

Conference on Performance Measures for Transportation and Livable Communities

SEPTEMBER 7-8, 2011
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Conference Summary

Conference on Performance Measures for Transportation and Livable Communities

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Rapporteur

September 7–8, 2011
Omni Austin Downtown
Austin, TX

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Opening Session

Katherine F. Turnbull, Texas Transportation Institute, presiding

Conference Welcome and Overview

Katherine F. Turnbull, Texas Transportation Institute

Katie Turnbull, chair of the planning team, provided a welcome to conference participants. She highlighted the conference sponsor and co-sponsors and the background to the conference. She described the conference format, the anticipated follow-up activities, and the challenge to participants. Katie covered the following topics in her presentation.

- The conference is sponsored by the University Transportation Center for Mobility (UTCM) at the Texas Transportation Institute (TTI), which is a part of The Texas A&M University System. Conference co-sponsors include the Center for Transportation Studies (CTS) at the University of Minnesota, the Transportation Economics Center at TTI, and the Transportation Research Board (TRB) of the National Academies.
- Tara Ramani, conference coordinator, and the conference planning team were recognized and thanked. Other members of the team included Linda Cherrington, Suzie Edrington, and Shawn Turner all of TTI, and Gina Bass of CTS. Robin Kline from the Research and Innovation Technology Administration (RITA) was recognized and thanked for her support.
- The need for a conference on performance measures related to transportation and livable communities was one of the suggestions from the TRB, RITA, and UTC Transportation for Livable Communities Conference held in the fall of 2010. It also builds on the TRB Performance Measurement conferences. The most recent of these conferences was held in May 2011. A TRB Geographical Information System (GIS) and Livability and Sustainability Workshop was also held in May.
- The focus of this conference is to advance the discussion and use of performance measures with transportation and urban, suburban, and rural livable communities. Identifying further research needs, outreach activities, and professional capacity building opportunities represents an additional focus of the conference.
- The conference format includes general sessions and breakout sessions. The first two general sessions provide a federal perspective on livable communities and the Partnership for Sustainable Communities that involves the U.S. Department of Housing and Urban Development (HUD), the U. S. Department of Transportation (U.S. DOT), and the U.S. Environmental Protection Agency (EPA). State Senator Kirk Watson, who also served as Mayor of Austin, is the Wednesday luncheon speaker. Wednesday afternoon and Thursday morning will be spent in breakout sessions. The closing luncheon on Thursday features observations and open discussion. Optional walking and commuter rail/transit-oriented development (TOD) tours are offered Thursday afternoon.
- A total of 120 individuals pre-registered for the conference. Participants come from 22 states and the District of Columbia. Participants represent metropolitan

planning organizations (MPOs), state departments of transportation, transit agencies, universities, consultants, cities, private non-profit organizations, and other groups.

- The PowerPoint presentations from all the sessions will be posted within the next few weeks on the conference website. The conference proceedings will also be prepared and distributed to participants and posted on the website. Research problem statements may be prepared based on topics discussed in the sessions. Future conferences and other activities will also be organized.
- Challenges to conference participants are to learn something new, to take a new idea or new information back to work, and to meet new colleagues. Further challenges are to actively participate in the sessions, to interact with others, to provide thoughts and ideas, and to help with the next steps.

Livable Communities: The Critical Role of Performance Measures from Concept to Implementation

Robert C. Johns, Associate Administrator and Director, Volpe National Transportation Systems Center

Bob Johns provided an overview of performance measures and livable communities to help establish the context for the conference. He described the Volpe Center and the Partnership for Sustainable Communities involving the U.S. DOT, HUD, and the EPA. He described the connections between livable communities and performance measures, identified key challenges in using performance measures to enhance livable communities, and suggested areas for further research. Bob covered the following topics in his presentation.

- The purpose of the Volpe Center is to advance transportation innovation for the public good. The mission is to improve the nation's transportation system by serving as a center of excellence for informed decision making, anticipating emerging transportation issues, and advancing technical, operational, and institutional innovations. The four Volpe values focus on public service, innovative solutions, professional excellence, and collaboration and partnering. Some of the unique aspects of the Volpe Center include modal knowledge and experience, disciplinary breadth and depth, the federal role, and the entrepreneurial culture. The Volpe Center includes 578 federal employees representing a full spectrum of disciplines from engineering to physical and social sciences. The Center also supports more than 60 federal career interns and co-op students.
- The five U.S. DOT strategic goals address safety, the state of good repair, economic competitiveness, livable communities, and environmental sustainability. The Administration's Federal Performance Initiative is driving federal performance. President Barack Obama made the following statement on April 13, 2011, "*If we believe the government can make a difference in people's lives, we have the obligation to prove it works – by making government smarter, leaner, and more effective.*"

- The HUD-DOT-EPA Partnership for Sustainable Communities includes six principles of livability. The first principle is to provide more transportation choices to decrease household transportation costs, reduce dependence on oil, improve air quality, and promote public health. The second principle is to expand location- and energy-efficient housing choices. The third principle is to improve the economic competitiveness of neighborhoods by giving people reliable access to employment centers, educational opportunities, services, and other basic needs. The fourth principle is to target federal funding toward existing communities – through TOD development and place-based policies. The fifth principle is to align federal policies and funding to remove barriers to collaboration, leverage funding, and increase the effectiveness of programs. The sixth principle is to enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods, whether rural, urban, or suburban.
- The Volpe Center is involved in a number of livability and performance measure projects. Examples of projects conducted for the Federal Highway Administration (FHWA) include MPOs and healthy communities, scenario planning workshops, a white paper on performance-based planning, and a non-motorized pilot program. Projects for the Federal Transit Administration (FTA) include the HUD-DOT-EPA Partnership for Sustainable Communities and Transit @ the Table: Statewide Planning, Rural Transit, Livability. The Volpe Center conducts statewide and metro planning oversight for the FTA and FHWA. It was also involved with the Chicago MPO *Go to 2040* transportation/land use vision plan and the Federal Lands Performance Measure Framework.
- The intersection between livable communities and performance measures is critical. A number of key concepts can be identified from the successful use of performance measures. Performance-based planning is a holistic, continuous approach. It includes broad long-range goals and measures appropriate to these goals. Performance data to analyze alternatives is essential. Applying measures throughout the planning process and using the measures to monitor and evaluate results is also important. A feedback loop to adjust the on-going planning process is also important.
- A goal is defined as a broad statement of what is to be accomplished. Performance measures are indicators that evaluate how well something is performing. Performance measures may be qualitative or quantitative. Output measures record the level of activity from plans, programs, and projects, such as hours and miles of transit, and tons of salt per mile of roadway. Outcome measures focus on how effectively policies, plans, and projects accomplish goals. Examples of outcome measures include injuries per million miles, carbon dioxide (CO₂) per vehicle mile, and walk access to transit. Process measures address how well planning activities meet requirements, such as the effectiveness of public involvement, institutional collaboration, and fiscal constraint. Finally, targets translate goals into quantifiable, measurable, and realistic terms expressed in performance measures. Agencies commit to meet defined targets. Examples of targets include reducing road fatalities per capita by 10 percent in five years and reducing transportation-generated CO₂ by 20 percent of 2005 levels by 2020.

- A number of challenges may be encountered with the development and use of performance measures with transportation and livable communities. These challenges include operational and flexible definitions of livability; integrating federal, state, regional, and local transportation and livability goals; and rural livability and the role of performance measures in rural areas. Other challenges are measuring health benefits, estimating community economic impacts, cross-sectoral integration or bringing all the elements together, and capacity building.
- A first challenge is defining a livable community. Clarity is critical to have an operational definition for each locality. Focusing on the issues and opportunities in each area is important. Flexibility is essential, as there is no one model approach for all areas. The definition must make sense to decision makers and the public. Exploring relationships between livability and sustainability may be appropriate, especially the economic, environment, and equity goals of sustainability. Possible research opportunities related to this challenge focus on examining communications, education, consensus building, and collaborative planning techniques.
- A second challenge is integrating federal, state, regional, and local goals. Policies, funding, and technical assistance provide the building blocks for goals. Examining the goals relevant to transportation decisions that advance livable communities is important, as is integrating and establishing supportive roles and decision-making processes. There may be a possible need to combine diverse and complex goals. A possible research opportunity related to this challenge is developing case studies of effective integration of MPOs, state departments of transportation, transportation authorities, and other agencies.
- A third challenge is rural livability and performance measures. Elements to consider include the differences between urban and rural livability, the role transportation plays in rural livability, and how to reflect these items in goals and performance measures. Rural performance measures may need to focus on non-traditional approaches. The Island Explorer in Acadia and Ellsworth, ME provides an example of a transit system serving a national park and the gateway communities. It provides visitors with access to the park and residents with access to jobs, housing, and health care. Possible research opportunities associated with this challenge include examining the integration of transportation, health, and housing plans and programs and the role of performance measures on technical and institutional issues.
- Estimating the health impacts from transportation represents a fourth challenge. There is growing interest in health as a livability goal. There is a need to move beyond traditional related goals, such as improving safety and air quality. Examining the health benefits of increased physical activity from walking and biking, the access to health-related destinations, such as healthy food and medical care, and aging in place should be examined. Health is a key goal of the Congressional Non-Motorized Pilot Program. Possible research opportunities related to this challenge include developing standardized measures of walking and

biking, developing tools to estimate health and economic benefits, and identifying best practices to incorporate within transportation planning and decisions.

- A fifth challenge is estimating community economic benefits. Economic development and jobs are key benefits of transportation investments. Examples of benefits include new employment and improved options for access to work and to training. Key issues to consider include the distribution of benefits and equity, the interaction of land use and transportation, and incorporating performance measures into the transportation planning process. Possible research opportunities related to this challenge include data and forecasting tools for meaningful performance measures, successful applications for decisions, and communication to citizens groups.
- Cross-sectoral integration represents a sixth challenge. The second challenge deals with vertical integration of planning by transportation agencies at the federal, state, regional, and local levels for livable communities. In contrast, the sixth challenge addresses the newer issue of horizontal integration across sectors, such as integrating transportation and land use, economic development, housing, and health. It brings a complex assortment of groups around the transportation table. These groups have different agendas, priorities, clients, regulations, financial resources, and technical processes. A key transition will be from recognizing relevance for livability to mainstreaming new considerations into transportation decisions. Performance measures can translate goals into agreed-upon outcomes and can be combined with traditional goals and measures in the planning process. Examples include land use and transportation options and the housing plus transportation index. Possible research opportunities associated with this challenge include refining data and measures, and conducting case studies of technical and institutional integration.
- Capacity building represents a final challenge. This challenge focuses on training and capacity building across transportation, land use, economic development, housing, environment, and health sectors. The potential and limits of cross-training need to be examined. For example, do transportation planners also need to be public health, housing, and economic development experts. There are limits of direct expertise, requiring the need to rely on coordination and collaboration. A key role for performance measures is to provide technical resources to communicate, compare, and decide how to make a community more livable. Possible research opportunities associated with this challenge include exploring new core competencies for practitioners, potential inter-disciplinary training, and focused collaboration across sectors. Another research need is examining the use of performance measures with transportation and housing, economic development, health, and the environment.
- In conclusion, clarity of concepts is essential for livable communities and performance measurement. It is important to maintain flexibility as there is no absolute concept of a livable community. Performance measures are critical as a basis for decision making and transparent results. Performance measures must accommodate this flexibility. Data availability continues to be a key concern to

match the range of livability goals. Capacity building between levels of government and sectors will be needed. An incremental approach to improve connections appears best. Best practices research on integrated, inter-disciplinary approaches would be of benefit. Providing examples of using performance measures at a regional scale and at a project level, highlighting cross-sectoral collaboration, would also be of benefit.

Federal Highway Administration Livability Initiative

Jim Thorne, Federal Highway Administration

Jim Thorne discussed FHWA's livability initiative. He described approaches to incorporating livability into the transportation planning process and FHWA guides and tools to assist in these activities. Jim covered the following topics in his presentation.

- The HUD-DOT-EPA Sustainable Communities Partnership focuses on improving access to affordable housing, providing more transportation options, and lowering transportation costs, while protecting the environment. It also encourages incorporating livability principles into federal programs and funding. The partnership is based on the premise that working together is the most effective way to achieve the nation's economic, social, and environmental goals.
- The partnership livability principles focus on transportation choices, equitable and affordable housing, economic competitiveness, supporting existing communities, aligning federal policies, and valuing communities. For transportation agencies, these livability principles relate to considering all transportation modes and affordability, and serving people of all ages, incomes, races, and ethnicities. They also relate to improving access to work, services, and markets. Additionally, the principles support making government more efficient and responding to community vision and values.
- Recent federal legislation – including the Intermodal Surface Transportation Efficiency Act (ISTEA), the Transportation Equity Act for the 21st Century (TEA-21), and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) included a number of transportation planning factors. Examples of these factors include supporting economic vitality, increasing safety, increasing security, and increasing accessibility and mobility. Other planning factors focus on protecting and enhancing the environment, enhancing connectivity across and between modes, promoting efficient system management and operation, and preserving the existing transportation system. The transportation planning factors are intended to protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns.
- Livability in transportation can be defined as using the quality, location, and type of transportation facilities and services to help achieve broader community goals, such as access to good jobs, affordable housing, quality schools, and safe streets. A variety of terms may be used to describe the same general concepts. These

terms include livability, sustainability, smart growth, walkable communities, new urbanism, healthy neighborhoods, active living, TOD, and complete streets.

- A number of elements for incorporating livability in the planning process can be identified. These elements include increasing public and decision maker understanding that land use and transportation are intertwined and helping regions develop a vision related to community growth and values. Developing goals, performance measures, and policies that address livability and quality of life are also important elements in the planning process. Better integration of land use and transportation planning is also key to livable communities. Other elements include active public involvement, multimodal planning, and interdisciplinary efforts. Considering safe, connected, multimodal roadway networks and context-sensitive solutions (CSS) in regional, and corridor project planning is also important. The process may also focus on plans, programs, and projects to support broader community goals. It is important to remember that options and approaches vary depending on the characteristics of the area and the vision of residents.
- The FHWA is undertaking a number of efforts to advance livability. Examples of these activities include the FHWA Livability website, the *Livability in Transportation Guidebook*, and including the role of FHWA programs in the *Livability Report*. The FHWA has sponsored five regional workshops co-sponsored by the National Association of Development Organizations (NADO) Peer Exchanges on Rural Livability. An *Environmental Justice in Transportation: Emerging Trends and Best Practices Guidebook* has been developed. The Sustainable Communities Division Office Network provides ongoing support. The FHWA Livability website is www.fhwa.dot.gov/livability and the Partnership website is www.sustainablecommunities.gov.
- The *Livability in Transportation Guidebook* provides planning approaches that promote livability. The report highlights projects, visioning activities, planning and process efforts, and policy development. It also highlights developing partnerships, design elements, and implementation and funding considerations. It includes urban and rural case studies and strategies that facilitate revitalizing rural small towns, better connecting downtowns with neighborhoods, and completing street networks. The case studies also address supporting compact, mixed-use development, maximizing the efficiency of existing transportation infrastructure, mitigating impacts of climate change, and preserving natural and cultural resources.
- The role of FHWA Programs in *Livability: State of the Practice Summary* highlights implementation of the livability principles within the context of the federal-aid highway program. It describes highway projects and programs, safety projects and programs, bicycle and pedestrian programs, management and operations, and freight projects and programs. It also presents strategies for implementing livability in multimodal corridors and system planning, and programmatic support and technical assistance. It describes processes, performance measures, and tools.

- The FHWA *Land Use Tool Kit*, *the Transportation Planning for Sustainability Guidebook*, and the FHWA *Scenario Planning Guidebook* are available at www.fhwa.dot.gov/planning/landuse/. The summary of the peer exchanges on “Effective Practices in Planning for Livable communities at Metropolitan Planning Organizations” is available at <http://www.planning.dot.gov>. Topics addressed in the peer exchange included transportation and land use integration, the transportation planning process, and programming and project prioritization. Other topics addressed included funding, project implementation, program evaluation and performance measures, and partnerships and outreach.
- The FHWA also has a number of activities underway to advance livability. These include livability in transportation webinars, creating a livable communities report, and developing livability fact sheets. A primer on the *Role of Management and Operations in Supporting Livability and Sustainability* and a *Desk Reference for Integrating Demand Management into the Transportation Planning Process* are being finalized. *Livability Performance Measures* and a *Sustainable Highways Tool* are also being developed.
- The new FHWA publication, *Role of Management and Operation Strategies in Supporting Livability and Sustainability* is available at <http://plan4operations.dot.gov/>. It describes how management and operation strategies can help improve existing transportation systems interface with communities. It addresses traffic incident management, traffic signal coordination, transit signal priority and bus rapid transit, and freight management. Other topics include work zone management, special event management, road weather management, congestion pricing, managed lanes, and ridesharing programs and demand management programs. Parking management, electronic toll collection and transit smartcards, and traveler information are also addressed.
- The livability performance measures project is developing and defining performance measures appropriate to creating, developing, and enhancing livable communities. It focuses on making the adoption and tracking of livability performance measures easier by distilling current practice, knowledge, and research into a resource that will guide users through the process. The project will produce a handbook to help transportation agencies incorporate performance measures related to livability.
- Examples of next steps in developing methods for gauging livability include researching the literature and best practices of measuring livability. Interviews with members of the academic community, state departments of transportation, and MPOs are being used to obtain information on rural, suburban, and urban examples. A draft livability performance measures handbook is being developed. An expert panel peer exchange will be convened to assess the proposed performance measures and a beta test will be conducted to engage a broader cross section of practitioners in the effort. The results of these activities will be used to create an electronic “how to book” on livability performance measures. Outreach workshops will be held to help promote the wide-spread use of the guidebook.

- The sustainable highways tool is a self-evaluation tool to measure sustainability over the life cycle of a transportation project. It includes a collection of best practices. The web-based tool is based on the triple bottom line of environmental, economic, and social sustainability. A pilot test version is available at www.sustainablehighways.org.

General Session

Laurie McGinnis, Center for Transportation Studies, University of Minnesota, presiding

Federal Transit Administration and Livable Communities

Keith Gates, Federal Transit Administration

Keith Gates discussed the FTA's activities related to livable communities and the Partnership for Sustainable Communities. He reviewed the roles of HUD, U.S. DOT, and EPA in the partnership and summarized activities underway related to performance measures for transit and livable communities. Keith covered the following topics in his presentation.

- There are a number of trends affecting infrastructure investments, including the growing U.S. population, which is also aging. Other trends include increasing transportation energy use and plans for reducing carbon emissions. There is a growing need to repair and maintain the existing infrastructure, and to leverage existing resources. There is also a desire to protect open spaces and farmland.
- The U.S. population energy consumption from all sectors, including transportation, has increased significantly since 1960. These increases are projected to continue. Infrastructure investment decisions affect household budgets. According to 2004 data from the Bureau of Labor Statistics, the average family spends 19 percent of their household budget on transportation. Households in auto-dependent neighborhoods spend 25 percent of their household budget on transportation, however. Households with good access to transit spend just 9 percent of their household budget on transportation. This savings can be critical for low-income households.
- Infrastructure investments also influence local government budgets. For example, the population of Cuyahoga, OH remained relatively constant at almost 1.4 million people from 1950 to 2002. The same population was spread out over a much larger area in 2002, however, costing the taxpayers more for providing infrastructure, police and fire protection, and other services.
- The Partnership for Sustainable Communities with HUD, DOT, and EPA is based on six principles, which were developed jointly by representatives from all three agencies. The first principle is to provide more transportation choices. The second principle is to expand location- and energy-efficient housing choices. Improving the economic competitiveness of neighborhoods by giving people reliable access to employment centers, educational opportunities, and other basic services is the third principle. Targeting federal funding toward existing communities through transit-oriented development and place-based policies is the fourth principle. Aligning federal policies and funding to remove barriers to collaboration, leverage funding, and increase the effectiveness of existing programs is the fifth principle. Enhancing the unique characteristics of rural, suburban, and urban communities is the sixth principle.
- The partnership is leveraging the expertise, capabilities, and programs within the three agencies. All of the agencies play important roles in the partnership and have numerous activities underway. For example, HUD has a long history of

using community development block grants to fund projects. Recent programs include \$100 million for regional planning grants and a local challenge grant program. HUD also has expertise and programs in affordable housing. The EPA has a broad range of programs, including the Smart Growth Office, which provides technical assistance and localized help to communities. The EPA also has technical assistance programs for Brownfields restoration and over \$3 billion in a revolving water infrastructure fund program that is available to states.

- The U.S. DOT has numerous programs that support livable communities. The TIGER grant program, the FTA programs, and the FHWA flexible funding programs represent just a few examples. Existing partnerships, such as the United We Ride program, which focuses on human services transportation, are also being leveraged. The FHWA livability efforts, state and metropolitan activities, and railroad infrastructure programs represent a few other examples of related efforts. There is also an expanding relationship with the U.S. Department of Agriculture (USDA), which has significant resources targeted to rural America. A rural working group to address livability in rural America includes representatives from the USDA.
- The FTA's role focuses on the four areas of infrastructure investment, capacity building, policy and guidance, and research. FTA provides grants to urban and rural transit systems on an annual basis, including formula-based programs and discretionary programs. The new Transportation Investment in Greenhouse Gas and Energy Reduction (TIGGER) program focuses on grants for greenhouse gas (GHG) and energy reduction projects.
- The FTA has a number of capacity-building activities underway, including peer-to-peer exchanges. The FTA provides technical assistance, supports demonstrations, and develops case studies on livable community initiatives throughout the country.
- The joint development policy provides flexibility in the use of federal funds to purchase real estate for transit projects to also support TODs and joint development projects. A clarification of the FTA policy regarding the use of local funds in bicycle and pedestrian access to transit projects was announced in 2010. Information on the use of flexible funding from the FHWA that can be used for transit projects is being provided. The FTA is encouraging environmental management systems within transit agencies.
- The FTA supports research related to livable communities, including the development of transit livability performance measures. Research projects examining issues associated with providing affordable housing near transit have been funded by HUD and FTA. The Center for Transit-Oriented Development (CTOD) is working with FTA on different research projects related to TODs. Other research efforts focus on examining the impacts of climate change on transit and enhancing access to transit.
- The Region 6 DOT-HUD-EPA partners selected the Austin, TX metropolitan area as one of three showcase communities under the partnership, along with Port

Arthur, TX and Little Rock, AR, due to the multitude of ongoing sustainability efforts. The Capital Area Council of Governments (CAPCOG) was also selected for a \$3.7 million 2010 HUD Sustainable Communities Regional Planning grant.

- The more extensive use of performance measures in the public sector began with Peter Drucker's 1954 book on "management by objectives," which focused on measuring the performance of an organization at meeting its objectives. Performance measurement sets targets, motivates staff, and quantifies results. Performance measurement requires consensus on objectives.
- Performance measurement with livable communities includes the development and use of objectives, goals, strategies, and activities. There has been an attempt at the federal level to more broadly define the objectives of transportation and community development efforts. These objectives focus on linking housing and transportation decisions, safety, reduced congestion, and cleaner air. Examining the role transportation plays in improving the quality of life in communities is also important. Performance measures also need to allow different answers for different types of communities.
- Selected metrics for transportation and livable communities need to help identify problems, establish baselines, track trends over time, and inform policy decision-making. Performance measures also need to help evaluate program effectiveness and focus on key issues.
- Performance measures also need to address real social issues, including an increasingly older and more urban society. Other issues include air and water quality concerns, GHG emissions, and obesity and lack of exercise opportunities. Additional issues are the loss of community identity and charm, ineffective and underfunded public programs, and economic competition and unemployment. Still other issues are reliance on imported oil and safety.
- There are a number of key questions to address in developing appropriate performance measures. Can people get where they need to go safely, quickly, and without using too much energy? Do older people, persons with disabilities, economically disadvantaged people, and people in dense urban environments have access to public transportation and other transportation options? What community transportation features promote health and minimize environmental impact and which communities do not have these features? As an example, the areas around Austin within three-fourths of a mile of a transit stop can be mapped.
- The transit livability performance measure projects are underway. The urban livability metrics project is headed by Marc Schlossberg at the Oregon Transportation Research and Education Center (OTREC) and the University of Oregon and the rural livability metrics project is headed by Linda Cherrington at TTI. The livability data collection project is headed by Martin Catala at the Center for Urban Transportation Research (CUTR). The FTA Office of Budget and Policy staff responsible for the project are Angela Dluger and Keith Gates.

Sustainable Transportation Performance Measures

Christopher Forinash, U.S. Environmental Protection Agency

Chris Forinash discussed the EPA's role in the Partnership for Sustainable Communities. He also described the EPA's Office of Sustainable Communities, the partnership and performance measures, and recent EPA work on performance measures for sustainable communities. Chris covered the following topics in his presentation.

- The EPA has had a focus on sustainable communities since the early 1990s with the Brownfield re-development efforts. These efforts focused on the private sector. Gaining support for sustainable communities at that time was not easy. The smart growth concept helped build coalitions in many areas.
- Sustainable communities provide numerous environmental and social benefits. Examples of possible benefits included reduced emissions and improved air quality, reduced water demand and water impacts, and reclaimed abandoned and hazardous lands. Other potential benefits include more walkable and healthier neighborhoods, enhanced quality of life, and strengthened social fabric.
- Sustainable communities also provide numerous economic benefits. Examples of economic benefits include reduced infrastructure expenses and energy and water cost savings. Other potential benefits include the increased attractiveness of local economic development opportunities, reduced health care costs, and better connection of workers to education and job opportunities. Additional benefits are reduced household expenditures and the revitalization of neighborhoods and communities.
- The mission of the EPA Office of Sustainable Communities is to support development that saves money for the public and for households, provides choices in where to live and how to travel, makes people healthier, and protects the environment by conserving land and energy and improving air and water quality.
- Since 1996, the Office of Sustainable Communities has been working to address the mission by changing the conversation, working with the willing, and changing the rules. Publications, conferences, and awards related to Smart Growth helped change the conversation. Voluntary standards, voluntary codes, and EPA regulations helped change the rules. Working with the willing activities include providing technical assistance to communities, the Governor's Institute for Community Design, and working with states to revise stormwater permit requirements.
- The EPA Office of Sustainable Communities (OSC) provided a wide range of OSC technical assistance and workshops throughout the country between 2005 and 2010. Examples of these activities include Smart Growth technical assistance, the Greening America's Capitals program, the Partnership Summit on Rural Development, the Partnership Summit on TOD, the Governor's Institute Workshops, and state stormwater technical assistance.

