Evolving Use of Level of Service Metrics in Transportation Analysis – Florida Case Study

Background and Context

Florida is the third most populous state in the country, and the vast majority of the state's population – 90 percent – lives in urban areas.[1] While only about 10 percent of the state's highways are owned and operated by the Florida Department of Transportation (FDOT),[2] the agency has the responsibility to maintain a safe and efficient transportation system for all users. The state government influences the 88 percent of Florida's highways that are owned and managed by municipalities[3] through regulations and guidance, as well as by providing technical assistance.

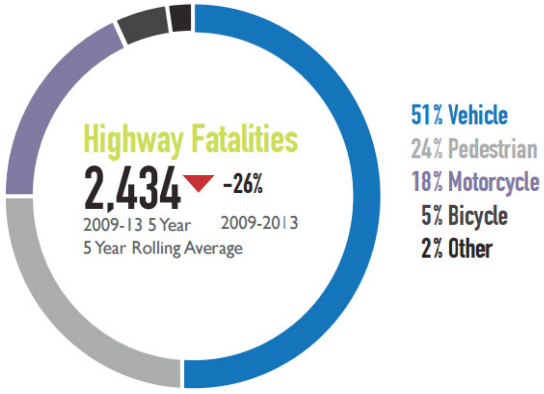

Figure 1: Florida Highway Fatalities by Mode
Source: FDOT

Safety has always been a top priority for FDOT. The state's 2015 interagency Strategic Highway Safety Plan (SHSP) sets an overarching goal to reduce fatalities and serious injuries by at least five percent annually between 2013 and 2017.[4] The SHSP includes specific metrics and targets for reducing pedestrian and bicyclist fatalities, and speeding-related fatalities, among others.

While total highway fatalities decreased by nearly a quarter between 2009 and 2013, pedestrians and bicyclists account for a disproportionately high share of these fatalities (see Figure 1). Just over nine percent of total daily trips in Florida are made on foot;[5] however, pedestrians account for nearly one quarter of roadway fatalities. This disparity is even greater for bicyclists, who comprise five percent of the state's highway fatalities while only 1.2 percent of trips are made by bicycle.[6] Florida's safety challenges are most pressing along roadways that do not align with the surrounding context, such as a wide, high-speed roadway running through a dense, mixed-use area.

FDOT has begun to recognize that its current standards, policies, and manuals – including its current LOS policy – focus primarily on accommodating the needs of motorists, which may negatively affect safety, especially for pedestrians and bicyclists. In order to raise awareness and address these safety issues, FDOT initiated a Complete Streets approach, in which the needs of all modes using a corridor are

[1] FDOT Fast Facts, 2016, retrieved from http://www.dot.state.fl.us/planning/fastfacts.pdf
[2] Ibid.
[3] Ibid. The remaining two percent of roadways are owned by the federal government.
[4] State of Florida 2015 Highway Safety Plan
[5] In 2008, FHWA, NPTS/NHTS series via FDOT, retrieved from http://www.dot.state.fl.us/planning/trends/tc-report/bike-ped.pdf
[6] Ibid.

considered throughout the project development process. In part, this new approach aims to address the standard use of automobile LOS and increase design flexibility and context sensitivity. As identified in the agency's 2015 Complete Streets Implementation Plan, "FDOT's existing Level of Service (LOS) standards pose a barrier to meeting the needs of all transportation system users by placing an implicit priority on vehicle capacity and speed during planning, design, traffic engineering and operations, impacting decisions made at the network, corridor, and intersection scales."[7]

Case for Change

In 2011, Transportation for America (T4 America) released the Dangerous by Design report, which profiles the most unsafe metropolitan areas in the country for pedestrians. The report found that Florida's major cities held the top four spots for most hazardous metro areas in the country for pedestrians.[8] Deeply troubled by this ranking, FDOT's then-Secretary, Ananth Prasad, established a series of initiatives to address pedestrian and bicycle safety in the state, including the immediate appointment of a pedestrian and bicycle safety champion, Billy Hattaway, in a leadership role in the agency as Secretary of District One.[9]

FDOT's resulting 2014 Complete Streets Policy states that FDOT will "routinely plan, design, construct, reconstruct and operate a context sensitive system of 'Complete Streets.'"[10] The Policy specifies that the Department will serve the transportation needs of system users of all ages and abilities, including pedestrians, cyclists, transit riders, motorists, and freight handlers. The Complete Streets Policy asserts that FDOT will incorporate these tenets into its manuals and guidelines related to planning, design, construction, and operations.

