈməltiˌmɒd, ˈməltī-/  
More than one travel mode including potentially the four highway modes (auto/truck, bicycle, bus/transit, and pedestrian), aviation, rail, and seaports.
FIGURE 15 EXPECTED USER TYPES IN DIFFERENT CONTEXT CLASSIFICATIONS

- **C1-Natural**
- **C2-Rural**
- **C2T-Rural Town**
- **C3R-Suburban Residential**
- **C3C-Suburban Commercial**
- **C4-Urban General**
- **C5-Urban Center**
- **C6-Urban Core**
Shifting perspectives...

- Traditionally roadway performance measures are for Level of Service (LOS)
  - Auto travel
  - The Quality of Service from the Driver’s perspective
  - Traced back to as early as 1950 Highway Capacity Manual
  - Does not measure if you are able to reach your destination

A qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating cost
Highway free flow speed is considered to be the speed a driver chooses under low volume conditions when the interaction between vehicles and the influence of traffic control devices is minimal.
Multimodal Level of Service

Developing the framework

• Goal to provide a well-rounded performance measure of the roadway and person throughput
• Growing interest and methods in practice and in development
Multimodal Level of Service

- Research states that a combined MMLOS may dilute results
- Instead, recommendations are to keep individual level of service evaluations for each mode
Multimodal Level of Service

- Example: Bicycle Level of Traffic Stress - Bellevue, WA

<table>
<thead>
<tr>
<th>Roadway Characteristics</th>
<th>Bicycle Facility Components: Guideline to Achieve Intended Level of Service/Level of Traffic Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Limit (MPH)</td>
<td>Arterial Traffic Volume</td>
</tr>
<tr>
<td>&lt;3k</td>
<td>1</td>
</tr>
<tr>
<td>3-7k</td>
<td>3</td>
</tr>
<tr>
<td>&gt;=7k</td>
<td>3</td>
</tr>
<tr>
<td>&lt;15k</td>
<td>3</td>
</tr>
<tr>
<td>15-25k</td>
<td>4</td>
</tr>
<tr>
<td>&gt;=25k</td>
<td>4</td>
</tr>
<tr>
<td>&lt;25k</td>
<td>4</td>
</tr>
<tr>
<td>&gt;=25k</td>
<td>4</td>
</tr>
<tr>
<td>&gt;35</td>
<td>Any</td>
</tr>
</tbody>
</table>
Multimodal Level of Service

- Example: Pedestrian LOS

<table>
<thead>
<tr>
<th>Pedestrian LOS</th>
<th>Metric</th>
<th>Implementation</th>
<th>How to Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidewalk &amp; Landscape Buffer</td>
<td>Combined Width for sidewalk and landscape buffer</td>
<td>Frontage Improvements Capital Investment Program</td>
<td>Standard per Land Use Code and Transportation Design Manual</td>
</tr>
<tr>
<td>Intersection Treatment</td>
<td>Design Components</td>
<td>Frontage Improvements Capital Investment Program</td>
<td>Guideline</td>
</tr>
<tr>
<td>Mid-Block Crossings</td>
<td>Spacing of Crossings</td>
<td>Frontage Improvements Capital Investment Program</td>
<td>Guideline</td>
</tr>
</tbody>
</table>

Above: Bellevue, WA- PLOS example
Right: Boston, MA- guideline example
Becoming Multimodal- Considerations

• Performance Measures- MMLOS/MMQOS, Counts
  • Connectivity

• Safety and perceptions of safety
  • Vision Zero, Target Zero, Road to Zero
  • Speed Management
  • Managing conflict with other modes

• Roadway real estate/ curbside management
• Right-of-way, Easements
• Funding and Programming
Safety

• A big part of becoming truly multimodal is safety and creating the appeal for a mode shift
  • Perception of Safety
  • Real Safety

• Speed management-
  • Speed is the single greatest indicator of injury severity
Vision Zero

• Goal to eliminate all deadly and severe injury crashes
• Safety Program for all modes and all people
  • Emphasizes the vulnerable roadway users
  • Targets the High Injury Network
  • Equity
Vision Zero