- There is public support for sustainable communities. A national opinion survey in 2011 found that the majority of Americans – regardless of political affiliation – support sustainable communities (79 percent overall); a majority of Americans believe their region needs more sustainable communities (66 percent overall); and most Americans believe that sustainable communities are an important part of rebuilding the national economy (80 percent overall). The poll also found overwhelming public support for the Partnership’s core principles.
- The Partnership for Sustainable Communities is focusing on a number of activities. Examples of these activities include aligning HUD, U.S. DOT, and EPA programs, developing livability measures and tools, re-developing underutilized sites, and re-defining housing affordability. Providing a vision for sustainable growth and enhancing integrated planning and investment represent other activities.
- The six Partnership livability principles are providing more transportation choices, promoting equitable and affordable housing, enhancing economic competitiveness, supporting existing communities, coordinating policies and leveraging investments, and valuing communities and neighborhoods.
- Measuring performance is important for a number of reasons. Performance measures quantify the consequences of decisions. Performance measures predict, evaluate, and monitor the accomplishment of public objectives. Performance measurement information is key to communicating results to decision makers and the public.
- A common structure used with performance measures includes broad outcomes, indicators of progress, and key strategies. Examples of broad outcomes include lowering household transportation costs, lowering transportation-related emissions, and improving mobility. Examples of indicators of progress include shorter automobile trips, improved safety, and more walking, biking and transit use. Key strategies are the range of housing opportunities in major activity centers, more walkable neighborhoods, and re-development in more accessible places.
- This structure can be used with the six Partnership principles. Principle one is developing more convenient reliable, safe, and economical transportation alternatives. Broad outcomes associated with this principle are lowering household transportation costs, improving public health, reducing oil dependence, improving air quality, and reducing GHG emissions. Examples of indicators of progress are more trips made by walking or bicycling, increasing transit ridership, and shorter automobile trips. Key strategies include expanded transit services, improved transit performance, more homes and jobs near transit, more housing opportunities near major activity centers, and more homes and jobs in walkable places.
- The second Partnership principle is expanding access to energy-efficient housing choices. Broad outcomes associated with this principle include lowering the combined cost of housing and transportation, improving public health, reducing

oil dependence, improving air quality, and reducing GHG emissions. Possible indicators of progress are more trips made by walking or bicycling, increasing transit ridership, and shorter automobile trips. Key strategies include more homes in walkable neighborhoods, more housing opportunities near major activity centers, and more affordable housing in major employment centers.

- An early Partnership goal related to performance measures was to have a single set of measures for the Partnership activities for use by grantees, as well as assisting program results. The current thinking is to develop a pool of measures that can be adapted to specific program requirements. Solid and available data is needed for use with these measures. Providing guidelines to build capacity at federal, state, and local agencies is also needed.
- The recently completed EPA *Guide to Sustainable Transportation Performance Measures* highlights best practices by MPOs and state departments of transportation. Sustainable transportation goals and performance measures related to safety, the environment, the economy, and equity are presented. The use of performance measurement in the various decision-making steps is described. These steps include land use visioning, long-range transportation planning, programming and grant awards, corridor studies, environmental review, and performance monitoring.
- Examples of sustainable transportation performance measures are in use by agencies throughout the country. A transit accessibility performance measure used by the Atlanta Regional Commission (ARC) measures the ability of people to reach destinations using transit. Two metrics – the distance to stops and destinations accessible by transit – are used with the measure.
- The Metropolitan Transportation Commission (MTC) in the San Francisco Bay area uses vehicle miles of travel (VMT) per capita to measure the amount of vehicle activity, normalized by population. The metrics used are VMT per capita, light-duty VMT per capita, and VMT per employee. The MTC uses the cost of transportation relative to income to measure transportation affordability. The measured costs include transit fares, owning and operating a personal vehicle, and housing costs.
- The City of Portland collects data on bicycle use and crashes involving bicycles. The data are used in performance measures related to bicycle use. The average number of cyclists per day is compared to reported bicycle crashes on an annual basis.
- Sustainable transportation performance measures may be applied in long-range planning, corridor level evaluations, and performance monitoring. Portland Metro used performance measures in the visioning stage of the transportation planning process. Performance measures were used to explore the impacts of major alternatives in policy and investment direction and to test the ability to achieve regional sustainability goals.

- The Hillsborough County MPO in Tampa uses performance measures for corridor level evaluations. Examples of performance measures used in the evaluations include transit services, sidewalk availability, and bicycle facility availability.
- The Delaware Valley Regional Planning Commission (DVRPC), the MPO for the Philadelphia metropolitan area, uses a dashboard to track progress on performance measures. The dashboard uses a colored dial to indicate trends in a positive direction (green), a negative direction (red), and a neutral direction or a baseline measure (yellow).

U.S. Department of Housing and Urban Development's Housing and Sustainable Communities Initiative

Richard Lopez, Department of Housing and Urban Development, San Antonio

Richard Lopez discussed HUD's housing and sustainable communities initiatives. He described elements of the interagency sustainability partnership and activities underway at HUD's Office of Sustainable Housing and Communities (OSHC). Richard covered the following topics in his presentation.

- HUD's Region VI has jurisdiction over Texas, as well as Arkansas, Louisiana, New Mexico, and Oklahoma. There are a lot of exciting projects going on in the region to help create the types of communities where housing, transportation, and jobs all work together to provide the best living environment for residents.
- In June 2009, President Obama announced the Interagency Partnership for Sustainable Communities to help communities across the country improve access to affordable housing, increase transportation options and lower transportation costs, while protecting the environment. The nation's ability to compete in a global economy is dependent on quickly and efficiently connecting our workers and families to education and employment opportunities. Regions that embrace sustainable development—connecting housing to jobs—have a built-in competitive edge in attracting jobs and private investment.
- The partnership for sustainable communities includes HUD, U.S. DOT, and EPA, and is designed to remove traditional federal government silos that exist between departments. Six guiding livability principles were identified to achieve these goals. These principles are providing more transportation choices, promoting equitable and affordable housing, increasing economic competitiveness, supporting existing communities, leveraging federal investment, and valuing communities and neighborhoods.
- The OSHC is HUD's arm of the partnership. The OSHC is administering two new grant programs as part of the Sustainable Communities Initiative. The Sustainable Communities Regional Planning Grants have a total of \$100 million in available funding. A total of \$68 million is available in Sustainable Communities Challenge Grants in conjunction with the U.S. DOT's TIGER II grants.

- The Sustainable Communities Regional Planning Grant program supports metropolitan and multi-jurisdictional planning efforts that integrate housing, land use, economic and workforce development, transportation, and infrastructure investments. Of the \$100 million appropriated for this grant program, \$98 million is for competitive grants to support regional planning for sustainable development. A total of \$2 million is reserved for capacity support grants to ensure that the grantees have access to the best available data, tools, and techniques for regional planning. Of the \$98 million, approximately one quarter, or \$25.6 million, of the awards were designated for small regions, with populations between 200,000 and 500,000, and rural places with populations below 200,000. The remaining \$74.4 million was allocated through 19 grants to regions with populations over 500,000. The grants ranged from \$220,000 up to the full amount of \$5 million.
- There are three regional planning grants in Region VI. CAPCOG in Austin was awarded a \$3.7 million planning grant to help implement elements of the Capital Area MPO (CAMPO) 2035 long-range transportation plan. That plan envisions future regional growth being accommodated in a network of 37 mixed-use, mixed-income, walkable, connected, and transit-supportive activity centers that provide a balanced mix of jobs, housing, and services.
- The Houston-Galveston Area Council (H-GAC) was awarded a \$3.7 million planning grant covering the 13 counties in the Houston and Galveston area. The funding will support a new initiative to address the interaction of land use, transportation, housing, economic development, infrastructure, the environment, and social equity. There are more than 25 core partners in the project, who will provide an additional \$3.7 million to the effort.
- HUD partnered with the U.S. DOT to combine the \$40 million Community Challenge Planning Grant program with \$28 million in U.S. DOT TIGER II planning grants. The grants are supporting local planning and pre-development costs associated with sustainable projects within communities. HUD and U.S. DOT received more than 850 applications for the Community Challenge/TIGER II Planning Grant program from across the country.
- There were five grant awards in Region VI. New Orleans received a \$2 million Challenge Planning Grant for the Claiborne Corridor Plan that will focus on the re-integration of the city's neighborhoods across the physical boundary of the Claiborne/elevated I-10 expressway. Bernalillo County, NM, received a \$500,000 Challenge Planning Grant for Albuquerque's Bridge Boulevard corridor redevelopment plan to guide development on a very congested corridor. Oklahoma City, OK received a \$500,000 Challenge Grant for PLANOKC, which is a comprehensive plan to address the unsustainable development pattern of the past 30 years. It will look at future workforce, housing, and land use needs. The City of Dallas, TX received a \$2.2 million Challenge Grant to fund land acquisition and planning for four sites in Dallas for TOD workforce housing project sites, which are expected to have 193 housing units. North Central Texas Council of Governments (NCTCOG), the MPO for the Dallas-Fort Worth area,

was awarded \$640,000 for planning for the livable military communities project. This project will provide improved transportation and housing conditions while providing military families a more traditional neighborhood and home town feel in residential areas near the naval air station located in Fort Worth.

- The HUD Choice Neighborhoods Grant program does not involve the U.S. DOT and EPA, but it does involve the transformation of communities into sustainable, livable communities. Choice Neighborhoods is built on a foundation of 17 successful years of the Hope VI program, which has revitalized deteriorating public housing developments across the country. Choice Neighborhoods expands on Hope VI to allow for the re-development of private and federally-assisted properties surrounding public housing. Private or other housing that fosters crime and blight can now be included in comprehensive neighborhood revitalization efforts. The bottom line is that the projects are not just re-developing public housing; they are re-developing neighborhoods surrounding the public housing as well, with local partners. These partners include schools and retail developments.
- To date, HUD has awarded Choice Neighborhood Planning Grants and one very sizable Choice Neighborhood Grant. Three Choice Neighborhood Planning Grants were awarded in Region VI. The Northwest Louisiana Council of Governments was selected for a project with their partners, including the City of Shreveport, to help transform the Allendale and Ledbetter Heights areas of Shreveport. The San Antonio Housing Authority received a Choice Neighborhood Planning grant to revitalize the Wheatley Courts public housing complex and surrounding neighborhood. The Community Action Project for Tulsa County (OK), Inc. was awarded a Choice Neighborhood Challenge Planning Grant to transform the Eugene Field neighborhood of the city.
- HUD's Assistant Secretary for Public Housing, Sandra Henriquez, held a press conference at the Iberville Public Housing Development in New Orleans last week to announce that the Housing Authority of New Orleans, LA has received a Choice Neighborhood Implementation Grant of \$30.5 million. It was only one of five Choice Neighborhood Implementation Grants in the nation and the only one in HUD's southwest region. The grant will be used, along with other funding, to rebuild the 821-unit distressed Iberville public housing project, under sustainability principles. It will transform this entire neighborhood near the French Quarter. Preservation plans call for 24 of the existing buildings to be renovated while the remaining 50 buildings will be replaced. The new development will consist of 830 units, of which 300 will be public housing available to current residents of the Iberville development. The remaining 530 units will be split evenly between market rate and low-income housing tax credit units. An additional 1,632 rental units will be created within the neighborhood. As part of the effort, the school district and its partners will build and renovate Iberville/Treme school facilities. A partnership with the newly expanded Tulane Community Health Clinic will provide a detailed assessment of resident health programs to address critical health outcomes. There will be new residential properties, a grocery store, and a farmer's market along the eastern edge of the

Iberville site. These implementation efforts involve a full range of private and public partners and will create jobs and other private housing development.

- There are similar Sustainable Communities Regional Planning Grants, Challenge Grants, and Choice Neighborhood Grants across the nation. These grant programs are being integrated with U.S. DOT and EPA efforts. These coordinated activities have great potential for improving how people live and work in communities across the country, and for job creation and environmental improvements. HUD is very proud to be a partner in these efforts.
- In terms of process, HUD grants are structured as cooperative agreements, so the agency is involved in ongoing conversations with the grantees. Agencies and groups receiving grants are constructing logic models for HUD to gauge performance and progress. Grantees are also required to submit semi-annual performance reports. HUD will be conducting an independent evaluation of the grantees via a contract with a third party.
- There are ongoing conversations among HUD, U.S. DOT, and EPA, as well as local partnership agencies with regard to performance measures. At this point, the HUD planning grants focus on only one measure or one deliverable, which is completion of the plan. These grants are all individualized, with each being tailored to the community and the nature of the plan.
- There are a number of basic factors taken into account in evaluating HUD grant applications. Many of these factors will be used to judge the effectiveness and performance of projects. Examples of these evaluation factors include access to transportation and housing costs; environmental quality, along with economic opportunity; and healthy communities, fresh food access, and addressing socioeconomic inequity.
- Benchmarks are included in the HUD Implementation Grants as well. For example, the New Orleans grant allows for physical transformation of the project and the pace, and results of that transformation will be key components of any evaluation process.
- The HUD regional office in Fort Worth maintains a high level of involvement with the partnership agencies in the region. HUD staff participates in a working committee with U.S. DOT and the EPA staff. The Regional Sustainability Coordinator is Nic Ramon. The work of the committee is to actively pursue outreach and education relating to the initiative. Revitalizing our communities is a long-term process, but the results can, and will change lives. More information on the OSHC programs and HUD grant programs is available at www.hud.gov.

Luncheon Speaker

Linda Watson, President/CEO, Capital Metropolitan Transportation Authority

Texas State Senator Kirk Watson

Senator Watson discussed the concepts of livability and sustainability and how these concepts apply to transportation. He provided examples of approaches used in the Austin area. Senator Watson covered the following topics in his presentation.

- The terms livability and sustainability have become lightning rods to many groups. People tend to feel strongly supporting livability and sustainability ideas or strongly opposing them. Many people view the concepts as all good or all bad. Similar reactions occurred a few years ago with the smart growth concept. People were either strongly in favor of smart growth or strongly opposed. There was very little middle ground. Projects that promote livability and sustainability may be under minded due to these strong feelings.
- Addressing sustainability as a more fundamental or human term may help address these concerns. Thinking of sustainability and livability as the quality of one's life, the quality of our constituents' lives, the contentment our constituents feel on a day-to-day basis, and their sense of wellbeing may be a better approach. These concepts do not begin or end with transportation. Transportation plays a key role in enabling or supporting all of these concepts, however, as it does in people's everyday lives.
- Rather than focusing on individual transportation projects, a better and more productive approach may be to focus on transportation programs and the concept of comprehensive transportation systems. Using the term "comprehensive lifestyle support system" may help overcome the concerns noted with the terms livability and sustainability. Transportation supports people's lives. Transportation enhances people's happiness and community contentment.
- Unlike the movie Field of Dreams and the "build it and they will come" perspective, for many years Austin had the perspective related to transportation of "don't build it and they won't come." Transportation was not being considered as a comprehensive system for the full community. It was not viewed as a comprehensive lifestyle support system.
- The Edwards Aquifer and the Barton Springs recharge zone are located in southwestern Travis County. This area is also home to the protected Barton Springs Salamander. Placing transportation infrastructure in other areas, such as the SH 130 Toll Road on the east side of Austin, helped direct growth and new development away from the Edwards Aquifer and the Barton Springs recharge area.
- It is also important to communicate the benefits of a comprehensive transportation system approach in personal terms. People related to how transportation will benefit their lifestyle support system, especially when they see a comprehensive

approach, not just individual stand-alone projects. This approach has been used successfully in Austin. A transportation investment decision tree, which included sustainability and livability, was used as part of this approach. Other elements in the decision tree focused on a transparent and accountable process, the project purpose, and project benefits, including mobility, economic development, environment, public health, social equity, and quality of life. A final element was the project cost.

- Process is important, but process may be used to slow down or stop a project or program. Focusing the transportation decision making process on lifestyle support systems, community wellbeing, and contentment can help address possible concerns.
- One challenge being faced at all levels of government is promoting a 21st century economy with 19th century tools. Making investments in transportation and other infrastructure today for the future is critical. Lifestyle support systems need state-of-the-art transportation.
- The transportation planning and investment decision process should be transparent and accountable. It is unrealistic to think that 100 percent consensus will be achieved on any project or program. It is important for transportation professionals to highlight the long-term gains and benefits from short-term costs in strategic investments.

Closing Session – Review of Conference Themes

Eric Gleason, Texas Department of Transportation, presiding

The closing luncheon featured four panelists who provided their thoughts on the general themes emerging from the conference. The panelists also highlighted areas for further research and follow-up activities. The topics covered by the panelists are summarized below.

Eric Gleason, Texas Department of Transportation

- The conference reflected a very high energy level throughout all the sessions. The speakers provided interesting examples and applications of performance measures associated with transportation and livable communities from different areas throughout the country.
- A number of innovative applications within public agencies were presented by speakers. Rather than thinking and working “outside the box,” it may be more practical and more appropriate for public agencies to work “at the edge of the box.” New methods, approaches, and techniques can be brought to the edge of the box and incorporated into practice within the box. This approach can help others understand the new concepts and methods and build support for their use.
- The differences and similarities between livability and sustainability were noted by speakers. While there may be differences between these two terms and concepts, they are very inter-related. Livability has more of a quality-of-life focus, while sustainability has more of an environmental, economic, and social focus that is nearer the edge of the box. It is worth discussing if it would be of use to separate the two terms and better define each or combine them into one general broad concept. There are benefits to both approaches.
- Speakers noted that transportation is a means to other ends, it is not an end in itself. Transportation is a key element of livable and sustainable communities. Transportation provides mobility and accessibility for people. Transportation can enhance the quality-of-life, but it can also detract from the quality of life.
- Public transportation plays a key role in livable communities. Transit is important in urban, suburban, and rural areas. There is support for transit, bicycling, and walking in many areas. There is a need to define the key issues and the most appropriate approaches to addressing these concerns. There are cultural changes underway in many areas that influence peoples’ needs and desires for transit, biking, walking, and driving.
- Participants discussed performance measurement at the national, state, metropolitan, and local levels. Participants discussed that these performance measures may be slightly different, but they should be coordinated and compatible.

Joe Zietsman, Texas Transportation Institute

- Speakers at the conference highlighted a wide range of activities underway throughout the country related to transportation, livability, sustainability, and

performance measures. The presentations and discussions in the sessions were excellent.

- As several speakers noted, it appears that performance measurement will be included in a new federal surface transportation bill. It was suggested that the transportation profession can learn from other disciplines that have used performance measures for many years. It was also noted that performance measures can serve as an equalizer among different situations.
- The need to have accurate and timely data for performance measures was also discussed. Data that addresses transportation elements and livable community characteristics are needed. A well thought out plan for collecting and processing, analyzing data is needed.
- The importance of communicating with the public and policy makers was also discussed. Numerous methods can be used to present information and to obtain input and feedback from key stakeholders. Performance measures provide key data for decision making related to transportation and livable and sustainable communities.

Lynne Bly, Minnesota Department of Transportation

- Senator Watson provided a caution on the language used in transportation performance measures. He suggested avoiding lightning-rod terms and the use of technical jargon. The senator suggested that people readily understand and support a call for “lifestyle support systems.” This suggestion keys well with the quality-of-life reported by research in Minnesota that found that people in focus groups, as well as via surveys, can easily explain what quality-of-life is and what really matters to them, their security, and their happiness. Transportation is valued as their connection to what matters, rather than for its own sake.
- As mentioned in one of the sessions this morning, livability provides an opportunity for transportation to play a leadership role in leveraging other interests, in achieving a means to many ends. The Minnesota GO visioning work has shown that public workshop participants placed the highest priority on choices that leverage limited resources to achieve multiple public purposes. Transportation professionals have been progressing from a position of consultation, to coordination, and to collaboration with local transportation partners and other state and federal agencies. We are moving from a 3C (continuing, cooperative, and comprehensive) to 3M (multipurpose, multimodal, multi-party/jurisdictional) world.
- The public is also telling us that accessibility is important to their quality-of-life and livability. They recognize the value of different modes for different trip purposes. A high priority is also given to strong regional connections – access to major regional centers – but that too is seen as a multimodal situation.
- Reliability is a critical facet to livability. System redundancy, or its lack, has implications for our security, vulnerability for our freight systems and economic well-being, and for emergency services, and evacuations when necessary.

- Many speakers noted the value transportation professionals bring to the table through their ability to digest data and, through analysis, and make it comprehensible. Transportation professionals can tell a story that helps provide a strong knowledge base for public sector decision making.

Christopher Forinash, U.S. Environmental Protection Agency

- A first general theme from the conference is that sustainability and livability matter to the public and that there is public support for sustainable communities. A national opinion survey in 2011 found that 79 percent of Americans – regardless of political affiliation – support sustainable communities. Further, 66 percent of the respondents believe their region needs more sustainable communities. Approximately 80 percent of the respondents believe that sustainable communities are an important part of rebuilding the national economy. The poll also found overwhelming public support for the DOT-EPA-HUD Partnership’s core principles.
- A second general theme from the conference is that transportation is a public service and performance measures can help operationalize the benefits provided to different groups. The third general theme is that there is still confusion over livability and sustainability. While there are differences between livability and sustainability, there are many similarities and it may not be worth using scarce resources to argue over definitions. The Partnership’s livability principles focus on providing more transportation choices, promoting equitable affordable housing, enhancing economic competitiveness, supporting existing communities, coordinating policies and leverage investments, and valuing communities and neighborhoods.
- A fourth general theme from the conference was the use of performance measures at different levels, including long-range plans, programs, corridors, systems, and project development. A fifth general theme was that place and context are critical to selecting performance measures and to realizing flexible criteria.
- Speakers at the conference provided numerous examples of local and regional leadership in the development and use of performance measures with transportation and livable communities. Innovation at the local level has created great examples, especially of specific goals and measures emerging from local priorities. Speakers discussed the use of performance measures even in cases where an agency cannot always control the outcome or get credit for success. Other speakers noted the power of scenario planning and the link to developing performance measures that resonate with the public and with stakeholders. Still other speakers stressed that the process used is critically important to the successful development of performance measures.
- At the national level, the Partnership for Sustainable Communities seeks to support and highlight best practices and to develop data sources for use by all groups. There is also a commitment to better coordinate activities of the three departments and make it easier for state and local governments to work with different programs. The national focus is also rewarding performance.

- A number of research challenges were identified during the sessions and discussions. Examples of these research challenges include identifying and analyzing the fiscal and economic impacts of livable communities and including other transportation impacts, such as emergency response, schools, and health with performance measures. The need for quick-response methods to integrate into scenario planning was discussed. Also discussed was the need to examine the resiliency of transportation systems to better respond to disasters, climate changes, and emergencies.

Breakout Session 1 – Complete Streets Performance Measures

Fred Dock, City of Pasadena, California, presiding

Principles for Measuring and Achieving Livability in Planning and Design Decisions

Bruce Appleyard, University of Utah

Bruce Appleyard discussed the *Livable Streets Primer*, which was written by his father, Donald Appleyard. He described the key concepts from the book and how it relates to the current focus on livable communities. Bruce noted that he is updating the book. Bruce covered the following points in his presentation.

- The *Livable Street Primer* was first published in 1981. It examined the extent of an individual's home territory based on different levels of traffic. People tend to have more extensive views of their home territory on streets with light traffic and more narrow limited views on streets with heavy traffic. It also appears that as traffic increases, neighborhood pride and property values decrease.
- The book describes the ecology of the street. This ecology includes a street at peace, in conflict, and in retreat. The adaptive responses to different situations are presented. University of California Professor Randolph Hester has said that "It was perhaps the most influential urban design books of its time. Prior to *Livable Streets*, streets were looked upon as 'sewers for cars' and traffic was not yet seen to have broader impacts on our psychology, our socializing, or our sense of comfort around streets. After *Livable Streets*, streets were appreciated more fully: as places where people lived; as potential places to build important social ties; and as places for children to play."
- A number of issues are being considered in the current discussion of livability. There are ongoing discussions on the definition of livability, including defining livability on a community-by-community basis. Other possible issues relate to addressing potentially competing objectives, meshing economic competitiveness and livability, supporting existing communities, and providing options to automobile-dominated development patterns.
- *Livable streets* established a framework to evaluate the impacts of traffic on people and communities. It introduced the phrase "ecology of the street." It helped change the focus from a driver-pedestrian conflict to a driver versus resident conflict. It also articulated the roles people play and the unequal distribution of power in different communities. It articulated many of the concepts that are now part of CSS. It pioneered the complete streets hierarchy of walking, bicycling, transit, and driving.
- The *Livable Streets Primer* notes that people adapt to poor conditions. To achieve livability, it may be necessary to uncover if community ties have been undermined, or even displaced. These social connections can then be re-established. Researching and observing people's revealed behavior, and uncovering aspects of people's lives that could be better may be needed to achieve livability.

Washington State Main Street Highways Initiative

Paula Reeves, Washington State Department of Transportation

Paula Reeves discussed the Washington State Department of Transportation (WSDOT) state highways as main streets initiative. She described the issues associated with state highways that also serve as main streets in small and rural communities, elements of the research study examining these concerns, and the study findings and outcomes. Paula covered the following topics in her presentation.