When FDOT Secretary Jim Boxold took office later in 2014, he increased the agency's emphasis on the initiative and insisted on a more aggressive implementation timeline.

Implementation

Putting in place FDOT's Complete Streets Policy and a pedestrian and bicycle safety champion at the leadership level were important first steps towards creating safer streets. In early 2015, FDOT established a Complete Streets Implementation Team to oversee the implementation process. That same year, FDOT held a series of two-day interactive workshops in order to help agency staff and external stakeholders identify the agency standards, guidance, manuals, and procedures that would require revisions in order to put the Complete Streets Policy into practice. The workshops covered broad topics, including transportation and land use, active transportation, transportation demand management, and multimodal development and delivery. Following the workshops, FDOT released an extensive Complete Streets Implementation Plan in December 2015.

[7] Complete Streets Implementation Plan, page A-22, retrieved from http://www.flcompletestreets.com/files/Final-CSI-Implementation-Plan.pdf
[8] Dangerous by Design 2011, Transportation for America
[9] GOVERNING, 2014 Public Officials of the Year, retrieved from http://www.governing.com/poy/poy-billy-hattaway.html
[10] FDOT 2014 Complete Streets Policy

The Plan highlights five key aspects of the implementation process:

- Revising guidance, standards, manuals, policies, and other documents;
- Updating decision-making processes;
- Modifying approaches to measuring performance;
- Managing internal and external communication and collaboration during implementation; and
- Providing ongoing education and training.

As a result of the workshops, FDOT determined that it would need to revise 10 documents, including standards and manuals, as part of the Complete Streets implementation process. Two of these 10 relate to LOS: the state's Level of Service (LOS) Standards for the State Highway System, and the Quality/Level of Service Handbook.

FDOT developed a detailed timeline for implementing the Complete Streets updates, with a goal of completing the process by the end of 2017.[11]

Performance Measures and Level of Service

One of the major undertakings of the implementation process entails reviewing and revising how FDOT uses performance measures. Over the course of several months in 2016, a work group, including staff from nine FDOT offices – Design, Environmental Management, Freight, Policy Planning, Safety, Systems Planning, Traffic Operations, Transit, and Transportation Statistics – worked to define Complete Streets performance measures. This process coincides with an additional effort to define multimodal traffic forecasting.

During the latter half of 2016, the agency focused on refining its level of service standards. FDOT is in the process of refining its LOS policy to provide added flexibility for Complete Streets implementation. The state's current LOS policy, established in 2015, outlines the LOS standards during peak travel hours on the State Highway System as "D" in urbanized areas and "C" outside urbanized areas.[12] In urban areas, the current lower limit of LOS D is 13 miles per hour (mph) for the two-hour peak period, while in suburban areas it is 18 mph. The revisions to the LOS policy will add greater flexibility for context-sensitive design solutions that emphasize safety and multimodal access. In addition to updating its LOS policy, FDOT is in the process of developing a mobility performance policy as part of the Complete Streets program.

Florida's Urban Infill and Redevelopment Act of 1999 states that "local governments shall use professionally accepted techniques for measuring level of service for automobiles, bicycles, pedestrians, transit, and trucks. These techniques may be used to evaluate increased accessibility by multiple modes and reductions in vehicle miles of travel in an area or zone" §163.3180(1)(b). The Act also charged FDOT with developing methodologies for calculating multimodal LOS and assisting local governments in implementing this new multimodal analysis.

