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A2-2 Taylor & Selin | Chattanooga 2040 RTP performance-framework: balancing regional and community needs
A2-3 Brown & Lee | Understanding differences in performance-based planning practices at small, medium, large, and very large MPOs
A4-1 Chamberlin | Greenhouse gas emissions as a performance indicator in corridor transportation planning
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As the “TEA Era” has come to an end, MPOs find themselves facing new challenges in planning applications, technology, and organizational capacity. Those in metropolitan areas of less than 200,000 population (non-TMA) are in some ways more challenged than their larger counterparts. This paper explores some new planning paradigms, and how smaller MPOs may find creative solutions, some of which are suggested below.

- **Performance Based Planning.** Moving Ahead for Progress in the 21st Century (MAP-21) created the first major policy shift in metropolitan transportation planning since ISTEA, by requiring MPOs and State DOTs to adopt a performance-based and outcome oriented planning process. It may be argued that this shift began in the American Recovery and Reinvestment Act of 2009, in which Congress demanded accountability on the outcomes of investment with stringent reporting requirements. The policy in MAP-21 reflects that desire to document the outcomes of federal investments in the context of national goals and various performance plans. This means MPOs will have to do performance measurement, target setting, and performance reporting for their long range plan and Transportation Improvement Program development. The law does not provide any simplified procedure for non-TMA MPOs.

  Data collection, analysis, and archiving can be costly. TMAs have some experience with this in preparing their Congestion Management Process. Potential solutions for non-TMAs include sharing the burden with partner agencies including states and transit operators. They may also look at group procurement of data, a strategy being investigated by the New York State Association of MPOs.

- **Organizational Capacity.** Small MPOs are often housed by city or county government, or regional planning organizations. With FHWA and FTA metropolitan planning funds being essentially flat, staff size is small and sometimes contracting. Yet the range of required planning tasks remains large. Non-TMA MPOs first need to make sure they scope their planning work appropriately for their community. They might then find assistance from their host and member agencies for specific functions, like GIS. An effort underway at NYSAMPO, called Integrated Planning, looks at how knowledge and resources can be shared among the 13 MPOs (5 are non-TMA) and New York State DOT. Judicious use of consultants for one-time needs can also be more effective than using staff.

- **Technology.** The use of technology to solve problems can seem daunting and expensive to a small MPO. Planners often think of capital projects in terms only of solving a transportation problem. A broader perspective may identify purchase of an advanced traffic signal system as a method of acquiring traffic volume data at no added cost. The private sector has identified a market for traffic volume and speed data; this may be a more effective option than using staff. Technology can also make public involvement less burdensome.
As part of 2040 RTP development, the Chattanooga TPO worked with stakeholders to create a comprehensive performance-based planning framework to guide plan development. Transportation investment needs defined during outreach efforts were frequently voiced by groups approaching the RTP from two different perspectives - one which advocated a more local, community-oriented investment approach and another that championed “big-ticket” investments needed to advance the economic competitiveness of the region. These two perspectives are often seen as being in opposition to one another, but both are critical to success of the plan. Rather than place them at odds, or prioritize the needs of one over another, the Chattanooga 2040 RTP is founded on a long-range vision that balances consideration of investment needs across both community and regional impacts.

In keeping with the vision to balance consideration of community and regional needs, goals and objectives for the 2040 RTP were organized within a “Community to Region” performance framework which presents goals/objectives across three geographic scales:

- **Within Community** – Goals and objectives that emphasize safe, multimodal connections and access to community resources and advance livability and quality of life principles;
- **Community to Region** – Goals and objectives that support strategic multimodal connections between individual communities and regional activity and economic centers; and
- **Region to Region** – Goals and objectives that emphasize mobility and intermodal improvements to ensure the region is well connected within the state and the nation to advance economic growth.

A set of three, succinct goals were defined to reflect the long-term direction for investment across each geographic scale. Objectives were defined accordingly to address the unique needs and considerations within each scale.

A critical aspect of this approach – varying goals and objectives by geographic scale – is that it enabled project evaluation to vary across each scale as well. To operationalize this, a set of performance measures were defined and weighted by the level of significance of each measure for each scale. As an example, Delay Reduction is not as significant a factor in determining project benefits Within Community, as transportation needs within this scale often focus on slower, safer, multimodal trips. This factor is of great significance (and therefore of greater weight) within the Regional scale, as the efficient movement of people and goods is vital to the regional economy. The different weighting system allowed projects to be scored and ranked according to unique needs of each scale. All performance measures were mode-neutral and aligned with both regional goals and national transportation goals established in MAP-21.

This proved to be a highly flexible approach which infused context in the project evaluation process and supported more targeted investment decisions yielding a truly balanced investment package:

- A doubling of funding for bike/ped improvements;
- Transit capacity investment at 25% of plan;
- A reduction in roadway capacity investment from 51% to 31% of plan; and
- Systems preservation funding at 39% of plan.

The presentation will focus on development of the performance framework and project calculator, and the transferrable policy and technical methods for other small/medium-sized MPOs.
New federal legislation, including MAP-21, places unprecedented emphasis upon the importance of performance-based transportation planning. Metropolitan Planning Organizations (MPOs) are now required to respond to the establishment of quantitative measures of system condition and performance by setting achievable targets for improvements in these metrics to be achieved by regional long-range plans. While federal agencies and DOTs may introduce some new metrics not previously considered by MPOs, a foundation for congestion performance measurement and forecasting already exists among those transportation management areas which maintain travel demand models in order to meet air quality conformity analysis requirements established by the U.S. EPA. Conversely, small and medium-sized communities which have fewer modeling resources than large MPOs may face greater challenges in adopting a performance-based planning approach, since they may lack many of the prerequisite tools and data.

During the summer of 2013, Citilabs conducted a survey of MPOs, in partnership with Dr. David Lee of the Center for Quality Growth and Development at the Georgia Institute of Technology to assess how the nationwide push towards performance-based transportation planning relates to metropolitan travel demand forecast modeling activities. A general overview of preliminary survey findings will be presented at the AMPO Annual conference in Portland, Oregon on October 22-25, 2013. For the 2014 TRB Tools of the Trade conference in Burlington, Vermont, the authors would like to present a summary of results focused specifically on what this MPO survey reveals about differences between small, medium, and large communities in adoption of performance-based planning methods. Key findings include:

- Most small MPOs did not use performance measures in developing their most recent long-range transportation plans, unlike most medium and large MPOs.
- Small MPOs were much less likely to have evaluated the performance of alternative future scenarios in developing their plans than medium and large MPOs.
- Small MPOs were more likely to use policy judgment or qualitative methods of forecasting land use than medium or large MPOs, who were much likelier to use land use modeling or visioning tools.
- Very large MPOs were much likelier to use an activity-based travel demand model, and many small MPOs did not include mode choice in their models.
- Small MPOs primarily forecasted mobility performance measures using their models, whereas larger MPOs were likelier to consider economic and environment performance measures as well.
- Small MPOs felt less comfortable than very large communities in sharing performance data derived from their models with other agencies and the public, but more comfortable than medium MPOs.
- Small MPOs were less likely to collect field data in order to measure transportation system performance.
- Small MPOs reported being less likely to address congestion reduction and environmental sustainability national performance goals in the future, and more likely to address safety, infrastructure condition, and reduced project delivery goals.
- Small MPOs were less likely to view an increased emphasis on performance-based planning as strengthening the role that models play in defining policy objectives.
Many Metropolitan Planning Organizations, Departments of Transportation, and other planning agencies have developed and adopted Climate Action Plans. These plans typically develop targets for greenhouse gas reductions from some baseline year (e.g. 1990) from many sectors of the economy. Depending on the geography, transportation-related greenhouse gas emissions account for 28% to as high as 50% of a region's greenhouse gas emissions. The State of Washington, for example, has targeted a 50% reduction of 1990 greenhouse gas generation, from all sectors, by 2050.

New transportation and mobile emissions modeling tools enable transportation planners to estimate transportation-related greenhouse gas emissions finer levels of geography, including sub-regional and corridor levels. Specifically, linking traffic activity models such as traffic microsimulation models with the Environmental Protection Agency’s (EPA's) MOVES model can generate "total greenhouse gases" associated with alternative transportation improvement plans.

In addition to estimating the tailpipe emissions associated with the so-called criteria pollutants (PM-10, PM-2.5, CO, hydrocarbons) EPA's MOVES model generates greenhouse gas equivalents (e.g. carbon dioxide, methane, etc.). Further, emissions are generated in stages associated with many facets of vehicle operation including cruising, braking, idling, and refueling. These various vehicle stages (refueling excepted) can be extracted from a traffic microsimulation model and post-processed to produce an "Operating Mode Distribution". An Operating Mode Distribution is a distribution of VMT by vehicle performance as characterized by the amount of VMT in each of 23 speed-acceleration bins. Representing a corridor transportation plan through its characteristic Operating Mode Distribution is the most direct way of providing input to the MOVES model.

This presentation will highlight two case studies where these tools have been used recently in New Hampshire and Vermont. The first case study will analyze the impact of converting a stop-controlled intersection to a roundabout, an analysis conducted to support a Congestion Mitigation and Air Quality application. The second case study will look at the Williston-Essex Network Transportation Study in Chittenden County. In this study alternative "Strategy Packages" -- assemblies of transportation improvements within a regional sub-area proximate to I-89 Exit 12 -- were evaluated relative to their generation of greenhouse gases.

The presentation will inform attendees of the most efficient way to utilize the mobile emissions knowledge embedded in the EPA MOVES model.
There are a wide variety of approaches for quantifying the degree to which a local or regional population is affected by road traffic emissions. The methods range from simple counting of population living within certain distances of high volume roads to using an emissions dispersion model to estimate concentrations. The latter approach is resource intensive and generally reserved for specific projects in which a conformity or hot spot analysis is required.

However, from a public health or environmental justice perspective, it is still often of interest to quantify the extent to which different population groups are affected by road traffic emissions on a broader scale. While roadway proximity or traffic density measures can function as proxies, it is more enlightening to use methods that allow a direct quantification of emissions loads, which can vary with traffic speeds and fleet composition (among other factors). The smaller areal geography often associated with small and mid-sized cities also allows for better spatial positioning of the population of interest compared to the usual assumption of even distributions throughout census blocks or zip codes, which typically does not reflect actual land use patterns.

This presentation will demonstrate the use of dasymetric population mapping at the parcel level, which allows for spatial (re)distribution of census populations. Using data from travel demand models and emissions inventories allows an emission loads estimate in grams per areal unit to be derived and in combination the two methods can provide a good overview of relative population affectedness. The differences in outcome between using this approach and using the typical census area level populations method will be shown.

Our case study area is the City of Davis, CA (population 66,000) and will include a real world example: the site for an affordable housing project in proximity to a freeway that was brought before the City in 2008. This presentation will also discuss how aspects of regional travel demand models can be appropriated for local analysis. Since any measure describing how a population is affected by road traffic emissions relies heavily on data from such models, their level of detail and accuracy significantly influences how indicative such measures can be of real world conditions.

As part of this presentation it is intended that members of the audience will get together in groups and discuss

a) which approaches they themselves have used or are aware of for creating any measures of population affectedness by road traffic emissions and in what context

b) and/or for which projects they might in future want to use such techniques.

These experiences and ideas can then be shared and collated to finish off the session.
Greenhouse gas emissions from the transportation system continue to be a topic of interest in many communities. While many larger MPOs are now routinely estimating GHG emissions for proposed transportation plan alternatives, most small MPOs do not. Many small MPOs are located in attainment areas, and have never had to conduct air quality analysis for transportation conformity or other purposes. However, in the last year, several new and streamlined approaches for GHG analysis have become available, making GHG analysis possible for smaller MPOs and communities that are interested.

1) FHWA’s *Handbook for Estimating Transportation Greenhouse Gases for Integration into the Planning Process* is designed for DOTs and MPOs of all sizes and capabilities to understand approaches for analyzing GHG emissions in the planning process. It helps users understand strengths and limitations of different approaches, step-by-step procedures, and common data sources. Recognizing that not all agencies have the same capabilities, it helps the user select an appropriate GHG analysis method, considering issues such as the goal of the analysis, the data, tools and resources that are available, and the variables that will be analyzed.

2) EPA’s guidance *Using MOVES for Estimating State and Local Inventories of On-Road Greenhouse Gas Emissions and Energy* describes how to use the MOVES emissions model for GHG analysis. It outlines streamlined approaches, using national default input data, making GHG analysis less resource-intensive relative to the requirements that apply for transportation conformity analysis.

3) FHWA is finalizing another handbook, *Addressing Greenhouse Gases Within Performance-Based Planning and Programming* (PBPP). This document describes voluntary approaches to integrating GHG emissions analysis in PBPP, including the selection of appropriate measures and the use of measures to support investment and policy decisionmaking.