- The costs associated with typical city infrastructure, including streets, are high. City streets are more than pavement. In 2008, the actual bid specifications for a typical complete street in Washington State were \$15.7 million. These costs included right-of-ways, easements, sidewalks, planting, parking, driving lanes, and lighting. They also include gas, electrical telecommunications, storm drainage, water, sewer, and utility relocations. Ongoing maintenance, preservation, and operating costs are extra.
- Cities in Washington have maintenance responsibilities on managed access highways. City responsibilities consistent with state laws focus on operations, including street illumination; cleaning streets, catch basins, and snow plowing; maintaining existing stormwater facilities; and traffic and parking enforcement. In addition, cities over 22,500 in population are responsible for slope stability and traffic control signs. WSDOT is responsible for the structural integrity, including the roadway surface and shoulders, traffic control signals, slope stability, snow plowing authority when necessary, and route markers and directional signs in communities under 22,500 in population. In communities over 22,500 in population, WSDOT is responsible for the roadway surface and shoulders, snow plowing authority when necessary, and route markers and directional signs. State highway improvements are typically a partnership between cities and the state.
- The State Highways as Main Streets: A Study of Community Design and Visioning focused on three main issues. The first issue was that state highways in Washington often serve as main streets in smaller communities, providing local access as well as regional mobility. The second issue was that the design of these highways affects community livability and safety. These roads have some of the highest rates of pedestrian and traffic collisions in the state. Increased costs and delays due to late stage design changes in projects on these highways represents the third issue.
- The study was undertaken to address these issues and a number of needs, including helping local agencies improve funding opportunities. The study also explored new methods for collaboration and problem solving when state highways serve as local main streets. It also determined successful approaches to meet the federal requirements for visioning set forth in SAFETEA-LU, and translated context sensitive design (CSD) guidance into practice. Finally, the

study supported staff and organizational development by connecting the architecture profession and the transportation engineering profession.

- There were a number of anticipated outcomes from the study. A first outcome was to develop more cost effective transportation projects by ensuring fewer scope and schedule changes and revitalize versus mitigate transportation impacts to communities. A second anticipated outcome was to identify partnership opportunities and resources, including transportation, historic preservation, environmental, economic development, and utilities. A final anticipated outcome was to ensure a measurable link between goals and transportation investments, such as outcomes versus throughput or volume-to-capacity ratio. Safety was also considered as a measurable link between goals and investments.
- The research involved both a system analysis and the development of case studies. The research was conducted by the Storefront Studio Program in the Department of Architecture, College of Built Environments at the University of Washington in Seattle.
- The first activity was to categorize a main street highway. The first step in this process was to screen a highway by specific variables. Examples of the screening variables included state route within the city limits, highway of statewide significance, National Highway System, state access control classification, and federal functional classification. Other screening variables were design speed, posted speed, year of incorporation, freight classification, and collision history.
- The second activity was to define main street highways. Variables used in this process included the proportion of commercial buildings that are visible, the proportion of street frontage with dead space, the proportion of street frontage with parked cars, and the proportion of street frontage with tree canopies. Other variables were the number of travel lanes, average travel lane width, average shoulder width, average median width, average sidewalk width, and total curb to curb width. Still other variables focused on sidewalks, bicycle lanes, and building characteristics.
- A number of main street highways were identified throughout the state using this methodology. The community design case studies included the communities of Roslyn, Morton, and Goldendale. Other cities also participated. The case studies utilized storefront studios, which included public open houses, exhibits, and information exchanges. Before-and-after streetscapes were developed using archival research, photographic documentation, and digital collages.
- The study findings indicated that scope changes are more common on main street highways than on other projects in the state. Scope changes occurred on 48 percent of all main street highway projects compared to 38 percent on projects in other parts of the state system. A retrospective review indicates that on 40 projects, or 20 percent of WSDOT's scope, schedule, and budget changes could have directly benefited from additional community design. The average estimated saving per project from additional community design was estimated at over \$9 million, or 30 percent of the project costs.

- The study research was implemented through the New Complete Streets/Main Street Highways Program approved by the 2010 Washington Legislature as HB 1071. The program focuses on retrofitting roadways that provide both local access and regional mobility.
- In addition to serving as the foundation for Washington's 2011 Complete Streets Law, the study was highlighted in the January/February 2010 issue of *CityVision* magazine, produced by the Association of Washington Cities. The project was also highlighted in the FHWA *Livability in Transportation Report*. Finally, a WSDOT research project was approved to develop the *Washington Complete Streets Guidebook*.
- A number of communities are implementing different elements from the study. Roslyn immediately striped the bicycle lane through their community, marking the famous Coal Mines Trail. Morton developed a large Safe Routes to Schools project proposal with full community support, secured funding for it, and moved forward with construction. The community of Concrete moved a stymied TE grant to completion with full community support immediately after the community design work. Clallam Bay is constructing a combined transit and community center developed through a community design workshop.
- In summary, by actively building consensus and addressing a range of both agency and community concerns, and community design, the State Highways as Main Streets: A Study of Community Design and Visioning helped ensure traffic flow, livability, safety, and tourism in the state. It also supports efficient project delivery with fewer changes – keeping delays and costs down. It is estimated that using the recommended process may save \$9 million per project.

Performance Measurement of Contact Sensitive Solutions in Urban Thoroughfare Design *Beverly Storey, Texas Transportation Institute*

Beverly Storey discussed the core principles of CSS, possible performance measures associated with CSS, and applying performance measures at the agency level. She described a case study in Fort Worth applying CSS and performance measures. Beverly covered the following topics in her presentation.

- Core principles of CSS include developing a shared stakeholder vision and a comprehensive understanding of contexts. Ongoing collaboration to achieve consensus and maintaining flexibility and creativity are also key principles.
- Performance measures associated with CSS and urban thoroughfare design may be used to assess the performance of the agency, project, and context. Performance measures may provide a perspective on the process, outputs, and outcomes. Performance measures may use conventional and direct participant quantification methods, as well as other data.
- Agency-level applications may include a number of steps. The CSS strategies and principles are typically included in the project development phase and are used to assist with the identification of project objectives. Performance measures are developed next, with consideration given to data needs and data availability. Identifying the appropriate estimation method is the next step, followed by conducting the performance assessment.
- A number of project performance outcomes may be realized from CSS including improvements in operations, safety, mobility by mode, and appearance. Other possible outcomes include improved service to users, positive effects on adjacent activities, creating lasting value for the community, and supporting quality of life.
- Lancaster Avenue in Fort Worth provides an example of the application of CSS. The case study focuses on the reconstruction of the downtown segment of Lancaster Avenue, which was a state highway. The project promoted redevelopment and revitalization. The highway segment was transferred from the Texas Department of Transportation (TxDOT) to the city upon completion of the project.
- The project goal was to reconstruct Lancaster Avenue to aid redevelopment. There was a commitment to collaboration between the city and TxDOT. Another goal was to transfer Lancaster Avenue to the city after reconstruction and to delete it from the state highway system. Conveying surplus right-of-way to the city was part of this transfer. Participating agencies and groups included TxDOT, the city of Fort Worth, Fort Worth South, and Downtown Fort Worth, Inc. The Lancaster Steering Committee included 33 members and was chaired by the mayor of Fort Worth. The Lancaster Task Force included staff from the different agencies, departments, and groups.
- A three-day steering committee workshop was used to identify and gain consensus on the project vision and goals. The goals included creating a great pedestrian street, promoting infill mixed-use development along the corridor,

showcasing the area for existing historical buildings, and linking the south side of downtown Fort Worth with the medical district. It is possible to examine if the project vision and goals have been realized from an agency, project, and context perspectives.

- The first project performance measure was to create a great pedestrian street. Elements examined in this measure included the total sidewalk area and curb extensions, crosswalk lengths, median widths, and pedestrian refuges. Walkability, perceived safety, aesthetic components, streetscape features, and lighting represent other elements associated with this measure. The second performance measure was to promote infill mixed-use development along the corridor. Elements examined included acreage available for redevelopment, the number of sites redeveloped, and the increased tax base for the city. The third performance measure was providing a showcase area for existing historical buildings. The number of historic buildings renovated was the metric used for this measure. The fourth performance measure was linking the south side of downtown Fort Worth with the medical district. Connectivity throughout the site and with surrounding parcels were used the metric for this measure.
- The evaluation conducted after the project was completed indicates that the project vision and goals were accomplished. Creating a great pedestrian street was accomplished through wider sidewalks, an enhanced streetscape environment, sidewalk extensions, pedestrian countdown signals, midblock crosswalks, and on-street parking at key locations. Pedestrian scaled lighting was provided and light sculptures were added in the roadway median.
- Promoting infill mixed-use development along the corridor was accomplished by using surplus right-of-way for new developments. The T&P terminal building was restored for reuse. The Sheraton Hotel and Spa was refurbished. A new Omni Hotel and Condominium complex was constructed.
- The goal of showcasing the area for existing historical buildings was accomplished by renovating the T&P building to make it the T&P lofts. The goal of creating a link between the medical district and the south side of Fort Worth was accomplished through improving pedestrian connectivity to the project perimeter and throughout the re-development parcels.
- Potential outcomes from using CSS in the project included stakeholder collaboration, a more people-oriented environment, and attracting economic development and re-development of historic buildings. Other outcomes included increased corridor property valuation, and the aesthetics of the area were greatly improved through re-development that was facilitated and supported by the street design. The project also resulted in less adverse environmental impacts. Finally, the project improved support for TxDOT, and the image of the agency greatly benefited.

Breakout Session 2 – Sustainability, Livability, Planning, and Policy Performance Measures

Antoinette Quagliata, Federal Transit Administration, presiding

NCHRP Project on Sustainability Performance Measures Joe Zietsman, Texas Transportation Institute

Joe Zietsman discussed a National Cooperative Highway Research Program (NCHRP) project developing sustainability performance measures for state departments of transportation and other transportation agencies. He described the focus of the project, the major work activities, and the elements of the flexible performance measures application framework. Joe covered the following points in his presentation.

- NCHRP Project 08-74 – *Sustainability Performance Measures for State DOTs and Other Transportation Agencies* focuses on developing guidance for transportation agencies to understand and apply concepts of sustainability through performance measurement. The two-year project was initiated in 2009 and was completed in the summer of 2011. The report, *A Guidebook for Sustainability Performance Measurement for Transportation Agencies*, will be available soon.
- A number of activities were conducted for the project, including performing a literature review, developing a flexible sustainable performance measures application framework, and developing the guidebook for use by transportation agencies in applying this framework.
- The project focused on the three sustainability dimensions-environment, the economy, and social systems. In addressing sustainability in transportation, the broad versus transportation-centric approaches were examined. The project used the following prescribed principles in the development of transportation-related sustainability performance measures, “sustainability entails meeting human needs for the present and future, while preserving environmental and ecological systems, improving quality of life, promoting economic development, and ensuring equity between and among population groups and over generations.”
- The performance measures for sustainability are based on a hierarchy of goals, objectives, and measures to help define robust performance measures. While the hierarchy is not absolutely essential and measures can be developed without using it, the hierarchy approach is more robust. It is important to note that no one single indicators measure is a “sustainability measure” in isolation. Further, the set of measures need to be applied appropriately.
- The development of the transportation sustainability flexible performance measures framework focused on answering the question – “what does a transportation agency need to be equipped with in order to successfully address sustainability issues through performance measurement?” The framework consists of fundamental components, overarching components, and auxiliary

components. The framework follows the traditional process of developing goals, objectives, and performance measures related to sustainability. The framework includes an implementation step and a feedback loop.

- The guidebook describes the application of the framework. It includes a spreadsheet-based compendium. The flexible framework enables agencies to understand and address sustainability. The compendium is a rich resource of possible measures and sample applications.
- A set of 11 key transportation sustainability goals are included in the guidebook. The goals reflect principles of sustainability in the transportation sector. The goals link back to principles of environmental and ecological systems; quality of life; economic development and prosperity; and ensuring equity. The 11 sustainability goals focus on safety, accessibility, mobility, efficiency, security, prosperity, feasibility, ecosystems, waste generation, resource consumption, and air quality. Agencies may select from, add too, or modify the 11 goals. The objectives and performance measures presented in the guidebook include goal-specific objectives based on focus areas. Examples of focus areas include planning and operations. The performance measures include process measures, output measures, and outcome measures.

Oregon Least Cost Planning – Livability and Quality of Life Indicators *Mariah VanZerr, CH2M Hill*

Mariah VanZerr discussed the Oregon Least Cost Planning (LCP) project. She described the project background, the project activities, the recommended livability and quality of life indicators, and the next steps. Mariah covered the following topics in her presentation.

- LCP was defined by the 2009 Oregon Legislature in the Jobs and Transportation Act (House Bill 2001) as follows: “Least-cost planning means a process of comparing direct and indirect costs of demand and supply options to meet transportation goals, policies or both, where the intent of the process is to identify the most cost-effective mix of options.”
- The LCP concept was developed in the electric utility industry to consider a broad set of choices for meeting electricity demand. Key characteristics of LCP include, measuring costs and benefits of investments and actions as often as possible using quantitative and qualitative evidence, while accounting for environmental, social, and economic effects.
- There are a number of LCP categories being used in Oregon, including mobility, accessibility, economic vitality, environmental stewardship, and safety and security. Other categories are funding the transportation system and finance, land use and growth management, quality of life and livability, and equity.
- Examples of categories, descriptions, and general indicators were reviewed. Examples of categories include environmental stewardship, safety and security, and quality of life and livability. A description of the quality of life and livability

category focuses on the extent the plan or action improves the quality of living and working environments, and the experience for people in communities across Oregon. General initiatives identified include physical activity, exposure to pollutants, community cohesion and severance, streetscape and journey ambiance, and access to recreational resources and open space.

- The research objectives for the livability and quality of life general indicators project were to understand the current application of livability and quality of life indicators to transportation systems and to facilitate a decision regarding the inclusion of livability and quality of life indicators in the LCP tool. The project examined how livability and quality of life are currently defined in the literature, the current understanding of how transportation impacts livability and quality of life, and the methods currently being measured by other agencies to measure livability and quality of life impacts.
- The literature review examined a wide range of journals, publications, reports, and other information. Academic journals reviewed were the *Applied Research in Quality of Life Journal* and the *Social Indicators Research Journal*. The HUD-DOT-EPA Partnership for Sustainable Communities report and the FHWA Livability in Transportation Guidebook were examined. Regional transportation plans from different agencies and transportation-related health impact assessments were also reviewed.
- The results highlight the variety of definitions of livability and quality of life. Livability typically refers to a community's services and amenities. Quality of life refers to how those amenities shape and benefit the human experience. For example, where livability might be concerned with the transportation choices a community offers its residents, quality of life refers to the associated health benefits received by residents who have the choice to select more active travel modes.
- The results also indicate that transportation impacts livability and quality of life in numerous ways. For example, traffic congestion affects businesses, transportation amenities influence housing price and development locations, and transportation emissions affect air quality and greenhouse gases. Transportation projects can divide communities and some modes may increase social capital. Transportation projects affect modal availability, access to destinations, streetscape amenities and other factors. Transportation networks may serve some populations more than others.
- Regional transportation plans from four areas were reviewed. The plans include the *Puget Sound Regional Council Transportation 2040 Plan*, the *Central Indiana Transportation Plan*, the *Portland Metro 2035 Regional Transportation Plan*, and the MTC's *San Francisco Bay Area Transportation 2035 Plan*. In addition, transportation project evaluation criteria from different plans were reviewed, along with transportation-related health impact assessments.
- The Puget Sound Regional Council (PSRC) *Transportation 2040* plan included health, safety, and security indicators under the quality of life heading. The MTC

plan included one affordability indicator designed to measure both equity and livable community goals. The Central Indiana Task Force identified a single property value premium indicator to measure community livability benefits. Various health-related impact assessments measured impacts on air quality, traffic collisions, physical activity, and included specific accessibility indicators.

- The general indicator selection criteria focus on the ability to distinguish portfolios of actions at the system level and the ability to forecast the impacts of various alternatives. Other criteria are readily available data and no overlap with a different indicator category.
- Five general livability and quality of life indicators were recommended for the Oregon LCP. These indicators are physical activity, exposure to pollutants, community cohesion, streetscape and journey ambiance, and access to recreational resources and open space. Social capital was recommended for future consideration as an indicator.
- The next steps on the project include working with project stakeholders to develop specific indicators for each general indicator and arranging these in an LCP tool. The tool will be tested on a planning process. A guidebook on the use of the LCP tool will also be prepared. Additional information is available at the project website at <http://www.oregon.gov/ODOT/TD/TP/LCP.shtml>.

Planning for Sustainability at a Regional Scale

Carissa Schively Slotterback, Humphrey School of Public Affairs, University of Minnesota

Carissa Schively Slotterback discussed a research project examining planning for sustainability at a regional scale. She described the project methodology, case study examples of sustainability planning at a regional level, emerging best practices, and next steps in the project. Carissa covered the following topics in her presentation.

- The project examined approaches to planning and implementing sustainability at a regional scale. The research project is also developing a model framework for regional sustainability planning and implementation. This model framework can be used by MPOs, regional agencies, and other groups.
- The research focuses on the framework used by organizations and stakeholders interested in regional sustainability planning and evaluating sustainability planning efforts. The model framework being developed can be adapted for use in a variety of contexts and by a variety of users.
- The project is funded by the CTS at the University of Minnesota. It is being conducted in collaboration with a research advisory group. The project is aligned with the HUD-DOT-EPA Partnership and Sustainable Communities Grants in the Minneapolis-St. Paul metropolitan area and Region 5.
- A case study methodology is being used in the project. The case study analysis focuses on the content of regional plans, the processes used to develop the plans, and the approaches being used to implement and monitor the plans. A diverse set of case studies are being examined. Elements being examined in the case studies

include the organizational context, geography, sustainability issues, and planning issues.

- A wide range of planning documents were reviewed. Examples of these planning documents include the Capital Regional District in Victoria, BC, *Regional Growth Strategy*; the New South Wales, Australia, *Metropolitan Plan for Sydney 2036*; and the Denver Regional Council of Governments, *Metro Vision 2035*. Other examples include the Chicago Metropolitan Agency for Planning, *Go To 2040*; the St. Cloud Minnesota Joint Planning District, *Sustainability Framework Plan*; the DVRPC, *Connections 2035 Plan—Regional Plan for a Sustainable Future*; and the Long Island Regional Planning Council, *Sustainable Strategies for Long Island 2035 Plan*. Interviews with key participants were also conducted.
- A number of emerging best practices related to the plan content, the planning process, and implementation were identified through the literature review and the interviews. Emerging best practices related to the plan content include taking the time to define sustainability relative to the local context, including land use, transportation, and the environment. Other best practices are documenting participation efforts in the plan and displaying plan and background information online.
- Emerging best practices related to the planning process include engaging multiple stakeholders – including the private sector – and working through existing networks. Other planning process best practices are using online participation and monitoring efforts, and using issue-specific work groups to help make connections and provide resources.
- Emerging best practices related to implementation are including clear steps in the plan and thinking beyond agency implementation to provide grants to support local efforts or toolkits to assist in regional activities. Other implementation best practices are to start small and focus on visible outcomes, and to link to indicator or monitoring systems using varied approaches.
- One case study example is MetroPulse, which is a web resource for the regional indicators project created in partnership with the Chicago Community Trust and the Chicago Metropolitan Agency for Planning. This customizable site provides extensive data on issues that shape the livability of local communities. MetroPulse was created to facilitate effective decision making and to measure the region’s progress in implementing the *Go to 2040* comprehensive plan. MetroPulse includes a wide range of transportation information, including road conditions, the travel time index, the percent of the population that is obese, the percent of regional trails that are complete, a pedestrian environment factor, the percent of transit vehicles and stations that are ADA compliant, a bridge condition rating, and schools with Safe Routes To School Programs.
- The DVRPC *Tracking Progress Toward 2030* is another good case study example. It tracks progress in the Philadelphia area toward meeting the regional goals using a dashboard dial. The dial arrow points to green for positive trends,

yellow for mixed trends, and red for negative trends. Other information is also provided in the report on the trends influencing goals, objectives, and measures.

- The Capital Regional District in Victoria uses a webpage and reports to monitor the *Making a Difference Together: The Regional Sustainability Strategy*. Status reports are provided on the various elements related to natural systems, social resiliency, and the built environment. Transportation is one of the elements under the built environment. Examples of factors that are monitored include the percentage of all trips made by different modes, the percent of work trips by different modes, and the average home to work trip distance. Information on progress toward meeting the targets is displayed graphically.
- The next steps in the project include developing and finalizing a framework for regional sustainability planning and implementation. The final framework should be available by the end of 2011.

Performance Measures or Indicators: Methods for Evaluating Transportation Policy
David Hitchcock and Jennifer Ronk, Houston Advanced Research Center

Jennifer Ronk discussed research on performance measures and indicators for use in evaluating transportation policy effectiveness. She also described the Sustainable Communities Regional Planning grant received by H-GAC. The Houston Advanced Research Center (HARC) is one of the 25 member organizations participating in the H-GAC project. Jennifer covered the following topics in her presentation.

- HARC was established in 1982 by George P. Mitchell. HARC is a non-partisan, non-profit research organization dedicated to moving knowledge to action to improve human well-being and protect the environment. It conducts research on a variety of topics for a wide range of sponsors.
- There is a difference between indicators and performance measures. Indicators focus on trends or patterns, while performance measures focus on achieving specific targets or goals. They measure success. HARC has extensive experience developing and applying indicators in other fields. A challenge is relating this experience specifically to transportation and sustainability issues. Good indicators do not necessarily equal good policy.
- H-GAC was selected for one of the HUD Sustainable Communities Regional Planning grants. A consortium of 25 organizations, including HARC, is participating in the project, which will develop a regional plan for sustainable development. The planning process includes extensive public engagement, technical analysis, and visioning activities. The consortium coordinating committee will work with local government partners to encourage the voluntary adoption and implementation of plan elements.
- Current related activities at HARC include three steps. The first step is indicator research. This step is examining HARC's indicator research in other fields, the Performance Measurement Frameworks and the Development of Effective Sustainable Transport Strategies and Indicators conducted by Georgia Tech, TTI's

numerous indicator projects, research undertaken by the European Union, and other research projects. A second step focuses on measuring what matters. Additional data driven methods of selecting indicators are needed. Benchmarking represents the third step. This step includes examining the policies that are used in places that are highly ranked in specific measures and attributes.

Breakout Session 3 – Urban and Rural Livable Communities

Tim Lomax, Texas Transportation Institute, presiding

Byway Awareness and Impact on Livability and Economy: Applications, Perspective, and Discussion

Brigid Tuck, Center for Tourism, University of Minnesota

Brigid Tuck discussed a research project examining the impacts of two scenic byways in Minnesota on the local quality of life and the local economy. She described the study purpose, the methodology, and the results. Brigid covered the following points in her presentation.

- The National Scenic Byways Program recognizes 150 Scenic Byways in 46 states that represent the most scenic and rarest of landscapes, culture, and history existing in America today. The Paul Bunyan Scenic Byway and the Lake Country Scenic Byway are part of Minnesota's 22 designated scenic drives. Tourism is an important part of the Minnesota economy and the scenic byways contribute to local economies.
- Approximately 12 percent of Minnesota traveler expenses are spent on transportation. Half of Minnesota traveler expenditures are spent by individuals staying in hotels, motels, and bed and breakfasts. Driving on designated scenic byways accounts for 13 percent of travel activities in the state. The annual number of travelers in Minnesota is approximately 39 million.
- The purpose of this project was to assess the impact of scenic byway visitors in the state on the quality of life and the local economies. The two sites examined in the project were the Paul Bunyan Scenic Byway and the Lake Country Scenic Byway; both are located in the north central portion of the state. The Paul Bunyan Byway is 54 miles in length. It is a double-circle route between Pequot Lakes and Crosslake. The Lake Country Scenic Byway is 88 miles in length. It includes an east-west route and a north-south route. Both byways include lakes, national forests, state parks, and small communities. Both offer recreation activities, events and festivals, local area attractions, arts and cultural sites, restaurants, lodges and resorts, and historical, scenic, and natural sites.
- Residents and travelers were surveyed at selected locations along the two byways in the summer and fall of 2010. Volunteers conducted the surveys, asking every third group to complete the questionnaire. A total of 337 questionnaires – 198 residents and 139 travelers – were completed along the Paul Bunyan Scenic Byway. A total of 176 surveys were completed along the Lake Country Scenic Byway – 84 by residents and 92 by travelers.
- The surveys were administered by volunteers at selected intercept sites. These locations included area chambers of commerce, local businesses, area attractions, events, retail centers, restaurants, and visitor center parking lots. The surveys were proportioned across the month and weekdays.
- The on-site survey instrument included questions on demographic and travel characteristics, byway awareness, and visitation duration. Residents were asked

14 quality of life and byway contributions questions. Travelers were asked about expenditures and byway effects on travel.

- The survey results were analyzed using SPSS 17.0. Descriptive data and frequencies were tabulated on demographics, visitation, and important community attributes and the byway contribution to these attributes. Comparisons were made based on the season, and by residents versus travelers.
- The economic impact analysis of byway tourists examined direct impacts, indirect impacts, and induced impacts. All of these influence the local economy and the state economy. Two sources of spending were used in this study – spending related to the byway itself and spending by travelers on the byway. The IMPLAN model, which measures indirect and induced impacts, was used in the analysis. The direct effects are entered into the model.
- A lot of research and work has been conducted on approaches to measuring the economic impact of scenic byway travelers. The National Scenic Byways Research Center in Duluth is working on developing a tool. A conservative approach was used in this analysis based on the work of John Crompton.
- Scenic byway tourist spending was calculated by determining total spending by byway tourists. A tourist spending profile was developed and the total number of byway travelers was estimated. The spending profile was multiplied by the number of byway travelers to identify the total spending by all travelers.
- The survey results identified common quality of life factors for residents in both scenic byway areas. Residents in the Paul Bunyan Scenic Byway area identified quality recreational opportunities, natural areas, community beauty, cultural and historical features, and community amenities as key quality of life factors. Residents in the Lake County Scenic Byway area identified cultural and history preservation, natural areas preservation, community beauty, quality recreational opportunities, and fairs and events as key quality of life factors.
- The results from the resident quality of life analysis can be used in a number of ways. Communities, businesses, and other groups can build on those factors residents see as most important. The factors can also be promoted to attract new businesses and new residents to the area. The factors also provide baseline measures for future research on potential changes.
- The traveler responses were examined in a number of different ways. Of the travelers in the Lake Country Scenic Byway, 52 percent were non-residents and 48 percent were residents. Approximately 8 percent visited due to the byway, 10 percent said it altered their route to tour the byway, and 2 percent said it altered their length of stay. A total of 29 percent paid for overnight accommodations, 32 percent used unpaid accommodations, and 39 percent were day visitors. For travelers in the Paul Bunyan Scenic Byway, 60 percent were resident and 40 percent were non-residents. Approximately 5 percent indicated they visited due to the byway, 14 percent said it altered their route to tour the byway and 2 percent said it altered their length of stay. In terms of economic impacts, 50 percent paid

for overnight accommodations, 40 percent used unpaid accommodations, and 10 percent were day visitors.

