2020 ITE Developing Trends
A Thought Leadership Report by the Coordinating Council of the Institute of Transportation Engineers
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Introduction

The Developing Trends Report represents collective input from ITE Councils and Standing Committees on emerging transportation challenges and solutions. The report covers transportation planning, engineering, management, and operation advancements and will benefit the industry’s leadership and professionals in public and private sectors. The Developing Trends Report Task Force reached out to all ITE Councils and Standing Committees to identify trends relevant to their scope and expertise. Material was received from the following groups:

- Consultants Council
- Education Council
- Public Agency Council
- Complete Streets Council
- Pedestrian & Bicycle Standing Committee
- Planning Council
- Parking Standing Committee
- Sustainability Standing Committee
- Transportation and Health Standing Committee
- Safety Council
- Vision Zero Standing Committee
- Traffic Engineering Council
- Roundabout Standing Committee
- TSMO Council
- Urban Goods Movement Standing Committee
- Ethics Standing Committee

Individual submissions were reviewed and edited by Task Force volunteers. The 27 submissions cover a diverse area of subjects. The COVID-19 pandemic and its impact on transportation systems and services obviously influenced this report’s content. Advancement of technology in connected automated vehicles, smart work zones, and crash prevention are evolving areas with new innovations. Active transportation challenges and opportunities such as use of data analytics, links to equity and accessibility, and designing for safety are included. Rethinking public assets such as curbsides and public parking spaces are also new topics in this year’s report. The Developing Trends Report aims to give insight into the transportation complexities that can guide the profession’s discussions on implementing new solutions and re-evaluating traditional approaches.

Developing Trends Facing the Transportation Profession
A Thought Leadership Report by the Coordinating Council of the Institute of Transportation Engineers
Smart Work Zones

**Author:** Hardik Shah and Jennifer Toth  

**Audience:** Public Sector (State, Local), Private Sector (Consultants, Contractors, and Technology Providers), Human Resource, and Academia

What public agencies across the country are making the shift toward technology to improve the safety and mobility of workers and travelers through work zones. Major contributing factors to work zone crashes are queue back up, failure to follow speed limits, lack of traffic control, and limited lines of sight. Studies have shown that rear-end crashes in the advance warning area for a work zone are the most common type of work zone crash. Speed differentials between vehicles approaching the queue and vehicles in the queue tends to be very high which are one of the primary reasons for the “back of the queue” crashes being severe and/or fatal in nature.

For locations where the traffic queues are expected to occur frequently in a work zone, it is imperative for state and local DOT’s to be proactive in communicating changing conditions to motorist using traditional and ITS solutions. These efforts will help to reduce the number and severity of crashes, as well as communicate traffic incident information to motorists. SWZ methods include wireless real-time communications, zipper merge systems, and digital signage including lane closures and travel times. This information will let drivers know the travel conditions up to a mile downstream so they can slow down or at least be prepared to avoid the area, merge in traffic or perform smoother and safer decelerations.

With the key problem being unpredictable secondary, rear-end crashes, it is not only important to first and foremost detect traffic conditions issues but also provide real-time, delay information to approaching motorists.
Some questions to develop appropriate solution are the following:

- What are the hazards with queuing caused by work zones?
- What are the steps to quantify work zone impacts?
- How to determine time and location of queues that are likely to occur?
- What strategies can help mitigate potential back-of-queue hazards?
- Do we need to push this information digitally to commercial navigation systems?
- How do we address distracted or fatigued drivers in advance of a work zone?

The Florida Department of Transportation (FDOT), North Carolina Department of Transportation (NCDOT), and Maricopa County Department of Transportation in Arizona (MCDOT) have all deployed various SWZ tools. FDOT has implemented several intelligent transportation systems (ITS) technologies and is in the planning stage to add connected and automated vehicle (CAV) applications simultaneously to mitigate factors to work zone crashes. Both NCDOT and MCDOT have deployed smart zones for work zones in areas where recurring congestion existed before the work zone began. SWZ technologies can vary, but all aim to improve safety for workers and travelers. As these technologies continued to be implemented, more data regarding their effectiveness will become available. Until then FDOT, NCDOT, MCDOT, and others continue to test and modify approaches to implementing SWZ.

ITE can help produce a synthesis of SWZ applications and best practices implemented by agencies to serve as guidance for members and transportation practitioners. This can help bring all of us as owners, operators, designers, contractors, and practitioners of these transportation systems one step closer to achieving vision zero in our communities.
Transitioning to Emergency Remote Instruction

Authors: David Hurwitz and Pete Savolainen
Audience: Public Sector, Private Sector, Academia

The Coronavirus (COVID-19) pandemic has required a rapid transition from normal, in-person instruction to remote instruction. More than 4,200 institutions and more than 25 million students have been impacted. This has introduced a host of challenges from the perspective of both the instructor and the student population. Instructors have been tasked with utilizing new pedagogical approaches and technology, which also require different skills from their students, for whom online instruction may be novel.

One of the key decisions that has a pronounced impact on numerous aspects of course delivery is whether to deliver instruction synchronously or asynchronously. Synchronous instruction occurs in realtime, with students typically receiving instruction through a video-conferencing platform. Asynchronous instruction leverages pre-recorded content, which the students can access at any time. Both methods of delivery introduce a series of advantages and disadvantages for both the student and instructor, including the resources required for effective implementation and the manner in which communication and feedback are facilitated.

Moving forward, there are important opportunities to assess best practices involved with online instruction and to share resources such that all transportation educators are provided with the requisite tools to effectively adapt to the changing circumstances precipitated by COVID-19.

The Transportation Education Council conducted a webinar focused on the advantages and disadvantages of synchronous and asynchronous course delivery. This webinar included 113 registrants and the materials are available free of charge to all ITE members through the Learning Hub website. The broader educational community has also developed a diverse collection of high-quality materials, which could be very useful to other instructors and contexts. Moving forward, the Council aims to develop and disseminate examples of best practices to facilitate effective teaching in light of the challenges presented by remote instruction.
Building Capacity for Tomorrow’s Transportation Professionals

Authors: David Hurwitz and Pete Savolainen

Audience: Public Sector, Private Sector, Academia

The ONE ITE initiative has sought to introduce a consistent experience for all ITE members in terms of their access to resources, connection to other members, leadership opportunities, and representation at the District and International level. Paramount to these efforts is the recruitment of the next generation of transportation leaders. The ITE Transportation Education Council helps to lead large-scale efforts aimed at recruiting, retaining, and cultivating relationships with transportation professionals who will become these future leaders.

However, several important gaps inhibit the Institute’s ability to optimally engage its student chapters. First, there are challenges in simple tasks such as identifying those universities with active student chapters. Based on ITE data, there are at least 183 universities that have an active charter. However, the degree to which these chapters are active is largely unknown. Student chapter experiences tend to vary substantially across universities and there are similarly varying levels of engagement with faculty advisors and professional mentors. Research is warranted to understand how ITE can better support its student chapters and to facilitate opportunities that effectively engage students, faculty, and transportation professionals.

The Transportation Education Council is working with ITE to strengthen the Institute’s ability to recruit and retain future transportation leaders. This includes a series of outreach activities and surveys that were implemented during 2020 to identify all active ITE student chapters and faculty advisors, in addition to identifying potential barriers to participation among both groups. Subsequent efforts are warranted to find ways to better engage ITE student chapters and faculty with both ITE international and the practitioner community.
Sociomobility – Societal Implications of Connected/Autonomous Vehicles

Authors: David Hurwitz and Pete Savolainen

Audience: Public Sector, Private Sector, Academia

Connected/automated vehicles (CAVs) offer the potential for significant improvements in the mobility and safety of transportation systems. As the automotive industry continues rapid advances in the technical domain, there is a myriad of associated social consequences that will result from large-scale deployment. Additional goals for CAVs include enhancing accessibility, increasing environmental and energy sustainability, and encouraging economic development and equity. However, the potential consequences of CAVs on these areas are not well understood. For example, while a search for the keyword “autonomous vehicles” shows more than 25,000 research articles, articles as to the societal implications comprise only 6.6 percent. This reinforces an imminent need to train students in sociomobility — an area of research at the intersection of engineering and the social sciences.