4) Finally, since GHG emissions from construction and maintenance of infrastructure also impact climate, FHWA is producing a tool to estimate GHG emissions and energy consumption from highway and transit construction and maintenance activities. The tool can be used by MPOs and state DOTs of any size to estimate GHG emissions from implementing long-range transportation plans. The tool will account for a wide range of highway and transit project types, will allow the user to evaluate the benefits of alternative construction methods and materials, and will also enable the user to assess the emissions benefits of more aggressive roadway maintenance. While these tools and documents are focused on analysis of GHG emissions, the same principles and techniques are also applicable to energy analysis. MPOs and communities that are not concerned about GHG emissions but are interested in energy efficiency can use these tools to evaluate the energy consumption impacts of transportation plans and projects. This presentation will summarize these new tools and guidance documents, demonstrate how they can be applied in small and medium-sized communities, and include a real-world case study with data from a small MPO’s transportation plan.
It is well known that transportation funding has not kept pace with multimodal transportation needs. In response to this problem, numerous states have statutes and many Metropolitan Planning Organizations have board driven policies to prioritize projects based on certain goal-oriented criteria and performance metrics. By setting a direction and evaluating projects for how well they meet statewide and MPO goals, MPOs are making critical comparisons based on quantitative and qualitative data to identify projects that best meet their multimodal transportation goals. This session will highlight several project prioritization best practices and tools being used by states and small and medium sized MPOs from around the country. The session will discuss the national goal areas identified in MAP-21 and practical performance measures MPOs can use in their project prioritization process to track progress toward goals and targets. This session will also provide an outline on how a MPO can develop a project prioritization process framework to assist in making the project selection process more transparent to the public, beneficial to addressing MPO goals and objectives, and more focused to improving the performance of the MPOs multimodal transportation system under uncertain funding constraints.
SMALL MPO TRANSPORTATION PLANS AND THE FHWA INVEST PROGRAM

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The Kittery Area Comprehensive Transportation System (KACTS) is the Metropolitan Planning Organization (MPO) for the Kittery portion of the Kittery, Maine and Portsmouth, NH urbanized area and the Dover/Rochester, NH urbanized area. KACTS received a grant from the Federal Highway Administration (FHWA) in 2013 to utilize the new INVEST program. The INVEST program is free online evaluation program that is voluntary to use and is not required as part of any federal program. The INVEST program is a tool for municipalities and other organizations to help integrate sustainable practices within existing projects and plans. The primary focus of the INVEST program is the ability to provide a project or program with a sustainability score, based on predetermined criteria. KACTS will use the INVEST program to guide the development of the upcoming update to the KACTS Long Range Transportation Plan. The process includes three components. The first step is to give the current 2010 Long Range Transportation Plan an INVEST score, using a subcommittee of the KACTS Policy Committee and other volunteers. The second step involves writing the new 2013 KACTS Long Range Plan that will consider the results of the INVEST program scoring. The third step involves scoring the 2013 KACTS Long Range Transportation Plan and then comparing the two scores. The 2013 KACTS Long Range Transportation Plan will be reviewed and scored by another subcommittee of the KACTS Policy Committee. At the end of the process, KACTS will develop materials on lessons learned and a final report for FHWA. KACTS will complete this project in February 2014.

The INVEST program is relatively new and only a few municipalities and agencies have used this tool for their projects or programs. The KACTS region includes six communities in Southern Maine. According to the 2010 Census, the total population of the KACTS region in 2010 was 48,720. There are many small regions and communities in the United States that would benefit from the work that KACTS will perform using the FHWA’s INVEST program. Many municipalities are interested in making their communities more sustainable and the INVEST program is a new tool that can provide guidance and assistance. The INVEST program can assist in this process by allowing municipalities to create a sustainability score for any type of project or program and then use those scores to improve results. KACTS is proposing to explain the process involved using the INVEST program and its direct benefit to small communities. During the presentation, KACTS proposes to describe the process step-by-step and how the INVEST program has impacted the KACTS region.
Transportation agencies are under intense pressure to maximize the return on investment dollars and to clearly justify infrastructure project investment decisions in today’s constrained financial environment. The development and use of evaluation criteria that utilize objective/quantifiable performance metrics to aid decision-makers in selecting effective projects is critical. The selection and prioritization of transportation roadway projects is a complex, multi-step process that involves many different stakeholders and can incorporate many different evaluation criteria (both objective and subjective). The roadway project prioritization process can be rather confusing as it can involve different combinations of subjective and objective performance metrics and analytical approaches; and can vary in terms of how various intergovernmental and stakeholder objectives/considerations are weighted and incorporated into the decision-making process. Historically, roadway project prioritization evaluation metrics have relied on the use of localized, volume-based traffic engineering metrics such as peak-hour V/C and ADT. These performance metrics can then be used as inputs for various analytical approaches. The Federal Highway Administration (FHWA) suggests three general categories of methodological approaches for prioritizing transportation infrastructure projects using: 1) ranking, 2) incremental benefit-cost analysis (BCA), and 3) optimization. All three approaches have different strengths and weaknesses and each is clearly only as good as the performance metrics and input data that are available.

In this project, we describe and demonstrate a novel approach for prioritizing roadway infrastructure projects using an objective, spatially-based network measure that considers the network-wide (as opposed to localized) impact of the proposed project. The approach can be categorized as a multiple criteria approach that directly incorporates user equilibrium dynamic traffic optimization into the routing choices of the individual travelers, with the ultimate goal being to rank-order candidate roadway projects in terms of which projects provide the greatest network-wide travel time benefits to the entire population of travelers. Our approach considers network topology and connectivity, the dynamic rerouting of traffic flows on roadway links, and the interests of all travelers of the road network as opposed to a localized subset. We illustrate our solution approach using the municipal planning network, travel demand data, and actual candidate roadway projects from the Chittenden County Regional Planning Commission (CCRPC) of Vermont.

Our results show that the evaluation and prioritization of roadway projects can be very non-intuitive both in terms of the travel-time impact an individual project can have on the network as a whole (some projects make things worse) and with respect to the aggregate impact associated with groups of projects (adding projects does not necessarily lead to improved performance, and building two or more projects that individually provide substantial benefits can actually reduce overall travel-time benefits for the network). Network-wide performance cannot be predicted by examining performance outcomes on the individual links comprising the network because small changes on one part of the network can dramatically impact the roadway network as a whole. We demonstrate that some capacity improvement projects actually degrade system-wide performance. This phenomenon is commonly referred to as Braess' Paradox.
Rural counties and small communities depend on transportation to support their economies and quality of life by providing access to jobs, goods and services, health care, and education, and to enable visitors to access tourism destinations and support local businesses. Transportation challenges facing rural areas are often similar to those in urban areas, but they differ as well; low population densities, residents’ isolation from services and opportunities, and limited budgets for infrastructure expansion and preservation confront many rural communities trying to grow or even retain their populations and economies. As transportation needs continue to increase and financial resources remain constrained, strategies are needed that help decision-makers analyze and prioritize transportation programs and projects. Performance measures are a means of encouraging expenditure of transportation dollars to achieve the most significant public benefits. This study developed performance measures to assess accessibility in rural areas and small communities at a national level.

The diversity of rural areas requires thoughtful analysis to define the most appropriate rural accessibility environment. In this study, rural was defined to include metro counties with a population density below 50 persons per square mile and all non-metro counties based on the OMB definition. Urban influence codes from USDA Economic Research Service provided a means of differentiating between types of economic development and accessibility. Utilizing this definition, rural areas accounted for 17.3 percent of the total U.S. population and included 2,221 counties.

Data sources, analytical methods, and practical applications for transportation accessibility measures were evaluated and primary economic and social issues in rural areas were identified. Selected measures of rural accessibility included access to transportation infrastructure and access to economic centers and services. Access to transportation infrastructure describes the quality of connections to the larger transportation network at the state, regional, and national level. People, communities, and counties with better transportation connections have increased opportunities for interactions in urban or suburban markets, and a greater chance of making those connections at lower cost. Access to economic centers describes opportunities for economic transactions, education, better health care, and employment.

The team developed measures to evaluate rural accessibility at a national level. Each rural county was identified as exurban, destination, or production, based on employment concentration at the county level. The team assessed accessibility using the selected performance measures in a geographic information system to compare distances between population centers and different types of facilities. There were considerable variations in the accessibility of facilities and destinations across rural counties nationally. Summary statistics produced from minimum distance accessibility results for all rural counties found that:

- median distance to the nearest interstate ramp from rural locations is 28.4 miles
- median distance to the nearest intermodal facility is 33.8 miles
- median distance to an urban area from a rural county is 17.6 miles
- median distance from rural counties to the closest MSA employment center is 52 miles
- median distance from a rural county to a public airport is 48.4 miles
- median distance to the nearest bus terminal from rural locations is 30.9 miles

This work, conducted under the auspices of the Federal Highway Administration, is of value to state DOTs, regional planning organizations, and others seeking to understand the transportation characteristics of rural communities and the relationship between these characteristics and factors such as economic performance. This research also offers a basis for understanding where current and emerging investment needs and opportunities may exist.
The Partnership for Sustainable Communities was established in the United States in 2009 between the Department of Transportation, the Department of Housing and Urban Development, and the Environmental Protection Agency. The broad goals for the Partnership are to better coordinate practices for lowering transportation costs and increase transportation options while accessing affordable housing. A nexus for these goals are the six livability principles developed by the three partner organizations. The livability principles are: promote equitable, affordable housing; enhance economic competitiveness; value communities and neighborhoods; coordinate and leverage federal policies and investments; provide more transportation options; and support existing communities. These principles provide structure for a community’s exploration of themselves and their future. The six livability principles were integrated into the four state Interstate 80 Corridor System Master Plan study. The principles allowed broad study participants to connect the work of the study with their organizations and communities across California, Nevada, Utah, and Wyoming. The initial efforts in linking existing planning work with the livability principles produced suboptimal results for connecting stakeholders with their communities. A self-assessment approach provides the connection between stakeholders and their communities.

This discussion details the steps in developing and conducting a livability self-assessment including an assessment of its use. Note, this livability self-assessment was developed without a singular focus on transportation. The self-assessment was developed to be administered to all audiences: it is not topic specific. The structure includes six to eight positive affirmations about varied elemental activities that demonstrate success in achieving the livability principle. Each elemental activity for the livability principles was identified through research of the broad-based, emerging activities for implementing each of the principles. A panel of seven diverse professionals worked to generate common, neutral language for each statement that removed the range of background data sources. Ongoing refinement of the self-assessment instrument was established as part of its original development.

The response range was developed in parallel with the self-assessment instrument as an initial validation for the instrument statements. The six level response range captured degrees of awareness and engagement ranging from non-responsive to highly involved and effectively engaged. The livability self-assessment and response range were formatted on a web-based survey tool with instruction for completion. Initial trials indicated that while the self-assessment could be accomplished individually, a group instructed format would prove more time-effective. These trials highlighted the nature of perspective for the respondent and their responses. An individual could view the self-assessment from a personal, work, or community perspective. These three perspectives were integrated into the self-assessment. This approach also provided invaluable first-person feedback on the individual experiences with the self-assessment tool. An initial one-hour group session was conducted yielding responses for three of the livability principles and additional refinement for the self-assessment instrument. A second group session completed the individual self-assessments. The results were compiled using a spreadsheet into “rose diagrams” depicting the nature of the responses and a format for understanding livability. The rose diagram depicts the degree livability is achieved in each category as individual color bars emanating from the center of a common circle. These were included in the comprehensive feedback document generated for respondents and their individual organization’s consideration. Ultimately, the wide range of response levels and three perspectives captured in the self-assessment indicates this approach provides a robust discussion of the six livability principles leading to insights about their implications for action.
One of the greatest challenges facing small communities is obtaining an accurate picture of existing pedestrian systems, which is needed to analyze factors affecting use such as connectivity, condition, adjacency and accessibility. The cost of hiring outside technical assistance to survey the system often exceeds the capacity of smaller communities, particularly those with fewer than 5,000 residents. As a community-planning component in rural Iowa, crowdsourcing has proven a viable method for gathering georeferenced information about the local network in more than 50 communities.

This paper discusses and compares two approaches of using new technology and crowdsourcing techniques to collect and analyze the infrastructure supporting non-motorized transportation. The first approach uses GIS-enabled smartphones to help communities map the location and condition of sidewalks around elementary schools as part of their Safe Routes to School (SRTS) program as well as locations where older residents desire to walk/bike (parks, downtown, grocery store). Community volunteers participate in a one-day workshop where they are trained to use a customized mapping application and then go out into the community to map the infrastructure. The app includes questions tailored to the type of environment the user is documenting (e.g., intersection or midblock). Each evaluated item is mapped using assisted visual map placement or the phone's GPS. Volunteers also have the option of including photographs as part of the evaluation. As each location is evaluated, the results are sent to a GIS web/database server where they can later be retrieved by the local community coalition for review and analysis.

The second approach utilizes web-mapping technologies to create modular interfaces for use by citizens in web surveys on traditional computers or as Web apps on tablets such as the iPad or Galaxy Tab. Four modules are currently utilized in various transportation assessments in several Iowa communities. These include 1) identifying and mapping assets and barriers; 2) mapping the most frequently used biking, walking and running routes; 3) identifying areas where citizens want a sidewalk or trail connection; and 4) generating and evaluating a sidewalk and intersection network map that when complete allows a community to generate “what if” scenarios regarding community walkability.

While both approaches allow community coalitions to collect, visualize and evaluate walkability information using a variety of web-enabled spatial technologies, a key element of a project’s success is a crowdsourcing methodology referred to as facilitated-Volunteered Geographic Information (f-VGI). Whereas VGI allows users to provide voluntary, unsolicited information on their own, f-VGI utilizes predefined criteria and prompts users to respond to a set of queries or directives that guide the range, type and spatial extent of the information to be provided. This is particularly important with transportation-related inquiries. This paper also discusses how f-VGI allowed both students’ parents as well as older residents to provide spatially coded information regarding their perceptions and observations of driver behavior and the adequacy of infrastructure supporting non-motorized transportation.

As communities strive to improve the health of their citizens they need both infrastructure and user information. Once collected, this data can be used to encourage physical activity, develop SRTS programs, and support the needs of a disproportionately aging population through accessibility and way-finding enhancements. Web mapping and smartphone technology approaches may be the perfect low-cost participatory solution to generating this information.
Midsize cities face a number of sustainability challenges, particularly in terms of transportation and land use, however only a small subset of the literature has attempted to address these issues. Examination of the state of the art in midsize city research reveals two possible reasons for this: there is no consensus on a framework for defining midsize cities, nor is there an empirical or qualitative understanding of the characteristics of midsize cities. This presentation addresses both of these issues from the transportation planning perspective. First, a transportation policy based framework for classifying cities is briefly explained, and the different travel behavior characteristics of Small, Midsize, Large and Major cities are compared. Second, two in-depth case studies of midsize Canadian cities are reviewed. The case studies involve both quantitative and qualitative data collection, and investigate the specific culture around transportation in midsize cities. The case studies are also tasked with understanding the key ingredients that have enticed residents to live in these midsize cities, and understanding how transportation policy may need to be sensitive to these cultural ingredients. Finally, the policy implications of this research are summarized.

