

Winters, P.L., C. Francis, E. Mierzejewski, and Lisa, T. *Assessing Level of Service Equally Across Modes*. White Paper. Prepared for Florida Department of Transportation. Prepared by Center for Urban Transportation Research, College of Engineering, University of South Florida. December 2001.

<http://www11.myflorida.com/planning/systems/sm/los/pdfs/AssessingLOSFinal.pdf>

This paper is motivated by the knowledge that current LOS classification schemes make the total transportation system performance and multimodal tradeoff decisions difficult to assess. For example, for automobile travel, most will consider LOS D or E as satisfactory while the same LOS for bicyclists is poor enough to deter all but the most skilled bicyclists from making the trip. Hence there is a need to find a method to assess level of service across modes in a way that is consistent as well as easily interpretable.

“The primary focus of this research is to assess the need for the development of an LOS system that can be assessed equally for the motor vehicle, bicycle, pedestrian, and transit modes.”

An advisory committee of transportation experts was established to advise and brainstorm the need for and ways to develop alternative methods. While the committee agreed on the need to develop alternative methods, members stressed that any alternative method should relate the LOS for each mode to user perception.

Assessing the Alternatives

The following alternative methods, along with their advantages and disadvantages, are described in the paper conceptually:

- Dow Jones User Ratings

- Multimodal LOS Profile (a.k.a. Slide Rule)
- Weighted Slide Rule
- Community Standards Based Method
- Modified Miami Method
- Sensory Method
- Icon Method

Dow Jones User Ratings

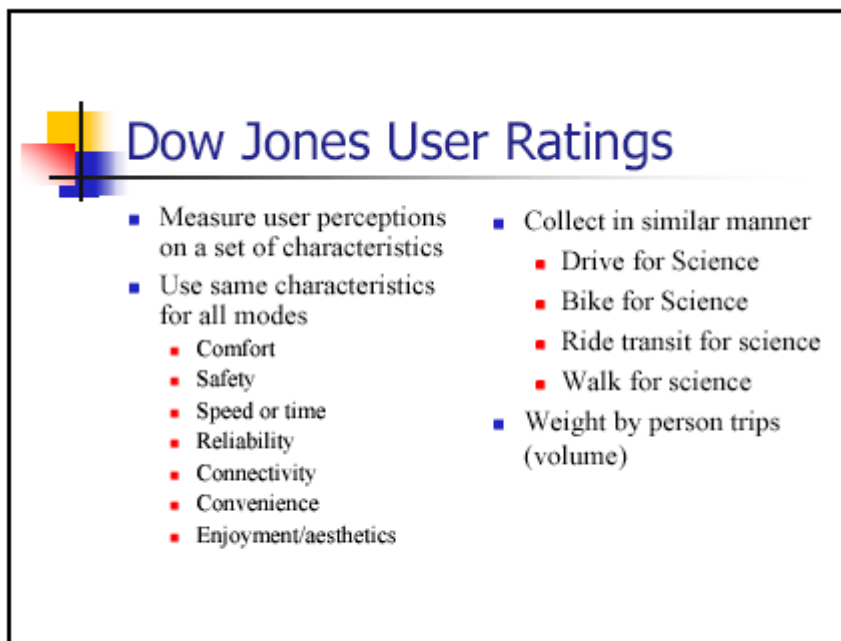


Figure 1 - Summary of Dow Jones Rating method

The group assessed the advantages and benefits of the Dow Jones User Ratings (DJUR) method as follows:

- Makes all modes based on user perceptions by adding “Drive for Science” and “Ride transit for science” efforts. It would use the same characteristics across all modes.
- Builds political consensus through a survey of people’s assessment rather than transportation professional’s assessment.
- Provides a consistent measure with which to compare the system over time and across geography, much like the Dow Jones stock index.

- Generates media interest. The media would love it as a means to generate stories and lists such as the “10 Worst Intersections”.
- Increases work for consultants.

The group also identified the following perceived drawbacks of such a system:

- Increases the costs for measuring LOS.
- Increases the data collection effort. Many factors are missing for some of the modes (e.g., Drive for Science), and thus the workload of local staff would have to increase.
- Relies on public opinions, making the DJUR very subjective (i.e., it is difficult to identify specific improvements).
- Masks differences and underlying interactions.
- Encounters resistance to change, as convincing current transportation professionals and others invested in the status quo to use a new method for measuring system performance would take a lot of effort.
- The usefulness of some characteristics (e.g., travel time or delay for bicycle users) is debatable.
- User opinions would be collected from people who are outside of that particular area and may not be familiar with prevailing conditions.