[11] FDOT Decision Framework & Timeline for Complete Streets Implementation, retrieved from http://www.dot.state.fl.us/rddesign/CSI/files/CSITimeline.pdf

[12] FDOT Level of Service Standards for the State Highway System, October 9, 2015.

While FDOT is revising its own LOS policy, the agency is also looking to other states to learn from their experiences. FDOT conducted an LOS policy benchmarking study of six other states, in which it sought to determine whether they have LOS policies, and if so, how they are applied in practice. FDOT focused on California, Minnesota, New Jersey, Oregon, Pennsylvania, and Washington for this study, noting that these states are leaders in addressing the needs of both motorized and nonmotorized roadway users. The study reviewed how these states use traditional auto LOS and multimodal LOS, including their standards or targets. FDOT will use findings from this study to inform its own process of policy revisions.

Multimodal Level of Service

For over 15 years, FDOT has been a national leader in research related to developing multimodal level of service (MMLOS) metrics. While auto LOS includes estimations of capacity and delay, MMLOS aims rather to gauge how well the facility or intersection meets the needs of different modal users. MMLOS estimates the traveler perception of service separately for pedestrians, bicyclists, and transit riders. While there is no clear consensus on the best way to make MMLOS consistent and quantifiable, it can be a useful supplement to – though not a replacement for – traditional auto LOS by focusing attention on the conditions experienced by other modes. FDOT led and supported extensive research on MMLOS that helped to inform the addition of MMLOS into the Highway Capacity Manual's fifth (2010) and sixth (2016) editions. The sixth edition of the HCM added the subtitle, "A Guide for Multimodal Mobility Analysis."

FDOT has been calculating non-auto mode LOS for individual facilities for over 10 years. As part of its new mobility performance measures program, beginning in 2015 it began calculating and reporting pedestrian and bicycle LOS at a planning level for all National Highway System and State Highway System facilities (see Figure 2).