The results of the Canadian urban classification analysis show that over 37% of Canadians currently live in midsize cities and that midsize cities are indeed uniquely automobile centric. In this analysis, small and midsize cities are characterized by two different types: centers and satellites, dependent on the role they play within their region. Centers exhibit lower than average transit commute shares, whereas satellites exhibit lower than average active commute shares. The case studies investigate Kamloops, British Columbia, a midsize centre city with 86,000 residents, and Milton, Ontario, a midsize satellite town with 84,000 residents. The results of the case studies reveal some of the context around the observed automobile-centric behavior. The case studies show that, even when local and regional commute environments are accounted for, Kamloops residents have higher propensity for local travel by active modes and Milton residents have a slightly higher propensity for travel by transit. However, significant markets for active transportation exist in both communities. The qualitative results include motivation for and barriers to walking, cycling, and transit use in each community. The qualitative results also summarize the key aspects of each community that are most valued by residents. A key goal of this research was to understand how to create a sustainable transportation system in midsize cities without compromising the municipal characteristics that enticed people to live in midsize cities in the first place. The final policy suggestions attempt to address this question.
A "Simple" Land Use Data Allocation Method: The Georgia DOT REMI Data Allocation Process

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This presentation summarizes a process used to allocate REMI data to Georgia Department of Transportation (GDOT) Statewide Travel Demand Model Traffic Analysis Zones. The allocation process improved upon previous historical trend methods using a relatively simple, but more realistic approach of allocating growth within each REMI district. Although applied at a statewide level, the allocation procedures are transferable to any geographic scale.

The allocation process is not a sophisticated land use model, but it includes several important features that improve upon a simple trend approach. The most significant feature is the consideration of land consumption due to development, which is not considered in simple trend methods. Another important feature is the influence of accessibility. Introducing accessibility permits the allocation process to reflect the fact that new development tends to occur near existing development. Undeveloped land near existing development is more likely to develop than remote land. The allocation process also permits zones within the same REMI district to experience both growth and decline, where simplified methods may scale all zones within a district up or down. Redevelopment or more dense development can occur in the allocation process.

The GDOT allocation process was applied in ten year increments, so the influence of land consumption, accessibility and increased density is considered over time. For example, an undeveloped zone currently on the edge of an urban area may be predicted to receive considerable growth in ten years. As a result, that zone will have less developable land available in the next allocation period. A byproduct of applying the process in ten year increments is that it is possible to review the results for each ten year period. Shorter or longer time increments could also be used.

The primary inputs to the process are a TAZ acreage database, a base year highway network, base year TAZ socioeconomic data, REMI district control totals and REMI-TAZ equivalencies. The highway network and TAZ socioeconomic data are used to estimate accessibilities for each TAZ. Socioeconomic data are used in conjunction with TAZ acreage data and accessibilities to estimate land available for development. A development score for each TAZ is computed as a function of land available for development and zonal accessibility. The share allocated to each zone is computed as a function of the development score and the existing socioeconomic data in the zone, where the relative importance of each factor depends on whether the REMI forecast variable is increasing or decreasing. For example, if REMI forecasts manufacturing employment to decline, the allocation process places more weight on existing manufacturing employment, which tends to scale the existing manufacturing employment down. If REMI forecasts an increase in manufacturing employment, zones with existing manufacturing may grow, but the allocation process increases the likelihood that new manufacturing sites may occur. Once zonal allocation shares are computed, they are used to distribute the REMI control totals. Socioeconomic data created by allocating REMI district control totals for a given ten-year period becomes the input socioeconomic data for the next ten-year period.
TITLE OF ABSTRACT: The Role of Privacy and Personal Control in Choosing Sustainable Commuting in Northeastern Rural Areas: Looking Beyond Travel Times and Costs

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Changing behavior away from single occupancy automobile commuting towards more sustainable patterns of transportation will be particularly difficult in rural areas and areas of lower density in general. The decision to consider a more sustainable mode of transportation will involve both utilitarian and emotion-based factors. The relative times and relative costs will be important; yet, more visceral feelings about privacy and personal control may dominate. A survey of 1837 employed persons from Maine, New Hampshire, Vermont and Upper New York State was undertaken to examine how variation in attitudes and values might be associated with variation in willingness to consider changing their commuting patterns. Part of that survey described a hypothetical transit service which would, in effect, offer the worker door to door transit from her home to her workplace, with costs limited to a portion of the cost of the fuel of the vehicle. As added benefits, the participating worker would be offered a shared vehicle during the work day, with a guaranteed ride home. Respondents were randomly shown travel times in which the new service ranged between five minutes and 20 minutes longer than the single person auto trip. This setting allows the closer examination of the role of both travel times and underlying attitudes/values related to the private automobile and residential preference in the explanation of the propensity to change commute modes away from the auto. A structural equation model was created in which propensity to consider mode change was explained by comparative travel time, commute trip distance, need for flexibility and the importance of privacy and control during the trip. These, in turn, were examined for the influence of preferences for residential neighborhood and home type. While the comparative travel times of the new transit proved to be a statistically significant predictor ($\beta = .26, p < .001$), attitudes towards privacy and control provided by the auto were far stronger ($\beta = -.75, p < .001$) than any other explanatory factor revealed, with an $R^2$ of .58 for the outcome factor. Longer trip distance was positively related ($\beta = .12, p < .02$) to propensity to consider mode change. Overall, those who value homes with greater levels of privacy were less likely to consider changing mode. For smaller communities where fixed route and schedule transit is difficult to support, significant diversion away from the single occupancy auto may require a better understanding of the psychological aspects of the attributes of the private automobile.
With the advent of Texas House Bill 3588, all future capacity enhancements and new facilities in the State of Texas must undergo a toll viability study to determine if a corridor or facility may be appropriate for toll considerations. For the larger metropolitan areas in the state, such as Dallas-Fort Worth and Houston, tolled facilities have existed for a number of years, even decades. In the past decade, virtually all of the freeway level expansion in Austin has been achieved via toll roads. San Antonio and El Paso are also evaluating fee based roadway projects as a part of the long-range planning process. Fee-based roadway expansion is not only limited to the largest study areas in the state. Urbanized areas, such as Tyler and Laredo have built toll roads as a means to by-pass congested roadways closer to existing urbanized portions of the study area. The initial segments of the toll road in Tyler are open and are expected to eventually be a part of a larger facility that circumvents both the Tyler and the Longview study areas. Brownsville has also embarked on construction of toll road to provide a more direct connection to the Port of Brownsville. Other study areas, such as Corpus Christi and Hidalgo County, are also examining the feasibility of toll roads for specific corridor level accessibility and mobility. For the tolled facilities currently operational in small to medium-sized study areas, the fees are fixed and are not dynamic by time of day or congestion levels.

The Transportation Planning and Programming Division (TPP) of the Texas Department of Transportation (TxDOT) has full model development responsibilities for 21 of the 25 urbanized areas in the state. The appearance and evolution of toll facilities in Texas was such that the Texas Department of Transportation’s (TxDOT) travel demand modeling process for the small and medium size urban regions in Texas historically did not include toll demand estimation procedures. Organizationally, this function was performed on an independent, project-level basis outside the regional travel model process for which TxDOT developed and calibrated travel demand models. This method of toll demand estimation was sufficient for the small and medium regions until recently as toll facilities only existed in the context of future project level planning.

TxDOT funded research, led by the Texas A&M Transportation Institute (TTI) and the Center for Transportation Research at The University of Texas-Austin (CTR), to review and evaluate toll demand estimation procedures used in travel modeling practice and to recommend a path forward toward ultimate expansion of TxDOT’s travel modeling process. This project was particularly focused on practices and procedures suitable for and offering context-appropriate benefits to small and medium-sized regions.

Given that toll demand estimation procedures are well established in practice, this effort started with a review of national practice, with a focus towards smaller Metropolitan Planning Organizations (MPOs) as well as larger urbanized regions in Texas where toll demand estimation has been a part of the travel modeling process for some time. The research evaluated several corollary modeling procedures that compliment and/or enhance toll demand estimation procedures such as time-of-day modeling, multi-class traffic assignment, iterative congestion feedback and mode choice modeling.

These procedures were studied individually and complimentary to one another to identify the best approach for estimating toll demand in small and medium sized study areas via a case study of the Tyler, Texas region. The case study results were used to identify which procedures and groupings of procedures made the greatest impact on toll demand estimation. Lastly, the research highlighted contextual variables, such as congestion trends (auto and truck) and demographic changes, which TxDOT may wish to consider when deciding the toll accounting technique or techniques for implementation in the small and medium-sized regions in Texas.
Small to medium urban areas are not immune the growing need for transportation improvements to provide access and mobility, and to bolster economic development. Urban areas of all sizes across the US are facing transportation needs that exceed anticipated funding through traditional gas tax sources. More and more, these areas are turning to tolls as a means of securing the necessary capital to construct new capacity improvements. This presentation explores how tolling can be used to finance new projects even in small areas, not just the major urban areas typically associated with toll projects.

As traditional sources for transportation funding continue to dry up, transportation providers are more amenable to investigate a variety of alternative funding opportunities, including the possibility of tolling as an alternative source of capital, operating or maintenance needs. Tolling has begun appearing in several metropolitan planning organization (MPO) transportation plans as an anticipated funding source and is being considered in more and more areas not typically associated with new toll facilities. In many cases, tolls have been used to supplement traditional funding sources to accelerate the construction of important new projects by several years. For projects with the right demand characteristics, tolling can provide a means to leverage or stretch gas-tax dollars to fund construction when traditional sources are scarce.
The project is focused on the introduction of a tolled facility to replace an existing non-tolled arterial serving interstate traffic which traverses the rapidly developing community of Middletown, Delaware. A significant portion of the trips on the existing roadway (US 301) are long-distance travelers seeking to minimize their toll costs when traveling from the Washington DC region to destinations in the Northeast Corridor. In response to safety concerns and the significant percentage of truck traffic using the road, several alternatives were evaluated which led to the selection of a limited-access toll road which effectively intercepted traffic at the Maryland – Delaware state line. The option of a toll road also permitted the sponsoring agency to consider financing the new toll road using toll revenue bonds.

Forecasting demand for this project required estimating how travelers would respond to different tolling plans and collection methodologies. Toll rates were structured to discourage truck traffic from diverting away from US 301 through both local road prohibitions and toll rates established for various paypoints along the alignment. Toll plans included both options for cash and open road tolling (ORT) as well as all electronic tolling (AET). A discount plan for frequent use by local travelers was also a potential option that needed to be reflected in the modeling process.

The demand forecasting process needed to address several key issues and incorporate several advanced modeling features. Both the local and long-distance markets view the available travel routes differently and have significant variations in the values of time. The issue of trip frequency required separate choice models for each trip purpose and the estimated toll costs for these trips will vary based on the methods used for payment. Toll collection via transponders would be less expensive and would be required to provide discounts for frequent use. Under the AET option, vehicles without transponders will be identified via video recognition of license plates and the owners of the vehicles will be identified from DMV databases. Costs related to collecting revenue from these pay-by-mail (PBM) patrons require surcharges to the base toll rates. Additionally the potential loss of revenue from PBM transactions for which payment was not obtained needed to be incorporated into the project’s financing plan. To address all of these issues, the highway assignment routine was modified to incorporate an embedded route choice model within the existing equilibrium assignment process. The resulting project forecasts provided transactions and revenue streams for the 40-year horizon period which will be used to secure financing for the new toll road.
The North Carolina DOT recently hired Cambridge Systematics (CS) to study the economic impacts of improving I-95 through the state. NCDOT considered several funding options, including tolling the existing I-95. Improving I-95 could attract traffic currently using other routes; however, adding tolls to fund those improvements may have the opposite effect, causing traffic currently using I-95 to divert to other routes. As part of the CS team, Kimley-Horn examined the changes in traffic operations as a result of adding tolls to I-95 and determined the resulting community impacts.

The purpose of the traffic and community impact analysis was to determine the non-economic impacts of the I-95 improvements project on communities in eastern and central North Carolina. Kimley-Horn began by identifying the roads that are most likely to be used as diversion routes using an iterative method that included interviews of staff in 30 counties, travel time estimates, output from the travel demand model, and local knowledge of traffic patterns. A Synchro network was created of approximately 275 intersections along potential diversion routes in the 30 counties. Turning movement volumes were derived from daily traffic forecast volumes for routes that were most likely to experience a change in traffic volumes with the addition of tolls on I-95. Kimley-Horn conducted capacity analyses for three scenarios: Existing, Future Without Tolls, and Future With Tolls. The analyses included summaries of delay, level of service, and queue lengths. A segment analysis also was performed using a volume-to-capacity ratio to describe congestion levels.

After the traffic analysis was completed, the next step was to determine the long-term impacts of diverted traffic on the affected communities. Potential impacts were determined based on the change in traffic patterns between the two future scenarios. In the areas with potential impacts, additional research was conducted to further understand the nature of the intersection or roadway segment. Impacts may result from changes in traffic volumes or anticipated safety consequences.

Mitigation opportunities also were identified to reduce the impact of the I-95 improvements project on other roadways. Options included physical mitigation such as spot improvements, intersection improvements, or signal improvements. The report also included discussion on the location of toll plazas or policy options that could reduce demand during peak periods.

Finally, impacts on communities during construction were considered. Construction-year impacts focused on impacts of diverted traffic potentially caused by lane closures, shoulder closures, speed reductions, lane narrowing, and time-of-day restrictions.

Although the larger economic study presented findings for the region and North Carolina as a whole, the traffic and community impact assessment focused on impacts to individual intersections and communities within each county. NCDOT included this element to fully understand the effects of tolling I-95 not only on the overall economy, but also the local communities in eastern and central North Carolina. The study also provided NCDOT with a list of potential mitigation strategies that may be considered further if tolls were introduced to I-95.
In order to reduce traffic congestion and improve mobility, the State of Rhode Island is expanding the existing Providence to Boston commuter rail transit service operated by the Massachusetts Bay Transportation Authority (MBTA). The commuter rail service was extended from the City of Providence to two new stations in the City of Warwick in December 2010 and the Town of North Kingstown in April 2012. This presentation describes the public-private partnership approach used to design and build the new station and its parking garage as well as its surrounding mixed-use development in the Town of North Kingstown, with a population of 26,486 in 2010.