- The major expenditures for visitors were associated with lodging, dining and drinking, grocery stores, and fuel. The estimated impacts to the local area were \$15-to-38 million for the Paul Bunyan Scenic Byway and \$12-to-38 million for the Lake Country Scenic Byway.
- The results from the traveler surveys mirror previous research, although the surveys were conducted during the economic downturn of 2010. Higher expenditure levels and more travel could be anticipated as the economy recovers. The results can be used to target certain segments of the population and to promote longer stays and return visits.
- There were limitations with the study. There were seasonal constraints with surveys conducted only in the summer and fall. Only on-site visitors were surveyed, not people who might be interested in visiting. The study also used volunteers to conduct the surveys, which has limitations.
- Future research needs can also be identified. Assessing the views of non-visitors would be beneficial, as would longitudinal studies to examine factors influencing values associated with quality of life.

Measuring Livability in Small Urban and Rural Communities with Disaggregate Data
Nathan Belz and Lance Jennings, Transportation Research Center, University of Vermont

Nathan Belz discussed a research project using disaggregate data to measure livability in Chittenden County, VT. He described the study background, the data sources, the analysis, and future activities. Nathan covered the following topics in his presentation.

- Geographic scale is important in analyzing data related to livable communities. Boundaries and units need to be considered. Using aggregate scales may induce unequal representation, especially in rural areas.
- Seven capitals for livable communities have been suggested. These capitals are infrastructure, the environment, financial, political, human, social, and cultural. These capitals relate to the livable community building blocks of the environment, the economy, and society. Individuals and communities may place different values on these capitals. Livable communities should provide a balance in these elements.
- The infrastructure or built capital includes sidewalks, roads, buildings, and land uses. The environment includes parks and recreation, green space, and land cover. Other environmental elements include nature trails, bike trails, and shared-use paths. The ecosystems, including water quality, fragile habitats, and other elements, are also part of the environmental capital. Conservation organizations represent still another element.
- Political capital includes voting districts, voting turnout, satisfaction with elected officials, and the allocation and utilization of funds. Financial capital includes tax

revenues, budgets, household incomes, property values, businesses, jobs, employment, and sales.

- Human capital includes schools and education, job training centers, as well as mortality rates, age ranges, and health indicators. Social capital includes connectedness, trust, and neighborhood groups. Electronic social networks are becoming more important. Community events may also be used as a measure of social capital.
- Cultural capital includes churches, race and ethnicity, proximity of generations within a family, and transferring knowledge. Other cultural capitals include events, fairs, and parades, celebrating the history of a town through preservation and historical designations, and designated villages and downtowns.
- There are a number of top 10 lists that rank communities by different measures, including those associated with livability. Austin is included in many of these lists. CNN's America's Best Small Towns, *Best Places To Live* top 10 lists are Louisville, CO; Milton, MA; Solon, OH; Leesburg, VA; Papillion, NE; Hanover, NH; Liberty, MO; Middleton, WI; Mukilteo, WA; and Chanhassen, MN. Austin is ranked number one on the RelocateAmerica.com, *Top Overall Places to Live* list. Austin ranks second on Parenting.com, *Best Cities for Families* list. Sperling's Best Places lists Charlottesville, VA at the top of the *Best Cities to Relocate To*. Men's Health *Best Cities for Men*, which measures the number of bars, the ratio of men to women, and other related factors ranks Austin number seven. The Gallup-Healthways Being Index lists Austin second among large cities.
- While people have different perceptions of livability, most would agree that the ability to fulfill basic daily needs is at the foundation of livable communities. Quality of life, sustainable communities, and social capital are also important elements of livable communities. The built environment influences the ability to reach destinations, and the frequency of walking, which in turn influences the frequency of chance encounters, which enhances social ties, which leads to a higher level of social connectedness and increases social capital.
- Disaggregated data was used to examine a number of transportation elements in Chittenden County, VT. Streets, sidewalks and shared-use paths were identified and displayed using GIS. The Sidewalk Coincidence Ratio (SCR) was calculated by Census block and displayed using GIS. The results from the 2010 National Household Travel Survey (NHTS) were examined for subareas in the country. One of the NHTS questions addressed adequate sidewalks/walking paths in the area. The SCR was also examined by Census block groups and a one-mile service area.
- The responses to NHTS questions addressing adequate sidewalks and paths, and feeling safe when outside were compared against the mean SCR. Areas where respondents strongly agreed or agreed to feeling safe when outside had higher mean SCRs than areas with respondents strongly disagreeing or disagreeing.

- The mean of household density in different areas was compared with responses to questions addressing biking in their neighborhood being safe and enjoyable. Respondents that strongly agreed with these statements were in areas with higher mean household densities.
- Responses to questions on the ease of traveling to buy groceries were compared to the mean distance to the nearest grocery store. Respondents strongly agreeing with the ease of travel had shorter mean distances to the nearest grocery store. The service areas of major grocery stores were mapped using GIS. A similar analysis was conducted with health care and emergency response.
- Future research is planned on a number of elements. First, the spatial relationships between livability and public attitudes and behavior, the built environment, social capital, and daily needs will be explored. These factors have elements in common and unique features which both contribute to livability. The spatial and temporal variations in livability will also be examined.

An Evaluation of Automobile Use, Parking Provision, and Urban Activity
Christopher McCahill and Norman Garrick, University of Connecticut

Christopher McCahill described a study examining automobile use, parking, and urban activities in selected cities throughout the country. He discussed the study process and highlighted some of the results. Christopher covered the following points in his presentation.

- An on-street parking utilization study was conducted along a three-quarter mile section of Nantucket in Hartford. The utilization rate was 94 percent. The generally accepted designate level for on-street parking utilization is 85 percent. A land use study and review of the zoning code had indicated the need for between 670-to-2,337 additional parking spaces. Parking is free and the area is very walkable.
- The study examined how much parking is actually needed to meet growth and development projections. The theoretical model of land consumption indicates that increases in automobile mode share result in taller buildings and/or fewer activities. The trend of wider freeways, taller buildings, and activities moving to the suburbs has occurred in many urban areas throughout the country. In contrast, the street system and buildings in the downtown areas of Hartford and Cambridge have not changed all that much over the past 40-to-50 years.
- The percent of resident commuters from the Census data from 1960 to 2010 was examined for Hartford and the peer cities of Lowell, San Mateo, Alameda, Albany, New Haven, Evanston, Silver Spring, Berkeley, Somerville, and Cambridge. Hartford experienced an increase in the percent of resident commuters from 1960 to 2000, before a slight decline between 2000 and 2010. Hartford is in the middle of these peer cities when they are combined.
- The percent of resident commuters by automobile in 2000 was examined. Cambridge, Berkeley, Somerville, and Evanston had automobile use below 65 percent. Silver Spring, New Haven, Hartford, Albany, Alameda, San Mateo, and

Lowell were classified as high automobile percentages with automobile use over 70 percent.

- The provision of parking in 2000, as measured by square feet per activity, was examined for the same group of cities. Cambridge had the lowest square feet of parking activity, while Alameda had the highest. Examining the parking provisions in square feet activity per activity, and automobile use, measured by the percent of commuters, for the same cities indicated a general increase in parking with an increase in the percentage of resident commuters.
- The activity density, as measured by combined residents plus employees per square mile in 2000, was examined for the 11 cities. Cambridge had the highest levels, as residents and employees are frequently the same. On the other hand, most employees in Hartford commute to the downtown area from the suburbs. Examining activity density measured by activities per square mile and automobile use, measured by percent of resident commuters, indicates that activity density is higher at lower levels of automobile use. This analysis indicates that adding parking may not result in increased activity density.
- The employee density measured by employees per square mile was examined for the 11 cities. Cambridge experienced a significant increase in employment density, while having the lowest percent of resident commuters among the 11 cities. Hartford and New Haven both experienced declines in employee density between 1960 and 2000, with commute rates of 83 percent and 88 percent, respectively.
- The findings seem to indicate that high levels of automobile use and parking correspond with fewer activities. This relationship may not be causal, however. It appears that cities with the most activities have preserved their urban fabric and provide a range of transportation options.

Sustainability Performance Measures for El Paso's Transit Corridors *Tara Ramani, Texas Transportation Institute*

Tara Ramani discussed a project examining sustainability performance measures for transit corridors in El Paso, TX. She described the project goals and process, the performance measures framework, preliminary measures, and next steps. Tara covered the following topics in her presentation.

- The overall project goal is to develop a framework to apply sustainability performance measures in transit corridors in El Paso. The project was funded by the Texas Transportation Institute's Center for International Intelligent Transportation Research (CIITR), in cooperation with the City of El Paso. The first phase, which is nearing completion, focuses on identifying appropriate goals, objectives, and measures. These goals, objectives, and measures will be implemented in the second phase.
- The original concept of sustainable corridors was based on interactive workshops developed for TxDOT. Information from the recently completed NCHRP project

on sustainable performance measures for state departments of transportation and public transportation agencies was used in the project. The city of El Paso is in the process of implementing rapid transit system (RTS) projects in major travel corridors.

- The first phase of the project has four goals. These goals are to develop an understanding of sustainability in the context of transit corridors; to identify a framework and approach for performance measurement in the corridors; to develop goals, objectives and performance measures for use in their corridors; and to discuss the application of performance measures with local agencies, policy makers, and the public.
- The project approach focuses on providing an understanding of sustainability and making it relevant to the city's strategic plan. An interactive workshop process was used in this approach. The city of El Paso's strategic plan was used to develop sustainability goals for RTS, which formed the basis to develop objectives and performance measures for RTS. The performance measure implementation framework consisted of fundamental components, overarching components, and auxiliary components.
- The principles of sustainability were reviewed as part of the process. Sustainability entails meeting human needs for the present and future while preserving and restoring environmental and ecological systems; fostering community health and vitality; promoting economic development and prosperity; and ensuring equity between and among population groups and over generations.
- The framework focused on goals, objectives, and performance measures. The performance measures applications can be quantified individually or index together. Performance measures applications may be descriptive or evaluative. They may also focus on accountability, decision making, and communication.
- Transit corridors in El Paso were defined to include terminal nodes and intermediate nodes. The links consisted of the roadway and general-purpose travel lanes, the RTS facility, which may occupy same physical space as the roadway, and sidewalks and bike lanes. The influence area, or buffer zone is also part of the transit corridor.
- There are eight RTS sustainability goals. These goals include reducing automobile dependence, mitigating traffic congestion, improving international mobility, and increasing livability. Promoting economic development, ensuring system effectiveness and efficiency, promoting equity, and improving the environment are other RTS sustainability goals.
- The RTS sustainability goals were mapped to the four sustainability principles. A draft performance measure framework was developed. Objectives were identified for each of the eight RTS sustainability goals. Indicators and performance measures were developed for each objective. Data sources and potential targets and benchmark values were also identified.

- One of the objectives associated with the goal to reduce automobile dependence is to shift automobile users to the RTS. A performance measure associated with this objective is the number of medium/high income users in the RTS corridor influence area.
- One of the next steps in the project is to quantify selected measures for the Mesa corridor in El Paso. Activities to be conducted in the second phase include identifying the specific applications using the developed goals, objectives and measures, and quantifying the measures and establishing a tracking system for each of the application types. The pilot applications will also be conducted in the second phase.
- In conclusion, this project illustrates that a performance measurement framework can successfully be adapted for transit corridors. Goals, objectives and performance measures can be developed for sustainable RTS corridors. The interactive process and the linkage to the city strategic plan helps ensure support for the plan. The next steps will be demonstrating the practical application.

Breakout Session 4 – Transportation Performance Measures for Communities of all Sizes, Shapes, and Forms

Maulik Vaishnav, Arup, presiding

New Tools for Measuring Livability

Jeff Taebel, Houston-Galveston Area Council

Jeff Taebel discussed livability plans, projects, and measurement tools at H-GAC. He described planning activities in the area, pedestrian/bicycle special districts, and livable center studies. Jeff covered the following topics in his presentation.

- Transportation and livability can result in numerous direct benefits, including reduced automobile dependency, shorter trips, and fewer crashes. There are also numerous indirect benefits, including improved health and enhanced aesthetics.
- The 2007 American Community Survey (ACS) was used to identify the share of walk and bike trips to work in different cities throughout the country. Boston, Washington, D.C., San Francisco, and New York had the highest levels of walk and bike trips to work. Seattle Minneapolis, Philadelphia, New Orleans, Portland, and Honolulu round out the top 10 cities for the percentage of walk and bike trips to work. These cities tend to be denser than Houston and other southern cities.
- The North Hardy alternative analysis study examined forecasted traffic volumes and peak period travel speeds for different alternatives. The preferred alternative included eight lanes with four managed lanes and an estimated cost of \$2.11 billion. The preferred alternative provided travel time savings in both the general-purpose lanes and the managed lanes over the no-build alternative. Consideration was also given to the economic value of the alternatives.
- The Bayou Greenway Initiative includes 236 miles of new trails, 10 miles of rebuilt trails, and 52 miles of existing trails for a total system of 298 miles. The estimated cost of the project is \$490 million. The estimated annual benefit from the project is \$117.1 million.
- The air quality cost effectiveness of different types of transportation projects are also estimated. The Clean Air Action Public Outreach Program, which had a total cost of \$814,938 was estimated to result in a reduced volatile organic compounds (VOC) by 64.41 tons a year and reduced oxides of nitrogen (NO_x) by 90.178 tons a year for a cost effectiveness of \$12,836 per ton.
- The H-GAC regional transportation/livability measures include both direct measures and indirect measures. Examples of direct measures include trip distance, travel time, mode split, and per capita crashes. Examples of indirect measures focus on the community, the economy, and the environment.
- Implementation metrics include the amount of funding allocated to transit, sidewalks, bicycle facilities, and safety. The amount of funding used in sustainable locations represents a second metric. As an example, the travel time

on transit to the nearest major employment center is examined. Other factors include street activity and density, walkable urbanism, and TOD.

- Pedestrian-bicyclist special districts have been identified throughout the region. The purpose of these districts is to improve circulation and safety in areas where non-motorized travel is in high demand. Key elements include improving the on-street network for pedestrians and cyclists, upgrading intersections and crossings, and ensuring Americans with Disabilities Act (ADA) accessibility and removing physical barriers. A total of 10,429 pedestrian-bicyclist destinations were identified. These destinations were scored by pedestrian-bicycle demand factors. The analysis results were aggregated into districts. The pedestrian-bicycle districts and study areas were identified. Public meetings and workshops were used to identify and evaluate potential pedestrian and bicycle improvements in the different areas.
- Livable centers are also being identified. Livable centers are walkable, provide mixed uses, and are connected. Livable center studies are being conducted in different areas using a centers benefit calculator. A total of 16 livable centers studies have been conducted to-date.
- The Waller Livable Center Study provides an example of these efforts. Early initiatives and long-range projects are identified in the plan, as well as potential funding sources. A total of \$72 million in improvements and projects are included in the plan. The early initiatives include a heritage trail, an extension of Field Store Road, redesign and reconstruction of Main Street, and the realignment of Main Street and Highway 290. These projects are estimated at \$2.4 million. There are \$30.1 million in other short-range improvements and \$39.9 million in long-range improvements. The long-range improvements include street and sidewalk improvements, crosswalk and intersection improvements, streetscaping elements, a bike lane along Washington Street, and development of Station Square.
- The goal of reducing single-occupant vehicle use by 10 percent could be accomplished through different approaches to capture new growth. For example, 36 percent of new growth could be captured through 25 neighborhood centers, 85 town centers, 18 regional centers, or 10 urban cores to equal the 10 percent reduction. On the other hand, a 36 percent new growth could also be captured through 50 neighborhood centers, 25 town squares, seven regional centers, and one urban core to equal the 10 percent reduction.
- Partnerships are needed to advance livable communities in Houston and other areas. Engineers, planners, health professionals, and economists are needed. Public agencies, private sector, academia, and local organizations also need to be involved in these efforts.
- More information is available at the following websites:
 - Livable Centers: h-gac.com/livablecenters
 - Pedestrian and Bicycle: h-gac.com/go/pedbike
 - Subregional Planning: h-gac.com/go/subregional

- Ecological: eco-logical.h-gac.com
- Sustainability planning grant: gosustainablenow.org

Targeted Transportation Programs for Livable Communities: Lessons from Three Pennsylvania Programs

Mark Stout, Consultant

Mark Stout discussed the experience with three programs in Pennsylvania focusing on transportation and livable communities. He described programs at the Delaware Valley Regional Planning Commission (DVRPC) in the Philadelphia region, the Pennsylvania Department of Transportation (PennDOT), and the Lancaster County MPO. Mark covered the following topics in his presentation.

- The Transportation and Community Development Initiative (TCDI) at the DVRPC represents one element of a smart growth approach promoted by the agency. The TCDI was initiated in 2002 to help communities support revitalization. More than \$10 million has been invested in the program to-date. For FY 2012, the program funding levels are \$1.2 million in Pennsylvania and \$1.0 million in New Jersey.
- Areas eligible for the TCDI include core cities, developed and mature communities, identified centers, and environmental justice areas. Planning and early design projects, which include transportation improvements and support redevelopment, are eligible for TCDI funding. The projects must be consistent with the DVRPC plan and other plans. The project selection scoring criteria includes a direct relationship to the transportation network, revitalization, and consistency with the DVRPC plan and other plans.
- The DVRPC publishes periodic program evaluation reports on the TCDI. Highlights from these evaluations include 13 percent of the projects involve planning or zoning changes and 20 percent of the projects involve a TOD. The experience with the TCDI indicates that keys to successful projects include local leadership, agency partnership, community involvement, and innovative planning.
- The PennDOT Pennsylvania Community Transportation Initiative (PCTI) is the second case study. PennDOT currently has a strong smart growth orientation and the PCTI was launched to promote a project-driven vision of smart transportation. The development and implementation of PCTI was supported by the 10,000 Friends of Pennsylvania, an advocacy group. The PCTI is a temporary program funded from the PennDOT Secretary's discretionary funds. In 2009, 50 projects were selected for a total of \$59 million in funding. In 2011, \$25 million in funding was made available for 41 projects.
- There are no restrictions on eligible areas or eligible projects for the PCTI. There are no requirements that a project be related to an adopted plan. The scoring criteria focuses on how well a project implements a smart transportation principle.
- The quality of applications has been mixed. Some of the projects selected would not be considered the "smartest," including highway operational improvements.

PennDOT had hoped MPOs in the state would adopt spinoff programs, but there has been limited action on the part of MPOs. PennDOT has also not yet adopted smart growth performance measures.

- The third case study is the Lancaster County MPO Smart Growth Transportation Program (SGT). Lancaster County has a very progressive planning program. The MPO area is the county, which makes planning easier. Some of the MPO members wanted a better “smart growth” focus for transportation funds and created the SGT Task Force to examine different approaches. A consultant helped explore options and approaches, including considering ideas from the TCDI and PCTI. The SGT program was developed and implemented as a result of these efforts.
- Designated growth areas in the county plan are eligible to apply to the SGT program. A sample list of eligible projects was developed. Only 20 percent of the funds will be used for planning projects. A project must be consistent with county and local plans, which means a municipality must have a plan. The scoring criteria supports development in the identified growth area, increasing mobility options, context sensitive design, and implementing a study.
- The first round of SGT applications are due in the fall of 2011. It is expected that the selection process will be very selective. The Lancaster County MPO may consider a program evaluation in the future. Keys to the successful launch of the SGT include strong local leadership and expert help.
- A number of lessons can be identified from the experiences with the three programs. Although there were some performance measures for implementation, there were no performance measures for outcomes in the programs. The careful targeting of communities and project types can promote better outcomes. The three examples indicate that the diffusion of best practices does work. More program evaluations with an emphasis on outcomes will be needed to help document the benefits programs.
- Suggestions for new targeted livable communities programs can also be identified from the experience with the three programs. These suggestions include establishing a strong link to transportation and community plans, carefully defining target communities, and carefully defining target projects. Other suggestions include being selective with project awards, cultivating strong local leadership, obtaining expert support, and never underestimating the lack of information.

Learning about Transportation-Related Livability: A Mixed-Methods Approach

Ingrid Schneider, Center for Tourism, University of Minnesota

Ingrid Schneider discussed a study conducted for the Minnesota Department of Transportation (MnDOT) examining transportation and quality of life performance measures. She described the study purpose, the work tasks, and the preliminary results. Ingrid covered the following topics in her presentation.

- Quality of life is subjective. Measuring quality of life is difficult as people place different importance on different elements. What is important to one person may not be important to another person.
- The purpose of this study is to better understand what quality of life means to Minnesotans and to identify where transportation fits within this mix. The study examined how MnDOT programs and services address the identified quality of life factors. The results will help MnDOT review and revise existing performance measures addressing transportation and quality of life.
- Three methods were used in the study to reveal 11 quality of life factors and seven transportation elements. The study methods included a literature review, focus groups, and a survey. The literature review was completed in November 2010. The focus groups were conducted in the fall of 2010. The survey was conducted in the spring of 2011. These mixed methods are necessary to address the subjectivity and objectivity of quality of life measures and to meet the needs of different audiences. Rich stories are needed for policy makers and the press, while objective and quantitative information is needed to guide, monitor, and track performance measures.
- The literature review results indicate that quality of life has been a topic of interest for at least 50 years. It has been inconsistently measured, however, and typically includes a variety of domains and factors. The World Health Organization (WHO) uses nine domains to define quality of life. These domains are frequently used by other groups. These domains include freedom, physical safety, and security; home environment; work satisfaction; financial resources; and health and social care. Other domains are opportunities for acquiring new information and skills, participation in and opportunities for recreation and leisure activities, physical environment, and transportation.
- Few links between transportation and quality of life were found in the literature review. There were also few transportation and quality of life performance measures. Those that are in use focus on mobility and accessibility, or specific aspects such as traffic noise.
- The focus groups were based on a 2009 MnDOT pilot study, which broadly explored quality of life measures. There were 24 focus groups conducted with residents in the Minneapolis-St. Paul metropolitan area and other parts of the state between August and November 2010. Participants were selected from a telephone census-block list, which was purchased by MnDOT. Participants were screened to obtain a variety of locations and community sizes, the inclusion of all MnDOT districts, and multiple age groups.
- A total of 11 quality of life domains emerged from the focus groups. In alphabetical order, these domains included education, employment and finances, environment, housing, and family, friends, and neighbors. Other domains were health, local amenities, recreation and entertainment, safety, spirituality and individual psychic, and transportation. The initial exploration with diverse groups indicated differences by age and other characteristics.

- There were seven transportation elements identified by focus group participants related to quality of life. These elements were access, design, the environment, maintenance, mobility, safety, and transparency.
- The survey included a representative sample throughout the state. A 44 percent response rate was realized, with approximately 3,400 returned questionnaires. The survey focused on quantifying quality of life and transportation's role. It included questions related to the importance of different transportation elements and satisfaction with the performance of these elements. The analysis of the results is underway.
- The study results to-date present a number of implications for research. First, measuring quality of life domains is difficult. Groups and individuals place different values on different factors and domains. Second, there are nuances within the transportation elements and sub-elements. The results also indicate that multiple methods are needed to fully understand quality of life factors and to develop and use quality of life performance measures.
- The implications for transportation planning are that quality of life measures are complicated. There is a need to examine the population demographically, technologically, and attitudinally. For example, younger individuals tend to think of access in terms of access to amenities, while the older individuals think more of access to health care. There are also differences between metropolitan area residents and individuals in other parts of the state.

Livability and Sustainability Efforts in the State of Texas

Kirk Fauver, Federal Highway Administration

Kirk Fauver discussed activities underway in Texas related to transportation, livable communities, and sustainability. He discussed the FHWA's role in supporting livable communities, and activities sponsored by the FHWA Texas Division, TxDOT, and MPOs in the state. Kirk covered the following topics in his presentation.

- A livable community has been defined as one in which people have multiple, convenient transportation and housing options, as well as destinations easily accessible to people traveling by different modes. Through workshops, training sessions, and dialogue on the concept of livable communities, the U.S. DOT has determined that livability is not a "one size fits all" concept. Livability is a concept that means different things to different communities, and the U.S. DOT acknowledges that the needs of rural and urban communities are not necessarily the same.
- Livability involves providing more transportation choices, valuing unique characteristics of communities, and improving the links between public transit and communities. Livability also means gaining better access to affordable housing, reducing transportation costs, enhancing the economic and social well-being of Americans, and providing easy access to employment opportunities and other destinations, while protecting the environment in communities.