Multimodal LOS Profile (a.k.a. Slide Rule)

Under this method (Figure 2), the actual levels of service of each mode are aligned (i.e., the LOS bars move).

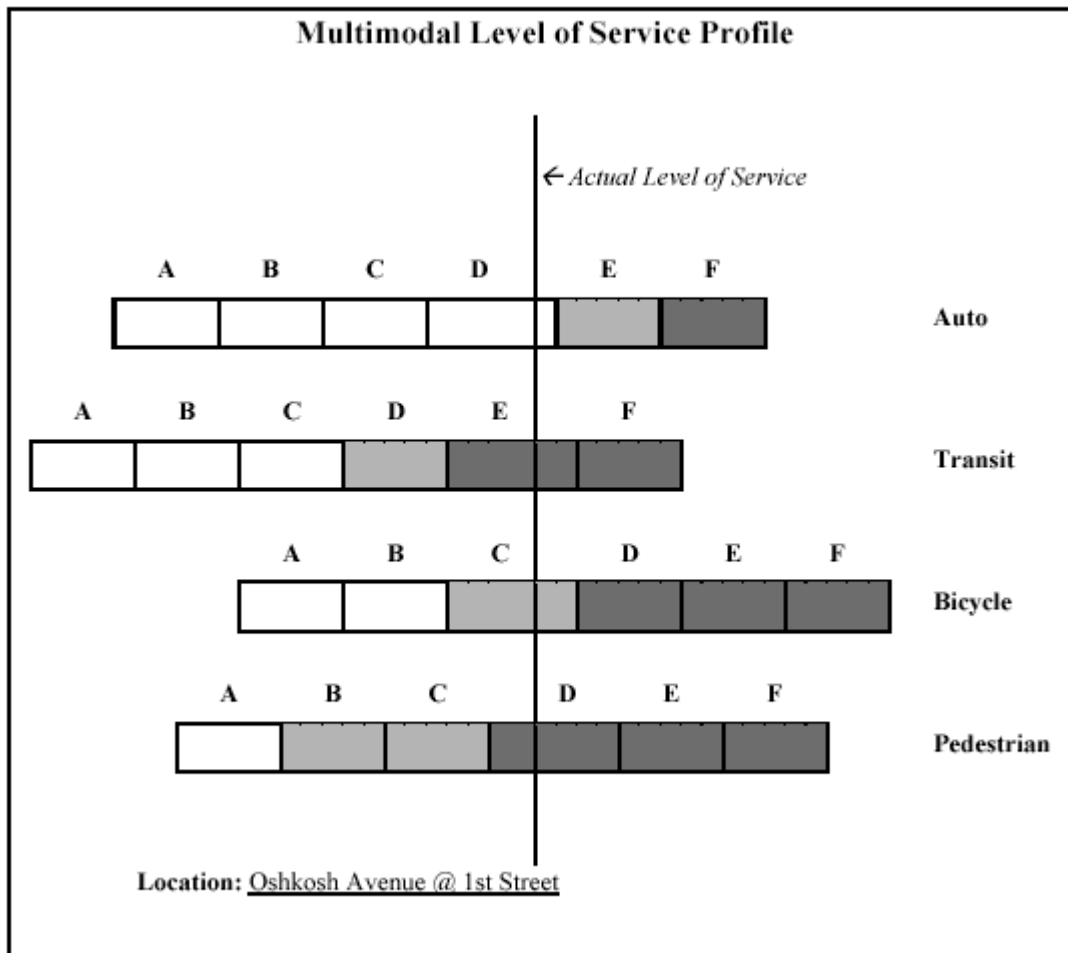


Figure 2 - Multimodal Level of Service Profile

The group assessed the advantages and benefits of the MMLOS Slide Rule (Slide Rule) method as follows:

- The slide rule is a more continuous method of showing how close a particular mode is to the previous or next LOS (i.e., we can “see” whether the LOS is a high D vs. low D).
- Shows LOS clearly for each mode.
- Provides way to compare one mode with another.
- Recognizes the value/progress of within-range changes (i.e., moving from a high D to a low D).
- Provides a way to compare one facility with another.
- Provides a common scale – green, yellow, red.