There is an important need to train both current and future transportation professionals for careers that are focused on the development of innovative, multidisciplinary solutions that jointly address both the technical and societal aspects of CAVs. These professionals must be able to do the following: (1) examine social, political, legal, and economic concerns that may affect the widespread adoption of AVs; (2) assess issues related to social equity and the accessibility of AVs to groups with limited mobility alternatives, including adolescent, elderly, low-income, and disabled individuals; and (3) study the implications of AVs on public health, urban planning, workforce development, and the environment. The multidisciplinary nature of CAVs creates the potential for the development of transformative solutions from a diverse network of interested stakeholders. Much of the early focus in CAV research was focused on technical aspects, such as the technologies required to allow for self-driving vehicles. The transition towards fully-autonomous vehicles may bring myriad unintended societal consequences, which are concerns to transportation professionals of all backgrounds. Research into these social issues will help to inform future investment strategies and will better prepare both the public and private sectors to develop solutions that explicitly consider the holistic impacts that will be created by CAVs. ITE is uniquely positioned to play a prominent role in helping to lead these efforts.
Adapting Streets to New Travel Demands

Authors: Lawrence Marcus, Matthew Roe, and Alex Rixey

Audience: All Transportation Professionals

As demands increase to accommodate users of all abilities in an equitable manner, jurisdictions are finding that there simply is not enough space within the existing right-of-way of traditionally-designed streets to add these facilities. Although new typical sections add multimodal facilities such as bike lanes and transit priority lanes, existing streets possess inconsistent and insufficient right-of-way for these new designs. Determining the allocation of this limited space routinely falls into project specific forums, resulting in inconsistent decision-making.

This challenge has been compounded by three developing trends: (1) the emergence of micromobility and shared mobility demands; (2) the forthcoming connected and autonomous vehicle mobility and docking needs, and (3) the current COVID-19 impact on the need for flexibility in the use of right-of-way such as curbspace. Developing strategies to address these challenges include the following:

1. Establishing a prioritization process for portions of a typical cross section, by street type (street function/land use context)
2. Implementation of temporary/tactical sidewalk extensions, bike lanes, and drop-off zones previously used for parking or motor vehicle lanes
3. Installing separated/protected bike lanes (also used by micromobility devices) instead of standard bike lanes
4. Piloting shared space streets (slow traffic, fewer signs, and less striping) with mixed bicycle, pedestrian, and vehicle traffic
5. Implementing quick build tactics, tools, and techniques

As these multimodal design standards are relatively new, research and guidance with regard to implementation are limited to a select few cities’ Complete Streets design manuals. Baltimore’s draft Complete Streets Manual also includes a clear prioritization of right-of-way by street type, and includes a sub-section focusing on such allocation for curbspace management. ITE is currently developing guidance titled Allocation of Right-of-way Space for Multimodal Streets Practitioners Guide (Guidebook) to address these challenges and is the purpose of this project. This Guidebook will serve as a “how to” guide for agencies and practitioners as they are planning and designing the allocation of roadway space, including vehicle lanes, bicycle lanes, transit lanes, shared lanes, parking lanes, and sidewalks. This project will advance the work done previously under the Optimizing Lane Widths Task Force including case studies, agency guidance, and noteworthy practices both nationally and locally. In addition to including a summary of that work, the Guidebook will provide methodologies for decision making for agencies as they assign widths to the various roadway elements and assess trade-offs for all users.
Managing Curbspace: Keeping up with Changing Demands

**Authors:** Lawrence Marcus and Matthew Roe

**Audience:** All Transportation Professionals

As addressed in ITE’s *Curbside Management Practitioners Guide*, managing curbspace has become one of the most challenging tasks of the transportation industry. Storing private vehicles for extended periods of time is no longer considered the best use of curbspace on commercial streets—or even on residential streets in the urban core—but repurposing the curb or removing parking is one of the most challenging actions a jurisdiction can take. The demands and guidance continue to evolve due to multiple competing interests such as the following: multimodal locking and docking needs, the advent of shared mobility, transit priority goals, bikeway network development, demand for public space such as parklets, and upcoming connected and autonomous vehicles.

New challenges continue to emerge with curbspace demand moving from parking to docking with the growth of shared mobility and micromobility, in addition to traditional transit, taxi, commercial loading, vending truck, and other short-term demands on the curb. As a result, stakeholder engagement has become even more critical and complicated.

These competing demands increase the need to refine the process to prioritize this valuable space. The success of the curbspace is no longer measured by parking revenue, but by the ability to move people and complement the surrounding community’s needs.

Due to the current COVID-19 pandemic, curbspace has become a vital tool for emergency management. Curbspace provides critical access to services and businesses, with many
jurisdictions using flexible zones to optimize access in a safe manner. Transit authorities face the challenge of serving transit-dependent patrons curbside at stops, shelters, and stations, while maintaining social distancing and coordinating other curbside demands.

2018 guidance from the ITE’s Curbside Management Practitioner’s Guide outlines the steps to understand the community needs and evaluate the use of curbspace. NACTO has also issued the following guidance targeting transit benefits: Curb Appeal: Curbside Management Strategies for Improving Transit Reliability.

Given the pace of change, parking programs should transform into curbside management programs. Collaboration with the stakeholders providing the competing services as well as the communities served is critical to the success of the program. Key functions of the program include the following:

- Create an asset management system for curb space resources
- Understand planning, operations, and community priorities when allocating curbspace
- Develop an evaluation method to prioritize/optimize curbspace for existing conditions and new developments
- Prepare for connected and autonomous vehicles by developing a process to manage and price access
- Craft a transition plan from traditional parking to the new curbside management program
Making Streets Safer for Vulnerable Users

Authors: Lawrence Marcus and Matthew Roe

Audience: All Transportation Professionals

As more communities reckon seriously with pedestrian safety through Vision Zero and pedestrian safety action plans, two issues prevalent on major streets have come to the forefront; speed management and improving pedestrian crossings.

Our industry has long faced competition between two competing sets of goals to measure a project’s success; higher speeds and faster vehicular mobility; or better access, lower speeds, and safer streets for all users. Practitioners are reconsidering whether higher vehicular travel speeds reflect success in urban, suburban, and rural streets.

A growing number of jurisdictions and practitioners are basing their speed limit decisions on the latter set of metrics. To minimize injuries, engineers can set a target design speed and posted speed based on the types and frequency of conflict present in the street. These factors are related to the street network, land use context, and both existing and future users of the street. Setting speeds based on human survival in an impact is emerging as a North American best practice after being used for decades in Western Europe and Scandinavia.

With the NTSB and NCUTCD’s recommendations to revise federal speed limit guidance to no longer rely primarily on free-flow speed, and the recent publication of urban speed limit guidance by NACTO, practitioners in the United States have more support than ever before to set speed limits based on safety needs. Transportation professionals are currently applying the following three methods to manage excessive vehicle speeds on Complete Streets:

Traffic calming treatments/strategies
Traffic calming strategies retrofit existing streets, targeting corridors/streets experiencing excessive vehicle speeds, based on the jurisdiction’s policy and confirmed by traffic counts. This method responds to existing conditions.

Quick build /interim strategies
These strategies/tactics apply temporary materials such as delineators, planters, and street markings to retrofit streets to improve multimodal safety and accessibility, including speed management tactics.