The site of the new station is in the Wickford Junction Shopping Plaza on Route 102 in North Kingstown. Route 4, the primary route from southern to northern Rhode Island is located less than a mile away and offers an easy access to the station area. The shopping center was planned and built by Robert Cioe, a private developer who had a vision of having a train station in North Kingstown from the time he bought the land in 1982 to develop the shopping center. Currently, Wickford Junction is a 450,000 square feet, mixed-use transit oriented development. Wal-Mart and Staples are the anchor stores. With just 35 minutes travel time to Providence and less than two hours to Boston’s South Station, commuting from Wickford Junction station saves Rhode Island commuters time and money as well as reduces traffic congestion on Route 4 and I-95. State transportation officials expect 1,500 riders a day using the station by 2020. The station includes a single-side commuter rail platform with seating and covered areas, a four-story parking garage that accommodates 1,100 cars, a drop-off and pick-up area for cars and buses, covered bicycle racks, coffee and snack shop and an indoor waiting area with seating.

Public stakeholders for the project included Rhode Island Department of Transportation (RIDOT), Amtrak, MBTA, the Federal Transit Administration, Federal Railroad Administration and the Town of North Kingstown. Private stakeholder is Robert Cioe, the private developer of Wickford Junction Shopping Center that abuts the site of the train station. The station and parking garage project was RIDOT’s first design/build contract, as the project used one team to design and build the job almost simultaneously, which greatly reduced the necessary timetable for the project and its total cost. The project, initially projected to cost $47.9 million, was completed with a $43.4 million cost, a saving of about $4.5 million. The federal government paid $36 million and the State of Rhode Island contributed $8 million.

Lessons learned from this case study can benefit other small and medium-sized communities interested in investing in rail transit service. Public-private partnerships represent a cooperative, flexible and unique financial solution to implementing the rail station infrastructure and the development of its surrounding area.
Since its inception in 1996, the Indian River County fixed route transit system (known as the GoLine) has experienced dramatic growth in ridership and now exceeds 1,100,000 riders in a community of just under 140,000 persons. The system has changed everything from its routes to its hubs to its name to its operating hours, but one critical factor has remained constant – its fare-free policy. In this regard, Indian River County is not unique; in fact, nearly 40 mostly small urban transit systems do not charge a fare.

The million-rider milestone is all the more remarkable given the urbanized area’s extremely low residential density (1.75 dwelling units/acre), lack of major attractors (such as Universities, Stadiums, or Commercial Air or Rail service), and high income and auto ownership rates. While the overall costs and subsidies have remained constant, ridership is up. This means the marginal cost of each rider is plummeting. In fact, GoLine has the lowest cost per rider of any system in the state of Florida. GoLine has more boardings per capita (at far lower cost) than some of the largest Metropolitan areas, including Palm Beach County (population 1.3 million).

Although a lot of factors contribute to this success, including efficient management, effective marketing, a sound route structure, and favorable operational policies, one factor distinguishes the system – the lack of a fare.

Like most systems operating in urban areas between 50,000 and 200,000 persons, the GoLine receives federal and state operating subsidies. In the case of the GoLine, those subsidies amount to approximately 75% of the operating budget. Mindful of the ability to pay the local share through farebox recovery, the County has instead opted to pay for the local match from local government sources and from advertising revenue. As a result, the system has become a popular and useful community asset that received broad financial support from elected officials.

Some of the factors that weigh in to this policy decision include a desire to maximize ridership by removing obstacles to ridership; equity, particularly for elderly, fixed-income, and poor passengers; and cost effectiveness. When the total cost of imposing a fare on a small transit system is taken into account, the yield from a fare is substantially less than may be expected, at a substantial cost to ridership. Some costs - such as farebox purchases and cash handling and counting – are easy to identify. There are much larger costs beneath the surface. Imposing a fare adds considerably to delay at each stop resulting in higher fuel costs. Federal and state policy often takes ridership into account when awarding grant money. Therefore, the ridership lost by imposing the fare may result in a reduction in grant allocations, transferring the operating burden from state and federal sources to the riders. When a fare is imposed, systems must have a reduced fare policy, and this involves screening and qualifying applicants for reduced fares. Fares are considered operating revenue. Therefore, any fare collected will reduce the local government’s operating deficit, which is the basis for determining federal financial assistance. Other factors come in to play, such as the costs of crime, pilferage, stress on drivers, and cash handling and accounting procedures.

Without a fare, Indian River County has been able to achieve a substantial transit mode share in a small urban environment at a tremendously low cost per rider.
Paratransit, or demand response transit, is a critical form of transportation in small and medium sized communities for mobility impaired, low income, and elderly individuals. Paratransit agencies often face limited resources including funding, staff, and fleets, making it critical for them to be as efficient as possible. However, this can be challenging as, by its nature, service is based on the daily requests for pick-ups and drop-offs by passengers. These requests can vary dramatically by time of day, day of week, or even month, making it difficult for agencies to efficiently plan in advance. As such, fleet vehicles (and drivers) can sit idle or be overwhelmed with passengers at different times. While many agency planners have a sense of the behavior of their passengers, they could benefit from a better quantitative understanding of the temporal and spatial trends in passenger trip requests.

Therefore, this study used observation paratransit trips from Wiregrass Transit Authority in Houston County, Alabama, to identify such temporal and spatial trends in transit trips. Specifically, the analysis focused on over 5,000 paratransit trips completed over seven weeks in April and May, 2013. Each trip contained pick-up/drop-off time, origin and destination addresses, passenger mobility, and an imputed generalized trip purpose. These trips were geocoded to the street network within Houston County and a series of maps highlighting the spatial locations trip requests by a) flexible and inflexible arrival trip purposes (e.g. to home might be flexible but to a doctor appointment is inflexible), b) morning/ evening peak and off-peak periods, and c) days of the week. Additionally, land use data was added to the analysis to determine correlation between specific land uses as well as local geographies and trip requests of different types. Finally, time-of-day and day-of-week diagrams of trip requests by purpose were composed.

The results emphasize significant trends in where paratransit trip making occurred over different times of the day and days of the week. For example, much of the inflexible travel was done in the mornings to very specific attraction centers within the county. Trip requests were quite clustered in specific locations that tied directly to low income and higher average age neighborhoods. A number of opportunities for rescheduling passengers and shifting paratransit service more evenly through the day are apparent, especially with respect to inflexible trips.

Houston County, Alabama, is similar in size and population to many medium sized communities within the southeast and results from this study can be used by transit providers from across the country. Specifically, transit agencies can repeat the methodologies presented in this study with their own data or they can apply the recommendations for rescheduling trips based on the findings of this work. Either way, paratransit providers will have an opportunity to improve the efficiency and cost-effectiveness of their service by considering the temporal and spatial trends in their passenger trip requests.
Transportation policy makers and planners are interested in partnerships and collaborative planning efforts that cross regional boundaries as a means to coordinate infrastructure and increase economic competitiveness. Transportation planning at a megaregions scale often focuses on metropolitan or State level planning organizations, but planners will increasingly need to incorporate rural areas in their large-scale planning efforts as these regions house infrastructure and industry critical to economic and transportation planning. Rural areas may be both recipients of the benefits derived from this scale of planning as well as contributors to advancing the larger goals of the region. Regional transportation planning organizations (RTPOs), which serve as the designated transportation planners for many rural areas, are a key player in planning for the transportation networks and economies of surrounding megaregions, as they oversee planning of critical freight networks, natural resources, and economic engines.

The 2012 surface transportation reauthorization bill Moving Ahead for Progress in the 21st Century is the first transportation authorization that establishes a formal definition and scope of work for RTPOs to serve areas outside of metropolitan planning organization (MPO) regions, thus formalizing their responsibilities. MAP-21 represents significant new opportunities for RTPOs and other rural stakeholders to participate in transportation planning, on behalf of their rural areas, concerning larger geographic issues at the State and megaregions scales.

The Volpe Center conducted research for the Federal Highway Administration Office of Planning that explores the implications of RTPOs engaging in transportation planning partnerships and projects of megaregions significance. The research assesses the benefits of this participation to rural areas and to their State and metropolitan partners, specifically in the areas of economic development, freight, and natural resources. Considering the limited resources of RTPO staff, the research describes the institutional barriers to entry for RTPOs in cross-regional transportation planning and considers partnerships that may lead to greater involvement in megaregions initiatives. Through three case studies, the paper outlines the benefits for rural areas, including economic and transportation benefits, and suggests recommendations and best practices for RTPOs to consider in partnering with MPOs and State DOTs. The recommendations also demonstrate how transportation planning can be the mechanism to support rural participation in plans and projects at a megaregions scale, bringing value to rural and urban areas alike.
Abstract: There are now over 120,000 electric vehicles on the roads in the US. Many state DOTs and regional entities have adopted GHG reduction goals which include an increased use of alternative fuel vehicles and MAP-21 clarified that deploying Electric Vehicle Supply Equipment (EVSE) is a federally eligible activity. The Chittenden County Regional Planning Commission's (CCRPC) ECOS regional sustainability plan includes the federally required long range transportation plan for the Chittenden County region.

The plan calls for increased use of alternative fueled vehicles, such as plug-in electric vehicles, which support greenhouse gas reductions, decreased mobile source air pollution and reduced fossil fuel expenditures. This presentation will report on Phases 1 and 2 of work conducted by VEIC for the CCRPC on the optimal location, business models, and the development of tools and guidebooks for EV charging in Vermont. Phase 1 provided preliminary findings related to the general location, number and cost for needed public EVSE charging network for Chittenden County over the next 5-10 years for inclusion in the region's Long Range Plan.

The second phase will provide more detailed analysis and prioritization of potential locations for public and workplace EV charging, including detailed site investigations of several priority locations. Tools and training to support increased regional outreach will also be developed.

The CCRPC region is a 19 municipal region with a population of approximately 120,000 all of which are designated as either small rural or rural communities.

This presentation will provide leaders from similarly sized communities with an opportunity to learn about the characteristics that make a location optimal for the placement of EVCE, the costs involved and potential business models. In addition we will explore the EV Charging Guidebook designed for small and rural communities.
Major retail and commercial developments in modestly-sized communities have the potential to drastically alter traffic conditions. A microsimulation model is a critical tool for accurately assessing the traffic operations impacts of such large retail/commercial developments. Using a new methodology presented in this paper, modestly-sized communities can leverage existing regional analyses, such as a 24-hour travel demand model (TDM), to create local-scale microsimulation models. This innovative methodology for disaggregating time and space from the regional TDM down to the fidelity needed for a local-scale microsimulation model is illustrated using a case study in Morgantown, West Virginia.

The West Virginia Division of Highways (DOH) is submitting an Interchange Justification Report (IJR) for a proposed interchange on Interstate 79 adjacent to Morgantown. The interchange would accommodate traffic associated with various proposed commercial developments sited on undeveloped land proximate to the proposed interchange location. Microsimulation-based analysis was performed on present day traffic conditions and projected future year demand volumes to support the IJR.

The creation of the microsimulation model involved an innovative approach to disaggregating the 24-hour regional TDM origin-destination (O-D) matrix into a series of 5-minute matrices. The regional TDM uses an O-D matrix that represents trips for an entire day. Because trips are summed over 24 hours, the regional matrix does not capture any of the diurnal patterns in traffic (e.g., away from employment centers in the evening) that are essential for creating actionable mitigation steps. Additionally, the smaller geography in the microsimulation model results in short trips that are at most ten minutes long. In order to faithfully reproduce the bottlenecks observed in the field and provide the drivers with useful route choice information, a fine-grained O-D matrix was required.

A pioneering method for disaggregating space was also used. The proposed developments would represent a fundamental shift in the land use of the area, rendering the TDM’s Traffic Analysis Zones (TAZs) largely obsolete for the future year models. Additionally, network loading is critical for accurate microsimulation modeling. Ideally, the microsimulation model would be able to capture driveway-by-driveway land use. This unique method uses the TDM to provide information on background traffic patterns and ITE trip generation rates to project traffic volumes in order to disaggregate the regional TDM TAZs to the driveway level. This case study fully illustrates the power of these innovative approaches for disaggregating data from a regional TDM to a local-scale microsimulation model in order to evaluate the transportation impacts of major developments in modestly-sized communities.
Planning and Environmental Linkages:
The Jefferson Road Corridor

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The West Virginia Division of Highways (WVDOH) prepared a Planning and Environmental Linkages (PEL) study of the Jefferson Road (WV 601) corridor improvement project. The improvements would relieve current and future traffic congestion and improve safety in the corridor. The corridor lies within the City of South Charleston, within the Charleston metropolitan area. The Charleston SMSA has a population of 240,000, the second largest in the state. The study facility is a two lane road, approximately 1.7 miles long, connecting two regional expressways, I-64 and US 119. The development of the two expressways has led to extreme traffic congestion along Jefferson Road, exacerbated by the inclusion of a major offset intersection with Kanawha Turnpike (CR 61/12) and an at-grade rail crossing with a CSX dual line.

The objective of this PEL study was to identify planning considerations and environmental features in the Jefferson Road corridor prior to the project entering the preliminary design and NEPA phase of the project development process. PEL is one of 10 initiatives in FHWA’s “Every Day Counts” program aimed at shortening project delivery time. According to FHWA, PEL represents a collaborative and integrated approach to transportation decision-making that 1) considers environmental, community, and economic goals early in the transportation planning process, and 2) uses the information, analysis, and products developed during planning to inform the environmental review process. WVDOH chose the Jefferson Road project for the first PEL study in the state, with the idea that it would serve as a template for future transportation projects.

