LEVERAGING BICYCLE NETWORK PERFORMANCE MEASURES

105TH PURDUE ROAD SCHOOL
SESSION 129
Presentation Overview

• Story telling through visualizations
• Raising awareness to create empathy
• Razing barriers to implementations
Obvious Facts About Bikes!

- Bikes are ridden by people
- People travel to get places
- People only travel in ways that make them feel comfortable
- They have to feel comfortable for the WHOLE TRIP
Implications of these Facts

• Decision to ride a bike starts at the beginning
  – Can their whole route be “low stress”?  

• Available routes are more important than direct
  – Reasonable path of “least resistance”
    • A bike lane is not necessary on every street.
    • It also doesn’t mean that a bike lane on every street would be enough.
Industry Background

• Roadway analysis for motorized users is mature
  – Capacity / Level of Service / Delay / Models / “Standards”
• Support for non-motorized is less prevalent
  – Overcoming inherent biases
  – Gaps in systemic approaches to project development
• Increasing number of resources
  – NACTO / NCHRP / FHWA / AASHTO
Who are the Users?

**LTS 1**
Comfortable for **most** cyclists

**LTS 2**
Comfortable for **many** cyclists

**LTS 3**
Comfortable for **some** cyclists

**LTS 4**
Comfortable for **few** cyclists
Bicycle Facilities

Each of these facilities or markings is useful in its correct context.

Increasing Comfort Levels
Performance Measures

• “What gets measured gets done”

• Quantify and qualify effectiveness
• Prioritize plans
• Measure outcomes
• Adjust actions
Performance Measures

• Defining context for desired outcomes and objectives for a model
  – Meet majority of needs
  – Ability to customize

PERFORMANCE MEASURE

NETWORK COMPLETENESS

The portion of the transportation network that is usable for people walking or bicycling, and represents the minimum accommodations needed for a facility to be considered part of the walking or bicycling network.

GOALS

CONNECTIVITY ☑
ECONOMIC ☑
ENVIRONMENT ☑
EQUITY ☑
HEALTH ☑
LIVABILITY ☑
SAFETY ☑

CONTEXT

PERFORMANCE MEASURE APPLICATION
PROJECT PRIORITIZATION

A measure of network completeness can be used to prioritize projects that fill gaps or meet unmet accessibility needs for women and disabilities.

ALTERNATIVES COMPARISON

When comparing design options, an agency may consider how two or more positive configurations contribute to a more complete transportation network for those walking or biking.

SCENARIO EVALUATION (POSSIBLE)

Network completeness can be applied in evaluating future scenarios of potential transportation investments and policy changes.

BENCHMARKING

An agency can report change over time through regular updates to inventories of interaction networks, bicycle facilities, and sidewalks.

STANDARD

A performance baseline related to measures of completeness may exist for a given percentage of the network to be completed each year or for a given percentage of sidewalks to meet AASHTO standards by a given year.

RELATED MEASURES

“Connectivity Index”
“Miles of Pedestrian/ Bicycle Facilities”
“Pedestrian Space”
“Route Directness”

DATA

NEEDS & SOURCES

Inventory data for:
- sidewalks
- pedestrian facilities
- bike facilities
- movement markings
- signs
- signage

PEERS TRACKING THE MEASURE

Most agencies maintain an inventory of sidewalks, crosswalks, and bicycle lanes in their jurisdictions.

A network completeness measure can provide insight into the level of traffic safety and accessibility. This measure is important for assessing the completeness of a network. Peers tracking the measure include:

Peers tracking the measure include:

NOTES

Completeness can be a subjective term and should be explicitly defined. For example, a minimum width of a sidewalk should be identified as part of a complete system.

Collecting inventory data can be time consuming and challenging, and data quality is key. Organizations may look to pedestrian and bicycle infrastructure and data management systems and pedestrian count data to support this effort.

Network completeness can be tied in with agencies’ AASHTO Inspection Plans, which require ODOT and other agencies to identify barriers to accessibility for pedestrians. Additionally, the AASHTO Inspection Plans may be used to identify areas where the network is not complete and recommend solutions to address the accessibility challenges.
Livability

• How does transportation impact quality of life for residents, employees, and visitors?
Economy

• How does a transportation investment impact the local economy?
Environment

What are transportation’s impacts on:

- Air quality?
- Water?
- Noise?
- Wetlands?
- Habitat and wildlife?
- Carbon emissions?
Connectivity

- How well does the transportation system connect people between origins and destinations?
Equity

- Does the multimodal transportation system provide people with reliable and affordable connections to employment, education, services, and other opportunities?