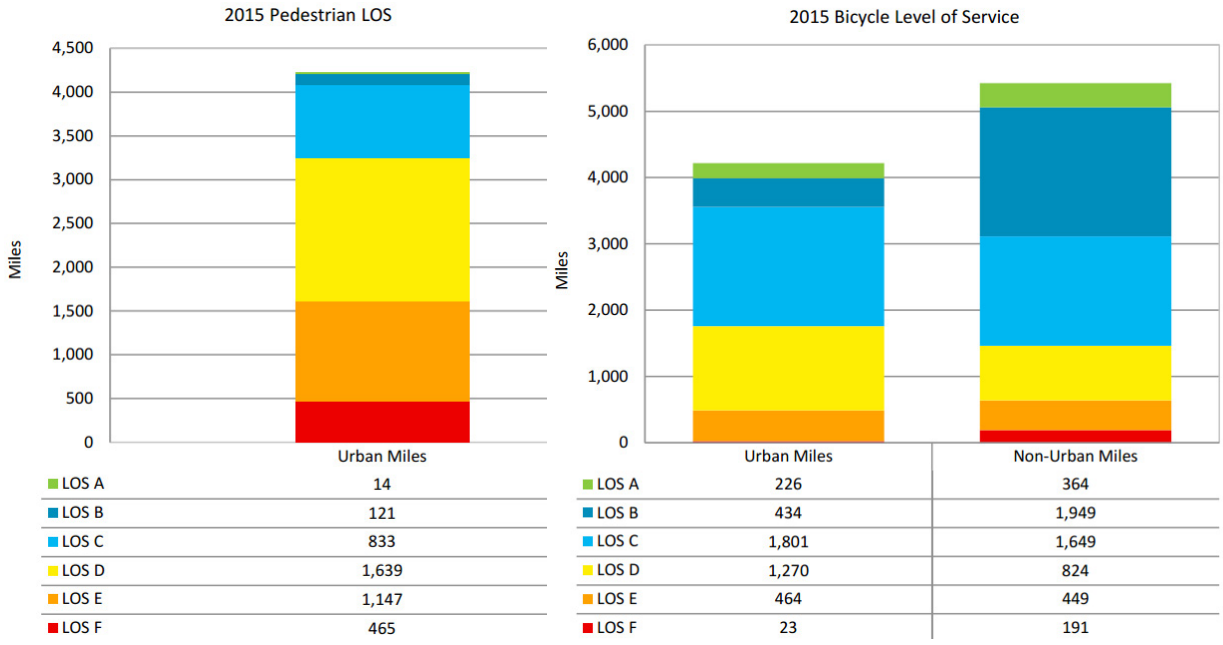

Figure 2: Florida's 2015 Peak Hour Pedestrian and Bicycle Level of Service, with roadway miles by LOS grade
Source: 2016 Multimodal Mobility Performance Measures Source Book, FDOT Transportation Statistics Office

FDOT uses the MMLOS calculations for informational purposes and makes design decisions on an individual facility basis.[13] Florida's 2015 Level of Service Standards for the State Highway System states that "no specific level of service standards are established for other highway modes (e.g., bus, pedestrian, bicycle). Quality/level of service for these modes is determined on a case by case basis." The pending update to the LOS policy, which is expected to take effect in early 2017, will not include specific MMLOS standards but will add further language related to pedestrian, bicycle, and transit LOS considerations and flexibility according to the context. As MMLOS entails determining an LOS grade for each mode independently, FDOT is exploring more comprehensive Complete Streets performance measures that may be able to assist in evaluating the tradeoffs between modes. The agency is also exploring enhancements to its LOS analysis software to include more robust methodology for multimodal calculations, which would provide more accurate MMLOS results for corridor analyses.

Complete Streets Design

Moving forward, FDOT plans to create design standards that take into account land use context zones. In April 2016, FDOT released a proposed list of context zones with greater detail than the previous two designations of "urban" and "rural." The new list includes eight context classifications (Figure 3) with descriptions ranging from "natural" to "urban core." The agency is working on establishing different design speeds for these context zones and plans to institute design controls and criteria for low speed roadways. FDOT is also creating standards for bicycle lanes to be seven feet wide rather than the current four feet. Exceptions to these new design standards would require approval from the Secretary. FDOT has already increased flexibility for designing multimodal streets at the project level by sanctioning the use of MMLOS or other tools, such as bicycle level of stress or a walkability index, to gauge design impacts on road users. As FDOT works towards creating safer streets, it has also instituted policy guidance that requires roundabouts – to be evaluated and ruled out before a signalized intersection will be approved. Roundabout are one of FHWA's Proven Safety Countermeasures because they are proven to be a much safer alternative to traditional intersections.[14, 15, 16]

FDOT Draft Land Use Context Zones

Context Zones	Context Classification	Description
Rural	C1	Natural
	C2	Rural
New! Rural Town	C2T	Rural Town
New! Suburban	C3R	Suburban Residential
	C3C	Suburban Commercial
Urban	C4	General Urban Residential
	C5	Urban Center
New! Urban Core	C6	Urban Core

Figure 3: FDOT's Proposed Context Zone Nomenclature
Source: FDOT Complete Streets Implementation, Interim Products and Materials

[13] FDOT Level of Service Standards for the State Highway System, October 9, 2015.
[14] FHWA Office of Safety, Roundabouts and Mini Roundabouts, retrieved from http://safety.fhwa.dot.gov/intersection/innovative/roundabouts
[15] FHWA Office of Safety, Proven Safety Countermeasures – Roundabouts, retrieved from http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_005.cfm
[16] FDOT, Florida Roundabouts, Business Partner Resources, retrieved from http://www.fdot.gov/agencyresources/roundabouts/business.shtm

As part of the Complete Streets implementation process, FDOT is updating its Intersection Design Guide and plans to begin updating the Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways, known as the "Florida Greenbook," in the spring of 2017. FDOT is also beginning the process of updating other related documents such its Quality/Level of Service Handbook and Traffic Engineering Manual, both of which are slated for completion by mid-2017.