- The slide rule provides an easy to understand, visual method.
- Provides flexibility for interpreting the results.
- Provides more information content than just a number.
- Does not require additional data collection.

The group also identified the following perceived drawbacks of the slide rule system:

- Implies that the range of experience is the same across modes because of the equal length representation of the letter grades (i.e., the same level of effort is required to move from one letter grade to another within the modes and across modes).
- Requires additional time and resources to portray LOS network-wide.
- Doesn't lend itself to trade-offs across modes.
- Doesn't lend itself to fund allocation at the area-wide and corridor levels.
- Can't rank order and prioritize.
- Someone has to determine what is acceptable (Politicians?).
- Requires cross-country connections/cooperation.

Weighted Slide Rule

This option is an extension of the Slide Rule concept discussed above. The major difference is the conversion of the above to a single quantified score that is weighted and that represents overall LOS. Weighting schemes could take into account one or more of the following:

- Weight by number of people
- Weight by CO₂/mile
- Weight by cost
- Weight by CO
- Weight by energy
- Weight by geography

The group identified the following advantages or benefits of the Weighted Slide Rule system:

- Converts several multi-modal LOS measures into a single score.
- Prioritizing is easier when numbers are converted into a single score.
- Allows for the comparison of facilities.
- Simplifies a complex process.
- Permits communities to emphasize one mode over another (or not) by the weight assignment process.
- Can be adjusted to reflect changes in policies.
- Allows for applicability at different locations (i.e., geographic based) with different weightings.
- Provides a visual representation.
- Allows for single- and system-level calculations.

The group also identified problems or obstacles with the Weighted Slide Rule:

- Masks modal characteristics.
- Uses subjective classifications (e.g., Green/Yellow/Red).
- Is not calibrated to user perceptions (good vs. bad).
- Demands a level of effort for creating all charts.

Community Standard Based Measurement

Another permutation of the Slide Rule was discussed by the group (see Figure 3). The focus of the Community Standard Based Measurement is to align the scales along the community standard axis and show the gap between what actually exists and the community standard. For example, in the exhibit below, only Pedestrian LOS A is acceptable to this particular community. However, Highway LOS of A through D would be acceptable. The scales are disproportionately sized to allow for the alignment with the various community standards. The gap could be measured as the area under the acceptable standard. Furthermore, the gap could be weighted by geographic location. What is acceptable could be determined by location or subarea.

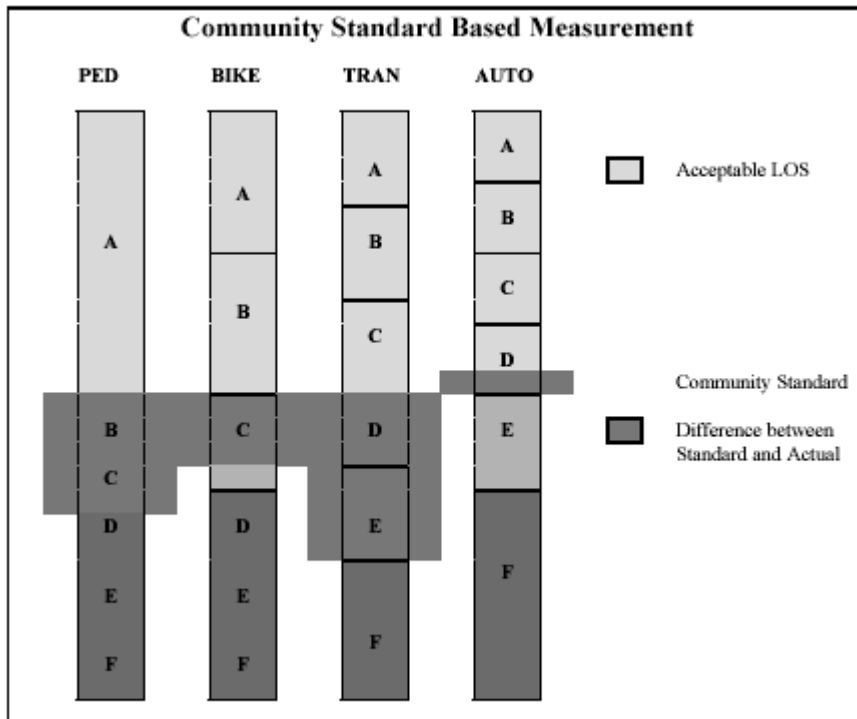


Figure 3 - Community Standard-Based Measurement System

The group found the following benefits and advantages of the Community Standard approach:

- Permits differences to be viewed easily, as all acceptable areas line up and the current conditions of the area under question vary (zigzag).
- Makes it easier to compare relative differences.
- Assigns priority by sizing by LOS modes (modes that are more important or desirable can be emphasized by stretching).
- Leaves standards in place but shows actual performance.
- Provides a measure of quantifying the gap between standards and performance.
- Shares many similar benefits to the Slide Rule.

The group found the problems and obstacles with the Community Standard approach to include the following:

- Could be misinterpreted.

- Shows that changing from one LOS grade to another varies across mode (i.e., we don't move through the scale at the same rate).
- Makes it more difficult to explain to citizens why the length of LOS is different (by requiring a more technical explanation) if A-F scale is used rather than “acceptable/tolerable/unacceptable” or “green/yellow/red” gradations on the bars.

Sensory – Static Picture

While the previous examples rely nearly exclusively on numbers or letter grades to communicate the concepts of levels of service, the group collectively described the Sensory LOS option with the following attributes:

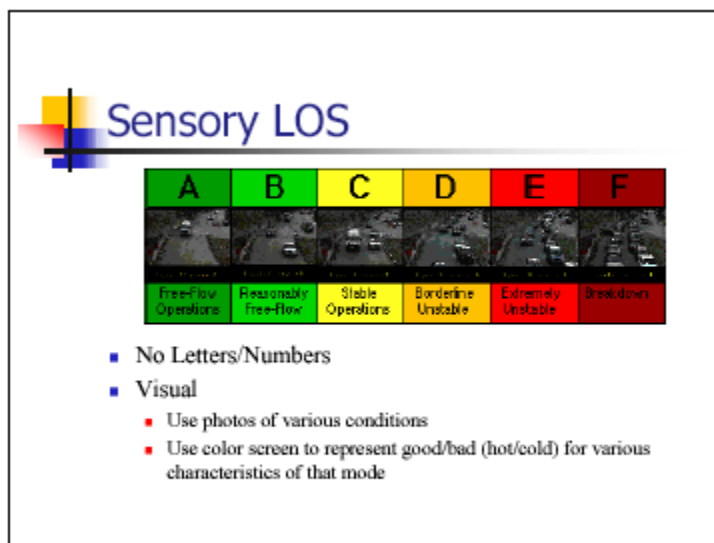


Figure 5 – Summary of Sensory LOS Concept

The group identified the following advantages and benefits associated with the Sensory LOS option:

- Use of visuals makes it simple to understand and easy to relate to.
- Does not require explanation.
- Demonstrates the way LOS is being measured today (for motor vehicles).
- Explains the differences of peak vs. non-peak traffic on the same facility.
- Uses static images, which is cheaper and more transferable than motion.

- Allows a community to capture shots over time at intersections with cameras.
- Captures and communicates skill level using particular icons (Kids thru Adults).
- Could use descriptions.

The group identified the following disadvantages and problems associated with the Sensory LOS option:

- Makes it easy to distort the truth.
- Can't use it for forecasting.
- Pictures are not available for some conditions or modes.
- Does not easily measure time and speed components of the experience.
- Uses the same methods, just a different communication tool (does not provide anything new).
- Becomes more complicated – increases resources needed – more paperwork.
- Diverts discussion to “my road doesn't look like that.”

Much of the focus of the group discussion was on the visual representation of the levels of service. However, the group also identified but did not assess the advantages and disadvantages of other “senses,” such as the sense of hearing (e.g., use of sounds and/or changes in volume) and touch (e.g., use of relief maps) to represent different levels of service. The group also recognized the potential of using the other senses as additional means of communicating LOS to the visually impaired.

Modified Miami Method

The group also discussed the Modified Miami Method of measuring level of service that focuses on person-carrying volumes and capacities (i.e., person volume (divided by) person capacity).