- USDOT Ladders of Opportunity
“Networks”

• Starting point of assessing performance
• Routable geospatial roadway data
  – Facility types and conditions

• Apply Level of Traffic Stress (LTS) methodology
  – Macro and microscopic assessment
### LTS Analysis Process

#### Table 2. Criteria for Bike Lanes Alongside a Parking Lane

<table>
<thead>
<tr>
<th></th>
<th>LTS ≥ 1</th>
<th>LTS ≥ 2</th>
<th>LTS ≥ 3</th>
<th>LTS ≥ 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street width (through lanes per direction)</td>
<td>1</td>
<td>(no effect)</td>
<td>2 or more</td>
<td>(no effect)</td>
</tr>
<tr>
<td>Sum of bike lane and parking lane width (includes marked buffer and paved gutter)</td>
<td>15 ft. or more</td>
<td>14 or 14.5 ft.</td>
<td>13.5 ft. or less</td>
<td>(no effect)</td>
</tr>
<tr>
<td>Speed limit or prevailing speed</td>
<td>25 mph or less</td>
<td>30 mph</td>
<td>35 mph</td>
<td>40 mph or more</td>
</tr>
<tr>
<td>Bike lane blockage (typically applies in commercial areas)</td>
<td>rare</td>
<td>(no effect)</td>
<td>frequent</td>
<td>(no effect)</td>
</tr>
</tbody>
</table>

Note: (no effect) = factor does not trigger an increase to this level of traffic stress. *If speed limit < 25 mph or Class = residential, then any width is acceptable for LTS 2.

#### Table 3. Criteria for Bike Lanes Not Alongside a Parking Lane

<table>
<thead>
<tr>
<th></th>
<th>LTS ≥ 1</th>
<th>LTS ≥ 2</th>
<th>LTS ≥ 3</th>
<th>LTS ≥ 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street width (through lanes per direction)</td>
<td>1</td>
<td>2, if directions are separated by a raised median</td>
<td>more than 2, or 2 without a separating median</td>
<td>(no effect)</td>
</tr>
<tr>
<td>Bike lane width (includes marked buffer and paved gutter)</td>
<td>6 ft. or more</td>
<td>5.5 ft. or less</td>
<td>(no effect)</td>
<td>(no effect)</td>
</tr>
<tr>
<td>Speed limit or prevailing speed</td>
<td>30 mph or less</td>
<td>(no effect)</td>
<td>35 mph</td>
<td>40 mph or more</td>
</tr>
<tr>
<td>Bike lane blockage (may apply in commercial areas)</td>
<td>rare</td>
<td>(no effect)</td>
<td>frequent</td>
<td>(no effect)</td>
</tr>
</tbody>
</table>

Note: (no effect) = factor does not trigger an increase to this level of traffic stress.

#### Table 4. Criteria for Level of Traffic Stress in Mixed Traffic

<table>
<thead>
<tr>
<th>Speed Limit</th>
<th>2-3 lanes</th>
<th>4-5 lanes</th>
<th>6+ lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25 mph</td>
<td>LTS 1&lt;sup&gt;<em>&lt;/sup&gt; or 2&lt;sup&gt;</em>&lt;/sup&gt;</td>
<td>LTS 3</td>
<td>LTS 4</td>
</tr>
<tr>
<td>30 mph</td>
<td>LTS 2&lt;sup&gt;<em>&lt;/sup&gt; or 3&lt;sup&gt;</em>&lt;/sup&gt;</td>
<td>LTS 4</td>
<td>LTS 4</td>
</tr>
<tr>
<td>35+ mph</td>
<td>LTS 4</td>
<td>LTS 4</td>
<td>LTS 4</td>
</tr>
</tbody>
</table>

Note:<sup>*</sup> Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; use higher value otherwise.
LTS Analysis Process

WHAT IS THE SPEED LIMIT?

35+ MPH
LTS 4

30 MPH

HOW MANY LANES DOES IT HAVE (TOTAL)?

UP TO 3
LTS 2 IN A RESIDENTIAL AREA, LTS 3 IN A COMMERCIAL AREA

4+
LTS 4

UP TO 25

HOW MANY LANES DOES IT HAVE (TOTAL)?

UP TO 3
LTS 1 IN A RESIDENTIAL AREA, LTS 2 IN A COMMERCIAL AREA

4 or 5
LTS 3

6+
LTS 4
LTS Analysis Process

- Pedestrian Connectivity and Comfort Assessment
- Data needs:
  - Sidewalk/buffer width
  - Speed
  - Number of lanes
  - Presence of parking (on some streets)
  - Crossing spacing (on some streets)
Level of Traffic Stress Mapping
Example: District Mobility – Washington DC LTS Network

- GIS Roads and Highways network
  - High percentage of surface facilities documented at segment level
- Targeted data collection
  - “Triage” methodology
- LTS is a “layer” in DDOT GIS Linear Referencing System network
  - Flexibility for scenario planning and analysis
Performance Measure Applications

- Accessibility to LTS facilities: census + LTS
- Accessibility to Jobs via LTS facilities: census + employment + LTS
District Network Mapping
Network Applications

• Network analysis
  – Sensitivity and scenario planning
• Project planning and prioritization
• Planning beyond “Low hanging fruit”
Project Prioritization

- Lack of connectivity
- Pinch points
- Barriers
- Equity
Summary

• Telling a complete story…..
  – Understanding users, needs, and objectives
  – Performance measure identification
  – Tools to understand infrastructure and network

• Project prioritization opportunities
  – Informed and measurable
  – Master plan
"DAMN, THE ROAD LANE ENDS AGAIN! I HATE SHARING THE TRACKS WITH THE TRAIN."

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