Insights and Lessons Learned

Much of Florida's work to implement its Complete Streets Policy began in 2016, but the process is ongoing and is not expected to be completed before 2018. Therefore, it is too early to evaluate the impacts that the suite of updates will have on safety across the state. Ultimately, change will take time, as Florida continues on its path towards providing safer Complete Streets.

FDOT has encountered a number of challenges, successes, and lessons learned, and these insights may serve other agencies as they embark on similar initiatives. Given where FDOT currently is in its implementation process, the insights provided below are primarily process-oriented. More technically-focused insights are likely to evolve once FDOT concludes the implementation process, gathers data, and is able to evaluate the impacts of the Complete Streets updates.

- **Continuity between administrations enables changes requiring a long time horizon**. The fact that FDOT's current Secretary not only supports his predecessor's Complete Streets Policy but has chosen to expand and accelerate the implementation process, is one of the key enablers of FDOT's success in pursuing such a far-reaching Complete Streets program.
- **Office overseeing program signals its importance to the agency's vision**. FDOT's Office of Design manages the Complete Streets program, ensuring that it is connected to the core of the agency's work and signaling its importance to FDOT staff at all levels. Additionally, FDOT leadership understands the importance of placing champions of Complete Streets and roadway safety in management positions, as demonstrated by the appointment of a bicycle and pedestrian safety champion as District One Secretary.
- **Process is more in-depth and time-intensive than initially anticipated**. FDOT realized that in order to effect real change, it had to embark on a much broader set of updates to existing documents, manuals, and standards than originally envisioned. Improved safety will not come about by simply instituting a Complete Streets Policy or calculating MMLOS for the state's roadways. FDOT's thorough Complete Streets implementation process requires years of extensive coordination among numerous offices. Further, the underlying cultural change within the agency supporting a greater institutionalized focus on safety for all road users will likely take place over an even longer time horizon than the planned implementation process.
- **Communication can be especially challenging within a large agency**. FDOT is a large, decentralized agency with seven districts, each with its own organizational structure, independent culture, needs, and challenges. While the FDOT Central Office provides policy, standards, and training, it is not involved in district-level implementation. Therefore, the districts' involvement throughout the Complete Streets implementation process will be critical to its success. Coordinating such an extensive array of updates in this expansive agency will require continued dedication and outreach from the Central Office and various Complete Streets champions in district offices across the state.

Making Florida's streets safer and more accommodating to multiple modes will require changes at the regional and locals levels, in addition to the state level. While FDOT distributes project funding, metropolitan planning organizations (MPOs) and municipal governments are responsible for programming projects for the majority of the roadways in the state. Some MPOs are also starting to see the benefits of Complete Streets and are choosing to move away from standard roadway capacity expansion projects. For example, after reviewing the results of FDOT's Project Development and Environment (PD&E) study for a portion of US 98 in Lakeland, the Polk Transportation Planning Organization, the MPO for the Lakeland and Winter Haven urbanized areas, requested greater consideration for multimodal options. As a result, FDOT's District One has a PD&E study underway that will evaluate exclusive transit lane options, bicycle and pedestrian facilities, as well as opportunities for hybrid improvements for transit and non-motorized modes. Additionally, the state's first Complete Streets Corridor Study is under development in the City of Lakeland.[17] With FDOT and a growing number of cities and MPOs leading by example by favoring Complete Streets projects, instances such as these may become more common across the state.

In order to foster safer, more complete streets, FDOT is taking advantage of FHWA's promotion of design flexibility and context sensitivity to reevaluate its LOS standards and approach to street design. FDOT will continue to work to further its Complete Streets initiative, undertaking an ambitious set of changes to address the safety of all road users, and learning in the process.

[17] South Florida Avenue (SR 37) Complete Street Design Charrette & Master Plan, Lakeland, Florida