Complete Streets design standards
Progressive street design standards align the street’s function with community values, modal priority, and purpose within the broader street network. Complete Streets design manuals identify street types that possess these characteristics. Street type design standards include a target speed to proactively manage vehicular speed to match the users of the street with the community/land use context. ITE’s recently released Vision Zero Core Elements address the trade-off between vehicular mobility and multi-modal safety, accessibility, and mobility, as well as speed management resources.
Big Data for Active Transportation Analysis

**Author:** Alex Rixey  
**Audience:** All Transportation Professionals

“Big data” from the movements of mobile devices, whether collected passively (from location-based services running in the background on mobile devices) or actively (from mobile application users who explicitly opt to track their own travel), has been used increasingly in transportation planning and engineering in recent years. To date, big data in the transportation space has primarily been deployed for vehicular analysis; however, there are emerging active transportation big data offerings that can inform planning and engineering studies. For example, Strava provides data on the magnitude and routing of bicycle and pedestrian trips and StreetLight Data offers estimates of bicycle and pedestrian volumes.

Big data for active modes still faces limitations and shortcomings. Big data estimates do not always match observed counts (though, conversely, observed short-duration counts may not accurately reflect overall activity levels) and big data may be biased towards smartphone users (a growing share of the population) in the case of passively collected data and recreational runners, hikers, and bicyclists in the case of actively collected data. Nevertheless, with continuous temporal and universal spatial coverage, these sources provide substantially more information about pedestrian and bicyclist activity than can be collected through permanent automated counters or manual or automated “spot” counts over short durations. Estimates from big data sources can be combined with observed counts and direct statistical activity modeling to better estimate bicyclist and pedestrian activity volumes and patterns.

Some applications for big data-derived bicycle and pedestrian activity estimates include the following:

- **Predictive safety analysis.** Information about pedestrian and bicyclist activity levels is key to estimating exposure and properly normalizing collision rates.
- **Project planning.** Origin-destination and routing data can help to identify demand and preferred alignment for new facilities.
- **Project prioritization.** Demand and routing data can help to prioritize projects that benefit the most users.
- **Project evaluation and before/after studies.** Data on activity levels before and after project completion can assess project effects on activity and help to quantify the number of users benefitting from the project.
Beyond Equity Toward Restorative Justice

**Authors:** Dan Hennessey, Aaron Zimmerman

**Audience:** Public Jurisdictions, Private Practitioners, Decision Makers

The COVID-19 pandemic and the renewed nationwide focus on the experience of African Americans, as seen with the Black Lives Matter movement, have transformed viewpoints on several issues; mobility and planning among them. These events have made achieving equity for historically discriminated against and underserved communities the lens through which decisions should be made; not only with respect to how we as an industry make transportation equitable going forward, but also how we break down barriers and redress the inequitable decisions of the past 20, 50, 150, and 400 years.

What does “restorative justice” mean for transportation? Restorative justice includes proactive improvement of neighborhoods by listening to and learning from people both living in them and harmed by past decisions (e.g., urban freeways, redlining practices) and taking steps to redress the negative economic and societal consequences that stubbornly linger. It includes changes that some communities are considering such as shifting responsibilities from police departments (i.e., traffic enforcement) to enhance other needed services and quality of life in Black, Indigenous, People of Color (BIPOC) communities. In the transportation industry, practitioners can plan communities that are self-enforcing that then reduce the need for enforcement. It will mean more departments of transportation actively developing programs and plans for creating new public spaces, enhancing mobility options, and making streets safer for BIPOC. It will also mean developing plans and allocating funding to tear down urban freeways that have cut off access to jobs, housing, education, health care, and recreational opportunities, among others.

Environmental justice will be at the forefront of all decisions made, with special consideration given to those whom the environment affects and harms most. It certainly means a change to funding mechanisms and priorities; restorative justice likely means a shift in leadership to allow people who have not traditionally been allowed in the space to guide our industry to better ends.

Transportation planning is such a broad categorization that almost everything the transportation industry does has a connection to planning. The moment demands that our profession meaningfully contribute to more than the discussion of current events. We will need to be a catalyst for the creation of a more just society and for fixing the inequitable planning and transportation decisions of the past. To do so, we will need equity to become more than a talking point; no other issue is as important for our industry or our society at this moment.

There are several people and groups already doing this work, including the following: Dr. Destiny Thomas and The Thrivance Group, The Untokening, Tamika Butler, City of Oakland Repaving Plan, Veronica Davis, Randall “Keith” Benjamin II, Charles Brown, Blackspace Manifesto, Design Justice Principles, and Better Bike Share, among others.

Starting this year, there are several actions ITE can take as an organization, including educating membership, diversifying ITE leadership, and helping to provide a BIPOC pipeline for traffic engineering, transportation planning, urban design, community planning, etc.
Moving Toward Vehicle-Miles Traveled Evaluations in the Site Development Process

Authors: Dan Hennessey, Aaron Zimmerman

Audience: Public Jurisdictions, Private Practitioners, Decision Makers

As transportation planners, traffic engineers, and decision makers have begun to understand the limits of peak hour level of service analysis, many have sought a new evaluation metric for infrastructure investments and site development review that better aligns with modern policy goals. Comprehensive goals have moved beyond congestion reduction (and accompanying capacity expansion), and increasingly, metrics surrounding Vehicle-Miles Traveled (VMT) are used to evaluate transportation planning and infrastructure decisions. This change has reframed the evaluation; previously, the emphasis was on the impacts to drivers, but new analyses are examining the impacts from drivers.

VMT has proven a very useful tool at the comprehensive plan/master plan level, where often land use density, mix, and proximity (important drivers of VMT) are planned alongside the transportation system and are under discussion for change. This is not true when attempting to evaluate a specific land development project where the land use component is often locked in by the allowable mix of uses defined in the Zoning Code. This poses a challenge on how to lessen the impacts of new development on the transportation system when the most important tool in the toolbox is missing.

The conversation around VMT has shifted as well. Rather than focusing on if it should be the focus of evaluation, professionals are now more seriously analyzing how to measure VMT, how to reduce VMT, and assessing the challenges for using it as a metric of sustainability. The
mitigation measures for excessive VMT more closely align with the long-stated goals of many jurisdictions, including more active transportation and transit facilities, increased density, and infill development, less land dedicated to parking, appropriate pricing of public facilities, and transportation demand management strategies. ITE has an opportunity to lead the industry toward greater adoption of this metric, or at least help jurisdictions tailor it to their needs depending on their urban, suburban, or rural context.

In the public sphere for long-range plans and infrastructure projects in particular, this conversion provides additional opportunity to heal communities and repair past injustices. Many previous transportation decisions have put up both physical and proverbial barriers, divided communities, and amplified racial inequalities, particularly in Black and Brown neighborhoods. Focus on LOS too often centers on people who are not local to neighborhoods and creates disincentives for serving local citizens. This shift allows additional local control in transportation planning, with an emphasis on understanding the accessibility needs of low-income populations and people of color. By de-centering LOS, new performance measures and evaluation methods can be developed to better reflect the ultimate goal of transportation: access. These are more easily able to reflect the quality of life (i.e., public health) and equity metrics, particularly as a way to be accountable to health and equity goals.