- A shift in thinking

<table>
<thead>
<tr>
<th>TRADITIONAL APPROACH</th>
<th>VISION ZERO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic deaths are INEVITABLE</td>
<td>Traffic deaths are PREVENTABLE</td>
</tr>
<tr>
<td>PERFECT human behavior</td>
<td>Integrate HUMAN FAILING in approach</td>
</tr>
<tr>
<td>Prevent COLLISIONS</td>
<td>Prevent FATAL AND SEVERE CRASHES</td>
</tr>
<tr>
<td>INDIVIDUAL responsibility</td>
<td>SYSTEMS approach</td>
</tr>
<tr>
<td>Saving lives is EXPENSIVE</td>
<td>Saving lives is NOT EXPENSIVE</td>
</tr>
</tbody>
</table>
Safe System Approach
Guiding Principles
1. The human body has a known and limited ability to tolerate crash forces.
2. People make mistakes that lead to crashes.
3. System designers share responsibility with road users for crash prevention.
4. All elements of the system should be strengthened to multiply their effects.
Safe System Approach +
• FDOT Strategic Highway Safety Plan, 2021
Safe System Approach

- FAU Publications Examples


Eric Dumbaugh, Dibakar Saha, Louis Merlin

First Published August 13, 2020 | Research Article | https://doi.org/10.1177/0739456X20931915
Complete Streets

- Complete Streets discussions are evolving
- Previously, generally described as livable streets designed for all users regardless of ability or mode of travel
Update Complete Streets Policies

- Increasing emphasis on Equity, Speed, Safety, Comfort, Public Health
- Complete Streets are streets for everyone.
  - designed and operated to prioritize safety, comfort, and access to destinations
  - are for all people who use the street,
  - addresses equity – race and ethnicity, ADA, vehicle ownership
- A Complete Streets policy can empower communities “to direct their transportation planners and engineers to routinely design and operate the entire right of way to prioritize safer slower speeds for all people who use the road, over high speeds for motor vehicles.”
Update Complete Streets Policies

• 4’ or 5’ bike lanes are not appropriate for all roadways
• Direct routes vs Low Stress Routes
• Integration of greenways and neighborhood greenways or bicycle boulevards
• There are many different methodologies to assess connectivity
Emerging Micro-Mobility

Emerging Mobility – Disruptors:
• Serve as First – last mile solutions and remove vehicular trips
• Personal Devices, or
• Mobility as a Service (MaaS)
  • Bikeshare- standard and e-assist bikes
  • E-scooters
  • Docked and Dockless
Emerging Micro-Mobility

• For example, Fort Lauderdale E-Scooter Dockless Mobility:
  • Regulated by local ordinance
  • E-scooter estimated average trip length less than 2 miles.
  • Average ride duration 27.78
  • Averaged over 100k trips per month
  • 75% of riders reported that their e-scooter ride replaced a vehicular trip
    • Personal car or TNC (e.g., Uber, Lift, Taxi)
Emerging Micro-Mobility

MaaS has had their own challenges

- Curbside management
- Safety - increase in injuries
- May expose a lack of safe and connected infrastructure -
  - Highlight and justify the need for greater bike lane/facilities to be rebranded as micro-mobility
  - Highlights the imperfections in pavement or uneven surfaces - the need for smooth seamless infrastructure or a required design change for technology itself
- Parking
  - Although less than 25% of scooters were found to be mis-parked in Fort Lauderdale's study, it is often cited as a nuisance
The Health Benefits of Multimodal Planning & modal shift adoption

Active Transportation vs. Sedentary forms of transportation

- Sedentary forms of transportation - requires little energy expenditure and is primarily sitting
- Active Transportation is most closely related to Alternative Transportation
  - Walking, Biking, Transit Use
  - Active transportation can play a role on fighting our obesity epidemic and promote health behaviors
“The estimated annual health care costs of obesity-related illness are a staggering $190.2 billion or nearly 21% of annual medical spending in the United States. Childhood obesity alone is responsible for $14 billion in direct medical costs.”

— National League of Cities
“If the 10 cities with the highest obesity rates cut their obesity rates down to the national average, the combined savings to their communities would be $500 million in health care costs each year.”
The Health Benefits of Multimodal Planning

• For each additional hour spent in a car per day was associated with a 6% increase in the likelihood of obesity. (Frank et al, 2004)

• Each additional kilometer spent walking was correlated with a 4.8% reduction in the likelihood of obesity. (Frank et al, 2004)

• Americans who use transit spend a median of 19 minutes daily walking to and from transit; 29% achieve > or =30 minutes of physical activity a day solely by walking to and from transit (Besser and Dannenberg, 2009)

• Encouraging people to use public transportation increases physical activity and reduces sedentary time (Bista, Debache, Chaix, 2020)
The Health Benefits of Multimodal Planning & modal shift adoption

• Designing for multimodal infrastructure to facilitate accessibility and mobility to destinations can help us improve the health of our communities and increase the productivity of our transportation system.

• Land use and zoning play a big role in the urban fabric of our communities

• Diet and nutrition share a great proportion of the impacts on health and a healthy weight
  • Access to healthy foods
  • Decreasing food deserts
Questions, Comments, Discussion

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