- The FHWA supports building livable communities through transportation-related projects and activities such as CSS and public involvement, as well as funding programs such as the Transportation Enhancements (TE) Program, the Congestion Mitigation and Air Quality (CMAQ) Program, and the Safe Routes to School Program. The FHWA aids the planning and development of projects that may have multimodal, multi-faceted dimensions, non-traditional partners and sponsors, inter-disciplinary elements, and selection and criterion outside of the regular process.
- The FHWA Texas Division took a lead role in conducting a one-day workshop on Livability and Sustainability in conjunction with EPA, HUD, and the FTA Region VI offices. On March 23, 2010 over 160 participants from MPOs, TxDOT, TTI, cities, counties, and regional transit authorities met to discuss livability and sustainability goals and objectives. The outcome of this one-day workshop provided the participants with a better understanding of the roles and responsibilities of the EPA, HUD, FHWA, and FTA as part of the Sustainable Communities Partnership Initiative.
- On July 14, 2011, the FHWA Texas Division again supported a free one-day livability and sustainability workshop at the Austin City Hall. Over 170 participants attended, representing MPOs, TxDOT, TTI, EPA, HUD, and FTA Region VI. The outcome of this one-day workshop resulted in an action plan developed to focus on several areas of livability, including integrating TODs, strengthening federal partnerships, and improving land-use and transportation linkages.
- In FY 2010 the FHWA Texas Division also conducted a livability survey that included 25 MPOs in the state and TxDOT to determine how livability is being incorporated into transportation planning and programming processes. All 25 MPOs and TxDOT responded to the survey. The results indicate that MPOs and TxDOT are in various stages of incorporating livability goals into their transportation planning process.
- TxDOT has focused on increasing transportation choices through high-speed intercity rail studies, supporting transit, and incorporating bicycle and pedestrian projects into roadway projects where feasible. The Texas Transportation Commission has selected 471 projects under the Safe Routes to School Program over three program calls totaling approximately \$83 million. Approximately 7 percent of all K-8 grade schools in the state are participating in the program. TxDOT has also recently updated its design guidance manual to account for the principles of CSS/CSD into its highway design process.
- The Texas Transportation Commission has funded 59 percent of its TE program for bicycle and pedestrian improvements over the past several years under TEA-21 and SAFETEA-LU. Alternative forms of transportation, including non-traditional highway projects, have been funded through the TE program by the Commission. Consideration of livability is indirectly part of TxDOT's project prioritization process, since livability aspects (including safety, intermodal improvements, mitigation to reduce emissions and improve efficiency, and

improved mobility via congestion relief) are incorporated within TxDOT's planning and project development processes.

- The TxDOT Statewide Long-range Transportation Plan, adopted in November 2010 by the Texas Transportation Commission, includes three strategies related to livability. The first strategy is to maximize available resources by refining the current project selection process to investigate comprehensive multimodal options and increasing investment in technology. The second strategy is to manage demand by encouraging shifts in modal departure times and routes, considering capital investments that support modal shifts during peak hours, and coordinating with local governments to develop land use plans that support sustainable transportation systems. The third strategy is to leverage partnerships to meet growing demands.
- The Pew Center Report, *Measuring Transportation Investments: The Road to Results*, released in May 2011, noted that Texas is one of 13 states leading the way in having essential tools – goals, performance measures and data – needed to help decision-makers choose more cost-effective transportation funding and policy options.
- There are a number of examples of MPOs in the state incorporating livability into the planning process. The Tyler MPO has programmed a pedestrian access study to identify routes and to inventory facilities. The MPO has created a master trail plan throughout the entire MPO planning boundary. The regional trail plan will connect multiple communities within the planning boundary for connections other than personal vehicle. The Tyler Parks Department has developed a long-range plan for hike and bike trails throughout the city. Currently, the MPO is utilizing PL funding to develop alternative transportation plans.
- The Texarkana MPO has developed a master bicycle-pedestrian plan, and has recently completed data collection for an inventory of sidewalks along arterials within two blocks of schools. These data will be used to analyze the overall condition of sidewalks and any gaps in sidewalk service to develop a 20-year implementation strategy to repair and replace, upgrade, and expand the bike and pedestrian system in the area.
- The Corpus Christi MPO has completed a report funded in part by MPO PL funds on *Transit's Role in Livability and Sustainability*. The report is available on-line at: http://www.corpuschristi-mpo.org/Studies/Transit's_Role_Sustainability_&Livability_0510.pdf. Livability issues are being addressed by multiple agencies and groups in the area, including the City of Corpus Christi, the Regional Transit Authority, the Downtown Management District, Destination Bayfront, Smart Growth, and the Uptown Neighborhood Initiative. Livability factors must be considered for each project, as are most accessibility improvements. The Corpus Christi region has focused on livability for many years. Award-winning projects, such as the Staples Street Station transit oriented design, and the recent Destination Bayfront initiative provide examples of this focus on livability. Information on these projects is available at

http://www.pps.org/great_public_spaces/one?public_place_id=113 and <http://www.destinationbayfront.org/>.

- The Midland-Odessa MPO conducted a series of workshops over an 18-month period as part of the community visioning/scenario planning process for the 2010-2035 Metropolitan Transportation Plan (MTP), bringing together local communities to develop one over-arching vision for regional growth and transportation investments. The MPO developed a preferred scenario for a well-connected transportation network that provides optimal mobility and accessibility for all travelers.
- The San Antonio-Bexar County MPO incorporated scenario planning into their 2035 MTP. In March 2009, the MPO adopted a growth scenario focusing on infill and TOD. Additionally, in April 2009, the MPO adopted and distributed a resolution to all municipalities encouraging them to adopt transportation and land use policies that promote multi-modal travel options. For over 10 years, the MPO has hosted and staffed the Bicycle Mobility Advisory Committee and the Pedestrian Mobility Advisory Committee to support these active transportation modes. In 2011, the MPO celebrated its 15th year of annual Walk & Roll events.
- The San Antonio-Bexar County MPO also coordinates several related programs including the Walkable Community Program that focuses on the walkability and livability of neighborhoods throughout the San Antonio region. The MPO hosts safety classes for adults and children on cycling, and conducts bicycle rodeos for children to promote safety and best practices with cycling in their communities.
- The NCTCOG has provided dedicated funding to sustainable development programs to address livability. Most recently, the Regional Transportation Council (RTC) provided local matching funds to allow for the submittal of HUD Community Challenge Grants, TIGER II, and HUD Regional Planning Grant applications for several projects that would advance livability principles for specific communities in the region.
- *North Texas 2050*, a product of *Vision North Texas*, of which NCTCOG is a partner agency, has addressed livability issues such as housing, the economy, mobility, climate resilience, the regional ecosystem, community character, education, and health in the 16-county region. Individual communities are addressing livability as part of membership into the Mayors Climate Protection Agreement, building of LEED buildings, supporting mixed-use developments, and bicycle and trail planning. In 2008, projects were selected through the Regional Toll Revenue Program, which included set aside funds for sustainable development projects. One of the major goals for the Regional Toll Revenue Sustainable Development program was to support sustainable, walkable communities. These projects were recently funded and programmed within the FY 2011-2014 Transportation Improvement Program and State Transportation Improvement Program.
- Livability has been part of the NCTCOG project prioritization process since 2001. A part of the Local Air Quality and Regional Toll Revenue Programs was the

adoption of the Clean Fleet Vehicle Policy. Agencies that did not have the Clean Fleet Vehicle Policy in place were not eligible to compete for funds. This requirement ensured that livability and air quality concerns were considered in the project-selection process for all project types.

- Since 2001, the RTC has funded over \$120 million for livability projects and programs. The RTC seeks to advance livability throughout the region by incorporating livability criteria in the evaluation process of major funding initiatives. Bicycle and pedestrian projects, air quality clean vehicle and marketing programs to promote energy conservation and clean air, and developing the regional ecosystem framework for the NCTCOG planning area that promoted conservation of natural assets and environmental preservation provide examples of efforts to promote livability in the region.
- There are a number of issues being examined at the national level associated with livable communities. Examples of these issues include addressing livability in rural areas and establishing and tracking livability performance measures at the national, state, and local levels. Other issues focus on incorporating livability concepts into design guides and standards, and determining methods to evaluate the economic benefits of livability.
- Additional information on livability is available on the following websites:
 - <http://www.dot.gov/livability/>;
 - <http://www.fhwa.dot.gov/livability/>;
 - <http://www.sustainablecommunities.gov/index.html>; and
 - http://fta.dot.gov/publications/publications_10935.html.

Breakout Session 5 – Land Use, Social Justice, and Environmental Performance Measures

Lucy Galbraith, Capital Area Metropolitan Transportation Authority, Austin, Texas, presiding

Mobility 2035

Chad McKeown, North Central Texas Council of Governments

Chad McKeown discussed *Mobility 2035*, the MTP for the Dallas-Fort Worth area developed by NCTCOG. He described the planning and public involvement process, the mobility performance indicators, and the active transportation performance indicators. Chad covered the following topics in his presentation.

- The *Mobility 2035* MTP is a blueprint for a multimodal transportation system in the Dallas-Fort Worth Metroplex. It responds to the goals of mobility, quality of life, system sustainability, and implementation. The plan identifies policies, programs, and projects for continued development of the region. It guides expenditures of federal and state funds.
- The mobility goal focuses on improving the availability of transportation options for people and goods, and assuring all communities are provided with access to the regional transportation system and to the planning process. The quality of life goal focuses on preserving and enhancing the natural environment, improving air quality, and promoting active lifestyles. It also encourages livable communities that support sustainability and economic vitality.
- *Mobility 2035* includes major policy objectives focusing on the regional needs, which exceed available revenues. The region cannot build its way out of congestion. There is a regional need to maximize the existing transportation system. Another policy objective is to use sustainable development strategies to reduce demand on the transportation system, to provide multimodal options, to emphasize the environmental aspects and quality of life issues of programs and projects, and to invest strategically in the infrastructure.
- Development of the *Mobility 2035* plan included a number of steps and activities. There were 12 public meetings held to introduce the planning process and three public meetings were held in the development of the plan goals and priorities. The next two steps were determining the funding scenarios and evaluating and developing policies, programs, and projects. There were three public meetings conducted as part of the program and project selection process and nine public meetings were held as part of the Regional Transportation Commission approval process. The final steps were approval by the Executive Board and U.S. DOT on the air quality conformity determination.
- *Mobility 2035* includes overall recommendations and funded recommendations for different transportation system elements. These elements include freeway, tollway, and HOV/managed lanes improvements, passenger rail improvements, and bicycle and pedestrian off-street facilities. The plan includes mobility performance indicators. These indicators include the number of jobs accessible

within 30 minutes by automobile, the number of jobs accessible within 60 minutes by transit, and congestion levels by traffic analysis zone (TAZ). Other indicators are average travel time and access to special generators, such as hospitals and universities.

- The plan also includes active transportation performance indicators. These indicators include bicycle and pedestrian accessibility to transit, major employers, and other major destinations; bicycle and pedestrian facility gaps and missing connections; and parks, open space, and bicycle and pedestrian infrastructure and amenities built in an effort to increase physical activity and improve the quality of life in the region. Other active transportation performance indicators are the number of local governments that are actively involved in bicycle and pedestrian facility planning, design, and implementation, and safety enhancements for bicyclists, pedestrians, and motorists through infrastructure improvements.
- Current and forecast traffic congestion levels were analyzed. Based on 2012 congestion levels, the annual cost of congestion is estimated at \$4.5 billion. The cost of congestion in 2035 is estimated at \$10.1 billion. The plan includes descriptions of major projects.
- In summary, *Mobility 2035* is developed around four goal themes. The goals and policies are reflected in the plan recommendations and the new direction of the MTP. Metrics are identified to measure the attainment of goals in *Mobility 2035* and future transportation plans. With limited financial resources, continually monitoring the performance of the transportation system is key to managing congestion. More information on *Mobility 2035* is available at www.nctcog.org/mobility2035.

Social Equity Impact Assessment

Marc Brenman, Social Justice Consultancy

Marc Brenman discussed social equity impact assessments. He described some of the basic elements of environmental and civil rights laws and provided a recent example of a social equity impact assessment. Marc covered the following topics in his presentation.

- Social equity has been defined by the National Academy of Public Administration as the fair, just, and equitable management of all institutions serving the public directly or by contract; the fair and equitable distribution of public services and the implementation of public policy; and the commitments to promote fairness, justice, and equity in the formation of public policy. Social equity impact assessments grew out of both civil rights and environmental law. It requires that the potential effects of plans and projects be examined in advance to avoid adverse impacts on minority and low-income groups. Typically, from the standpoint of civil rights law, the affected individuals or groups file a complaint against the funding agency to seek redress. The recipient of federal funding is then subject to an investigation.
- A social equity impact assessment was conducted on the Bay Area Rapid Transit (BART) a few years ago. BART was planning to extend the rail system from

downtown Oakland to the Oakland International Airport. Its initial plan was for direct service from the downtown area to the airport, with no intermediate stops. Low-income and minority neighborhoods would not be provided with service under this plan. A number of advocacy groups brought action against BART. These initial efforts failed. An administrative complaint was filed with the FTA, based on Title VI of the Civil Rights Act Administrative Complaint process. The complaint alleged that the extension would bypass several minority and low-income neighborhoods, and that BART had not conducted a social equity impact assessment before developing the plan. The FTA conducted an investigation and found that BART had discriminated against the minority and low-income groups. The FTA deferred \$70 million in federal stimulus funds as a result of the findings.

- There were no guidelines for conducting social equity impact assessments when the BART case was filed. A process was developed, with assistance from the Social Justice Consultancy, after the BART decision that was supported by the FTA and the U.S. Department of Justice Civil Rights Division. The process is that every study and review by a government agency or recipient of federal financial assistance needs to include the following elements:
 - A clear description of the planned project;
 - An analysis of the impacts on all populations;
 - An analysis of available alternatives;
 - The documented inclusion of minority and low-income populations in the study and decision-making processes; and
 - An implementation plan to address any concerns identified in the equity analysis.
- Social equity impact assessments are somewhat akin to environmental law, where the presence of an endangered species at a project site is found in advance and avoided. The focus in a social equity impact assessment is on endangered people. One of the ways environmental and civil rights laws have separated over the past few years is that there are more protections under the laws for endangered animals than for endangered humans. Conducting social equity impact assessments is a step in correcting this disparity between the two bodies of law.
- Several principles of social equity impact assessments can be identified. First, projects built by agencies receiving federal funding should serve people, not harm them. Second, some demographic groups have traditionally been discriminated against, and therefore, deserve a higher level of protection to avoid more harm. Third, a civil rights violation can be found by showing what the logical and foreseeable consequences would be from decisions taken by a recipient of federal financial assistance.
- The largest category of transportation disadvantaged individuals is those without personal vehicles. The aftermath of Hurricane Katrina brought home the fact that African-Americans own private vehicles at the lowest rate of any demographic group. An evaluation plan based on the use private vehicles would automatically

disadvantage African-Americans and other groups that own private vehicles at lower rates than Caucasians.

- Social equity impact assessments use a variety of tools to determine the logical and foreseeable consequences of a project on different groups. Simulation and modeling may be used. If the negative consequences from a project weigh more heavily on protected and disadvantaged communities, then the project should not be built or it should be changed to equalize the negative effects or shift them away from the potentially injured group. Under federal law, a protected class is a group of people who are protected from employment services or other discrimination by law. In the U.S., these groups include men and women on the basis of sex; any group that shares a common race, color, or national origin; people over 40 years of age; and people with mental or physical disabilities.
- The Social Justice Consultancy grew the requirements for a social equity impact assessment under Title VI of the Civil Rights Act, which prohibits discrimination on the basis of race, color, or national origin by recipients of federal financial assistance. Most agencies and contractors in public transportation, public housing, public education, and public health are recipients or sub-recipients of federal funding. The Clean Air Act (CAA), ADA, the National Environmental Policy Act (NEPA), and some state laws also contain equity provisions. Administrative complaints can be filed under the federal laws, and federal agencies are obligated to investigate and resolve these complaints. Law-suits may be filed in limited situations.
- The Environmental Justice Executive Order was also used in developing the social equity impact assessment. Environmental justice adds to the Title VI protection because it specifically includes low-income individuals. There are very few federal statutes that protect the rights of low-income individuals against discrimination. There are many service laws and benefits laws that cover low-income individuals, but there are very few laws that protect them from discrimination.
- The Social Justice Consultancy feels that social equity impact assessments are consistent with sustainable development. The following questions should be asked as part of a social equity impact analysis. Who will most likely be affected by the policy, plan, or proposal? What is known or understood about the areas of the community most likely to be affected? What will be the nature of the effects? Are the effects likely to be differentially distributed by socio-economic status, race, ethnicity, gender, geography, age, disability, or other factors? What is the evidence base for predicting the impacts? How likely and how severe will the impacts be? What are the risks involved and what are the benefits and burdens? How will the benefits and burdens be distributed in terms of dimensions of equity, accessibility, travel time, social and physical mobility, funding, safety, quality of life, and the cumulative and secondary impacts?
- Cumulative impacts are supposed to be examined under NEPA. Cumulative impacts occur both over geography and over time. Examining cumulative

impacts is important because some communities suffer more adverse impacts over longer periods of time.

- Social equity impact analyses may be thought of as dispute avoidance. It can be a preventative measure to address potential negative impacts before they occur. There is tension between the social equity view of doing the right thing and the desire to build projects quickly, especially under job creation and economic stimulus programs. There may also be tension within the EPA if permits that are granted under environmental law also meet the requirements of civil rights laws. HUD has recently established new guidelines on regional housing equity analyses, which have some similarities to social equity impact assessments.
- The social equity impact assessment concept is still developing. It is not yet a fully developed and accepted concept. As the country's population continues to change, transportation planners and decision makers should be sensitive to the needs of minority and low-income communities.

Transportation, Sustainability, and Urbanization

Jason Zheng, University of Connecticut

Jason Zheng discussed the Transportation Index for Sustainable Places (TISP) research project at the Center for Transportation and Livable Systems (CTLIS) at the University of Connecticut. He described the key elements of the project and future activities. Jason covered the following topics in his presentation.

- Transportation sustainability has been examined by the Canadian Centre for Sustainable Transport (CST), the Centre for Sustainable Transportation in France, the European Commission on Sustainable Development, and other organizations. The three elements typically associated with transportation sustainability are the environment, society, and the economy. The environment includes resource consumption, ecological systems, land use, and pollution. Society includes health and safety, community input, social equity, and accessibility. The economy includes affordability, efficient mobility, finance equity, and resiliency.
- The environmental elements can be further defined to include minimizing the consumption of renewable and non-renewable resources for transportation, and designing transportation and place-making systems to maximize land use efficiency. Other environmental elements are minimizing transportation and the place-making system's impact on ecological systems and limiting transportation-related wastes and pollution.
- The social elements can be further defined to include transportation that provides access, but is consistent with human health and safety, and planning and managing transportation that incorporates government and community input. Other social elements are transportation and place-making systems that promote social equity and meet the basic access needs of all individuals.
- The economic elements can be further defined to include transportation that is affordable for all individuals, that is financed in an equitable manner, and that

provides further efficient movement of people and goods for economic growth. A final economic element is transportation that is resilient to economic fluctuations.

- The World Commission on Environment and Development defined sustainable development in 1987 as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” The Principles of Equity by Graham Haughton defines sustainability as equity issues between groups of people. The Green & Brown Environmental Agendas defines sustainability with perspective for direct, indirect, short-term, and long-term issues. The triple foundation for sustainability includes the economy at the center surrounded by society and the environment.
- A number of economic elements and variables have been identified to further define sustainability at a statewide level. Examples of these elements include affordability for individuals defined as the percentage of household income spent on transportation, and equitable financing, defined as federal funding for transportation per capita. Other elements are the efficient movement for economic activity, defined as a change in ratio of gross domestic product (GDP) per VMT and the current ratio of GDP per VMT, and resiliency to economic fluctuations, defined as fuel expenditure as a percentage of GDP.
- These variables were examined at the state level. The percentage of household income spent on transportation measures the cost of vehicle ownership, vehicle use, and transit use compared to median household income. As an example, in New York 23 percent of household incomes are spent on transportation, compared to 44 percent in Mississippi, and 38 percent in Montana. Federal funding per capita is \$96 in Virginia, \$103 in California, \$111 in Nevada, \$333 in Montana, and \$612 in Alaska.
- Efficient mobility was examined by both the level of GDP per VMT and the growth rate of GDP per VMT. The current level of GDP per VMT ranges from \$6.90 in New York to \$1.60 in Mississippi. The growth in GDP per VMT ranges from +41 percent in Oregon to -17 percent in Mississippi. Resiliency, which was measured as fuel expenditure as a percent of GDP, ranged from 7 percent in Montana, Wyoming, and Mississippi to 3 percent in Delaware, Connecticut, and Massachusetts.
- The overall scores for the economic components of the TISP were combined. States with the best scores included Washington, California, New York, Massachusetts, Connecticut, New Jersey, Rhode Island, Delaware, and Maryland.
- Sustainability does not mean “no growth.” In this study, the higher scoring states generally exhibit lower VMT growth and greater GDP growth. For example, Oregon experienced an 8 percent growth in VMT from 1997 to 2007 and a 51 percent growth in GDP. Mississippi experienced a 37 percent growth in VMT and a 14 percent growth in GDP.
- Urbanization and mode share were also examined. Urbanization was assessed by density and by the percentage of the state’s population living in central cities, small towns, suburbs, and rural areas. States were rated in the four categories of

low density rural-suburban, low density mixed, medium density suburban, and high density suburban-urban.

- In conclusion, the performance of the transportation system goes beyond just the measurement of automobility. Urbanization is a factor in measuring the performance of the transportation system. Both rural states and urban states can be sustainable. In general, the analysis indicated that the most affordable, efficient, equitable, and resilient states are those that tend to be more urban and have more diverse transportation options.

On Modeling the Travel Behavior – GHG Emissions Linkage

Chandra Bhat, University of Texas at Austin

Chandra Bhat discussed GHG emissions and modeling travel behavior. He described the sources of transportation generated GHG emissions, possible mitigation strategies, and the use of advanced modeling techniques to estimate the impacts of different alternatives. He recognized the assistance of other researchers and colleagues in various projects. Chandra covered the following topics in his presentation.

- Energy-related activities account for about three-quarters of human-generated GHG emissions, mostly in the form of CO₂ emissions from burning fossil fuels. If measures are not taken to reduce carbon emissions, it has been estimated that the 5.9 million metric tons generated in 2006 will increase to 7.4 million metric tons by 2030.
- The transportation sector is one of the most rapidly increasing sources of GHG emissions. Overall, the transportation sector accounts for about one-third of all human generated GHG emissions. Transportation-sector related sources of GHG emissions include vehicular travel sources, life cycle transportation sources, non-road transportation mobile sources, and mobile air conditioning and refrigerated transport sources. On-road and non-road vehicles account for a substantial portion of GHG emissions. Household automobile dependency is an important contributor.
- There are a number of possible reduction and mitigation measures for GHG emissions. Examples of transportation-related GHG reduction measures include improved fuel economy, decreased carbon content of fuel, reduced growth in travel demand or vehicle travel, and reduced emissions from infrastructure.
- A number of factors are influencing improved fuel economy. These factors include enhanced vehicle technology for both operating systems and fuels, increased transportation system efficiency, improved traffic operations, and changes in vehicle purchasing and retirement decisions.
- A number of approaches are needed to help reduce the carbon content of fuel. Research, development, and commercialization on alternative fuel infrastructure and distribution is needed. Research examining trade-offs in cost, size, power, mileage, and other factors between alternative fuel vehicle types would be beneficial. Evaluating the impact of fueling station availability and other

infrastructure needs would also be of benefit. Forecasting the temporal rate of adoption and assessing the potential of government initiatives and policies represent other research needs. The use of tax incentives and adopting regional low carbon fuel standards would also help reduce carbon emissions. Conducting life cycle analyses to ensure sustainability of resources would also be of benefit.

- A number of strategies can be considered to reduce growth in travel demand. Examples of these strategies include changes in land-use patterns and provisions for alternative modes. Other strategies focus on changes in the availability and price of parking, employer initiatives to reduce commuting, and pricing strategies. Additionally, enhanced freight strategies including modal alternatives addressing freight bottlenecks, especially on intermodal connectors, reduced truck idling, and reduce empty backhauls may also be considered to reduce growth in GHG emissions.
- Activity-based models (ABM) can be used to help evaluate travel demand strategies and other options. Five pillars of ABM design have been identified. The first pillar is sensitivity to policy issues and planning applications of interest. Second, ABM design is based on sound behavioral theory. Third, ABM design is computationally feasible and tractable, both in terms of model estimation and model implementation. Fourth, it optimizes the use of available data now and in the future. Finally, ABM should be both an activity-based model and an agent-based model.
- ABM focuses on activities and travel distributed in a time-space continuum, recognizing time-space constraints affecting mode choice, destination choice, and activity-type choice. The role of time-space accessibility is critical to modeling activity generation processes and the ability to explicitly represent induced or suppressed demand. ABM addresses time-space interactions and agent or family member interactions.
- The activity purpose definition challenges the traditional notion of mandatory and discretionary activities and trip activities, such as movies, ball games, and children's tennis lessons or soccer games often have spatial and/or temporal fixity. Activities and trips are characterized by the level of spatial and temporal fixity/constraints, besides purpose. Activity attributes can be incorporated using concepts of time-space geography. There are automated methods to add attributes describing degrees of freedom according to a set of spatial/temporal fixity criteria to activity records in data set.
- The notion of time is central to ABM. There is an explicit modeling of activity durations (daily activity time allocation and individual episode duration). Time is treated as "continuous" and not as "discrete choice" blocks. There is evidence of increased availability of leisure time and increasing travel time expenditures. There appears to be a loosening of time, space, and monetary constraints and productivity efficiencies brought about by technology and specialized services. The models also reconcile activity durations with network travel durations.

- In summary, ABM should capture the central role of time and space in a continuum, explicitly recognizing constraints and interactions, and representing simultaneity in behavioral choice processes. ABM should also account for heterogeneity in behavioral decision hierarchies and incorporate feedback processes to facilitate integration with land use and network models.
- The Comprehensive Econometric Microsimulator for Urban Systems (CEMUS) provides one example of ABM. A graphical illustration can be developed of a non-worker multiple stop tour. A graphical illustration of travel density for the region over a 24-hour period can also be created. These maps illustrate the flow of people throughout the day.
- In conclusion, understanding the effects of GHG emissions to develop successful reduction and mitigation measures requires extensive data and advanced data analysis techniques. For example, models integrating household vehicle ownership, vehicle type, and vehicle usage decisions are needed. These models would help to understand the decision makers' behaviors regarding the shift from small automobiles to larger vehicles and to develop reliable policy initiatives to reduce GHG emissions by encouraging fuel-efficient vehicle usage.

Breakout Session 6 – Livable Communities and Transit Performance Measures

Kartik Sribarra, Rails-to-Trails Conservancy, presiding

FasTracks Quality of Life Study: Measuring the Effects of Implementing Rapid Transit *Genevieve Hutchison, Regional Transit District, Denver, Colorado*

Genevieve Hutchison discussed the Denver Regional Transportation District's (RTD) Quality of Life (QoL) Study. She summarized the services operated by the RTD and the projects included in the FasTracks Program. She described the background and purpose, study scope, reporting, and example measures in the QoL study. Genevieve covered the following points in her presentation.