ITE is currently evaluating a Proposed Recommended Practice: Multimodal Impact Assessment for Site Development, which will have several new recommended practices for evaluating the multimodal transportation system and moving away from vehicle LOS as the sole metric for evaluating development, including VMT, Pro-rata Share Districts, evaluating off-street parking supply, and pedestrian realm design. This would be an opportunity to advance this new trend.
Curbside Management Impact on Public Parking

**Authors:** Peter Richards, Justin Barrett, and Albert Federico

**Audience:** All Transportation Professionals Involved in Urban Design and Planning

Until recently, most people outside of dense urban areas haven’t given much thought to the curbside or curbside management. In most places, the space is simply the “parking lane” where you can park your vehicle for hours, usually for free or a reasonable price. But in the past 5-10 years, demands on the curbside beyond on-street parking have rapidly evolved. These changes are prompting a renewed focus on managing this valuable public resource, including the relationship with adjacent land uses and its role in a comprehensive multi-modal transportation network. The curbside is a valuable resource with high demand, which impacts public parking and requires a significant refocus.

A competing outcome is the noted increased demand for curbside space for a range of uses, including public transportation, cycling, and pedestrian facilities, as well as Transportation Network Companies, eCommerce /curbside pickup, and micromobility, further reducing the current curbside supply. This is creating emerging challenges in this area.

These demands are creating new challenges for transportation practitioners as they attempt to balance the emerging trends with the “traditional” users. Stakeholder perception regarding “convenient” parking and municipal revenues are also typical factors that must still be addressed. Tools, such as digital information about curbside uses, should be developed so that municipalities, curbside stakeholders, and the general public can understand where parking is available to them, so they can better understand curbside management. This understanding should consider the role of on-street parking within the overall parking supply.

Speaking to public parking specifically, these competing curbside demands often mean the supply of on-street parking will be likely reduced or relocated. This could be to side streets, off-street facilities, or mobility hubs in strategic locations; viable options that can be made more effective by implementing digital tools and/or enhanced wayfinding. Updates to land use codes, including adjusting parking requirements to reflect current travel trends, to support mobility goals, and/or implement Complete Streets criteria are also opportunities to improve the utilization of this valuable public resource by incorporating guidance for curbside management.
Reviewing Parking Minimums in Zoning/Land Use Bylaws

Authors: Peter Richards, Justin Barrett, Mark Apeldoorn, Stefanie Herzstein, Rogier Goedcke, Gerald Salzam, David Nevarez, Najmeh Jami, Christopher Mojica, Simon Kong, Ralston MacKenzie, and James Veltkamp

Audience: All Transportation Professionals Involved in Urban Design and Planning

The world is gradually changing its perspective on parking. Parking minimums relate to the minimum number of parking spaces required by a land use statute, plan, or zoning bylaw.

Research has demonstrated that many municipal parking requirements are outdated and do not align with changes in travel modes, economic needs, or current parking demands. Current minimum parking requirements often result in higher development costs, a collective over-supply, a subsidizing of parking costs by development, and an unbalance elasticity with public and alternate transport modes, hindering positive changes to land use and revitalization of municipalities.

The blanket removal of parking minimums from municipal statutes is not without consequence and needs to be carefully considered. Some activities and land uses are vehicle-dependent, either because they are not well-serviced by or are simply not conducive to public or alternate transport modes. Municipal streets have long been seen as an overflow for parking demand; however, the streetscape is increasingly required by walking, bicycling, and public transit priority.

Further, the removal of parking minimums in the zoning or land use bylaw does not automatically mean no parking will be provided. While some developers may decide not to provide parking, others may provide the parking numbers that best meet demand. Instead of being required to provide a certain minimum number of parking stalls, the developer will need to decide how much parking is required to ensure a successful development. With minimum parking requirements, developers have had to challenge requirements on a case-by-case basis, complicating the process and lengthening application timeframes.

A comprehensive parking management approach is necessary to avoid potential, significant, and unexpected consequences arising from the removal of minimums. It needs to examine and plan for parking pricing to influence travel. It requires a principle and policy-based focus on both the demand and supply, to achieve long-term outcomes. Managing the effects of this transition is likely the most challenging part.
Equity has not been a historical priority in transportation and land use decision-making. We see its scars through neighborhoods displaced for development (Battle of Chavez Ravine: The Government Acquisition of land for the Dodger Stadium) and freeways (Portland’s Albina Neighborhood razed for I-5), as well as investments in affluent areas for systems like Streetcar (Seattle’s system that raises housing prices disproportionately to other areas) and bikeshare (launches nationwide focused in touristy and more affluent areas, especially during its first implementation in Washington, DC and New York City). Within the industry, transportation professionals are predominantly White and do not reflect nationwide demographics (civil engineers and city planners are 5-6 percent Black compared to the nationwide average of 12.6 percent).

Now more than ever, the systematic issues and biases of our society that have been evident to people of color and low-economic standing for decades are forefront in the conversation. While historical decisions have had an adverse effect on underrepresented populations, the transportation industry has shifted to attempt to correct these historical practices. Municipalities have identified and established equity corridors and areas, seeking to protect vulnerable populations and ensure fair distribution of both positive and negative impacts. Increased data availability has allowed for planning projects to engage underrepresented populations in decision making and incorporate their feedback into recommendations. Work zone requirements have advanced to include facilities for bicycles and pedestrians, as opposed to the historic focus on private automobiles. Nationwide research has collected best practices in Plans, Specifications, and Estimates (PS&E) to design facilities for users of all capabilities. Despite these factors, there are still things that can be improved in the realm of transportation and equity.
Horizontal equity requires that public resources be allocated equally to each individual or group unless a subsidy is specifically justified, although exactly what constitutes an equal share depends on which resources are considered and how they are measured. Planning and investment decision-making can be improved with increased transportation data to better understand underrepresented people’s travel demands, and the quality of walking, cycling, and public transit, improved information on indirect, external, and non-market costs of transport, and least-cost planning, so resources (funding and road space) can be allocated to all modes and demand management strategies whenever they are cost effective, considering all costs and benefits.

Vertical equity (also called social justice, environmental justice, and social inclusion) is concerned with the distribution of impacts between individuals and groups that differ in abilities and needs, in this case, by income or social class. There are many ways to increase transport system affordability and ensure that policies and programs are progressive with respect to income. Policy and planning decisions should favor affordable modes (walking, cycling, public transit, ridesharing, carsharing, and delivery services). This includes improved sidewalks and crosswalks, traffic calming, traffic speed control, HOV and bus lanes, and other transit service improvements. Public engagement methods to include communities of color and low-income groups can include a mix of virtual public involvement to allow flexibility in schedules, childcare at in-person public events, and direct calls and invitations to community-based organizations.
Incentives for the No-Car Commute to Reduce Congestion: State of Practice

Authors: Krista Purser and Keith Hall

Audience: Practitioners, Policy-Makers, and the Public

Reducing single-occupancy vehicle trips is a feat accomplished by the combined actions of decision-makers, transportation practitioners, employers, and employees; no single entity makes the decisions and creates the circumstances that allow for a sustainable commute option. This topic can be organized similar to the Safe Routes to School’s 5 E’s of safety: Education, Encouragement, Enforcement, Engineering, and Evaluation.

In Education, we look to transit providers to inform the public about its options for service and community organizations to share best practices in commuting stress-free on bicycles. Educating communities on the use of bicycle networks and public transit can break down barriers to using these modes.

In Encouragement, Bike Month challenges and peers offering to bikepool and show routes to work can encourage new bicycle commuters. Employers can select offices based on their proximity to transit, cycling, and walking options, and their facilities including bicycle storage and showers. Transit systems can encourage reduced congestion on the services themselves by providing off-peak commute perks, such as Bay Area Rapid Transit’s Perks system offering points and raffle rewards for commuting during shoulder times rather than peak times.

In Enforcement, employers can also offer cycling and transit commute benefits, similar to a monthly parking pass for those who drive or offer parking cash out, allowing commuters to choose cash instead of subsidized parking, “unenforcing” the default of driving. Maintaining a safe and comfortable ride on bicycle and transit can also be helped by enforcing, whether that’s ticketing for cars parked in bike lanes or security presence on transit.