This study summarized the following elements of the Jefferson Road corridor improvement project as it moved from Planning to Preliminary Design / NEPA:

- Project Goals and Vision
- Alternative Corridors
- Affected Environments
- Agency/Stakeholder Coordination
- Public Workshop
- Preliminary Alternatives Comparison

Seven (7) possible conceptual alternatives were identified and initial engineering and an environmental overview was done, along with stakeholder and public involvement. In general, it was found that there is strong community and stakeholder support for alternatives that include an overpass over the Kanawha Turnpike and CSX Railroad. However, there was significant concern over impacts to the Jefferson Park neighborhood adjacent to Jefferson Road, and impacts to Davis Creek, a treasured water resource within the corridor.

The key benefits of the study were:

- It has facilitated early project participation by agencies and the public,
- It was used as a basis for scoping NEPA,
- It was used for preliminary screening of alternatives,
- Early environmental work and alternatives development and comparison are now well documented and need not be duplicated as often happens in a non-integrated process.
Abstract: Following Vermont Governor Peter Shumlin's announcement in the spring of 2011 that the "Circumferential (Circ) Highway as originally conceived will not be built," a CIRC Alternatives Task Force was formed to identify alternative projects and planning activities to address the region's transportation issues. One of the major planning activities undertaken was the Williston-Essex Network Transportation Study (WENTS). The focus of the WENTS Project was to develop multimodal strategies that enhance corridor mobility and safety, improve access to major employment and retail centers, and support land use goals of the municipalities of Williston, Essex, and Essex Junction, in the context of a future without the Circ highway.

The WENTS project's findings and recommendations, which were formally adopted by the CIRC Alternatives Task Force in January of 2013, specifically cited the Exit 12 & VT 2A Project ("Exit 12") as a priority network improvement within the region. A re-configured interchange at I-89 Exit 12, in association with a new intersection of grid streets on VT2A between Exit 12 and Marshall Avenue was seen as generating significant mobility benefits for the study area as a whole.

The I-89 Exit 12 and VT 2A Scoping Study was launched by the Chittenden County Regional Planning Commission (MPO) in June 2013 to further investigate and refine transportation alternatives that address existing and projected traffic congestion; enhance safety for all users; improve bike-pedestrian connections from areas south of the interchange to the existing network north of the interchange; and advance economic growth in the study area.

The Scoping Study has included several interesting and innovative approaches including:

- The use of the regional travel demand model (developed in TransCAD) to create a detailed sub-area microsimulation model using TransModeler software. The TransModeler sub-area model has enabled the project team to dynamically evaluate regional and sub-area travel pattern shifts resulting from changes to both the road network and to the surrounding land uses (e.g. expanded interchange, new grid street connectors, targeted infill development). The model's simulations have enabled the team to observe actual future traffic flows on the proposed network and have led directly to the geometric design components included in the project's roadway design plans.

- A number of traditional and innovative interchange and intersection alternatives were evaluated using the an Excel sketch planning tool modeled on the FHWA research publication, Alternative Intersections/Interchanges: Informational Report (AIIR). The sketch planning tool provided a graphical, intuitive framework for screening numerous intersection/interchange options including conventional diamond interchanges, double-crossover diamond interchanges, the displaced left-turn intersection, the median u-turn intersection, the quadrant roadway intersection, roundabouts, and traditional signalized intersections using project-specific geometries and traffic volume projections. As a result of the sketch planning exercise, the short-list of alternatives evaluated included a double-crossover diamond interchange, a displaced left-turn intersection, and a grade-separated roundabout pair interchange.
Walkable, livable transit-oriented communities anchor many a transportation vision. Building such places from the ground up is one way to achieve that vision where they don’t already exist. For most small cities, though, that is not an option. Instead, they contend with outdated highway corridors that outlived their economic utility when the interstates were built decades ago, whose small commercial centers struggle to remain viable. Vision and policy alone are not enough to transform these old corridors into the vibrant, livable centers envisioned in adopted plans.

Urban corridors are a cornerstone of the Thurston region’s adopted vision for a sustainable future. Achieving the vision for compact, walkable multi-modal urban centers in this small region in Washington State is key to realizing other regional objectives to preserve farmland and critical habitats, take care of existing neighborhoods, minimize greenhouse gas emissions, protect drinking water resources, strengthen the local economy and increase access to affordable housing and jobs. In many respects, the success of the rest of the Thurston region’s sustainability objectives depends upon achieving the urban element of its collective vision.

Thurston Regional Planning Council (TRPC) is tackling this issue head-on with efforts to revitalize the former State Highway 99 corridor linking the three small cities of Olympia, Lacey, and Tumwater. Over the years, this corridor has emerged as the backbone of the urban transit system and most of the corridor has been retrofitted with sidewalks and bike lanes. Unfortunately, this transportation infrastructure and service have not yet stimulated the changes in land use envisioned in local and regional plans. Little redevelopment has occurred where walk and transit trips can be easily accommodated – outlying suburban development still dominates local real estate investments.

TRPC’s Urban Corridor Communities are deploying a combination of strategies including market-based analysis, sub-area planning, zoning and design tools, outreach, and innovative partnerships to realize the region’s urban vision. Working to overcome market limitations such as developer financing in a secondary lending market, small and scattered developable parcels, and disparities in rent structure that undermine financial feasibility, TRPC and its partners have moved beyond simply promoting the vision and benefits of vibrant urban communities. Instead, they are focused on the nuts-and-bolts details of what it takes to actually make such places happen in this market and its economy, details needed to translate vision into reality.

This presentation offers a look at the real-world challenges TRPC and its partners face in transforming this old state highway corridor, and the evolving strategies and lessons learned along the way. Insights will be useful to any small community working to reverse decades of auto-oriented development patterns in support of a more urban, walkable, transit-oriented community.
A Pedestrian Safety Analysis Tool (PSAT) has been developed by Michael Baker, Jr., Inc. to assist the New Jersey Department of Transportation (NJDOT) focus investments in areas of high need. The PSAT identifies and prioritizes state roadways and considers factors such as pedestrian crash history as well as roadway attributes which typically create an unfavorable pedestrian environment and have land uses which support sensitive pedestrian trip generators.

PSAT is a user-friendly, Geographic Information System (GIS) based application which creates a numerically ranked list of locations for potential pedestrian project based on spatial data. The PSAT application utilizes existing GIS datasets to analyze and rank roadway sections. Considered criteria for NJDOT included pedestrian crash history and severity, proximity to sensitive pedestrian trip generators such as schools, senior centers, transit services and designated transit villages. Roadway attributes considered include posted speed limit, traffic volumes, and the presence of sidewalks and ADA compliant curb ramps. Users have the ability to filter the above criteria as well as filter by roadway classification, MPO region, County, Municipality and specific roadway.

The PSAT was developed to utilize existing GIS data previously developed. In most cases the data used for the PSAT, specifically the roadway attribute data, had been collected and maintained. Although a majority of the data included in the tool has been collected and maintained by Baker for NJDOT, the application is flexible enough to handle any GIS data sets standardized on the same Linear Reference System (LRS). Data layers are pre-processed and merged using NJDOT’s standardized Linear Reference System (route and milepost). As a result, report generation is extremely fast, providing users the ability to “tweak” included criteria as needed. Other data sources included NJDEP, NJ Transit, and bureaus within NJDOT itself.

The primary goal of the PSAT is to prioritize pedestrian improvements throughout the state and has the capability of identifying potential projects to improve pedestrian access and mobility. Output, generated in the form of a report, can assist in developing statements of need for pedestrian specific improvement projects and/or expand the scope of other construction or maintenance projects (resurfacing projects, for example) to improve the pedestrian environment. The PSAT report has the ability to export query results to the major file types including Excel, PDF, CSV and TIFF.

Although the PSAT was developed for a state Department of Transportation, the tool is scalable to fit small and/or medium sized communities, municipalities, and counties. Due to ever shrinking funding sources, PSAT allows communities to customize and filter roadway attributes and priority improvements to effectively and efficiently manage funding.

To reduce costs, this tool was developed to be installed on local PCs without the need for server/IT support or any other programs. As part of the tool development Baker prepared demonstrations and provided training sessions for NJDOT staff.
Roundabouts have many distinct features the engineering community can employ to solve complex or unique traffic scenarios. This paper illustrates how to capitalize on many of the features through three real-world project examples.

In the first example, a roundabout is used to combine two closely spaced skewed intersections into one five-legged intersection. This example is located in the heart of a city exploding with population and traffic growth. Under existing conditions, the two closely spaced intersections experience spillback across one another resulting in poor intersection operations and frequent conflicts. This is further exacerbated by the 7 uncontrolled driveways within 215 feet of the major intersection. The proposed five-legged roundabout mitigates the negative effect of the skewed intersections, consolidates the two closely spaced intersections and provides access management for the uncontrolled driveways. Not only does this improvement provide an anticipated reduction in crash potential and improved intersection operations, the alternative also provides significant aesthetic benefits, leading to a revitalized city center.

In the second example, roundabouts are employed upstream of a central intersection that is oversaturated and experiencing safety issues specific to permitted left-turn movements. The proposed bowtie intersection configuration converts left-turn movements at the central intersection to U-turn maneuvers at the upstream roundabouts. Eliminating left-turn maneuvers at the central intersection resolves safety issues corresponding to the movement. Eliminating left-turn maneuvers also prioritizes high volume through movements at the central intersection, reducing motorist delays and queues that block upstream intersections and business driveways.

In the third example, roundabouts are utilized corridor-wide to assist in development of a stringent access management plan in a densely accessed central business district. Specifically, a combination of medians and mini-roundabouts are used to eliminate left-turn conflicts throughout the corridor to significantly reduce crash potential, improve corridor progression, reduce intersection delay and improve pedestrian mobility. This alternative converts left-turn maneuvers from private driveways to U-turn maneuvers at conveniently-spaced roundabouts throughout the corridor. The strategy provides safety and operational benefits without significantly impacting a thriving central business district. This example illustrates how roundabouts can be applied in nearly any context if designed appropriately.

As public stewards, engineers are challenged to develop infrastructure improvement strategies that maximize benefits to the public. Maximizing benefits often requires innovative solutions that stray from common practice. With proper planning and design, roundabouts offer distinct features that can reduce crash prevalence and improve intersection operations in ways unobtainable by traditional intersection configurations.
LESSONS LEARNED FROM COMMUNITY TRANSPORTATION SAFETY PLAN DEVELOPMENT IN MONTANA

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Beginning in 2010 the Montana communities of Butte-Silver Bow, Shelby-Toole County, Hamilton, Bozeman, Missoula, and Helena have developed Community Transportation Safety Plans (CTSPs) with support of the Montana Department of Transportation (MDT). The CTSPs use a similar methodology to that for the State’s Comprehensive Highway Safety Plan, but at a community level and at a reduced scale, consistent with the needs of each individual community. This approach was taken given the majority of crashes in the state occur in urban areas. It was determined that the most effective way to address these crashes is to engage communities in developing their own plans so that local stakeholders can collaborate to develop strategies customized to the institutions and character of their community, and to which they are committed to implementing.

Primary elements of the CTSPs include stakeholder input, development of a vision and goal, analysis of crash data, inventorying of existing community safety programs, defining emphasis areas on which to focus resources, and identification of feasible and effective new transportation safety strategies. The CTSPs also include an implementation plan defining specific action steps, implementation responsibilities, performance measures, and comprehensive lists of safety resources.

MAP-21 now requires establishment of safety performance measures at the MPO level. Therefore many communities will need to establish fatality and serious injury targets and may consider developing regional safety plans using a similar process to help them achieve those targets. The experience of Montana communities’ CTSP process provides similar sized communities with a template for how to approach CTSP development. Best practices and lessons learned include strategies for engagement of stakeholders representing the 4Es of safety (education, enforcement, engineering and emergency response). The process involves a two-tiered approach to safety data analysis by which first emphasis areas are defined and then crash factors within each emphasis area are explored in more detail to help define strategies and action steps. The plans define safety performance measures overall and by emphasis area as well as a structure for reporting implementation progress.
This paper presents a case study of a highly detailed, tax parcel-based travel demand model and how it was used to support a week-long land use & transportation planning charette for a small town. The charette travel modeling process used an analysis tool developed by the Delaware Department of Transportation called “Land Use and Transportation Scenario Analysis and Microsimulation” (LUTSAM). This process extends the use of GIS, traditional travel demand models, and microsimulation and the capabilities of four-step travel demand forecasting processes well beyond their traditional evaluation of regional plans, major roads, and required air quality conformity determinations. LUTSAM allows planners and engineers to successfully and easily apply standard travel modeling tools across a much wider range of studies and projects now relevant in today’s planning and engineering industries.

For the charette, LUTSAM facilitated analysis of a series of hypothetical land development scenarios involving combinations of residential units and non-residential (mainly retail and office) spaces across a range of scenarios related to street interconnectivity, bike and pedestrian amenities, and density.

This real-world case study:
1. Demonstrates advantages the method has over traditional modeling processes
2. Illustrates how higher levels of detail enhanced study results from various perspectives, including useful, more detailed outputs for technicians and easier, more effective interpretation by the public
3. Describes how the process derived useful MOEs for bike and pedestrian trips within and among potential community design forms, and how the levels of non-auto travel affected VMT, VHD, VHT, and mobile-source emissions
4. Presents lessons learned during the week-long process in how to set up, run, and present model outputs to support public participation
INTEGRATING WEB-BASED PUBLIC INVOLVEMENT IN SMALL Sized COMMUNITY PLANNING

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Obtaining public input is a key component of the transportation planning process. Many areas are expanding their public involvement process to include the internet in an attempt to reach a broader audience. Such efforts have typically included project websites and surveys. The purpose of this presentation is to provide innovative examples on expanding the interactive nature of typical website designs to improve the public involvement experience and to generate more responses and comments. In Jefferson County, West Virginia, interactive websites have been used to support a corridor land use study near Harpers Ferry and a city transportation plan in the small city of Charles Town. These unique survey websites have been successful in generating important input to each plan and expanding outreach to those that may not have attended meetings.

The interactive websites have been developed by Michael Baker Jr., Inc. using the MetroQuest framework maintained by Envision Sustainability Tools, Inc. The tools and sites developed provided a unique experience for participants that expanded each study’s outreach beyond the number of people that typically attend public meetings in the region. The websites were developed to collect public input, rank priorities, and showcase the results of alternative land use scenarios and associated transportation impacts. Key examples of the interactive experience include the ability to drag and rank regional priorities, to identify spatial markers on a Google-based roadway map, and to select and comment on proposed transportation projects in the region.