- The RTD operates public transit in eight counties in the Denver Metropolitan area. The RTD covers a 2,300-square mile service area. The RTD is funded by sales and use taxes. The RTD is governed by a 15-member Board of Directors. The RTD operates a family of services, including 35 miles of light rail transit (LRT) and 150 bus routes, to meet the diverse needs of the region.
- Voters in the Denver region approved a 0.4 percent tax increase to fund expansion of the regional transit system in 2004. The FasTracks program includes 122 miles of new commuter rail and LRT, 18 miles of bus rapid transit (BRT), 21,000 new parking spaces at rail and bus stations, and enhanced bus service to facilitate bus and rail transfers across the eight-county district.
- The RTD Board adopted three core goals for the FasTracks program as part of the 2004 *FasTracks Plan*. These three goals were to balance transit needs with future regional growth, to increase transit mode share during peak travel times, and to provide improved transportation choices and options. The plan also outlined the anticipated benefits to the region from the FasTracks projects. As part of the planning process, there was interest to ensure that these goals were being met and the anticipated benefits were being realized from the projects.
- The QoL study is a multiyear monitoring program. The primary goal of the program is to objectively track and measure how the region changes as the FasTracks program is planned, constructed, and operated. The study also serves to fulfill the before-and-after study data requirements for corridors receiving federal New Starts funding.
- The study objectives are matched to three FasTracks goals. Study objectives associated with the FasTracks goal of establishing a proactive plan that balances transit needs with future regional growth include meeting future transportation needs, providing opportunities for development near transit, and environmental sustainability. Study objectives linked to the FasTracks goal of increasing transit mode share at peak times are transit usage, travel safety and security, and customer satisfaction. The study objectives associated with the FasTracks goal of improving transportation choices and options are system mobility and travel

choices and accessibility. There are multiple QoL study indicators and measures associated with each objective.

- The QoL study measures the effects of the FasTracks program at three geographic levels – the region, rapid transit corridors, and rapid transit station areas. Only representative stations are used for the station area data collection.
- A number of reports are being prepared as part of the QoL study. The first detailed report was completed in 2006. It established a baseline of data for the full set of 70 measures. Detailed reports are issued every three-to-five years. High level measures reports are issued annually between detailed reports. These reports provide updates on a subset of 11 measures.
- The system mobility objective of the FasTracks program includes measures related to travel times and trip time variability. One measure related to corridor travel times is the travel time to reach downtown Denver during the morning peak period. Automobile travel time has increased in both the southeast corridor and the southwest corridor, while transit travel time decreased in both corridors. The southeast corridor LRT improved transit travel in the southern I-25 corridor by reducing travel time by 15 minutes.
- The travel choices and accessibility objective includes measures related to transit access, land use, and destination access. The transit access measures focuses on the population within walking distance of representative stations, which was defined as a ½-mile walkshed versus a ½-mile radius. Further, walkable streets were defined to include all roadways except limited access freeways.
- The land use measure focuses on transit-supportive zoning changes around existing and future rapid transit station areas that increase densities and encourage mixed-use development. Zoning changes were implemented in 2006 and 2007 around 10 stations. The zoning was changed around the Louisville station in 2008. There were no transit-supportive zoning changes in 2009.
- The regional destinations served by the high-frequency transit measure focused on high-frequency transit service areas defined as a ½ mile radius of rail stations and a ¼ mile radius of bus stops with 15-minute or better peak and off-peak headways. Currently, 30 percent of Denver’s regional destinations are served by high-frequency transit, compared to 25 percent prior to opening of the Southeast corridor LRT.
- There have been both challenges and opportunities in conducting different elements of the QoL study and long-term performance monitoring program. In using new data sources and methodologies, it is important to decide when to change or remain consistent. Maintaining objectivity is important, as is understanding the difference between correlation and causation. Finally, considering transferability to other projects is important, including data availability and use of different methodologies.

Smart Mobility for Sustainable Communities

Kim Slaughter, Metropolitan Transit Authority of Harris County, Houston, Texas

Kim Slaughter discussed the new focus at the Metropolitan Transit Authority of Harris County (Houston METRO). She described the background to the new focus on sustainability, the services and programs provided by METRO, and key policy development elements. Kim covered the following topics in her presentation.

- METRO recently went through a change in both the Board and President. The Mayor of Houston is limited to serving only two terms. A new Mayor was elected in 2009 and took office in 2010. The Mayor appointed new Board members, including a new Chair, and a new President/Chief Executive Officer. The City of Houston appoints five of the nine METRO Board members. There were also changes in other Board positions at the same time.
- The new METRO has a focus on sustainability. Key elements in the new approach include people, customer service, and partnering with other agencies and groups. Cost control, asset utilization, and safety are also key components.
- METRO provides a range of transit services, travel demand management programs, and freeway assistance activities. METRO operates local bus routes, park-and-ride routes, and commuter routes. Bike racks are available on buses. An initial LRT line, METRORail, is in operation, and more lines are being planned. METROLift is the specialized paratransit service. METRO, in cooperation with TxDOT, operates high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes on the major freeways. METRO Star is a vanpool programs. The Motorist Assistance Program (MAP) is operated on the major freeways, in cooperation with the Harris County Sheriff's Department. METRO also has its own police force and is a partner in TranStar, the regional traffic management center.
- METRO has three strategic priorities. These priorities are to be a trusted community partner, to provide a great transit infrastructure, and to operate first-class transit services.
- METRO is also pursuing key policy development elements related to sustainable communities. Enhancing the environment is one of these key policy elements. Environmental elements METRO is pursuing include TODs, developing a complete transit network, and providing technical assistance on regional initiatives focused on enhancing the environment.
- The economy represents a second policy element. METRO is focusing on playing an ever increasing role in the region's economy by maintaining and improving access to jobs, reducing travel times, expanding mobility options, and establishing the economic value of transit.

- Cost represents a third policy element. To maintain costs, METRO is implementing only what can be maintained. METRO is also focusing on non-traditional funding sources and partnerships, as well as leveraging federal funds.
- Components of a vibrant Houston region include sustainable communities, economic opportunities, and reliable transportation. METRO participates in key partnerships and coordinated planning efforts to support sustainable community initiatives.
- Performance measures drive sustainability. Transit's role in supporting sustainability can focus on at least three areas. From a design and capital construction perspective, transit can make facilities as green as possible. From an operations standpoint, transit can reduce hazardous waste and pollution and increase energy efficiency. From a service design perspective, transit can encourage land use and TOD to increase public transit ridership.
- METRO uses performance measures in a number of ways. Performance measures are used to determine service productivity and assess future services and facilities. Performance measures are also used to track facility and vehicle conditions and the state of good repair. Performance measures are used to assess project short- and long-term financial needs. Finally, performance measures are used to ensure METRO is meeting the needs of customers, including language requirements, signage, and transit dependence.
- In summary, at METRO sustainable policies plus performance measures equal smart mobility, sustainable communities, and a growing economy.

Using Integrated Data to Measure Performance at TriMet

David Crout, Tri-County Metropolitan Transportation District of Oregon

David Crout discussed the use of performance measures at the Tri-County Metropolitan Transportation District of Oregon (TriMet). He described the services provided by Portland TriMet, the performance measures used with the public and other stakeholders, and the performance measures used for internal management. David covered the following topics in his presentation.

- The TriMet service area population is approximately 1.5 million. TriMet operates 100 bus routes, four LRT lines, and one commuter rail line. In FY 2011 ridership was approximately 100 million. Bus ridership was 58.5 million, LRT ridership was 41.2 million, and commuter rail ridership was 370,000. Tri-Met owns 650 buses, 127 light rail vehicles (LRVs), three diesel multiple units (DMUs), and two rail diesel cars (RDCs).
- TriMet performance measures integrate data from a variety of sources. These sources include automatic vehicle location (AVL) system and automatic passenger counters (APCs) to collect ridership and on-time performance data. The TriMet Human Resources Department tracks attendance and hours worked. Financial data includes the budget, fare revenue, and operating costs. Maintenance data includes mechanical failures, scheduled maintenance, and use

of the ticket vending machine (TVM). Operations data includes the extraboard for drivers and bus pullouts. Safety data includes incidents and collisions. Customer Service data includes complaints and other input received from riders.

- TriMet uses a performance dashboard to provide key information to stakeholders and the public. The dashboard is available on the TriMet webpage at <http://www.trimet.org/about/dashboard.htm>. Performance measures related to ridership, efficiency, the budget, and safety are presented.
- The internal performance measures provide much more detail on TriMet operations. A wide range of operations and maintenance performance measures are reported on a monthly basis. The monthly target, and data on the current month, the previous month, the month the year before, and the year-to-date are presented in table format. Examples of data include on-time performance for all transit modes, accidents per 100,000 miles, and bus missed pullouts.
- TriMet also has an internal performance dashboard. The operations dashboard includes daily and weekly key performance measures. Examples of measures include bus and MAX light rail on-time performance, bus and MAX mechanical incidents resulting in lost service, and fixed route bus and MAX accidents. Measures are presented in table and graphic formats. Weekday route level on-time performance is reported by garage. Other examples include the daily total vehicle miles reliability report, the daily fixed route bus accident report, the operator absentee report, and daily MAX trips above achievable capacity, and the MAX headway performance report.
- There are also other examples of integrated performance reports. These examples include operator speeds to peers report sorted by safety-related complaints, and center bi-weekly operations report by badge and operator, which tracks attendance, on-time performance, and incidents.
- TriMet is working to expand the external performance dashboard to include more measures. This expansion will also facilitate public access to data. Another activity is increasing the use of internal measures among departments and seeking to institutionalize them. TriMet is also working with internal stakeholders to adjust performance goals and make them realistic.

More than Lines on a Map: How Capital Metro is Using Performance Measurement to Shape Transit Service

Todd Hemingson, Capital Area Metropolitan Transportation Authority, Austin, Texas

Todd Hemingson discussed the development and use of transit service guidelines and standards at the Capital Metropolitan Transportation Authority (Capital Metro) in Austin. He described an application of the guidelines in planning and evaluating transit service in the area. Todd covered the following topics in his presentation.

- Guidelines for initiating and operating transit routes and transit services are important for a number of reasons. Guidelines and standards help connect the appropriate types of transit services with land uses, development patterns, and

population and employment densities. Guidelines enhance agency transparency, support good governance, and demonstrate financial responsibility. Transit service guidelines also provide quantitative tools to help transit boards make fully-informed decisions.

- The process to develop service guidelines and standards at Capital Metro was initiated in 2009. The goal was to take informal guidelines used by staff and evolve them into a formal guidelines and standards document. The first edition was approved by the Capital Metro Executive Team and the Board of Directors in June 2009. A biennial review and update process was also established. A revised version is pending review and approval by the Executive Team and the Board.
- The Capital Metro service guidelines provide a framework for the provision, design, and allocation of service. They incorporate transit service planning factors including residential and employment density, land uses, activity centers, street characteristics, and demographics. The design criteria include defining service attributes such as route directness, the span of service, service frequency, stop spacing, and passenger amenities. The service guidelines are to be used with some flexibility, realizing that there may be unique situations and characteristics.
- The service guidelines and standards are used in a number of different ways at Capital Metro. They helped shape the comprehensive operational analysis, which resulted in *ServicePlan 2020*, the service operations plan for 2030. The guidelines are used to add service and to remove and reallocate service. They serve as a basis for reporting on the status of routes and services to the Board.
- The service guidelines and standards are complementary to the market analysis and market segmentation analysis conducted by Metro. Mode choice analysis and market segmentation help to understand customers. Origin-destination volumes and other travel market conditions help to understand markets. Service planning tools and the transit competitive index are used to identify transit competitive position, which feeds into service planning.
- An example of using the service guidelines and standards for examining a route realignment needed to improve productivity was presented. The example also evaluated urban form, pedestrian activity, ridership by stop and by time of day. The routes in the area were restructured to better service the major population clusters. The net effect of the study was positive.

Breakout Session 7 – Access to Destinations Performance Measures

Gina Baas, Center for Transportation Studies, University of Minnesota, presiding

An Open-Source Approach to Calculating Accessibility

Mike McGurrin, Noblis, Inc.

Mike McGurrin discussed the use of open government data and open-source software to develop simple low-cost analysis tools and visualization techniques. He described examples using available data, challenges, and future opportunities. Mike covered the following topics in his presentation.

- The movement of people and goods by different elements of the transportation system is a means to an end, not an end in and of itself. The transportation system supplies goods or services, providing access to jobs, and allows families to reach vacation destinations. Accessibility metrics measure the ease of reaching the desired destinations. They measure transportation outcomes, rather than intermediate performance or problems. Accessibility metrics have been recommended by multiple organizations. Accessibility metrics should be rigorous, quantifiable, transparent, and understandable. They have previously been difficult to analyze.
- A new approach to analyzing accessibility is to utilize the growing set of open government data and open-source software to develop simple low-cost analysis tools and visualizations. A data appender and/or visualization tools can be used as stand-alone techniques to visualize results. Input is simple using XML-based files.
- One example of using this approach is the on-time performance (OTP) travel times, which are calculated using data from the Washington Metropolitan Area Transit Authority (WMATA). Comparison of OTP travel times with the WMATA trip planner indicates similar results. Visualization tools and techniques can also be used to display data available from public agencies and other open sources.
- One challenge with the use of existing tools and data is the long run times needed on a single processor. For example, it can take two days to run 250,000 trip calculations in 500 regions. Potential solutions to this challenge include separating out the walk time calculations to avoid a huge duplicative effort. It also greatly simplifies the remaining graph and travel time analysis. Parallel processing represents another possible solution, as the problem is ideally suited for splitting over multiple processors.
- Another challenge is that many agencies do not publish transit schedules in General Transit Feed Specification (GTFS) format. For example, WMATA, Arlington County, and the DC Connector do publish transit schedules in a GTFS format, but Fairfax and Loudon Counties do not. Some GTFS formats may be available upon special request, however. It is labor intensive, but it is possible to create schedules in the GTFS format from other formats.

- An additional challenge is that there is no open data on automobile travel times. The development of connected vehicles offers a potential opportunity for anonymous, crowd-sourced open travel time data. If this data becomes available it would open up traveler information applications in the same way that the GTFS opened up transit information applications.
- In conclusion, new approaches using open government data and open-source software can reduce the investment costs and level of effort required to conduct such analyses. There is still a dependence on having the necessary data, however. Further work is needed to reduce run-times for large networks. Tools are available to provide easily used and understood visualizations to communicate results. The source code is available as an open-source code at Open Source Accessibility Toolkit (OSAT): <https://github.com/Noblis/OSAT>. The source code, example data, sample outputs, and documentation are available.

Access to Destinations: Methods, Findings, and Implications

Michael Iacono, University of Minnesota

Michael Iacono discussed a major study examining access to destinations in the Minneapolis-St. Paul metropolitan area. He described the study objectives, the process, and findings. Michael covered the following topics in this presentation.

- Accessibility is a measure that relates the transportation network to the pattern of activities that comprise land use. It measures the ease of reaching valued destinations. It has been suggested that accessibility may be the most important concept in defining and explaining regional form and function.
- The objectives of the access to destinations project included improving the understanding of travel on the current transportation infrastructure, developing measures of accessibility using travel and land use data, and examining how accessibility has changed from 1995 to 2005. An additional objective was using these new tools and information to assess how the existing transportation and land use system meets alternative policy goals.
- The access to destinations project was sponsored by the Minnesota Department of Transportation (MnDOT), Hennepin County, the Metropolitan Council, and the McKnight Foundation. Numerous faculty and researchers at the University of Minnesota and the University of Colorado were involved in the project.
- Accessibility can be generalized as more modes, more destinations, and more opportunities. The ability to reach jobs, schools, parks, shopping, and other destinations by automobile, transit, bicycling, and walking can also be measured or modeled.
- Public meetings were held to help obtain input on possible accessibility performance measures. Existing literature suggests that accessibility performance measures should be clear, comprehensive, cumulative, comparable, and calculable. For example, accessibility can be thought of as cumulative opportunities. Accessibility can be defined by the number of jobs, workers, or

other destinations, that can be reached in different lengths of time by different modes during different times of the day.

- A number of different data sources were used in the analysis. These sources focused on travel time information, the number of workers, the number of jobs, and origin and destination data. Data from the U.S. Census, the Metropolitan Council, the Center for Urban and Regional Affairs at the University of Minnesota, the State of Minnesota, and MnDOT were used in the study. The analysis highlighted that modeling accessibility is relatively straight-forward, but measuring accessibility is more difficult.
- Travel time data for the Minneapolis-St. Paul metropolitan area freeway network was generated using the system of embedded speed and volume sensors. The resulting speeds were displayed graphically on maps of the metropolitan area.
- The arterial travel time estimation process used in the study included a number of steps. The first step was to assign an origin/destination matrix using SUE assignment. The second step was to correct flows according to observed Automatic Traffic Recording (ATR) station counts, where available. The third step was to apply corrections based on covariance of links without ATR stations to links with ATR stations. The fourth step was to use the link performance function to estimate travel time based on corrected flows. Obtaining travel speed data on freeways and arterials will be easier in the future due to vehicles equipped with global positioning satellite (GPS) devices. An initial analysis of mean speed estimates from GPS data was conducted as part of the study.
- The study also examined if accessibility in the metropolitan area was increasing or decreasing over time. This analysis examined the change from 1995 to 2005 in the number of jobs accessible from origin traffic analysis zones by automobiles in 10 minutes, 20 minutes, and 30 minutes during the morning peak hour. The analysis indicates that accessibility may be decreasing for short trips due to congestion, but increasing for long trips where land use outweighs congestion.
- Access to jobs by other modes, including transit, walking, and bicycling was examined in the study. The number of jobs accessible within 20 minutes by these modes were estimated and presented graphically.
- The difference between accessibility and congestion was also examined. The delay per passenger during the morning peak period for the metropolitan area from the TTI Urban Mobility Report increased from 19 hours in 1990 to 43 hours in 2000. Accessibility to residents from downtown Minneapolis increased by approximately 15 percent between 1990 and 2000, however.
- Possible policy implications were examined as part of the study. For example, alternative goals focusing on accessibility were identified. These goals included maximizing overall regional accessibility, maximizing accessibility for those who are least advantaged, and ensuring choices.
- Access is a publicly or socially provided benefit to private landowners. The study examined the potential to capture this value to finance infrastructure which

creates access. This analysis is documented in the *Value Capture for Transportation Finance: Technical Research Report*.

- Additional information on the Access to Destinations research project is available at <http://cts.umn.edu/access-study/> and <http://nexus.umn.edu>.

Impact of Light Rail Implementation on Labor Markets Accessibility: A Transportation Equity Perspective

Andrew Guthrie, Humphrey School of Public Affairs, University of Minnesota

Andrew Guthrie discussed a study examining the impact of the new Hiawatha LRT line in the Minneapolis-St. Paul metropolitan area on labor market accessibility. He described the Hiawatha LRT line, the study findings, and possible policy implications. Andrew covered the following topics in his presentation.

- The study examined the locations of low-wage workers and jobs relative to LRT and bus connections to assess if a spatial mismatch exists. The study included a before-and-after comparison using 2002-2006 Longitudinal Employer-Household Dynamics (LEHD) data. The general residence locations of low-wage workers and employment sites of low-wage workers were identified and presented geographically.
- Accessibility was defined as the total number of low-wage jobs reachable within 30 minutes of travel by transit. The study area was the transit service area. The LEHD 2002-2006 database was used in the analysis. Overall, the accessibility for low-income jobs within 30 minutes improved after the Hiawatha LRT line opened.
- The Hiawatha LRT line runs from the Mall of America to downtown Minneapolis. The line serves the Minneapolis-St. Paul International Airport, the Veterans Administration Hospital complex, the Metrodome, and other destinations in the corridor. The line is 12 miles in length and includes 17 stations. Connecting bus routes are provided at many stations. The Hiawatha line, which opened in 2004, is the first LRT line in the Minneapolis-St. Paul metropolitan area.
- The analysis also examined transit area types, including station areas, connection areas, and regular transit-served areas. Connection areas provide direct bus-LRT connections, with LRT reachable within 30 minutes. Approximately 22 percent of all the metropolitan area population lives within connected areas.
- Changes in low-wage job accessibility across the different areas were examined by different time periods. Accessibility improved the most in the station areas for all time periods. Improvements in accessibility were also realized in the connected areas, and to a lesser extent in the regular service area. The accessibility changes during the morning peak hours from 7:00 a.m. to 8:00 a.m. were examined in more detail. The results were displayed graphically, illustrating the improvement in station areas and connecting areas.

- An analysis of before-and-after commuter flows was also conducted. This analysis estimated changes in the home-to-work flow volume. This analysis indicated that increased accessibility does not necessarily result in actual gains in low-income commuter flows. The job accessibility of a neighborhood or the number of job opportunities reachable by workers living in the neighborhood influences the actual results. For increased accessibility to equal actual gains, workers living in the station and connection areas commute to jobs in the station and connection areas. The workers moving in and the jobs moving in to the downtown areas, north Hiawatha Station areas, south Hiawatha Station areas, and suburban areas were examined. The downtown station areas had the highest number of jobs moving in and the north Hiawatha Station areas had the highest number of workers moving in.
- The research identified a number of potential policy implications from the analysis, including those providing positive evidence of LRT's role in promoting social equity. One policy implication is that the Hiawatha lines impact is regional in scale. A second policy implication is that transit system integration and coordination is essential to improving accessibility. A third policy implication is that low-wage workers and employers are able to take advantage of LRT, at least in the context of the Hiawatha line. A fourth policy implication associated with land use planning is that balancing jobs and housing can be accommodated at a corridor level, as well as at the site and station levels.

Accessibility Ratings

Anna Gartsman and Jessica Casey, Dukakis Center for Urban and Regional Policy, Northeastern University

Anna Gartsman and Jessica Casey discussed a study developing and applying accessibility ratings to municipalities in Massachusetts. They described the study methodology, the objectives, the initial analysis, and future activities. Anna and Jessica covered the following topics in their presentation.

- Destinations were examined in the study instead of origins for a number of reasons. First, examining destinations provides a market analysis approach to amenities, but adds a transportation focus. Second, it allows for the measurement of the number of people who have access to goods and services in each town, instead of how many goods and services that people can access. The approach can also translate into municipalities altering land use adoption and regulatory control. For example, goods and services can easily be relocated or located to increase coverage and market share, while residential land use can be increased around existing town centers and other highly active regions to increase coverage and accessibility.
- The research focused on a number of objectives. These objectives included conducting Massachusetts-based research, without LEHD data, opening up the spectrum of destinations beyond jobs, and developing a performance metric for multiple modes of transportation over a diverse geography. Other objectives included developing a performance metric for aggregating accessibility scores to

rank cities and towns in Massachusetts and approaching transportation questions with a severe limitation in data accessibility, without using too many assumptions.

- Some of the limitations encountered with the research included the lack of available updated data and the lack of LEHD data for some areas. Creative solutions and improvised measures were used to address these limitations.
- Aspects of accessibility include individuals and groups, modes, and activities. These aspects can be thought of as three overlapping circles. The analysis focuses on the State of Massachusetts. The 2000 population of the state was approximately 6.3 million. There are 205 colleges and universities in the state, and 82 hospitals and community health centers (CHCs). There are also 285 transit and commuter rail stops.
- A 250 m² grid file was used for developing the coverage measure. The proportion of the total population in each town covered in the accessibility buffer was calculated by mode for each unique activity. Only the relevant population is considered in each step of the analysis. For hospitals and transit, the total population is considered. For schools, the population between 5 and 18 years of age is considered. For higher education institutes, the population over 18 years of age is considered. Accessibility buffers cross over town boundaries, and the accessibility of surrounding towns increases, even if the activity is not directly located within the boundary.
- The service area analysis measures accessibility based on the location of destinations. It allows for the measurement of the access residents have to a particular activity. Attractiveness is addressed by weighing the amenities. Individuals have a number of choices in hospitals, while schools have equal weights. Individuals have a number of choices for higher education. Commuter and transit are based on frequency during the day.
- Travel times and speeds were estimated for the different modes. Walking uses a 10 minute buffer, assuming 3 mph walking speed, while avoiding highways. Biking uses a 10 minute buffer, assuming 10 mph biking speed, while avoiding highways. Driving uses a 10 minute buffer and incorporating various speed limits based on the road classification.
- The Weighted Cumulative Coverage was calculated using the following formula:

$$\mathcal{A}_{(D,M)} = \alpha_D \sum_{i=1}^I \beta_d * \frac{p}{P}$$

$\mathcal{A}_{(D,M)}$ Accessibility of a type of Destination (e.g. schools) in a given Municipality

β_d Binary threshold for accessibility (10 minute buffer)

α_D Attractiveness/quality of destination type in the town

$\frac{p}{P}$ Population within the accessible threshold compared to total population in the municipality

Summed over each instance (i) of a destination in the municipality, and calculated for each type of destination and each travel mode for each town

- The overall rank was determined using the following formula:

$$\mathcal{R}_{(M)} = \sum_{D=1}^n \frac{\mathcal{A}_{(D,M)}}{\mathcal{A}_{(D)}}$$

$\mathcal{R}_{(M)}$ A municipality's general measure/rank of accessibility

$\mathcal{A}_{(D,M)}$ A municipality's share of the total accessibility to destination type, summed over all destination types, calculated by travel mode

$\mathcal{A}_{(D)}$ Each municipality ends up with three rankings – accessibility by walking, accessibility by biking, and accessibility by driving

- The weighted cumulative coverage and the overall rank were calculated for cities in the state. Three cities – Boston, Weston, and Pittsfield were compared initially. The results indicated that Boston has an overall rank of 2.79 for driving to destinations, compared to .83 for Weston and .37 for Pittsfield. Boston had an overall rank of 3.46 for walking to destinations, compared to .21 for Weston and .32 for Pittsfield. Boston had an overall rank of 3.1 for bicycling to destinations, compared to .51 for Weston and .39 for Pittsfield.