In Engineering, we create safe and comfortable bicycle and pedestrian facilities, plan efficient transit signal priority and transit routing, and implement congestion pricing on highways. In Evaluation, we look at all of these things together to answer the following question: How do we make getting to work a safe, comfortable, and sustainable experience for all? This topic will collect examples of practices that are successful in shifting commuters into sustainable patterns.
Vehicle Miles Traveled; How to Reduce it, Measure It, and Challenges Using it as a Metric for Sustainability

Authors: Krista Purser and Keith Hall

Audience: Practitioners, Policy-Makers, and the Public

Vehicle miles traveled (VMT) serve as a performance metric for developments and capital improvement projects in many regions. Replacing the level of service (LOS) with VMT can advance not only environmental, but also health and equity goals. Reduced vehicular use reduces greenhouse gas emissions and can improve the respiratory health of communities. These benefits are particularly impactful to communities near freeways and highways, which have historically higher rates of asthma and other diseases, and also tend to consist of lower-income households and communities of color.

VMT can be estimated using travel demand models. Typically, an existing model is developed and validated using traffic count data. Scenarios can be tested by adjusting land use densities, travel behaviors, and transportation networks. A variant of this metric is VMT per capita, which helps communities with population growth gauge travel patterns more individually.

In California, VMT is set to replace LOS as the measurement for environmental impact studies. This legislation, and VMT replacing LOS in other places, results in increased infill development and decreased urban sprawl. For example, a developer looking to construct a new grocery store can develop an empty lot in a city, drawing nearby residents to use that grocery store rather than one further away and decrease overall VMT. A developer aiming to construct on the fringe of a city will rarely show decreased VMT; nearly everyone will be traveling further to use their development.

The City of Pasadena was one of the first to implement VMT. The City has exemptions for in-fill development TIA’s when the proposed development is consistent with general plan designations if the development is of a relatively small size surrounded by urban uses, has no endangered or threatened species, insignificant impacts to traffic congestion, noise, air, or water quality, and can be served by existing utilities and public services. Pasadena uses a VMT per capita metric with an impact threshold set at 22.6 VMT/capita.

The City of San Francisco also uses VMT efficiency metrics (per capita or per employee) for thresholds of significance. They also use map-based screening to determine whether a project exceeds certain thresholds, including factors such as project size and proximity to transit. They use the following thresholds for significance impacts:

- For residential projects, if it exceeds the regional household VMT per capita minus 15 percent
- For office projects, if it exceeds the regional VMT per employee minus 15 percent
- For retail projects, if it exceeds the regional VMT per retail employee minus 15 percent
- For mixed-use projects, evaluate each land use independently, per the thresholds of significance described above

VMT’s replacement of LOS encourages dense land use development, access to sustainable transportation modes, and more sustainable communities.

Developing Trends Facing the Transportation Profession
A Thought Leadership Report by the Coordinating Council of the Institute of Transportation Engineers
Health and Transportation

Authors: Tracy Shandor and Kelly Rodgers

Audience: All Transportation Professionals and Health Advocates

Transportation is much more than mobility; it is a social determinant of health (SDOH). SDOH is a framework (specifically, an ecological model) that recognizes that an individual’s health status is influenced by factors at many levels. One such factor is the design of our cities and communities, including our transportation systems. Critical to the SDOH is the recognition that acting only at an individual level is not enough to make significant changes in population health. That this generation of American children has a lower life expectancy than their parents underscores the urgent need to improve population health.

Thousands of people are killed or seriously injured on US roadways every year; pedestrians and bicyclists are disproportionately impacted.1 Transportation facilitates active living, or, alternatively, encourages sedentary lifestyles that increase the risk for chronic disease. Exposure to traffic-related pollution is linked to respiratory disease, the development of childhood asthma, and cardiovascular disease. Noise from traffic can also lead to stress and sleep disturbances, both of which can lead to a higher risk for Type 2 diabetes. Additionally, the transportation sector is the largest contributor to greenhouse gas emissions in the US. According to the World Health Organization, the greatest threat to global health is climate change, which will increase heat-related illnesses and deaths, increase food-, water-, and vector-borne disease, and increase cardiovascular and respiratory illnesses. Children, older adults, low-income communities, and some communities of color are especially vulnerable to the effects of climate change. Opportunities to live in healthy environments and make healthy choices differ by socio-economic status.
Transportation and Health Standing Committee (Continued)

Transportation is an essential component for creating better health; that is, we cannot improve population health without creating healthy transportation systems.

What is healthy transportation? Healthy transportation maximizes community health by providing people with options for active travel, minimizes exposure to harmful pollutants, supports mental health, and supplies affordable and accessible travel options for people to reach essential goods and services.

Transportation professionals can do the following to assist in healthy transportation:

- **Re-conceptualize health.** Transportation professionals are accustomed to thinking of health as injury prevention. However, we need a definition of health that includes not only health protection but also health promotion. The social determinants of health are a useful framework for conceptualizing health.

- **Collaborate with public health professionals.** Public health professionals are vital to transportation plans and projects; they know the health-related data sources, metrics, evidence-based best practices, and perhaps most critically, know how to ask the right questions to help advance health.

- **Design and build Complete Streets.** Adopt Complete Streets policies and build projects that encourage and enable more people to use active transportation safely and conveniently.

- **Incorporate public health metrics into planning and project frameworks.** Do not rely only on traditional evaluation measures. Work with public health professionals or community members to identify metrics that capture how transportation plans and projects will impact community health.

- **Work with disaggregated data.** As best possible, work with disaggregated data to understand the impacts of projects on specific communities. Averages over a geographic area can hide important impacts.
Data-Driven Safety Analysis in Support of Systemic Safety

Authors: Mohamad Banihashemi and Meghan Mitman

Audience: An Agency or Consultant Involved with Planning and Prioritizing Safety Investments

The Federal Highway Administration defines Data-Driven Safety Analysis (DDSA) as “Using tools to analyze crash and roadway data to predict the safety impacts of highway projects... to target investments with more confidence and reduce severe crashes on the roadways.”

The following two types of DDSA are emerging for use at the state and local level:

- **Predictive analysis**: This approach combines collision data and contextual (roadway and traffic characteristic) data to inform safety management and project development. Predictive models estimate the potential safety benefit of investment alternatives.

- **Systemic analysis**: This approach uses historical collision data in combination with contextual data to extrapolate from “hot spot” locations to locations most at risk of collisions. Systemic models allow for proactive safety investments with wider, yet more targeted, benefits.

As states and cities move toward systemic, proactive safety practice, they will increasingly be looking to collect and assemble large safety and contextual datasets and customize safety analysis tools and methods. This trend, then, will also address the elements and role of Big Data in data driven safety.

The second edition of the *Highway Safety Manual* (HSM), published by AASHTO, is currently being developed and is planned to be available in 2021. There are several tools available to implement...

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these methodologies. The FHWA Interactive Highway Safety Model, McTrans Highway Safety Software, and a variety of spreadsheet tools are available to implement crash prediction models of Part C of the HSM. Safety Analyst is offering an interpretation of methodologies of Part B of the HSM. The FHWA CMF Clearinghouse website offers thousands of Crash Modification Factors (CMFs) that can be used individually or in conjunction with the HSM Part C models. Many states have also developed their own SPFs and/or crash distribution tables or have calibration factors estimated for different crash prediction models. While more than 75 percent of states use ITE Data Driven Safety Analysis (DDSA) to some extent in their safety efforts, efficient data collection methods, and limited staff training in DDSA restrict its prevalence.

The ITE Data Driven Safety Analysis Working Group is a group working under the ITE Safety Council and was established in 2018. The focus of the ITE DDSA working group is encouraging and helping practitioners in using both “Predictive Analysis” and “Systemic Analysis” to gain the benefits of these methodologies in informed decision making, targeted investment, and improved safety.