The presentation will provide an overview of the design and content of these websites, the level of effort to develop, methods for advertising and marketing, and data extraction and processing. The MetroQuest framework contains a variety of existing templates that can used to cost effectively develop a local-specific website. The process of developing them involves collaboration among programmers and community staff to tailor each site to the local area and purpose. As for any public involvement activity, advertising and marketing was also a key step to ensure that a sufficient number of people access the website. This presentation will share the types of efforts used in this small urban region as well as other techniques used to advertise and attract participants for other MetroQuest sites around the country.
The lack of transportation choices is an all too common problem in Maine. Public transportation is limited, few residents live within walking distance of jobs and essential services, and most drive alone. Barriers to reliable transportation include the high price of gas, an aging population, and the high percentage of lower income persons needing services. Travel via technology (computer, internet access) for banking, distance education, home office, and more is also limited because of the unavailability of high speed or even dial-up connectivity.

Eastern Maine Development Corporation (EMDC), a private, non-profit regional economic development organization, and lead applicant Penobscot County Commission was awarded TIGER 2 funding to conduct a transportation feasibility study in four counties of Eastern Maine. EMDC convened an Advisory Group of public/private community partners representing service industries and local/state government and a transportation engineer to perform this study with the goal of identifying transportation gaps and developing solutions for rural residents living in sparsely populated regions.

The project had two phases: 1) The first involved information gathering using a random population survey, outreach to communities, and focus groups with citizens and major employers; and, 2) The second phase included the outcomes analysis and creation of recommendations and action steps. Circulated to more than 6,500 selected addresses (one survey per household), a total of 1,706 were returned for a response rate of 25.9%, well-exceeding our goal. We determined early on that needs vary from community to community and no single solution will work everywhere or for everyone.

Questions focused on work-related travel, education/training, health care and other appointments, grocery shopping, transporting children to school, recreation, and other shopping. Close to 23% respondents had experienced transportation problems within the last month and, for households with incomes <$25,000, that number increased to 38%. The high cost of gas and unreliable vehicle were the top reasons for problems. Of all respondents, 82% indicated that gas prices > $5.00/gallon would represent a "major" or "severe" hardship. Focus groups with individuals and employers mirrored survey responses, indicating a high degree of unfamiliarity with current, available options and a need for increased options.

As a result, recommendations are multi-modal and include the creation of a rural Transportation Management Association (TMA) that will serve the Eastern Maine region, helping rural residents respond to rising oil prices and improve mobility. Differing from traditional urban-based TMA’s, the rural TMA mission will be to educate, promote, and outreach to inform on options for carpooling/ridesharing and ridership on free and for-fee rides. The TMA will host an interactive website to provide comprehensive information/resources; named "Getting There: A Guide to Rides in Eastern Maine", a September 2013 launch is anticipated. We will work with communities to: encourage localized and/or remote-access approaches to employment, service delivery, and shopping; assess adding expanded transit routes and/or subscription commuter bus routes in corridors where demand is greatest; and, develop additional shared-ride safe parking lots.

Our fiscally viable solution is appropriate for application in other rural settings where logistics and dollars are slim.
Historically, external travel estimates utilized in travel demand models (TDM) were developed from data collected using traditional roadside intercept surveys. Given privacy and safety implications of roadside surveys that have arisen in recent years, many municipalities and planning entities have stopped conducting roadside surveys for the purpose of obtaining external-related travel data. However, planners and modelers still desire external-related data for the purpose of understanding the amount and composition of travel into, out of, and through their respective urban area.

In 2013, the Metropolitan Area Planning Agency (MAPA) in the greater Omaha/Council Bluffs metropolitan area sponsored an external travel survey. The purpose of the survey was to obtain data pertaining to travel into, out of, and through the Omaha/Council Bluffs area. The approach for collecting these data that was selected involved the use of multiple methods that include the following:

- Bluetooth Technology – for the development of external-external (E-E) estimates
- Automatic License Plate Recorders (ALPR) – for the development of residency statistics
- Community Web-Based Survey – for the development of internal-external/external-internal (I-E/E-I) estimates
- Intercept Surveys – for the development of I-E/E-I estimates
- Postcard Surveys – to advertise the web-based survey
- Vehicle Classification Counts – for use in data expansion

The approach of the survey was to provide a low-cost method to collect external-related travel data for use in the travel demand model and use in other planning related projects in the area. Portable Bluetooth readers were deployed at each of the area’s 25 external stations and 11 internal locations. Bluetooth devices deployed at external locations were utilized to develop E-E trip tables, and devices deployed at the internal locations (requested by the sponsor) were utilized to develop estimates of travel between key locations within the area. Intercept survey data collected at businesses or rest areas adjacent to external stations and multiple retail establishments within the study area were combined with data collected via a web-based survey to develop I-E/E-I trip estimates.

The presentation will provide detailed information on the various techniques utilized during the conduct of the survey as well as key findings and results. Additionally, topics including public awareness, survey recruitment, issues encountered, and lessons learned will be discussed.
The majority of transportation planning research and data collection, especially in small and medium sized communities, focuses on daily activity patterns. Unfortunately, the non-routine long distance activity patterns to and from these areas is often ignored or generalized as "external" trips. However, long distance and overnight travel describes the bulk of tourism and some types of business travel, and is critical for people in small communities for reaching important activities that contribute to their quality of life, such as medical services.

Therefore, this presentation will highlight important trends regarding the currently not-well-understood long distance and overnight travel patterns of individuals to and from small and medium sized communities in Alabama and Vermont. Specifically, the presentation will consider trip frequencies, transportation mode choices, overnight trip structures, planning horizons, and other travel choices. Additionally, we will emphasize differences in travel behaviors between the two states to identify important variations potentially caused by regional policies or geographies. Participants in this session will be able to use results from our presentation and the comparison results to make better policy decisions, tailor their travel demand forecasting methods, and focus their data collection to better capture long distance and overnight travel.

The data used in this paper comes from the Longitudinal Study of Overnight Travel (LSOT) conducted monthly online between February 2013 and January 2014. The overall goal was to measure planned and executed overnight trips for all purposes by individuals over age 24 years over a 12-month period. A total of 426 and 451 individuals in the sample are from Alabama and Vermont respectively. These sub-samples are large enough to allow inter-regional comparison while accounting for the rural and urban classification of the residential location as well as distance between the respondent’s home and a large urban area.

The duration and distance from home were recorded for overnight trips as well as the number of different places where individuals spent the night on a single trip away from home. In addition to business and leisure, collection of the primary trip purpose allowed for personal services including medical for oneself or a family member. For each overnight stop, participants indicated the relative proportion of the purpose that was business or leisure. Travel party size and travel mode were measured. By comparing more rural residents in Vermont and Alabama to others, an initial measure of the overnight and long distance travel burden for personal services is assessed.
This presentation will focus on the factors that affect which vehicle from the household fleet is used for travel for a given trip. This is of interest to assess whether there are possible efficiency gains in terms of energy use and greenhouse gases within usage patterns of the current vehicle fleet. Switching vehicles within an existing fleet is a viable short-term action to reduce GHG emissions that may be available to rural households where transit, bicycling and walking are less feasible due to travel distances.

This study is based on data from a stated preference on-line survey of workers in a four state region of the northeastern United States (Maine, New Hampshire, Vermont and upper New York State, excluding New York City). The Northeast Travel Choices Survey was conducted on-line in 2012 with 1795 individuals who work for wages. A non-random sampling strategy was used to ensure a sufficient number of both rural and urban residents were included in the sample in order to investigate several topics related to work travel choices, behavior, and attitudes in northern non-metropolitan and rural areas.

This presentation will focus on attitudes as expressed by participants using the following scale:
- Strongly disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Strongly agree
- Not applicable

The following statements related to choice of vehicle within the household fleet were shown to participants in random order to minimize any statement order bias.
- When I take longer trips, I prefer the bigger vehicle
- I prefer to use “my car”
- If I have cargo it affects my choice of vehicle
- I typically use a different vehicle for work and non-work trips
- The number of people traveling is a big factor in selecting which vehicle to use
- The choice of vehicle is based on who is going to drive
- The weather and road conditions affect my choice of vehicle
- We often discuss who will use which vehicle in our household

These attitude results were analyzed as a functional of socioeconomic variables including the number of vehicles per household as well as type of community (using the RUCA rural measure by zipcode area). Results are intended to complement recent quantitative findings using the NHTS data that indicate a reduction in fuel consumption is possible from reallocating vehicles within a household among drivers and trips across MSA size and geographic regions. In aggregate, households with two or more vehicles in the NHTS could reduce fuel consumption by over 5% if they reallocate their vehicles.
There is a perception that activity-based (AB) travel demand models are expensive and complex to develop, and are only feasible and affordable for larger metropolitan areas. While this was generally true for the earliest applications, and may still be true for some of the more advanced applications, it is also true that some AB models have been used in practice for more than 5 years, and that such models have been transferred to work in many other regions of varying sizes, often for a similar budget as is required to update a trip-based model. In this presentation, we focus on DaySim, an AB model platform first developed by Bowman and Bradley, and recently reprogrammed by RSG software engineers to run very efficiently with modest computing resources. Some of the small-to-medium size regions that DaySim has been applied for include Fresno CA, N. San Joaquin Valley CA, Burlington VT, Shasta CA, and Jacksonville FL. A new application is now underway for Nashville, TN.

A focus of recent applications has been to make the transition from a trip-based model to an AB model as straightforward as possible. This includes data utilities to use Census data along with existing MPO TAZ-level socioeconomic data to allow the AB model to predict trip ends at the Census block level, while still using the same TAZ-TAZ level auto and transit networks, assignment, and skim processes that are used in most trip-based models. DaySim also includes facilities to use standard all-streets network data (e.g. from Tiger files or Google Maps) to use block-to-block distances instead of TAZ-to-TAZ distances and times for short trips, avoiding some of the spatial inaccuracies that are common for intra-zonal trips and trips between nearby zones. The software incorporates multi-threading capabilities and efficient use of memory and computing, so that a day's travel and activities for the full synthetic population for a region of 250,000 persons can be simulated on a standard desktop machine (8 GB RAM, 4 processors) in around 15 minutes. That time is even less for smaller regions, or if a machine with more processors is available.

The presentation will include examples of how DaySim has been used for some of the MPO’s listed above, with examples of input data and simulation outputs, as well as a discussion of the required project resources.
NEW IMPROVEMENTS TO THE OHIO MEDIUM/SMALL MPO MODEL SYSTEM

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The Ohio Medium/Small MPO Model System (OMS) was developed 10 years ago to provide a standard enhanced four step modeling framework for eight of Ohio’s smaller MPO areas. The Department and the various MPOs update all travel demand models on a 10 year cycle following the decennial Census. As part of the 2010 model update, a number of improvements are being made to the system. ODOT’s goal is to move their small/medium sized models towards more advanced practice where it makes clear sense in small, manageable steps that can be applied to any area.

The initial tasks have focused on implementing improved assignment and feedback/warm start methodologies and improving the handling of school trips.

Several improvements are being made to assignment. More stringent convergence criteria and new algorithms for user equilibrium are being implemented to improve the stability of assignment results and reduce the amount of “noise” which can obscure meaningful comparisons between runs to compare different scenarios or project alternatives. Additional assignment classes are being added including more detailed breakouts of truck types and of travelers by income groups and more realistic estimates of vehicle operating and other user costs are being incorporated in the generalized cost function. These enhancements are designed to improve consistency with and support a new, more detailed benefit-cost analysis post-processor recently developed by ODOT.

New validation statistics including GEH and MAPE are also being added as well as new statistics to support travel time validation using INRIX data that has been purchased for the whole state by ODOT.

Tests are also being conducted to compare the original model which used free-flow speeds in distribution versus adding a feedback loop to distribution or alternately adding an option to warm start with a loaded network but without feedback. It is hoped that these tests will reveal whether the additional run time required for proper feedback results in any substantial improvement in model results or a simpler, less time consuming approach such as warm starting might offer comparable results.

Trips to serve passengers to school are also being re-categorized as home-based school rather than home-based other in order to facilitate more realistic handling of auto occupancy for both purposes.

Anticipated tasks in the next few months include enhancing the household model and adding an auto ownership choice model and an explicit transit captivity model, making concomitant enhancements to mode choice and distributing transit captive trips based on transit skims. Possible further enhancements such as replacing gravity models with destination choice models and enhanced handling of non-home-based trips for greater consistency with tours may be underway, but will likely not be complete by Spring of 2014. The presentation will review the various test and enhancements to the OMS model completed to date and provide an overview of ongoing work to enhance the models.
A TALE OF TWO FORECASTS

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The transportation project development cycle is very long. Many of today’s transportation projects started before the financial crisis of 2008. The sharp drop in travel demand and the slow recovery from the recession triggered by the financial crisis have caused some states, North Carolina among them, to reevaluate demand forecasts for projects already in project development. If the second traffic forecast is similar to the first then all is well and good. However, when the second traffic forecast is much different from the original traffic forecast it can call into question the need for the project, and undermine much of the effort put into developing the project to this point. The agency sponsors then must chose which forecast to use and which to discard. In turn, this can leave the sponsor open to charges of arbitrary decision-making if the project is at all controversial.

In cases like this, the project sponsor is often left with three undesirable, and possibly costly options. The sponsor may cancel the project. The sponsor may, based on judgment, choose which forecast to use. The sponsor may commission yet another traffic forecast, or if the forecast is based on a travel demand model the sponsor may perform an arbitrary sensitivity analysis to help inform the decision. Essentially, the project sponsor has the choice of using or discarding one, or more, forecasts. This is not the only, or perhaps even the best, option.