- Next steps in the study include expanding the approach to all of Massachusetts to establish a state average and to compare all municipalities. Another step is to account for an overlay of activities, such as schools and hospitals that are both accessible by the same population. Adding transit as a mode in addition to destination represents another future activity. Establishing alternate and additional measures of attractiveness is still another future step.

Breakout Session 8 – Freight, Economic Development, and Return on Investment Livability Performance Measures

John Elias, U.S. Department of Transportation, presiding

Freight, Economic, and Global Competitiveness Performance Measures

Katherine Turnbull, Texas Transportation Institute

Katie Turnbull discussed freight, economic, and global competitiveness performance measures and livable communities. She described challenges and opportunities, and highlighted examples of performance measures associated with freight, economic development, and global competitiveness from MPOs, state departments of transportation, and transit agencies throughout the country. She noted that the information presented was from research sponsored by TTI's Southwest Region University Transportation Center (SWUTC). Katie covered the following topics in her presentation.

- A literature review examined reports, plans, and websites for MPOs, state departments of transportation, transit agencies, federal agencies, and cities and counties. Information from economic development groups, port and airport authorities, and recent conferences and workshops was also reviewed.
- The use of performance measures in transportation has traditionally focused on pavement condition, safety, and congestion. Performance measures related to freight, goods movement, economic development, and global competitiveness are not as common and have been more difficult to address. Adding consideration of livable communities to performance measures on these topics is even more challenging.
- Goals currently in use by state departments of transportation and MPOs often focus on increasing mobility options for people and goods or providing for the efficient movement of people and goods. Objectives related to these goals address travel time, trip-time reliability, and access. Performance measures related to the travel time objective focus on a reduction in actual travel times, increases in travel speeds, and improvements in the travel time index and the fluidity index. Reliability performance measures address reductions in delay and improvements in the planning time index. Examples of access performance measures are providing appropriate access rates and increasing the number of destinations. Thus, truck freight performance measures are often grouped with those for all vehicles.
- The goals and objectives in recent long-range plans of many MPOs and state departments of transportation are broader in scope than previous plans. Transportation is viewed in a supportive role as a means to an end, not as the end in and of itself. Transportation goals are also linked to housing, health, land use, and economic goals.
- Examples of goals and objectives from recent plans include promoting places to live with easy access to jobs and services, identifying innovative approaches to economic recovery and long-term prosperity, and expanding connections to the

global economy. Other goals and objectives address increasing gross regional product (GRP) and improving tourist access and the movement of visitors.

- Economic viability goals focus on transportation costs. Performance measures may address affordability, such as the housing plus transportation (H+T) index. Other performance measures focus on providing transportation options, improving access to jobs and education, and reducing time wasted in congested traffic.
- Examples of environmental and human health goals and performance measures address reducing emissions from trucks, rail, and ships and increasing the number of clean locomotives and trucks. Other related goals and objectives focus on off-peak travel and new facilities.
- Examples of economic growth goals address businesses, jobs, and education. Performance measures in use track the number of new businesses, especially in targeted industries, businesses retention, and business termination. Other performance measures focus on new jobs, total jobs, and access to education.
- Goals related to economic growth from increasing trade are also in use. Performance measures associated with these goals focus on increasing air freight cargo, water freight cargo, rail freight cargo, intermodal connections, and international trade.
- The interest in livable communities provides opportunities for transportation professionals to take leadership role in advancing goals and performance measures related to freight, economic development, and economic competitiveness. Expanded coordination and cooperation is needed, as the involvement of more agencies and the private sector is needed. Addressing these topics is more complex and additional data will be needed for performance measures. Transportation can and should play a key role in making communities more livable and enhancing freight, economic development, and global competitiveness.

Using Performance Measures/Indicators to Calculate the Triple Bottom Line

Leigh Lane, Center for Transportation and the Environment, North Carolina State University

Leigh Lane discussed two current research projects examining sustainable return on investment (ROI) tools and place-specific sustainability indicators. One study is the North Carolina Department of Transportation's (NCDOT) Sustainability Blueprint and the second project is Sustainable ROI: FHWA Sustainable Highways. Leigh provided the background for both research projects, presented preliminary findings, and discussed challenges and opportunities. Leigh covered the following topics in her presentation.

- The conceptual framework for sustainability used in both projects focuses on interaction of social, environmental, and economic factors. Social elements include equity, human health, community livability, cultural and historic values, and public involvement. Environmental elements include pollution emissions, climate change, biodiversity, habitat preservation, and aesthetics. Economic

elements include productivity, business activity, employment, tax burden, and trade.

- The NCDOT Sustainability Blueprint projects focuses on ascertaining if sustainable practices are justifiable. The project is also examining indicators of sustainability for use as performance measures.
- The ROI database organization includes a categorization of research findings. A searchable database is being developed. It is organized into descriptive fields addressing scale, sub-type of sustainability, type of measurement, and focus of tool. Other descriptive fields include the applicable project types, the immediate applicability to transportation ROI, the transportation decision-making phase, and the methodology.
- The assessment of existing tools examined the type of measurement, the focus of the tool, the methodology, and the application of project types. Other factors examined included the scale, the transportation decision-making phase, and the sub-type of sustainability. The potential for immediate application to transportation ROI was identified.
- The Sustainable Highways Project Development Credits provides one example of an available tool. Projects are given points based on 20 factors, which include educational outreach, habitat restoration, freight mobility, bicycle access, and low-emitting materials. Other factors are long-life pavement design, energy efficient lighting, and construction equipment emissions reduction, noise mitigation, and quality control plans. Projects receive a bronze, silver, gold, or platinum rating depending on the total number of points. The Commute Solutions on-line calculator to determine an individuals' true cost of driving provides a different approach.
- The case studies were examined using HDR's Sustainable Return on Investment (SROI). The project's cash impacts, internal non-cash benefits, and external costs and benefits are used to develop the financial return, financial and internal, and SROI.
- Opportunities associated with developing and applying SROI include providing long-term returns, identifying cascading benefits, and justifying sustainable practices. For example, first-order, second-order, and third-order transportation benefits may be identified. First-order benefits include cost reductions on current freight miles, reduced transit times, and increased reliability. Second-order benefits include firms improving logistics, firms serving a larger market and output increases, and freight miles increase. Third-order benefits include improved products and new products. The economies of transportation investments include efficient transportation infrastructure investment, reduced transportation costs, enhanced productivity, and economic growth.
- Challenges associated with SROI include differentiating and addressing causal and correlated connections, data needs, and messaging. Establishing a means to link indicators to ROI tools represents another challenge.

- Sustainable transportation indicators and ROI overlap. Indicators and tools are conceptually linked. An indicator database could help determine the tools to use. Indicators can be generated from ROI tool outputs. Tools can be improved with a better set of indicators to provide guidance.
- The importance of place is evident in examining sustainable transportation indicators, performance measures, and SROI. Place-type indicators might include intersection density, patent density, average lot size, and the ratio of building value to land value. These indicators relate to the built environment, economic functions, and development sustainability.
- There are also interrelationships between the various indicators. For example, lower speed limits, better enforcement, traffic calming, and public education may all help reduce speed on roadways. Changes in speed may influence air pollution, physical activity, noise, and the numbers and severity of collisions.
- Next steps in the study include organizing the tools for use in different phases of the transportation decision-making process and identifying useful and readily available data sources. Research on causal links will also be undertaken. A culture change may be needed in some organizations to use these tools and to move to non-traditional measures for decision making.

Using Performance Measures to Improve Parking Policies and Livability

Valerie Knepper, San Francisco Bay Area Metropolitan Transportation Commission

Valerie Knepper discussed the development and use of parking policies at the MTC in the San Francisco Bay Area. She described the MTC's sustainable community strategy target, parking strategies to support smart growth, and analyzing parking structure proposals. Valerie covered the following topics in her presentation.

- The San Francisco Bay area includes 7 million residents and 4 million jobs. There are nine counties and 101 cities in the region. There are also 26 public transit operators and five regional agencies.
- The sprawl development patterns in many parts of the region have led to a disinvestment in the urban core. The urban core is characterized by stagnant household and employment growth, declining real estate values and tax revenues, deteriorating public infrastructure, and higher infrastructure costs and lower revenue per acre.
- Over 120 priority development areas have been identified in over 60 jurisdictions. Approximately 425,000 new housing units are planned by 2035 in these areas, which represent 3 percent of the region's land area and 55 percent of projected regional growth.
- California Senate Bill (SB) 375 requires reducing GHG emissions from automobiles and trucks by 15 percent per capita by 2035. Aligning transportation, housing growth, and land use planning is key to meeting this target.

- The MTC’s sustainable community strategy targets include climate protection, adequate housing, healthy and safe communities, and open space and agricultural protection. Other strategy targets are equitable access, economic vitality, transportation system effectiveness, and infrastructure security.
- Parking policies are important for meeting planning these targets. Excess, free, and subsidized parking generates traffic, VMT, and emissions. It makes infill more expensive, housing more expensive, and limits reuse of older buildings. Parking policies can tilt development toward suburban locations with cheaper land. It is expensive, economically inefficient, and inequitable. All of these factors influence the ability to meet the sustainability community strategy targets. Some parking is necessary for components of smart growth, however, including BART/rail, TOD, and downtown infill.
- Parking policies are primarily governed by local land use policies. Regional parking strategies to support smart growth have been developed to provide a multi-faceted framework to address parking issues. The policy development was undertaken with local partners. Technical assistance is available for station area plans. Support is provided through a technical toolbox, modeling, surveys and training, and consulting. Another component is analyzing funding proposals for parking structures.
- The smart growth parking tool box and model is available for use by communities and agencies throughout the region. Seminars and training sessions have been held to introduce the toolbox and model to potential users.
- The smart growth parking policies include strategies by area typology. These strategies include pricing and managing parking, unbundling parking from other elements, cash-out programs, and support for transit, walking, and biking. Reducing local requirements, implementing shared parking, and carshare programs represent other strategies.
- Performance measures for parking structures in a smart growth context focus on costs, ridership, revenues, and traffic demand management (TDM) and land use alternatives. Other considerations may include the impact on GHG emissions, mode share, equity, and community concerns.
- A typical parking structure proposal includes 1,000 spaces and costs \$30 million. These costs include land, construction, operations and maintenance, and the present value of funds. The calculated cost per space is between \$25,000 and \$50,000. The calculated cost per user per day is between \$7 and \$15.
- The traditional approaches include replacing parking spaces and reserving parking for transit users for free or for a \$1 fee. Other approaches include adding additional spaces for new TOD housing at the standard Institute of Transportation Engineers (ITE) suburban automobile dependent rates, adding new parking for new TOD retail and businesses at the standard ITE suburban automobile dependent rates, and adding extra spaces to ensure the success of new development. Large parking structures are very expensive, and are often oversized, with less than 85 percent occupancy.

- The MTC is analyzing parking structures for a number of reasons. Parking structures are expensive. There are many parking proposals in the planning process for TODs and station area plans, intermodal stations, and downtown areas. While TOD supports the MTC regional goals, how much parking to provide is an issue.
- The costs associated with parking structures can be broken down into a number of components. Capital cost averages approximately \$30,000 per parking space. Land value represents another cost. Operations and maintenance costs average \$1-to-\$2 per space per year. The full cost is approximately \$185 per space per month.
- The MTC examined recent parking structure costs at nine facilities. The construction cost per space ranged from a low of \$16,969 to a high of \$80,754. The average construction cost was \$31,000 per space. The estimated construction costs per parking space for 10 planned structures ranges from a low of \$18,143 to a high of \$40,230. The average planned construction cost is \$24,000 per space.
- A comparison of parking structures and TDM strategies was conducted. Parking characteristics include the number of spaces, net number of new spaces, revenues, occupancy and turnover, and the cost per new space. TDM possibilities include pricing strategies – charging, unbundling, and cash-out, shared parking, pedestrian and bicycle, and transit. The annualized cost of both parking and TDM effectiveness can be developed and compared to the cost per new trip on the transit system. One approach is to implement TDM to up the cost equivalent of parking space expenses. Another approach is to resize a parking structure and implement TDM strategies.
- The cost per trip for parking and TDM can be estimated and compared. The cost per net space, occupancy, and turnover are used to identify the cost per trip of parking. This cost can be compared to the cost of implementing TDM strategies. As an example, the parking cost per trip, accounting for only construction costs, was \$7.10 per workday at the West Dublin/Pleasanton parking structure and \$14.68 per workday at the Fairfield parking structure.
- The Parkway Transit Center provides a case study example. There are 207 current spaces at the facility. The proposal was for 710 new spaces for a total of 503 spaces. The construction cost was \$17.5 million, or \$25,000 per space or \$35,000 per net space. The monthly cost per new trip was \$269 and the daily cost per new trip was \$12. The area within one-fourth mile and within one-half mile of the transit center was examined. Alternatives to building more parking included improved transit service from one area, improved bicycle and pedestrian access from another area, and sharing an existing underutilized lot.
- Another analysis compared parking structures with TOD housing. Parking structure costs include the net new spaces, land, construction, operations and maintenance, and revenues. Housing costs included land, construction costs, and sales and rent revenue. The annualized cost and the return per square foot can be calculated and compared to transit ridership. The preliminary findings indicate

that compact housing with five or more stories delivers more transit riders. Housing provides more economic return. Structured parking costs are between \$7-to-\$15 per space. Policy issues to be considered include access, equity, GHG emissions, and design features.

- Surveys and research supports that some people choose to live close to transit. The easiest groups to attract to TOD are those that prefer transit, urban dual-income households without children, and younger individuals. The hardest groups to attract include high income suburbanites, automobile-oriented families, price-conscious individuals, and families focusing on children, automobiles, and schools. Possible groups to attract include older couples and ambitious urbanites. The results support designing TOD housing for people who want to use transit. Possible features include reduced parking, unbundling parking, providing transit benefits, and providing carshare, walk, and bike amenities.
- The structured parking versus housing preliminary findings from the analysis indicates that housing with five or more stories delivers more BART riders than parking structures. Further, housing, which is the highest economic return of land uses in suburban settings, provides positive financial returns and more economic value than parking. Structured parking costs are between \$5-to-\$15 per space. Other policy issues, such as access, equity, GHG emissions, design, and community concerns need to be considered. Finally, some parking is necessary for regional attractions, like BART, but it can be minimized and shared.
- In conclusion, parking policies are an important component of smart growth policies and better parking policies are necessary to achieve the MTC performance targets. Pricing policies that show drivers the costs of parking are essential, as is giving consumers choices with prices. Parking structures should be analyzed and compared with alternatives, such as housing, TDM, transit ridership, economics, equity, and GHG emissions. Other comparisons include right size parking and funding TDM. Regional parking policies should be considered, along with benchmarks and flexible standards.

Economic Development and Return on Investment Livability Performance Measures *Kevin Johns, City of Austin, Texas*

Kevin Johns discussed the Sustainable Places Project. He described the project focus, partners, and activities. Kevin covered the following topics in his presentation.

- CAPCOG received a \$3.7 million HUD Sustainable Communities Planning Grant for the Sustainable Places Project. Project participants include the cities of Austin, Round Rock, and San Marcos; CAMPO; Envision Central Texas; the Center for Sustainable Development at the University of Texas; and IBM.
- The project includes the development of a new analytical tool using IBM's super computers. The tool will provide an innovative model for planning and evaluating future development that integrates economic development, housing choices, mobility, and sustainability.

- The analytical tool will be tested at demonstration sites throughout the region. These demonstration sites will focus on activity centers. It is anticipated that at least one demonstration site will be selected from each of the five counties included in the CAMPO 2035 Plan. It is also anticipated that the demonstration sites will include a mix of larger and smaller projects in urban, suburban, and rural locations. An application process is being used to identify and select the demonstration sites. Applications were due August 31, 2011.
- In addition to developing and applying the new analytical tool to assess alternatives at the sites, ongoing technical assistance will also be provided. The project is scheduled to be completed over a two-year time period.

Breakout Session 9 – FTA Livability Performance Measures Projects

Linda Cherrington, Texas Transportation Institute, presiding

Overview of FTA Transit and Livability Performance Measures

Angela Dluger, Federal Transit Administration

Angela Dluger discussed the FTA transit livability performance measures research project. She described FTA's roles in the Partnership for Sustainable Communities, the scope of the transit performance measures research, and activities underway. Angela covered the following topics in her presentation.

- FTA has funded the transit livability performance measures research to identify potential measures that could be used in urban and rural areas. The research will also identify data that is nationally available and could be produced periodically. The research includes three separate projects. The rural transit livability measures project is being conducted by TTI, the livability data collection project is being conducted by the Center for Urban Transportation Research (CUTR) at the University of South Florida, and the urban transit livability measures project is being conducted by the OTREC at the University of Oregon.
- All of the agencies - HUD, DOT, and EPA - play important roles in the partnership and have numerous activities underway. The partnership is leveraging the expertise, capabilities, and programs within the three agencies. For example, HUD has a long history of using community development block grants to fund projects. HUD also has expertise and programs in affordable housing. The EPA covers a broad range of subjects and programs, including the Smart Growth Office, which provides technical assistance and localized help to communities. The EPA also has technical assistance programs for Brownfields restoration.
- The U.S. DOT has numerous programs that support livable communities. The TIGER grant program, the FTA programs, and the FHWA flexible funding programs represent just a few examples. Existing partnerships, such as the United We Ride program, which focuses on human services transportation, are also being leveraged. The FHWA livability efforts, state and metropolitan activities, and railroad infrastructure programs represent a few other examples of related efforts. There is also an expanding relationship with the USDA to address rural needs and activities. The USDA has significant resources targeted at rural America. While not officially part of the partnership, a rural working group to address livability in rural America has been formed.
- The FTA's role in the Partnership for Sustainable Communities focuses on the four areas of infrastructure investment, capacity building, policy and guidance, and research. FTA provides approximately \$11 billion in formula-based programs and discretionary programs to urban and rural transit systems on an annual basis. The new TIGGER program focuses on grants for greenhouse gas and energy reduction projects. The FTA has many capacity-building activities underway, while including peer-to-peer exchanges. The FTA also provides

technical assistance, supports demonstrations, and develops case studies on livable communities initiatives throughout the country. A clarification of the FTA policy regarding the use of local funds in bicycle and pedestrian access to transit projects was announced in 2010. Information on flexible funding from the FHWA that can be used for transit projects is being provided. Further, the FTA is encouraging environmental management systems within transit agencies.

- The FTA is supporting research related to livable communities. Over the past five years, HUD and the FTA have funded research projects examining issues associated with providing affordable housing near transit. The FTA is also working with staff from the CTOD on different research projects related to TODs. Other research efforts focus on examining the impacts of climate change on transit, including adaption, and enhancing access to transit, including access by individuals with disabilities and implementing the complete streets philosophy.
- Developing transit livability performance measures may help highlight the linkages among transportation investments and other community objectives. They can also be used to establish baselines and track trends over time. Further, performance measures provide a common language and publicly meaningful measures. They can be used to inform policy decision making. Performance measures also help identify data requirements for nationally available data.
- The objective of this project is to define national transit livability performance measures and to develop the data resources to be able to calculate these measures on an annual basis to allow for tracking trends and progress. The scope of this effort includes both urban and rural areas with specific direction toward measures that will allow FTA to gauge the effectiveness of federal transit livability efforts. Such metrics are required for evaluating the success of livability enhancement programs, and for identifying where these programs are needed. The process of defining quantitative measures of abstract concepts, such as livability, contributes to the understanding of objectives and builds a common vocabulary by which they can be discussed.
- The project is examining metrics that are general enough to be applied nationally and that do not require a large ongoing funding commitment for data collection. The classic measures of transportation system performance, accessibility, and mobility, have been defined and measured in many ways, usually in the data-rich context of academic planning exercises. They often include factors that are outside the scope of FTA influence. FTA is seeking to define more practical and relevant metrics for its own use.
- The candidate measures will be evaluated across a geographic region selected for data availability and for the variety of its urban and rural environments. This analysis is intended to demonstrate applicability at the national level. The results will incorporate a national perspective, while being compatible with regional and local planning efforts.
- The rural livability metrics project is being conducted by Linda Cherrington and Suzie Edrington at TTI. The livability data collection is being conducted by

Martin Catala at CUTR. The urban livability metrics will be conducted by OTREC at the University of Oregon.

Rural Transit Livability Performance Measures *Suzie Edrington, Texas Transportation Institute*

Suzie Edrington discussed the FTA rural transit livability performance measures project. She described the project objectives, conditions and trends in rural areas, rural area typologies, emerging visions for rural livability, and candidate rural transit livability performance measures. Suzie covered the following topics in her presentation.

- The first project objective is to identify, test, and recommend a set of metrics that characterize the contributions of rural transit systems to livability in the communities served. The second project objective is to assist FTA in gauging the effectiveness of federal transit livability efforts in rural America.
- The following questions were asked in developing the rural area typologies. What is rural? What are current rural issues and trends? What does transit look like in rural America? How is rural livability defined? What are existing metrics that measure transit impact on rural livability?
- Growth trends in rural areas were examined. The fastest growth is occurring in rural areas on the fringes or edges of urban areas. There is also significant growth in areas close to scenic landscapes and natural amenities. Shifts in industry location are also being experienced in some areas, with industries locating in rural areas.
- The conditions and trends in the rural built environment were also explored. Roadway configurations accommodate freight and intercity needs. Activity centers tend to cluster along major trade routes. National businesses may be in competition with local merchants. There is an erosion of the pedestrian realm in some rural areas.
- Demographic and economic factors vary across the country. These factors include the number and percentage of elderly, fertility rates, foreign born populations, education levels, zero vehicle households, and poverty levels. Other factors that differ include the racial and ethnic mix, the availability of nutrition programs, the presence of sub-families, the veteran population, and work age dependency.
- There is a large share of older people in rural areas. The human service risk index is also significant in rural areas. Factors in the transit needs index include demographic and economic characteristics. Applications for the use of the index include service planning and targeting public and private investments.
- The rural typologies were developed based on the realization that not all rural areas are the same. The typologies include edge areas, traditional main street areas, and gateway communities. Other typologies include agriculture dependent areas, single-industry dependent areas, university or military communities, and second home and retirement communities. The next steps in finalizing the rural

typologies include defining the ingredients for determining the typologies and developing recipes to classify rural communities.

- The emerging vision for rural livability includes utilizing the regional ability to accommodate multimodal travel, encouraging rural economic development through connections to regional employers, and providing equitable and accessible connections. Other factors include encouraging and preserving activities in nodes by concentrating activities in villages and rural town centers and encouraging hamlets (small neighborhood), villages (mid-sized), and small towns that contain multiple uses. Additional factors are preserving and restoring the pedestrian character of rural main streets and town centers, preserving rural landscapes and agricultural land, establishing multimodal connections between rural villages, and coordinating planning and funding programs.
- There are a number of opportunities for transit to help meet these visions for rural livability. A network of transit services that link town centers and villages, as well as providing connections to intercity routes, can improve rural mobility and accessibility. Linking regional multimodal connections can also enhance rural livability. Transit can provide access to an array of jobs, education, services, health care, and recreational opportunities in rural areas. Other opportunities for transit include providing equitable access, providing links between workers and rural area industries, and pooling resources to more efficiently serve a region and prevent service duplication.
- The development of the rural transit livability performance measures are based on two guidelines. The first guideline is that the measures should use national-level data sources. The second guideline is that the measures should be able to be represented spatially.
- The six partnership for sustainable communities livability principles were also used to guide the development of rural transit performance measures. The six principles are providing more transportation choices, enhancing economic competitiveness, valuing communities and neighborhoods, promoting equitable affordable housing, coordinating policies and leverage investment, and supporting existing communities.
- The candidate rural transit livability measures are focusing on supporting key decisions. The guidelines for the candidate measures include the use of quantifiable and qualitative measures, the use of measures that may be counter to one another, and measuring both direct and indirect benefits. Leverage existing data, developing reports to appeal to visual and statistical needs, and measuring results after implementation of projects represent other guidelines.

Developing Transit Livability Dashboard

Martin Catala, Center for Urban Transportation Research, University of South Florida

Martin Catala discussed the FTA project, “Development of Transit Livability Assessment Tool.” It represents the third project component in the overall transit performance measures for

urban and rural livable communities. He described the project objectives, the project tasks, and work activities to-date. Martin covered the following topics in his presentation.

- The project objectives are to develop a measurable livability evaluation tool and to assist FTA in gauging the effectiveness of federal transit livability efforts in urban and rural areas. A dashboard will be developed, which is intended to be a web-based application to give a clear, succinct indication of how transit affects livability.
- The project tasks including cataloging potential measures for livability and creating a data collection plan. Other tasks include developing a livability index database, developing livability index scores, and developing a livability index dashboard. A final task is demonstrating the dashboard, measures, and applicability in practice.
- The first task of cataloging potential measures includes examining performance measures in existing reports. Examples of these reports include *TCRP Report 22: Role of Transit Creating Livable Metro Communities*, the *Livability in Transportation Guidebook*, the *Role of FHWA Programs in Livability*, and the *EPA Guide to Sustainable Transportation Performance Measures*. These and other sources provide a wealth of information. Development of the catalog of potential performance measures for livability is underway. The catalog will examine potential urban and rural livability. Possible definitions of urban and rural livability will also be provided. The intent is to focus on realistic livability measures based on meeting defined livability goals and objectives, and on available data.
- The second task is to develop a data collection plan. The intent is to create an annual data plan that provides continuous measures for livability evaluations. The plan will focus on nationally available data, including Census data and parcel data. Currently, there is not a lot of extended Census data available for rural areas. Parcel data is also limited in many areas, but it is becoming more widespread. Opportunities for developing partnerships with other federal and state data stakeholders are being explored. Examples of partnerships include the USDA for data on rural areas, the U.S. Geological Society (USGS) for geospatial data, and HUD for data on Section 8 housing.
- The data collection plan is examining both transit system data and transit performance data. There is currently not a national database on transit system data, which includes route alignments, stop locations, and schedules. Examples of transit performance data include ridership levels, on-time performance, and access to jobs.
- Socio-demographic data includes population, income, and worker status. Examples of environmental data include sidewalk connectivity, amenities, and land use. Environmental data may not be available at a national level, although open street map files, such as Wikipedia GIS, have been found to be fairly accurate when compared to TIGER files.