The working group uses the ITE network at all levels, including district and educational institutional levels to achieve its goals. It will advocate for the inclusion of the DDSA in all levels of transportation study and inclusion of DDSA methodologies in the curriculums of transportation engineering and other related fields.

The committee will try to identify barriers to the adoption of DDSA methods in the industry, and to overcome them, serve as a liaison between the research community, DOTs, locals, and other safety stakeholders. The committee will connect to the practitioners’ user groups and try to promote DDSA methodologies among these groups. The committee will develop presentations, workshops, and other promotional tools to expand the use of DDSA methodologies among all levels of transportation practitioners.
The Safe System Approach in Support of Vision Zero

Authors: Meghan Mitman

Audience: Any agency or consultant involved with planning and prioritizing safety investments

If Vision Zero is the goal, Safe System is the emerging trend as the preferred approach to “get there.” A Safe System acknowledges the vulnerability of the human body — in terms of the amount of kinetic energy transfer a body can withstand — when designing and operating a transportation network to minimize the serious consequences of crashes. According to the World Health Organization, the goal of a Safe System is to ensure that if crashes occur, they “do not result in serious human injury.”

A Safe System approach addresses the following five elements of a safe transportation system: – safe road users, safe vehicles, safe speeds, safe roads, and post-crash care; – in an integrated manner and through a wide range of interventions. Sweden pioneered the Safe System approach to road safety as part of their Vision Zero proclamation that, from an ethical standpoint, no one should be killed or seriously injured on the road system.

The Federal Highway Administration (FHWA) has recently embraced this approach as a core focus for the United States’ safety efforts. The FHWA Safe System Approach includes the following principles:

• Death/Serious Injury is Unacceptable
• Humans Make Mistakes
• Humans Are Vulnerable
• Responsibility is Shared
• Safety is Proactive
• Redundancy is Crucial

The Institute of Transportation Engineers (ITE) and the Road to Zero Coalition’s Safe Systems Explanation and Framework articulate that to anticipate human mistakes, a Safe System seeks to accomplish the following:

- Separate users in a physical space (e.g., sidewalks, dedicated bicycle facilities)
- Separate users in time (e.g., pedestrian scramble, dedicated turn phases)
- Alert users to potential hazards
- Accommodate human injury tolerance through interventions that reduce speed or impact force

Jurisdictions who have embraced Vision Zero and are looking for proven and practical methods to meet their goals, along with those who have hesitated to commit to Vision Zero as a concept but are nonetheless on the Road to Zero and in need of concrete tools, are finding the Safe System approach resonates with their politicians, their engineers, and their community members.

To assist in this area, the Safety Council can raise awareness of the benefits of the Safe System approach. Education around Safe System is needed to support a culture shift that embraces this as an ethical imperative. In that scenario, tradeoffs between vehicle capacity and road user safety take on a different set of values; and speed management, the most important of the Safe System tools, becomes routine, and the focus of innovation for new engineering and technology applications.

Later in 2020, the Safety Council will be working on the *Safety Impact Assessment Practitioners’ Guide*. This national benchmark document will support the institutionalization of the Safe System via a common role for transportation planners and engineering: development review.
Balancing Performance-Based Practical Design with Safety

**Authors:** Safety Council

**Audience:** Public Sector DOTs, Cities, MPOs, and Consultants

State DOTs are increasingly moving to Performance-Based Practical Design (PBPD) for a myriad of project types, from general maintenance resurfacing to full scale build projects. PBPD allows for a rescoping of projects to limit them to their core purpose and needs, “value engineering” them to eliminate nonessential elements.

The more advanced state DOT programs consider safety as the primary factor in the decision of design variance. However, this is not always the case. An example may be where a DOT decides not to construct a shoulder along a route if the crash history supplies no evidence of roadway departure crashes or other crashes that would benefit from the addition of the shoulder. This can be a significant cost saving for a project in excessive cost right-of-way, environmentally sensitive areas, or cost-prohibitive construction sites, e.g., mountainous terrains. However, vulnerable road users are often overlooked in this analysis. A shoulder may provide an otherwise unavailable passage for a pedestrian, and the failure to construct a shoulder ends the possibility of this passage either today or in the future for the pedestrian.

To ensure that other objectives (safety, operational performance, context sensitivity, life-cycle costs, long-range corridor goals, livability, and sustainability) are not impacted by an over-emphasis on minimizing project cost, a comprehensive performance management framework is needed.
PBPD can be used to identify key opportunities for low-cost pedestrian and bicycle safety and mobility improvements. The Federal Highway Administration (FHWA) notes the following three case studies with this approach:

**Soapstone Drive Road Diet:** This case study of a project in Reston, Virginia illustrates a cost-effective improvement for bicyclists that took advantage of the community’s existing paving schedule and resulted in a large decrease in crashes involving bicyclists. 

**Exclusive Pedestrian Phasing in Beverly Hills:** This case study shows how a low-cost pedestrian enhancement can be implemented throughout a network to improve safety. Performance analysis allowed the City of Beverly Hills, California Engineering Department to investigate trade-offs and to maintain the enhancements only in those areas where benefits outweighed the costs.

**Nickerson Street Road Diet:** This case study illustrates how a single project can address both bicyclist and pedestrian safety concerns at a relatively low cost. This Seattle, Washington project also included a rigorous before-and-after performance analysis, tracking both vehicle speeds and crash incidence rates.\(^1\)

**Arizona SR 264 Burnside Junction to Summit:** PBPD can also effectively bring in systemic safety opportunities to reduce safety risk in a cost effective, targeted approach. FHWA notes a case study in Arizona with this approach. This 2015 case study illustrates how the Arizona Department of Transportation Traffic Safety Section took a systemic approach to review two-lane rural highways with a high potential for run-off-roadway crashes in order to identify and prioritize treatments to improve safety.\(^2\)

Many analytical efforts behind project decisions are typically focused on either operational impacts or safety evaluations, and seldom are the combined performance and user benefits and detriments reconciled. The Council and its volunteers should work through 2021 and beyond to identify and develop case studies that demonstrate combined performance using both qualitative and quantitative approaches.

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1. [https://www.fhwa.dot.gov/design/pbpd/case_studies.cfm](https://www.fhwa.dot.gov/design/pbpd/case_studies.cfm)
2. [https://www.fhwa.dot.gov/design/pbpd/case_studies.cfm](https://www.fhwa.dot.gov/design/pbpd/case_studies.cfm)
Vision Zero and COVID-19 Financial Impacts

Author: Gerard Soffian

Audience: Public Sector, Private Sector, Law Enforcement, Educators, Elected Officials

The effectiveness of Vision Zero programs relies on the successful buy-in from the general public to take greater responsibility for safer travel choices and accept changes in traffic controls and roadway design. As protection from Coronavirus (COVID-19) takes priority from a public health and safety standpoint, Vision Zero-related traffic safety issues may receive less focus. As a result of the COVID-19 pandemic, many municipalities are under severe budgetary constraints. As reported by the National League of Cities, “municipalities across the country are at serious risk. …”

The tightening of government budgets will likely challenge the ability to continue to adequately fund Vision Zero programs. Ongoing agency and public support for Vision Zero will require renewed enthusiasm and energy by transportation professionals as well as the numerous organizations needed for Vision Zero. Public health and safety are currently focused on protection from the COVID-19 and not traffic safety. In fact, as motor vehicle travel returns to pre-COVID-19 traffic volumes, fatalities per vehicle-miles-travelled are growing. According to NHTSA, riskier driver behavior is being documented with regard to seat belt use, speeding, and distracted driving.