The Modified Miami Method option was described as having the following attributes:

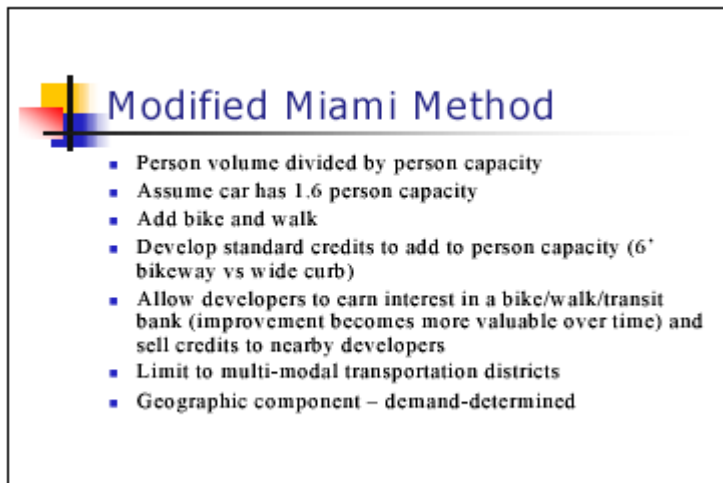


Figure 6 – Summary of Modified Miami Method

The group identified the following advantages and benefits associated with the Modified Miami Method:

- Credits are given to developers for capacity improvements even if the capacity is not used.
- Simple to calculate.
- Sounds good politically.
- Tried elsewhere.
- Reduces the burden on the government to increase supply/provide infrastructure to meet peak demands based on vehicles.
- Results in more multimodal facilities.
- Promotes multimodal solutions.
- Ties to geographic area.
- Allows for different modes to be identified in different areas.
- Provides an efficiency/utilization measure.

The group identified the following disadvantages and problems with the Modified Miami Method:

- Lacks a basis of user perceptions.

- Fosters a “We don’t care” image of public sector.
- Requires bike and pedestrian capacity to be measured (when it may be difficult or meaningless to measure).
- Doesn’t provide measures for individual modes.
- Might result in the building of useless facilities (on purpose) to gain capacity without solving the problem.
- May prioritize the wrong things.
- May skirt concurrency.

Icon Method

The group also discussed the use of icons as a means of communicating LOS across modes. The Icon Method option was described as having the following attributes:

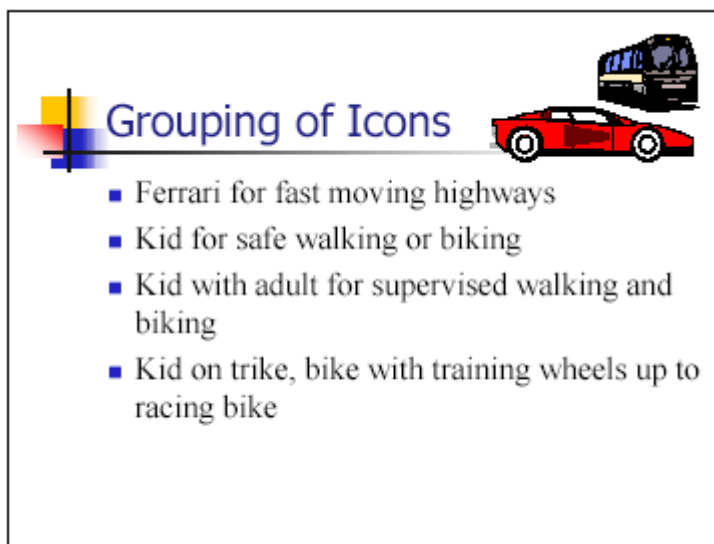


Figure 7 – Example of Icons to Represent Different LOS

The group identified the following advantages and benefits associated with the Icon Method:

- Uses icons to relate to skill levels (safe for children, safe only for children accompanied by adult, safe for adults only, etc.).
- Provides the opportunity to show non-real circumstances (three buses to represent changes in service or frequency).

- Decreases data intensity.
- Uses existing methods to quantify LOS.
- Shows all modes.

The group identified the following disadvantages and problems with the Icon Method:

- Lacks continuous symbols.
- Loses gradations (no representation of different gradations of LOS C).
- Limits display capabilities (possibility that icons would be too complex).