Over the past twenty years, the transportation planning profession has become familiar with the concept that traffic forecasts have a considerable amount of uncertainty built in to them. In fact there is significant variation in traffic demand on a day to day, month to month, and year to year basis. For years, researchers have been pointing out the uncertainty in travel models, and demand forecasts for toll roads, transit facilities, and mega-projects. In general, transportation researchers, and researchers on forecasting have learned several things: (1) at the regional level travel models are fairly good, but at the project level their output may vary by as much as 45%, (2) optimism bias exists in traffic demand forecasts, (3) different forecasters will produce different forecasts even when looking at the same information and (4) the average of several independent forecasts is more accurate than its component forecasts. This paper takes these lessons and applies them to a real project in North Carolina. It discusses how to determine if the difference between two forecasts is statistically significant, how improve the forecast by averaging forecasts together, and how to communicate the uncertainty or risk associated with the forecast to decision-makers.
Session C6
Lessons Learned on Performance-based Planning

USING MODERN AND COST-EFFECTIVE DATA COLLECTION TECHNIQUES TO OBTAIN ORIGIN AND DESTINATION DATA

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Using Modern and Cost-Effective Data Collection Techniques to Obtain Origin and Destination Data

Data collection is a key element of most transportation projects, and can often be the most expensive component of the overall project price. Considering the financial constraints faced by many municipalities, especially small and medium sized communities, traditional data collection activities may not be an option limiting these communities in their ability to fully understand travel in their region. One such data set that has historically been very expensive and cost-prohibitive is origin and destination (O&D) data. O&D data can be used to analyze something as simple as a small stretch of roadway, or a much larger area of multiple square miles.

Fortunately, advances in technology provide options for small and medium sized communities to obtain O&D data for costs that may be well within their available budget. This presentation and accompanying paper will provide a review of traditional data collection techniques and then compare these against modern, state-of-the-art options which exist. These advanced options include:

- Smart / Cell Telephone Technology: Using confidential cell phone records available from third party vendors, origins and destinations can be identified.
- GPS Technology: Similar to smart / cell telephone technology, GPS data can be stored in databases and queried into searchable subsets to identify Os and Ds of those records.
- Aerial Observations: Using airplanes and/or helicopters, video of defined study area limits can be taken and processed to determine O&D data of that study area.
- Bluetooth Data: Bluetooth devices have unique codes embedded into the devices which can be recorded and matched to determine O&D data.

Each option will be discussed and case studies will be presented. In addition, a comparison matrix with advantages / disadvantages will be presented to summarize the findings along with lessons learned, especially as it relates to small and medium-sized communities. Ultimately, the goal of the presentation and paper will be to give practitioners a new set of tools to consider when encountering data collection on projects.

While specific companies will be identified as options as well as certain vendors noted as part of the case studies, the presentation and paper will not be a sales pitch for a particular company / vendor.
Information on Origin-Destination (OD) based daily travel flows is a vital, but rather challenging to obtain, part of the regional transportation planning process. OD data specifies traffic flow volumes between specified geographic zones or specific points of locations. Traditionally, this data has been difficult to gather due to the expense of manual data collection and entry through license plate surveys and/or traveler interviews. This data is crucial for the calibration of travel demand models, which without OD data, are mainly based on known land use patterns and existing road networks, providing only generalized travel information. OD data contributes into the optimization of travel demand models and for use by transportation planners and analysts in all levels of agencies.

The major goal of this case study is to investigate how data as gathered under the 2009 National Household Travel Survey (NHTS) can be used to produce Traffic Analysis District (TAD)-based regional travel flow information critical to support transportation planners in two small/medium size Metropolitan Planning Organizations (MPO) in New York State. The research team works closely with transportation analysts from Syracuse Metropolitan Planning Council (SMPC) and Binghamton Metropolitan Transportation Study (BMTS) to identify TAD clusters in their respected MPOs that are most feasible for performing travel flow analysis at a disaggregated sub-county level.

The process involves the use of Geographic Information System (GIS) and examinations of detail geospatial data on business establishment locations, population size in the region, and considers the degree of travel activities (e.g., sufficient household trips originated from the given area) using data from the 2009 NHTS. Specifically, this process defines eight TAD-based zones for the SMPC region and five TAD-based zones for the smaller BMTS. The decision of dividing each MPO into specific TAD-based zones is made based on the considerations of not only having sufficient household travel data to support necessary analyses, but also ensuring that meaningful and useful results can be generated to support each MPO’s planning needs through this study effort. Analyses of travel flow patterns among TAD-based zones within each MPO, as well as between these zones and outside MPO regions, are conducted separately. This allows region-specific analyses to be performed so that any uniqueness in regional characteristics and their travel patterns can be revealed.

This paper presents the process and procedures used in defining appropriate TAD-based zones for studying OD flows (by mode and trip purpose) in passenger travel; discusses general travel flow patterns found; and addresses impact of integrating geospatial data/information to support regional planning and programs in small and medium transportation agencies. Although SMPC and BMTS are used in this study, the process and analysis procedures can easily be transferable.
CASE STUDIES USING BLUETOOTH O-D SURVEYS TO ADDRESS PLANNING AND POLICY ISSUES

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This paper will provide detail on three (3) important Bluetooth origin-destination (O-D) studies sponsored by the Texas Department of Transportation (TxDOT) for the purpose of collecting data to aid in making decisions about tolling along a corridor, the alignment of a major bridge, and the need for a bypass route around a community. The paper will illustrate and explain the data collection plans for each study and discuss the planning, implementation, analyses, and results from each. The paper will convey how small and medium-sized communities can utilize Bluetooth studies to collect information needed for transportation planning purposes. Summary information on each case study is provided in the following paragraphs.

The SH 130/IH-35 Traffic Diversion Study in the Austin, Texas region. A one-year truck toll reduction period was implemented on SH 130 east of Austin to improve safety and reduce congestion on IH-35 through central Austin by diverting more (commercial) trucks from IH-35 over to SH 130. To measure the effectiveness of this strategy, this study was conducted to collect O-D and traffic count data using Bluetooth readers, Automatic License Plate Recorders (ALPR), and vehicle classification counters to provide estimates of traffic being diverted from IH-35 to SH 130. The study focused on commercial truck diversion, but also obtained results for non-commercial vehicles.

The Harbor Bridge Alignment Study in Corpus Christi, Texas. The Harbor Bridge was open to traffic in 1959 and spans over Corpus Christi Bay. Four alternative build alignments/designs for a replacement to the Harbor Bridge were proposed and examined during the public involvement process. To study which alignment best met the needs of community travel, this Bluetooth O-D study was conducted to identify the major routes utilized by traffic approaching and departing the bridge. This data was used to assess which proposed alternatives most directly linked with prevailing traffic patterns, determine which ramping schemes at major interchanges best serve traffic demands, and help develop better cost estimates among competing alternatives.

The Highway Bypass Study in Alice, Texas. Alice, Texas is located along SH 44 in south Texas about 50 miles west of Corpus Christi. SH 44 is part of an east-west route used by commercial traffic travelling between the Port of Corpus Christi and international Texas/Mexico bridge crossings in Laredo, Texas. This study was conducted to determine the need for a relief bypass route around Alice. The study utilized Bluetooth readers in combination with ALPR cameras to assess O-D patterns around and through the Alice area. Key objectives of the study were to 1) estimate the amount of non-commercial and commercial traffic on SH 44 that travels through the Alice area, and 2) estimate the amount of commercial east-west traffic travelling through the Alice area that bypasses the city using routes to the north or south.
The Economic Census products of the U.S. Census Bureau provide critical data to assist transportation professionals in analyzing market conditions and making investment decisions. While some of elements of the Economic Census are widely utilized by the transportation community, many practitioners do not understand how the data sets could advance their planning, policy, and management activities. For example, County Business Patterns data are often used to identify important regional or statewide industries as a first step in developing regional transportation profiles and plans. However, use of these data tends to be ad-hoc and there are relatively few resources available to educate and guide the transportation community in making better use of the Economic Census products.

The purpose of this paper is to provide transportation planners in small and medium-sized urban areas with an introduction to the Economic Census products, focusing on those that have the potential to enrich transportation planning activities. This is particularly timely, as the Census Bureau is planning to release new Economic Census data, beginning in 2013 and continuing through 2016. The paper will include an introduction to the Economic Census products related to transportation and examples of how the data are or could be used in the transportation planning process.

Relevant data sets to be discussed include: sector and industry reports on transportation; service annual survey; quarterly services survey; survey of business owners; annual census of manufacturers; foreign trade statistics; manufacturer’s shipments, inventories and orders; commodity flow survey; and county business patterns. The data fulfill a wide range of transportation analysis needs—particularly those related to freight movement and economic development. Because the data are consistently collected, the data can be used to understand trends, to forecast future activity, and to develop performance measures. This includes identifying concentrations of freight dependent businesses (shippers and receivers), as well as commodity flows within and between neighboring regions.
Long-range transportation planning involves many difficult choices, especially in an era of constrained resources. Which modes of transportation should be prioritized? Which investments should be funded? And how can the outcome of the investments be predicted? These questions are hard to answer, particularly since transportation planners must make decisions within a time horizon that extends 30 to 50 years into the future. And it is virtually inevitable that the socio-demographics of a society as diverse as the United States will shift over this time period.

A key challenge for transportation decision-makers is to understand how the population might change over time, and how socio-demographic changes will affect the ways in which people travel and the kinds of transportation modes and infrastructure that will be needed. Metropolitan planning organizations (MPOs) and State Departments of Transportation need high-quality information that will help them to act—rather than react—in a way that best meets future transportation needs.

This presentation presents a new tool, Impacts 2050, available to MPOs and others that will open a window on the future ways in which socio-demographic changes could affect regional travel demand through the year 2050, and that will help policymakers plan for those possibilities. Impacts 2050 was developed with funding provided by the American Association of State Highway and Transportation Officials (AASHTO) through the National Cooperative Highway Research Program of the Transportation Research Board (NCHRP 28-83(6)).

Impacts 2050 is a menu-driven spreadsheet model that state and regional transportation decision-makers can use to play out the many ways in which changing socio-demographic factors in a region might impact travel demand over time. The tool helps users develop a realistic, inclusive understanding of:

- Which are the most important trends to watch for and monitor over time,
- How demographics, economics, land use, and travel behavior are likely to interact over time under a wide variety and range of scenarios, and
- Which are likely to be the most effective policy variables and intervention points in the system over time?

Scenario-based planning is still new to many MPOs, particularly small and medium sized MPOs. The presentation will introduce the underlying concepts of scenario-based planning, demonstrate the new tool, and provide useful guidance in how it can support small and medium sized MPOs, particularly those with limited resources, in reflecting an appropriate consideration of future economic, social, demographic, environmental, and other conditions in their long range planning.
The objective of this research was to identify factors associated with non-motorized travel, specifically walking trips, within the context of Chittenden County, Vermont, a small urban area. The research used survey, census, and geographic information systems (GIS) data to represent travelers from Chittenden County, Vermont in an analysis of personal, regional, and environmental factors. The data that were used for the analysis came from a variety of sources. The primary source for demographic, socioeconomic, and travel behavior details was the 2009 NHTS. The state of Vermont participated in the NHTS add-on program and as a result had a rich sample of 500 households in Chittenden County. The purpose of this paper is to provide a guide in how to prepare data for use in non-motorized studies in small urban areas. This includes both the techniques used to assemble the data as well as lessons learned in the process.

These data were used to prepare specific variables for statistical modeling. Created variables included densities of geographic areas (e.g. street blocks, land use types), distances between critical points (e.g. between transit stops), and length of segments (e.g. streets, sidewalks, and shared-use paths). The density variable layers were spatially joined with the census tract and TAZ layers to determine the number of bus stops and land uses within each area. Distances were calculated and the lengths of specific streets, sidewalks, and shared-use paths were all summed by TAZ and census tract.

The NHTS add-on for Chittenden County contained geocoded locations for home, work, and trip ends. The home locations were made anonymous to maintain respondent confidentiality. A quality control process was therefore performed to ensure that a deviation in home geocode did not have a significant influence on the resulting analysis data set. Trip distances and speeds were determined from the geocoded trip ends, and trip start/end times determined trip duration.

These data were used in a later analysis to estimate a discrete choice model. The model specified how users travelers influenced by individual characteristics (e.g. age, household income, medical conditions), regional characteristics (e.g. urban land use area, population density), and travel environment and behavioral characteristics (e.g. number of good sidewalks, attitudes toward walking from a health perspective). More research is needed to capture better the travel and built environment effects on walking within a small urban area as well as to determine how to best integrate the demographic characteristics into non-motorized planning efforts, this paper will provide data tips to support that research.
Passenger vehicle idling, defined as time periods when the engine is on but the vehicle is not moving, consumes fuel and produces both greenhouse gas (GHG) and criteria pollutant emissions. Discretionary idling is defined as idling that occurs at either trip-starts or trip-ends as opposed to in-travel or non-discretionary idling such as at traffic signals. In the case of trip chaining, trip-end idling events can occur at intermediate destinations and thus multiple trip-end idling events may occur during a single key-on to key-off operating period. The distinction between discretionary and in-travel idling is critical because different interventions may be required to reduce the duration and frequency of each of these types of events. Moreover, discretionary idling is more pertinent to small and medium-sized communities where congestion-related idling may be less common.

The data for this paper came from a field study of discretionary passenger vehicle idling in the state of Vermont. Using Global Positioning System (GPS) and onboard diagnostic (OBD) loggers, second-by-second vehicle-speed data were collected from a group of volunteers for 10-day periods. The data collected using this instrumentation in a prior state-wide effort showed that vehicles idle for a considerable portion, 15.6%, of their operating time and that there are significant seasonal differences in discretionary idling events which on average represent at least 6.5% of vehicle operating time. Among discretionary idling events longer than 60 seconds, trip-start idling events are significantly longer than trip-end events and the longest idling events are winter trip-starts.