“Because of COVID-19 related impacts, the number of miles driven in the first five months of 2020 decreased by 17.3% compared to 2019. The number of miles driven in May 2020 decreased by 25.5% compared to May 2019. Deaths for 2020 to date total 13,890. This preliminary estimate is down 6% compared to the first five months of 2019. Motor-vehicle deaths in May 2020 totaled 3,140. This preliminary estimate is down 8% from May 2019. However, because of the large decrease in miles driven, the monthly mileage death rates increased by 23.5% compared to May 2019. This increase is despite the 8% decrease in deaths. The mileage death rate per 100 million vehicle miles driven for May 2020 is 1.47, compared to 1.19 in 2019.”

Vision Zero programs will need to be re-invented to address the “new normal” as it manifests itself. Research is needed to document the extent to which operating budgets for Vision Zero programs are changing as well as how the transportation safety message is being modified to complement the COVID-19 public health messages.

1 https://injuryfacts.nsc.org/motor-vehicle/overview/preliminary-monthly-estimates/
COVID-19 Impacts

**Authors:** Chuck Huffine, P.E., AICP, PTOE  
**Audience:** Governments, Traffic Professionals

The amount of traffic congestion has visibly reduced due to the COVID-19 pandemic. Increased telecommuting, less transit use, increased numbers of walkers and bicyclists, less retail traffic, and increased delivery traffic have all been documented. Currently some of these patterns are lessening and trending closer to pre-COVID-19 levels. The following four critical questions should be explored by ITE through this topic:

- Will any of these trends continue post-COVID-19 and at what levels?
- What can ITE do to determine if any of the changes in travel habits can be permanent?
- What changes in the transportation network and traffic control will be needed to accommodate these trends?
- How will these changes in travel habits affect our economy?

Data and research concerning the transportation effects of COVID-19 have begun to appear on the Internet. This information will provide an excellent continuing source of data concerning travel trends, plus spur discussion on the long-term effects.

If some of these travel trends can be captured on a permanent basis, this pandemic could provide a tremendous opportunity to change travel habits. The challenge for transportation professionals and government officials is to determine which trends should be permanent and how best to achieve this. Through continued education and policy changes, perhaps more people will work from home, use alternative modes, and travel less, in general, with a continued focus on health and safety. What will the effects be on our profession and our systems; especially with the continued evolution of automated vehicle technology? What will the economic effects be? These questions and more should provide a framework for ITE to collect more data, explore these trends, and be a leader in changing how we work and travel.
Automated Enforcement of Traffic Laws

Author: Gordon Meth

Audience: Public Sector, Private Sector, Law Enforcement, Educators, Elected Officials

The use of automated enforcement did not become prevalent in North America until the 1990s. Presently, red light running cameras are used in 22 US states, the District of Columbia, the US Virgin Islands\(^1\), Canada, Australia, New Zealand, and other countries. The purpose is to improve traffic safety but many perceive it to be a revenue source for the government. The research used in the AASHTO Highway Safety Manual indicates that while red light running cameras improve safety for angle crashes, they increase the probability of rear end crashes.

Automated enforcement now includes speed enforcement, school bus stopping enforcement, and reserved bus lane enforcement. Automated speed enforcement—or photo radar—is used in Australia, New Zealand, Canada, and the rest of the world. In fact, within the last year, automated speed enforcement was introduced in two major cities in Canada. Currently, 12 states plus the District of Columbia use automated speed enforcement at one or more locations. Some of these applications are restricted to school zones and/or work zones.

New York City was given authorization by state legislature to install automated speed enforcement in 140 school zones as a pilot project in 2013. These operated during school hours only. In 2018, the enabling legislation expired. New York City then provided enabling legislation and is approaching 1,000 fixed-speed camera installations.

A considerable number of studies have been performed documenting the safety and speed compliance benefits of these cameras. Their findings were as follows\(^2\):

- Fatal/severe injury crashes in school zones declined over 20 percent with cameras
- Excessive speed violations (i.e., >10 mph above posted speed) declined 60 percent in school zones over time
- Only 20 percent of violators became repeat violators
- 0-2 percent of vehicles exceeded the speed limit by 11 mph or more during school hours, but violations were higher in deactivated periods

Some research on the safety benefits of automated speed enforcement is available through the Crash Modification Factors Clearinghouse where they show substantial reductions in crashes of various types, but most especially speed related crashes\(^3\). Existing installations also have data showing the impacts on speeds over time. Additional information is needed on the safety impacts on bicycles, pedestrians, and slow and medium speed vehicles (i.e., electric scooters), as well as area-wide effects, effects on average and 85th percentile speeds before and after, and other impacts of automated speed enforcement. Also, this knowledge requires distribution throughout the industry to help disseminate data driven facts regarding automated enforcement.

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\(^1\) Governor’s Highway Safety Association
\(^2\) NYC Speed Camera Report, June 2018
\(^3\) cmgclearinghouse.org
Implementation of New Guidelines for Determining Traffic Signal Change and Clearance Intervals Recommended Practice

**Author:** Christa Greene

**Audience:** Any agency or consultant involved with designing or implementing signal timing plans

After a lengthy process, ITE approved Guidelines for Determining Traffic Signal Change and Clearance Intervals Recommended Practice (RP) in March 2020. The most notable change is the use of an “extended kinematic equation” that includes additional speed variables when calculating the yellow change interval. The preliminary assessment is that the resultant total change and clearance interval times are much longer than previously used. In particular, yellow change intervals for left turns will be much longer than those used in current practice (up to 7 seconds). Several states have verbally expressed concern that such long yellow change intervals could exacerbate the indecision zone (aka, type II dilemma zone) safety risks. In other words, motorists approaching a traffic signal during excessively-long yellow change intervals would be at greater risk of making different decisions than the person that is following them, thus negating the importance of human factors in setting change and clearance intervals.

In addition, the new RP only provides application guidance for left-turn and through movements; it does not provide clear guidance for calculating yellow and all-red intervals for right-turn movements and specifically notes right-turn movements as an area needing more research. Limited guidance on this topic is provided in Chapter 3, Section 3.5. Several states are delaying the adoption of the RP until further research and evaluation are completed. The RP goes as far as noting areas where additional research is required.

In addition to the RP, an article by Jeff Lindley, P.E. (F), was published in the March 2020 *ITE Journal* titled “Traffic Signal Change and Clearance Intervals: Research Still Needed!” which clearly outlines the additional research areas needed to further refine the RP. In May 2020, FHWA posted a Traffic Signal Change and Clearance Interval Pooled Fund Study which is planned to start this year and conclude in 2023. Currently, $220,000 of the required $920,000 commitments have been identified. Several other states intend to participate in the study, but the commitments have not been finalized at this time. The Scope of Work for this Pooled Fund is as follows:

1. Evaluate the influence of yellow change and red clearance interval duration on driver behavior by movement type (left turn, through, right turn), approach speed (<30 mph, 30-40 mph, >40 mph), and context (downtown settings, suburban conditions, etc.).

2. Evaluate signalized intersections with longer change and clearance intervals.

3. Evaluate perception-reaction time, for alerted drivers for left- and right-turn movements. Factors considered should include the following: age groups, vehicle type, intersection geometry, the influence of countdown pedestrian signal indications, traffic demand, and presence of non-motorized modes.

4. Approach and passage speed variations associated with different left-turn lane characteristics.

5. Entry delay to account for the delay of drivers and pedestrians entering the intersection.

6. Comprehension of restrictive and permissive yellow change laws and their impact of these laws.

7. Interaction with and impacts on non-motorized modes of pedestrian and bicycle movements.
Roundabout Public Education
Public Engagement: Part of the Solution, Not Part of the Problem

Author: Lindsey Van Parys

Audience: Public Engagement Professionals and Professionals Involved in Education

As states and cities move towards implementing more roundabouts, teaching people how to walk, drive, and bike roundabouts will be critical to improve safety and operations; understanding their benefits will also prove helpful in having more roundabouts installed.

This initiative is most impactful if it is designed to reach a broad and diverse audience. This developing trend should be targeted at state and local agencies that influence driver education and “rules of the road” awareness as well as public safety and enforcement. To maximize its benefit, this initiative must reach well beyond ITE’s typical audience of designers, practitioners, and academia. This developing trend is also a call for engineers to step outside of “normal” engineering practices and engage in public education in traditional and nontraditional ways.

Roundabouts have been identified by the Federal Highway Administration (FHWA) as one of nine proven safety countermeasures and are being utilized on US roadways more frequently. However, the rate of implementation still has not been quick or widespread, and therefore, the broad nationwide safety benefits that could be offered by roundabouts are not being fully realized. The primary reason for this is that there is a general lack of public understanding as to why roundabouts are beneficial and how to properly navigate them. This lack of understanding not only creates fear that causes public opposition to proposed roundabout installations (which eliminates many roundabouts before they are constructed), but also contributes to a higher frequency of crashes in existing roundabouts, due to a failure to understand and adhere to the proper roundabout right of way priority and lane utilization.
TSMO in Local Agencies

Author: Ati Abad

Audience: Public Agencies and Consultants

The strategies, projects, and programs offered by transportation systems management and operations (TSMO) have proven to improve the safety, mobility, and reliability of the transportation system significantly. But what roles do the local agencies play in this?

TSMO for DOTs vs TSMO for Locals

TSMO frameworks consist of strategic, programmatic, and tactical Elements. Typically, DOTs set the strategic direction and support the TSMO implementation through the provision of resources, standards, leadership, and guidance for business processes, planning, and policy. On the other hand, and at the local level, operating agencies are focused on the implementation of TSMO at the service layer, focusing on tactical elements including TSMO strategies, TSMO systems, and emerging technologies. Therefore, it is necessary that DOTs and local agencies work collaboratively to maximize the benefits of TSMO implementation at the statewide level.

TSMO Program Management for Local Agencies

To efficiently implement and manage TSMO strategies, operating agencies are encouraged to identify needs and required resources for performance measurement and management, systems engineering, asset management, data collection and management, business processes, staffing, and workforce development. TSMO applies to not only urban areas, but also suburban and rural areas. In addition, local agencies may already be implementing TSMO, but the key is to ensure they are all integrated to achieve an overall goal for the system involving all jurisdictions.

How to Advance TSMO in Local Agencies

Depending on the regional goals and objectives, operating agencies are responsible for a hands-on approach to the identification, deployment, operation, and maintenance of specific TSMO strategies that are most relevant to their needs. These may include multimodal strategies that address the routes of recurring and non-recurring congestion, performance measurement, and/or emerging technologies to improve safety, mobility, reliability, customer service, and sustainability of the transportation system.
Examples may include, but are not limited to the following: Connected and Automated Vehicles Deployment, Traveler Information, Traffic Incident Management, Traffic Signal Coordination, Road Weather Management, Work Zone Management, Transit Signal Priority, Freeway Management, Congestion Pricing, and Management, Active Transportation, and Demand Management, Integrated Corridor Management, etc. The Federal Highway Administrations (FWHA) has recommended some of the following key questions to ask:

- Who owns what routes in the transportation system? (Freeways, arterials, local roads)
- Are we coordinating with the right stakeholders?
- Is TSMO integrated into current processes, such as planning and project development?
- Do we have goals and objectives for TSMO in our state or region? Are they reflected in our existing plans and processes or will new ones need to be developed?
- Does our staff have the right skill sets to advance TSMO?
- How are we tracking and monitoring the performance of our transportation system?
- How can we best utilize the data and metrics we have?
- What technology needs should we address to advance TSMO? Is our technology interoperable with other related systems and jurisdictions?
- Do senior leadership and other departments understand TSMO?
Rise of E-Commerce

Author: Daniel Haake

Audience: Transportation and Urban Planners, Curbspace Experts, Traffic Engineers, TSMO Professionals

Over the past decade, e-commerce has expanded its overall retail market share to almost 10 percent by 2018.\(^1\) As the shift to e-commerce continues (somewhat amplified by COVID19\(^{-}),\) freight is increasingly delivered to the consumers’ doorsteps instead of traditional brick and mortar stores. As a result, large orders delivered from distribution to retail centers by tractor-trailers are being replaced by parcel trucks and delivery vans. While these trucks may be smaller, they are more frequent in number, resulting in an overall increase in vehicle miles traveled. This challenge is aggravated by consumers’ increasing demand for rapid order fulfillment; sometimes within the hour. Delivery vehicles often have to compete for on-street parking with passenger vehicles. As a result, trucks often double-park, restricting overall traffic flow. Parking fines—intended to be a deterrence—are factored into the cost of doing business for many trucking firms that deliver to the urban core.\(^2\)

Research and Practice Examples:

E-Commerce Impacts on the Trucking Industry
American Transportation Research Institute
This American Transportation Research Institute document provides background on e-commerce and the transformation of retail supply chains and distribution/fulfillment network.

Freight Roadway Design Guidelines – Florida Department of Transportation
This guidance document outlines how to integrate freight deliveries into roadway design.

Final 50 Feet – University of Washington Supply Chain Transportation & Logistics Center
The Supply Chain Transportation and Logistics Center has completed several e-commerce and last-mile delivery studies and pilot projects.

Future Recommendations:

- Curbspace management and Complete Streets initiatives must account for increased deliveries
- Residential developments and buildings should consider installing delivery lockers
- Design, construction, and maintenance projects should consider the increased number of delivery vehicles near residential areas and fulfillment centers
- ITS solutions like truck parking reservation systems can help manage curbspace demand
- Parking fines are not a deterrent for delivery vehicles, instead, they are often treated as the cost of doing business.

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Ethics Standing Committee

Social Justice in Transportation

Author: Jeremy Chapman

Audience: Audiences are anyone involved in the design, analysis, or operations of a transportation system

The application of social justice to transportation is quickly coming to the forefront. There is a growing conversation focused on the intersectionality of social justice issues with transportation within the profession and the public. Lessons from the past—from the construction of the interstate system destroying many parks, natural areas, and minority communities—to the present day, where efficiency and throughput of vehicles is the primary focus (rather than vulnerable user safety), have led to a demand for change. The thought-provoking article “What does a traffic jam in Atlanta have to do with segregation? Quite a lot.” Published in the New York Times as part of the 1619 Project by historian Kevin Kruse, this article illustrates the present-day impacts of past land use, public policy, and transportation decisions.\(^1\) The transportation profession is being asked to understand this history and to help to rectify past wrongs on present day projects. In a 2016 speech to the Transportation Research Board Annual Meeting, then-USDOT Secretary Anthony Foxx spoke at length about the mistakes of past infrastructure design that divided and segregated rather than united, using infrastructure as barriers rather than bridges.

The dramatically-increasing level of pedestrian fatalities and their relationship to inadequate or car-centric infrastructure, combined with concerns about climate change, are creating pressure to deliver multimodal solutions. The general public has begun to demand that people have options for travel and that communities have a right to be safe when doing so. Social justice issues present themselves in the allocation of transportation resources and decisions for accommodating or resolving delays. Efforts to improve motorists’ delay in many cases, have resulted in decreased quality of life for people who live and work in locations impacted by highway and road-widening projects. Likewise, development patterns and restrictions on housing have resulted in people feeling forced to live far from jobs in environments that are not conducive to multimodal travel. The balancing of these tensions is increasingly placed upon transportation agencies to resolve.