In this paper, we will focus on a new dataset collected between January and July 2013 in Addison County, Vermont (36,000 population). Middlebury (8,500 population) is the largest community in the county and observations were split between rural and more urban residents. Idling events were classified as discretionary or non-discretionary and locations were tabulated in Geographic Information System (GIS) to calculate spatial predictor variables. Spatial analysis allowed calculation of land use variables including rural development codes, and surrounding residential and retail density. Daily high and low temperatures were calculated from the closest weather station. Day of week and time of day were used in additional to household demographic variables. The results are intended to further our understanding of the duration and location of discretionary idling to focus education, anti-idling laws and other countermeasures.
Commercial GPS-based travel time datasets have been acquired and a wide range of modeling-related uses for it both at the MPO and statewide levels within Ohio are being implemented or contemplated. These include model validation at corridor level, development of new “speed tables,” and buffer indexes for travel time reliability for estimating project benefits. The speed table development and validation of some MPO models previously has been accomplished with small-sample floating-car surveys.

Uses and potential pitfalls with these data to watch for will be presented, including problematic relationships to traffic volume and time of day, and the discovery of some “biased” values in the data for traffic modeling purposes when compared to other sources for this data (spot speed monitoring sites as well as the floating car surveys). A more limited but continuing role for the traditional data sources is also recommended given such biases, roadway segmentation, and limited GPS-based data available on some functional classes of roads.

Keywords: travel time data
The interest in using passively collected travel data from mobile phones in the development of travel models has increased in recent years as a low cost option for collecting data that can be used to validate trip distribution models or to better understand travel from outside the modeled region. While there are many examples of interesting and innovative uses of passively collected cellular data to support travel analysis, few examples exist of comparisons that have been made between this data and travel demand model outputs from a calibrated and validated model based on locally collected household survey data. This presentation will report on the findings of such a comparison, including the methodology for comparing the two data sources along with the results. These results show that the highway assignment using passively collected cellular data are comparable to the highway assignment using model estimated trip tables, supporting the use of passively collected cellular data as a low cost option for travel model validation.

KEYWORDS: Travel demand models, data
Abstract: This paper and presentation articulates what Health Impact Assessment means for transportation planning and how it can effectively inform transportation decision-making. While much of the buzz nationwide about Health Impact Assessments has focused on large urban areas, there are several case studies of HIAs conducted on transportation planning and design efforts in small and medium-sized communities. The presentation will focus on how five (5) Health Impact Assessments in North Carolina conducted for Regional Planning and Active Transportation encountered both challenges and opportunities related to data collection/evaluation, creating partnerships and breaking down silos, and changing community conversations about health and transportation.

The paper/presentation chronicles lessons learned on how HIAs can be applied in a variety of transportation planning contexts. The 5 HIAs used as case studies in this session are:

- Southwestern Commission COG/RPO Regional HIA (8 counties in southern Appalachia)
- Robbinsville Pedestrian Connectivity Plan HIA (pop. 700)
- Haywood County Comprehensive Bicycle Plan HIA (pop. 50,000)
- Buncombe County Greenways & Trails Master Plan HIA (pop. 200,000, including Asheville)
- Wake County Northeast Area Study HIA (50,000 within study area near Raleigh)

The varied contexts in which these HIAs have been conducted, including population base, local political climate, governance structure, involvement of local health organizations/individuals, geography, and availability of local health data, have led to distinct applications of different methods to address the six steps of an HIA. These HIAs have not only generated recommendations and had impacts as they relate directly to the subject of the HIA, but planning, economic and health studies conducted on the heels of these HIAs have been able to utilize their findings or help make the case for data collection methods that allow health data to comport with transportation and other demographic data.

The use and application of datasets obtained for each HIA has varied based on the geography. There are few datasets that have information available at a Census tract level as it relates to public health. Each HIA was able to utilized existing Census data tagged through research related to social determinants of health to identify hot spots of high prevalence of poor health conditions. Some HIAs have utilized additional data obtained from the North Carolina State Center for Health Statistics, but the utility of this data has been limited based on the geographic scale of the planning effort. In some instances, the HIAs have been able to utilize data collected by local health department to better refine recommendations through the planning process.

The other key lessoned learned is that four out of the five HIAs have received their primary funding from non-health-based funding sources, including MPOs, an RPO, the Appalachian Regional Commission and the Community Foundation of North Carolina.
The form and scale of streets are important factors influencing livability. Researchers and professionals from the design and planning communities recognize that human-scale streets akin with the principles of Smart Growth are important for creating street spaces that are inviting for pedestrians and other alternative uses. Today, many communities are looking to strengthen their core areas by planning for development with livable street environments and requiring performance metrics to gauge progress on this goal. Building and measuring livable streets is especially prescient for small-sized cities where the boundary between urban and suburban land use is narrow and there are challenges to promoting downtown growth in lieu of nearby greenfield development opportunities.

This presentation will demonstrate an innovative method using common GIS data to measure livability as a function of street form and scale using examples near the conference site in Burlington, Vermont. Most researchers studying micro-scale urban form have used manual audits to collect street-level environmental data. While audits allow for collection of myriad variables, audits are incredibly time consuming, expensive to conduct, and are limited in their capacity to precisely measure street features while traffic is flowing. GIS-based measurement allows more efficient and precise measurement limited only by the extent of data availability.

The new livability measurement approach combines commonly available GIS layers—building footprint, street centerline, curb line, and tree canopy area—to measure major physical characteristics of the street space as they are experienced by users. The method uses vector-based GIS tools to recognize the street wall formed by combined setbacks of buildings and measure the width between street walls as a user would experience it. By adding curb line and building height data simple cross sections can be drawn showing the height-width ratio of the street space and the proportions of the street allocated to pedestrians and vehicle traffic. High resolution tree canopy data is used to estimate how street trees provide additional room-like enclosure to the street space. The technique also measures consistency of street walls and tree canopy coverage along a street’s length to identify the variability of enclosure. While these relationships are sometimes straightforward to judge in person they are complex to quantify and study systematically over a broad area. This method allows planning stakeholders to consistently measure street environments and apply this information in the development of plans and codes where built environment form and scale are increasingly important considerations.
Abstract:

The concept of livability is not new to Montana or the Montana Department of Transportation (MDT). Helping build great places in great environments has long been embedded in the department’s mission, and even the state constitution. In light of the current national dialogue on livability, the challenge facing MDT is to more formally define livability for Montana and its communities and understand how livability relates to Montana’s transportation needs. The purpose of this study is to determine what livability means for Montana and the role of transportation. To achieve the goal of the study, the research team: (1) scanned existing demographic data and literature; (2) conducted interviews of peer states; (3) conducted a qualitative analysis on Montana TranPlan 21 public comments; (4) conducted a public survey of Montana communities and a local elected leader survey; and (5) interviewed Montana partner agencies and key MDT staff.

The study finds that Montana has some unique characteristics that may have a bearing on measures of its livability. For example, sixty-two percent of Montanans live in areas where the population density is 800 people per square mile or higher, but those areas account for only 0.1 percent of the land area. Along with its unique character, the surveys conducted for this study indicate that Montana is also a good place to live. Survey respondents endorsed the belief that MDT projects add value to their quality of life. There were some consistent themes identified through the various tasks of this study. One size does not fit all, and any definition of livability should have some flexibility and scalability based on local needs and a community vision. Well maintained road system, safety, public transportation systems, bike and pedestrian facilities, and winter maintenance are important features of livability for Montana communities. Based on research and outreach, the research team proposes the following definition for livability in Montana as it relates to transportation: “Provide a transportation system that emphasizes a safe, maintained road network; allows for multimodal transportation opportunities; and considers local community values.”
The Community Planning Association of Southwest Idaho (COMPASS) adopted a Complete Streets policy for the Treasure Valley region of Idaho in 2009. However, the next year the National Complete Streets Coalition issued their policy analysis report and ranked that policy as the penultimate Metropolitan Planning Organization complete streets policy in the nation and it scored zero points for "measurement."

To rectify this situation, COMPASS evaluated the multimodal analysis of every principal arterial within the Treasure Valley. COMPASS used the Multimodal Level of Service (MMLOS) methodology which was developed for the 2010 Highway Capacity Manual (HCM) to quantify and score (A-F) roads for automobile, bicycle, pedestrian, and transit users. The HCM considers a robust set of variables and quantifies the user experience:

- **Automobile LOS** is based on volume, capacity, posted speeds, signal timing, saturation flow rate, segment length, and arrival type.
- **Bicycle LOS** is based on presence of bike lanes, width of the outside through lane, adjacent motorized vehicle volumes, adjacent motorized vehicle speeds, heavy vehicle (truck) volumes, and pavement condition.
- **Pedestrian LOS** is based on existence and width of a sidewalk, lateral separation of pedestrians from motorized vehicles, adjacent motorized vehicle volumes, and adjacent motorized vehicle speeds.
- **Transit LOS** is based on bus frequency, pedestrian LOS score (i.e., access to transit stops), station amenities, and passenger load factors.

This session will provide an overview and history of the complete streets movement, show how the MMLOS methodology and software quantifies the travel experience for non-auto users, and outline some practical applications in integrating complete streets policies using case studies from California, Florida, and Idaho. Attention will be given to the obstacles that had to be overcome and the solutions that worked. In particular, the case studies will highlight how MMLOS can be used to evaluate and assess tradeoffs of different decisions of space allocation within constrained corridors.

This session will be interactive in two ways: Tom Laws, COMPASS, will lead attendees on a virtual mobile tour and a hands-on application of the MMLOS software. Participants will be led on a virtual mobile workshop of Treasure Valley streets, their characteristics, and multimodal scores. The virtual mobile tour will explore several road and intersection typologies from the urban core to rural routes. Sonia Daleiden, Kittelson & Associates, will then introduce participants to the MMLOS software by providing a brief tutorial, and then exploring various roadway alternatives chosen by the session participants and compare the results of each.

Attendees will receive interactive training of complete streets principles and MMLOS tools so they can go home and answer the question, "What is my street's grade?"
Natural disasters wreak havoc on infrastructure systems, requiring timely planning decisions to support short term rebuilding and long term recovery action. The desire for short term rebuilding must be balanced against the silver lining of disasters for communities- the ability to redesign and build infrastructure to meet contemporary performance standards for connectivity, multimodal access, storm water management and sustainable energy. Large communities with professional planning staff and close ties to Metropolitan Planning Organizations have greater capacity to assess and quantify potential positive impacts of such integrated infrastructure rebuilding in the wake of disaster than small communities. Yet small communities stand to benefit more than larger communities from the “silver lining” of disaster events- since the disaster itself opens up funding for building complete street projects difficult to finance in other circumstances.

This presentation will showcase three techniques for empowering residents and local leaders during planning complete streets after disaster that marry deep learning experiences with rigorous technical assessment. In the first, participants and leaders engaged in map and camera powered focus groups gain knowledge and awareness of all the people who rely on transportation to meet daily needs throughout their life, and how well local systems perform to meet these needs. In the second, participatory system mapping allows participants to “read” infrastructure systems and come to understand interrelationships of the parts, while also constructing a reliable inventory. In the third, design workshops open to the public and local system “caretakers” emphasize quantifiable sustainable infrastructure performance while also visualizing place qualities people care about when rebuilding, to create a design “bridge” between the past and the future qualities of the design. The design workshop also demonstrates the critical but hidden components of infrastructure that must be interlaced to achieve sustainable performance outcomes. When implemented in sequence, these assessment methods have led to visionary transportation plans that are embraced by local leaders and supported by state and federal agency rebuilding programs.

When working with small communities- where citizen planners play leadership and decision making roles- an engaged assessment and goal setting process is required so that the performance improvements of street infrastructure can be grasped and communicated among local stakeholders. Physical planning can then build on shared expectations for infrastructure performance, leading to shared expectations for infrastructure design. When small communities are confronted with long term change after disaster events, linking infrastructure planning to future focused visioning planning, citizen planners and other stakeholders are willing to consider ambitious infrastructure projects that support long term recovery goals for quality of life, economic development and sustainable energy. What might have seemed impractical before disaster is now viewed as not only practical but desirable due resident and agency interest in long term benefits.
Transportation policy has evolved from planning and designing almost exclusively for the movement of cars, to an increasing focus on the movement of people. Complete streets embody this paradigm shift by recognizing that:

1. Not all people travel by car, and
2. Land use affects who uses the street and how that street should function.

Although great strides have been made by communities across the nation to provide adequate facilities for all roadway users, many streets remain “incomplete” due to lack of bicycle, pedestrian and transit facilities. A major barrier to developing complete streets in small and medium sized communities is lack of resources, including funding for potential projects, staff and training.

The Monterey Bay Area Complete Streets Guidebook takes the approach that complete street features can be integrated into existing capital improvement program budgets and schedules to make the most of scarce funds. Converting a resurfacing/restriping project into a road diet with bike lanes or striping/restriping a crosswalk to improve the visibility of a popular pedestrian crossing are examples of how complete street features can be integrated into existing efforts and do not require separate and large infrastructure improvements.

In order to assist project sponsors in finding cost effective opportunities to develop complete streets projects, and to provide a practical resource to support development of complete streets from policy to implementation, the regional transportation agencies in the Monterey Bay Area developed a comprehensive complete streets guidebook.

The Guidebook contains planning and engineering best practices, sample general plan goals and policies, conceptual cross-sections, a six-step planning process, suggested tools for implementing a complete streets network, and a project review checklist amongst other resources. The project review checklist provides an opportunity to:

- Document the user needs specific to the project area and how those needs were considered and accommodated;
- Balance trade-offs amongst modes, consider alternatives, and provide a justification for the final design; and,
- Reveal cost-effective opportunities for incorporating complete streets features into projects.

Unlike many procedure manuals, which tend to be more prescriptive, the Monterey Bay Area Complete Streets Guidebook places greater emphasis on tools, stakeholder input, and the importance of understanding the trade-offs between different design considerations. This approach supports the goals of many small and medium sized communities to maintain their unique community identity and helps avoid missed opportunities to design facilities in a way that improves the roadway function for the most vulnerable users, including elderly, disabled and youth. This approach is intended to reveal opportunities for complete streets, consider the land use context, and address potential design nuances allows small and medium sized communities tailor complete streets to be most appropriate for the local context. A unique component of the Guidebook is a framework for evaluating the possible economic impacts of complete streets, which is scalable to small and medium sized communities.