- The third task is the development of the livability database. It is envisioned to be a relational database to store, manage, and share livability data. Components will include national data, such as the Census, agency data, and other statewide data. For example, the New York State Department of Transportation's (NYSDOT) 511 system contains statewide transit data.
- The fourth task is developing livability scores. Based on data, livability scores will be developed at a national scale, a regional scale, and a local scale. Quantifying livability will be challenging, as will translating scores into an index based on the mix of available data.
- Defining and identifying livability typologies may be the most challenging aspect of the project. Defining the typology may be data driven, user driven, and geographically driven. Possible data-driven criteria for identifying urban and rural typologies may include population densities, employment densities, street and intersection densities, and commute sheds. User-driven criteria can provide users of the system with preferences to measure communities for livability features. A hybrid approach would be to provide suggestions based on the data. Geographically-driven criteria could be scale typologies, including national, statewide, regional, city, and community.
- The fifth task is developing a livability index dashboard. The dashboard will display data using maps, graphs, pie charts, and other graphics. The dashboard will be a web-based application that can be used to illustrate how transit affects livability.
- The final task is demonstrating the measures, applicability, and dashboard. The demonstration locations will be selected with input from TTI and OTREC. Locations throughout New York State will be included due to the statewide transit data available through the NYSDOT 511 System.

Breakout Session 10 – State, MPO, and Local Examples

Sam Seskin, CH2M Hill, presiding

Go Ohio System Designation – Ohio Futures Statewide Plan

Elizabeth Sanford, Cambridge Systematics, Inc.

Elizabeth Sanford discussed the Ohio Department of Transportation's (ODOT) *Go Ohio* future statewide plan. She described the plan strategies, analysis framework, and the livability analysis. Elizabeth covered the following topics in her presentation.

- *Go Ohio* focuses on increasing economic growth and prosperity in the state. It addresses economy-focused, data-driven strategies for transportation investments. The four strategies are to increase Ohio's competitiveness, to connect transportation system investments to targeted industries, to link land use and transportation decision making, and to advance a green economy.
- The first strategy is to increase Ohio's economic competitiveness. The Ohio gross state product (GSP) experienced steady growth from 1990 to 2008. The state's share of the U.S. economic declined from 2003 to 2008, however.
- The second strategy is to connect transportation investment to targeted industries. This strategy realizes that the transportation network is the glue that binds the Ohio economy together. The transportation network allows people to reach their workplaces, corporations to receive supplies and ship products, and visitors to reach attractions. It also allows students to attend college, businesses to have face-to-face meetings, and restaurants and stores to draw customers.
- The third strategy is to link land use and transportation decision making. This strategy realizes that transportation investments can be a tool for ensuring future economic development, while minimizing the cost of growth. Ohio's population and developed land have both increased over the past 30 years. The person per developed acre has declined, however, indicating less efficient and sustainable development patterns.
- The fourth strategy is to advance a green economy. Transportation options provide redundancy, reduce demand on all modes, and allow for efficiencies to be incorporated into the system, which leads to congestion reduction, air quality improvements, and potential reductions in VMT. Encouraging modal diversity can be a tool for ensuring economic development while minimizing environmental impacts.
- The plan provides a foundation through goals and objectives for the analysis framework. Four strategies were explored in the analysis. The first strategy is to develop efficient, advanced, high-value transportation solutions that attract and grow business in Ohio. The second strategy is to identify high priority transportation needs that have the potential to dramatically grow business and elevate Ohio's position as a national transportation leader. The third strategy is to ensure the safe mobility of the state's residents, support the long-term vitality of communities, and incorporate green principles while improving its transportation

assets. The fourth strategy is to identify the most strategic elements of the state's transportation system and specific performance measures that will improve accountability regarding future investments.

- The *Go Ohio* overarching analyses focuses on a general economic analysis, a targeted industry goods movement analysis, a targeted industry people movement analysis, and a livability analysis. The overarching analysis components include analytic strategies, targeted industries, and all industries. For example, one analytical strategy is to focus on goods movement. Examining freight supply chains for target industries is one approach in this strategy. Examining the factors of each county to indicate economic development readiness is a target for all industries. The livability analysis is used as an integrated facet of overarching analysis, not a stand-alone analysis. The general economic analysis focusses on transportation, labor, business climate, livability, utility infrastructure and costs, and land and buildings. All of these elements focus on the business attraction criteria.
- The livability analysis focuses on the five building blocks of economic and social vitality, housing choice, transportation choice, the environment, and safety and security. The livability analysis approach includes eight steps. These steps include identifying a range of factors that contributes to each building block, refining factors to a manageable set of indicators that can be measured statewide, and determining whether statewide datasets are available to support these indicators. Other steps are developing individual methodologies to measure each indicator, collecting and synthesizing data, and analyzing data and evaluating findings. Additional steps are aggregating the individual indicators under each building block into a single metric for the building block and developing a livability index that weighs the relative contributions of each indicator to livability.
- The livability indices for economic and social vitality include the jobs-housing balance, vacancy rates, community growth or decline, population per square mile, and retail, dining, and related establishment density. Housing choice indices are dwelling unit-to-households ratio, housing units by value, and housing affordability index. Transportation choice indices include transit availability, relative transit accessibility, street grid density, and bicycle level of service (LOS). Environment indices are air quality, water quality, and park space. Safety and security indices are crashes on the road network and a modified index of crime per capita per county.
- A wide range of data was used in the livability analysis. Examples of these sources include the U.S. Census, and ACS, ODOT, and the Ohio Department of Public Safety. Transit availability, road density, and other data were presented graphically using GIS and other tools.
- Some lessons were learned through the experience in the transportation and livability analysis. A basic tension exists between two competing issues – geographic scale and data availability. From a geographic scale perspective, the study had a statewide focus, while livability is more naturally defined at a

community or a neighborhood level. From a data availability perspective, most of the indicators are calculated for census tracts to allow for measurement at the neighborhood level, where livability is naturally experienced, while also allowing for clearly defined statewide roll-ups. Another lesson is the need for creative approaches. Integrated planning using transportation and livability as components of overarching analysis is needed, as are a representative set of indicators.

Transportation Outlook 2040

Tom Gerend, Mid-America Regional Council

Tom Gerend discussed the development process and plan structure for the *Transportation Outlook 2040*, the long-range transportation plan at the Mid-America Regional Council (MARC) in the Kansas City metropolitan area. He described the performance measurement elements in the plan, the implementation process, and the feedback process. Tom covered the following topics in his presentation.

- The plan was developed over a two-year period and adopted by the MARC Board in June, 2010. There was extensive public input throughout the development process. A segmented approval process was used. The policy framework was approved first, followed by the financial assumptions and the evaluation framework. The projects and measures were approved last.
- The policy framework components included the regional vision statement and the regional policy goals. The vision statement and goals served as the structure and foundation for the plan's content development, the project evaluation and prioritization, and the identification of performance measures.
- There are nine policy goals in *Transportation Outlook 2040*. Five of these goals – system performance, system condition, safety and security, vital economy, and accessibility – were included in previous plans. Four of the goals – place-making, healthy living, climate change and energy use, and the environment are new.
- The system performance goal focuses on managing the system to achieve reliable and efficient performance. The accessibility goal is to maximize mobility and access to opportunities for all area residents. The public health goal is to facilitate healthy, active living. The climate change and energy use goal focuses on decreasing the use of fossil fuels through reduced travel demand, technology advancements, and transition to renewable energy. The performance measurement element used the policy goals for measurement reporting. Feedback was solicited on potential measures to help define the appropriate measures and track progress. All available existing data sources were screened for reliability and continuous availability.
- The *Performance Measures Progress Report* tracks progress toward meeting the plan goals, objectives, and performance measures. Key information and trends are highlighted in the report and presented graphically.
- The 2011 *Performance Measures Progress Report* provides an annual check-up on progress toward reaching the region's transportation goals. Overall, the

economic vitality, climate change and energy use, environment, public health, safety and security, system condition, and system performance goals reflect positive trends. The accessibility and place-making goals reflect negative trends.

- The level of transit service as measured by the ridership and vehicle revenue hours (VRH) is one metric for the accessibility goal. The trends indicated a decline in ridership and VRH from 2008 to 2009, after annual increases from 2004 to 2008. Daily VMT is tracked for measuring the climate change and energy use goal. Both daily VMT and daily VMT per capita declined from 2007 to 2008.
- The percent of population within one-half mile of fixed route transit service represents one measure of the level of transit service for the accessibility goal. Based on 2000 and 2010 Census data, the percentage of population within one-half mile of a transit route declined from 56 percent in 2000 to 51 percent in 2010, while the percentage within one-half mile of a transit stop declined from 43 percent in 2000 to 37 percent in 2010.
- The portion of MetroGreen[®] network completed is tracked for measuring progress toward meeting the environment goal. There has been a steady increase in the percentage of the MetroGreen[®] network completed from 2002 to 2010. In 2002, approximately 7 percent of the network was completed. By 2010, approximately 20 percent had been completed.
- The balance between modes of transportation is measured to assess multimodal options for the place-making goal. The use of non-drive alone modes has increased from 15.8 percent in 2002 to 17.5 percent in 2009, with variations by year.
- The policy framework and related performance measures served as a project evaluation and prioritization tool for the Surface Transportation Program (STP), the CMAQ Program, and the TE Program projects. The annual performance measurement report was developed to track regular progress, to report to policy makers, and to serve as a feedback loop for assessing plan objectives and strategies.
- Overall, the annual performance report indicates that the majority of measures are trending in the preferred direction. The challenging areas relate to accessibility and place-making including coordinating growth and development. The performance measures and annual reports are intended to help inform discussion regarding strategies and priorities. The report is available at: www.marc.org/2040.
- A few lessons learned can be identified based on the experience to-date with developing, using, and monitoring performance measures at MARC. First, as could be expected, there are gaps in the data needed to assess some of the measures. Second, there is local versus regional sensitivity related to some measures. Third, MARC did not set targets as it appeared doing so would be contentious. Finally, the experience at MARC supports the need to build on a strong foundation.

Case Studies in Livability

Kevin Tilbury, Gresham, Smith and Partners

Kevin Tilbury described examples of developing and applying livability goals, objectives, and performance measures. He described the Florida Department of Transportation (FDOT) Livable Community Initiative, the Knoxville Regional Plan for Livable Communities, and the Central Hamilton County Scenario Planning Study. Kevin covered the following topics in his presentation.

- The FDOT Livable Communities Initiative focused on enhancing the street environment. The SR 944/NW 54th Street Livable Corridor Study was conducted as part of the initiative. The project developed livability goals and mobility expectations for the corridor. Livability goals included creating an attractive and viable corridor that supports the economic development and revitalization of NW 54th Street and the Brownsville community; creating a safe, walkable corridor for all residents and visitors; and maintaining and preserving the corridor's unique history, traditions, and resources.
- Measures were identified for each of these goals. The mobility expectations were to provide adequate safety and mobility in the corridor and to provide a balance of transportation modes. Measures for providing mobility and safety included vehicular LOS, delay in the corridor, and minimization of turn movement conflicts and other safety hazards. Measures for balanced transportation modes included the presence of adequate facilities for all modes in the corridor, elimination of barriers to bicycling and walking in the corridor, and bicycle LOS, pedestrian LOS, and transit LOS.
- The livability goals, mobility expectations, and measures were defined with community input obtained through workshops and meetings. They represent a mix of qualitative and quantitative measures. Examples of evaluation factors included the opportunity for aesthetic features and enhancements to the roadway character, automobile access to businesses, pedestrian access to businesses, and the presence of safe, continuous pedestrian facilities. These and other factors were used to evaluate maintaining the current situation and different future alternatives.
- The EPA Draft *Guidebook for Sustainable Community Performance Measurement* provides a good source of information. It includes performance measures appropriate for use in different types of areas and settings.
- The *Knoxville Regional Plan for Livable Communities* includes a number of performance measures. Examples of these performance measures include transit trips per capita, jobs well-served by transit, and residential units near employment centers. Other measures are workers commuting by transit, bicycle, or foot and new homes built in areas well-served by transit or new homes built near employment centers. Additional measures are affordable homes and rental units well-served by transit or near employment centers, household transportation costs, and low income households within a 30-minute transit commute or within a 20-minute driving commute of a major employment center.

- The Central Hamilton County Scenario Planning Study provides an example of using performance measures in practice. The project examined the impact on the region of continuing 30 years of the current growth trends. A number of elements were examined and modeled for three different future scenarios. These scenarios were following current growth trends, following the existing comprehensive and area plans, and following alternative growth trends. Residential units near employment and activity centers, new schools and parks, and homes within walking distance of retail, services, and parks were estimated and examined for each of the three scenarios. The total dwelling units with bicycle potential, the total dwelling units with transit potential, and the minimum average distance to major attractors were also examined.
- The growth impacts on transportation were also examined. For example, lane miles by roadway character and operating speed were analyzed for the three scenarios. Slower travel speeds and more strip development along corridors occurred with the current trends scenario.
- In summary, livability has both qualitative as well as quantitative attributes. As a result, both qualitative and quantitative performance measures are needed. Performance measures are still an emerging practice. A number of robust tools are available that can be used to analyze the impacts of different measures and different future scenarios. These tools allow for creative applications and analysis to address the multi-faceted nature of livability.

Data Points for Measuring Livability in the Austin Area
Betty Voights, Capital Area Council of Governments, Austin, Texas

Betty Voights discussed livability initiatives underway at CAPCOG. She described the *Datapoints Newsletter*, projected growth trends in the region, and the Sustainable Places project. Betty covered the following topics in her presentation.

- The *Datapoints Newsletter* is published monthly by CAPCOG. It provides analysis of trends in the region. Data on aging, migration patterns, and job growth are presented. Information on commuting by county, economic trends and talent, and access to education is also documented. The Austin capital area grew from 1.3 million residents in 2000 to more than 1.8 million residents in 2010, an increase of 36 percent. Approximately 71 percent of this growth occurred in cities, while 29 percent occurred in unincorporated areas of the region.
- Approximately 1.5 million new residents are projected in the region by 2035. This projection means an average of 63,000 new residents annually, or the equivalent of adding another city of San Marcos every year for the next 25 years. The forecasts also indicate that the region will gain 645,103 more housing units and 989,022 more vehicles by 2035.
- The regional labor shed, including the number of workers leaving their home county for work, is monitored and reported in the *Datapoints Newsletter*. Only Travis County, which includes the city of Austin, has more workers remaining within the county than leaving for work. Approximately 73 percent of residents

of Travis County also work in the county. Between 56 percent and 86 percent of workers in the other nine counties in the region work in another county.

- Housing in the region is becoming more expensive and less affordable for the average family. Housing affordability in the major cities in the region in 2000, as measured by the ratio of median household income to median home value, was in the affordable range. The ratio in two communities – Austin and San Marcos – moved into the unaffordable range in the 2007-2009 time period.
- Driving alone continues to be the most popular work travel mode, with approximately 75 percent of workers indicating they drive alone. Carpooling accounts for approximately 12 percent of work trips. Approximately 5 percent of the work force telecommutes on a regular basis, almost 3 percent use public transit, and 4 percent use other modes, including walking, biking, and riding a motorcycle.
- Many of these trends are counter to the ideas of livable communities. The region continues to grow and the growth rate is constant for unincorporated areas. A majority of workers travel to jobs in another county. Housing continues to be less affordable and single-occupant vehicles continue to be the primary commute choice.
- The Sustainable Places project is examining the opportunity to blend data with education and change the development patterns in the region. Activity centers in the CAMPO 2035 plan provide a foundation for focusing some growth into specific geographic areas.
- The Sustainable Places project focuses on activity centers as demonstration sites. A site in each metropolitan statistical area (MSA) county will be selected. It is anticipated that a mix of small and large cities will be included in the project. The cities will be selected to align planning with Envision Central Texas principles. A formal process focused on community commitment and the likelihood of implementation will be used to select projects. An analytic tool using super computers will be developed to support planning in the area. Examples of possible measures included in the tool are the proximity of transit to employment centers, the availability of housing choices, the cost of all services to residential users, mobility options impact on post-secondary education, and the ROI on public sector investment in infrastructure.

Breakout Session 11 – Bicycle and Pedestrian Performance Measures

Joan Hudson, Texas Transportation Institute, presiding

Pedestrian and Bicycle Data

Shawn Turner, Texas Transportation Institute

Shawn Turner discussed pedestrian and bicycle data. He described the importance and use of pedestrian and bicycle data and the data needed for planning and decision making. He also highlighted national and international pedestrian and bicycle activities. Shawn covered the following topics in his presentation.

- Data on walking and bicycling is important for a number of reasons. Similar to other modes, pedestrian and bicycle data are needed to support policy decisions, to plan for cost-effective investments, to design safe facilities and infrastructure, and to measure performance and progress toward goals. As has been noted, “what gets measured, gets done” and “if you are not counted, you do not count.” Data on walking and bicycling are critical for making the case for new and improved facilities.
- The City of Portland provides a good example of a bicycle data collection program. In 1992, the city had 83 miles of bikeways, which averaged 2,850 daily bicycle trips. In 2008, the city had 274 miles of bikeways, which averaged 16,711 daily trips. Counts are taken at four bridge locations and 43 non-bridge locations throughout the city. Bicycle crashes are also recorded and analyzed. For example, combined bicycle traffic over the four main Portland bicycle bridges is compared with bicycle crashes.
- Collecting pedestrian and bicycle data should focus on the users and uses of the data, considering what agencies, departments, and groups need the data, how they will use it, and what decisions they will be making. Avoid collecting data only because “that is what our program plan lists,” “that is what my boss said to do,” and “that is what others are doing.”
- It is also important to consider pedestrian and bicycle data needed to measure livable communities. The quality and safety of facilities may be monitored to address the goal of providing more transportation choices. Accessibility by different modes may be used to assess the goal of reliable access to opportunities. Pedestrian and bicyclist safety and facility data may be used to address the goal of healthy, safe, and walkable neighborhoods.
- It is also important to consider output and outcome measures. Providing access to safe facilities is only part of the overall goal. Ultimately, the goal or outcome should be more people choosing bicycling and walking as a travel mode and improved safety for bicycling and walking. Counts and travel surveys measure outcomes.
- There are a number of activities underway at the national level. Examples of these activities include the Alta/ITE “National Bicycle and Pedestrian Documentation Project,” the Alliance for Bicycling & Walking (ABW)

“Benchmarking Report,” and the FHWA “Update of the Traffic Monitoring Guide,” with supporting state-of-the-practice review. Two NCHRP projects, “Demand Forecasting Methods (8-78)” and “Count Collection Methods/Equipment (7-19)” are underway. The TRB Pedestrian/Bicycle Data Subcommittee is also working on a number of activities.

- A recent international scan tour identified bike “barometers” or counters in highly visible locations in some European countries. The Queen Louise Bridge in Copenhagen, Denmark records 36,000 average daily bicycle trips (ADBT).
- A number of key challenges can be identified from these and other activities. Key challenges include consistency among state and local agencies to permit national data aggregation, and validity at the state and local level, including sampling approaches to avoid bias. Automation of the pedestrian and bicycle data collection processes is another challenge to help overburdened data collection personnel.
- In conclusion, collecting data on walking and bicycling is as important as collecting data on other modes. Pedestrian and bicycle data collection efforts should focus on the users and uses of the data and the decisions that will be made based on the data. Output performance measures focus on access to facilities and destinations. Outcome performance measures focus on safety and facility usage.

Roadway Bicycle Compatibility, Livability, and Environmental Justice Performance Measures

Greg Griffin, Capital Area Metropolitan Planning Organization, Austin, Texas

Greg Griffin discussed the application of a bicycle compatibility analysis in Austin to examine potential environmental justice (EJ) issues related to bicycling in the city. He also described future activities associated with the analysis. Greg covered the following topics in his presentation.

- The first livability principal in the HUD-DOT-EPA Partnership for Sustainable Communities is to provide more transportation choices. This principle focuses on developing safe, reliable, and economical transportation choices to decrease household transportation costs, reduce the nation’s dependence on foreign oil, improve air quality, reduce GHG emissions, and promote public health.
- Research has examined EJ and regional equity, pollution, road user safety, and access to jobs. A study by Pucher and Buehler 2009 asked if “*we really want to restrict cycling to a tiny percentage of the population and exclude most women, children, and seniors? Or should we be truly inclusive and design our cycling policies for everyone?*”
- The “housing + transportation” costs methodology developed by the Center for Neighborhood Technology provides one measure for examining potential EJ concerns. Data from the CAMPO 2009 regional roadways bicycling subset, and the 2009 ACS at the Census tract level were used in the bicycle compatibility analysis.

- The Bicycle Compatibility Index (BCI) was used in the analysis. The BCI is formulated by considering factors such as bike lane, width, volume, speed, parking, land use, and adjustment factors. The bicycle compatibility analysis was applied to the regional network by using the MPO's modeling network, adding missing variables with Google Streetview, and functional class estimations. The BCI or bicycle LOS was calculated using a spreadsheet. The results are summarized and displayed graphically.
- Common variables to assess EJ include the percentage of minority and low-income individuals in different areas. Data from the ACS on the percent of minority and median-income households by Census tracts were used in the analysis. The results were presented graphically and compared to the BCI results. The results were also compared statistically.
- The results of the bicycle compatibility and EJ analysis indicate that income and race are not significantly correlated with bicycle compatibility in the Austin metropolitan area. Future work activities focus on improving data sources to include a complete sidewalk network and adding pedestrian LOS variables. Other activities include using the 2010 Census data and new EJ definitions, and enhancing the bicycle network data with BCI or bicycle LOS variables. Additional activities include applying the method in other areas. For example, locations that reveal clustering and BCI inequities to demographics could be examined.
- Monitoring the results represents another future activity. Performing counts at different locations with similar urban form variables to isolate socio-demographic influences will be conducted. Finally, considering demand, not just supply, will be examined. Applying the non-motorized accessibility approach developed by Iacono and others to an EJ framework and exploring if Walkscore is more predictive of active transportation than infrastructure are additional future activities.

Multimodal Arterial Level-of-Service Measures

Bruce Landis, Sprinkle Consulting, Inc.

Bruce Landis discussed the inclusion of a multimodal LOS, a transit LOS, a bicycle LOS, and a walking LOS in the updated *Highway Capacity Manual*. He described the research activities undertaken to develop these measures and presented the formulas for calculating the bicycle LOS. Bruce covered the following topics in his presentation.

- The updated *Highway Capacity Manual* includes a multimodal LOS in the "Urban Street" chapter. There is also a transit LOS, a bicycle LOS, and a walking LOS. Reliable measures may include motor vehicle, bicycling, pedestrian, and transit LOS. Other potential measures are fuel savings, GHG emissions, improvements in health, and economic effects.
- The multimodal, bicycle, pedestrian, and transit LOS included in the updated *Highway Capacity Manual* are being used in plans and studies throughout the

country. The *Mobility 2035* plan developed by the San Antonio-Bexar County MPO provides one example. FDOT also has bicycle-related research underway.

- The NCHRP project 3-70, *Multimodal Level of Service Analysis for Urban Streets*, supported the development of the multi-modal LOS for arterials that was included in the updated *Highway Capacity Manual*. It also evaluated bicycling and walking conditions methods and identified the best measures and models. The project examined the traditional motor vehicle LOS and tested intertwining the modal methods. A first inter-translation quality of service (QOS)/LOS was created, along with simultaneous reporting.
- The NCHRP 3-70 project included nationwide testing and surveying. Test corridors were in Oregon, Texas, Illinois, Virginia, California, Georgia, and Florida. There are three test corridors in Austin. These corridors are Guadalupe from MLK to Dean Keeton, Manchaca from Berkeley to SH 71, and Manor from Chestnut to Rogge.
- NCHRP project 3-92 updated the *Highway Capacity Manual*. It incorporated other NCHRP reports and peer-and agency-reviewed methods. It included the bicycle, pedestrian, and transit QOS/LOS measures, placing them on par with motor vehicle measures. It acknowledges the new approach of asking customers about performance measures.
- The arterial bicycle LOS model is presented below.

$$\text{Bicycle LOS} = a_1(\text{Seg}) + a_2(\exp(\text{Int})) + a_3(\text{Cflt})$$

Where

- Seg = length weighted average *Segment Bicycle LOS Model*;
- exp = exponential function;
- Int = average Intersection Bicycle LOS Model;
- Cflt = number of conflicts per mile (e.g., driveways, unsignalized intersection); and
- a_1, a_2, a_3 = coefficients.

- The segment bicycle LOS model is presented below.

$$\text{Seg} = 0.507 \ln(V/(4*PHF*L)) + 0.199SP_t*(1+10.38HV)^2 + 7.066(1/PC)^2 - 0.005(W_e)$$

- The intersection bicycle LOS is presented below.

$$\begin{aligned} \text{IntBLOS} = & - 0.2144 W_t \\ & + 0.0153 CD \\ & + 0.0066 (Vol_{15} / L) \\ & + 4.1324 \end{aligned}$$

Where

- W_t = total width of outside through lane and shoulder /bike lane (if present);
- CD = crossing distance, the width of the side street (including auxiliary lanes and median);

Vol_{15} = volume of directional traffic during a 15-minute time period; and
 L = total number of through lanes on the approach to the intersection.

- There is also a pedestrian density LOS model. It is based on the minimum pedestrian space per person and the equivalent maximum flow rate per unit width of sidewalks. The updated *Highway Capacity Manual* also includes a pedestrian LOS model for a two roadway environment, a segment pedestrian LOS, an intersection pedestrian LOS, a roadway crossing difficult factor, and a complete streets LOS.
- Advanced tools can be used to estimate livability benefits in active transportation corridors. An FDOT project developed another method to identify the benefits of corridor investments, including the societal benefits related to fuel savings, CO₂ emissions savings, and health cost savings.
- Performance metrics can be developed and monitored to track walking and bicycle use. For example, metrics for effective mid-block crossings might focus on making motorists and pedestrians aware of the crossing, communicating the obligations associated with the crossing, and enabling the motorists and pedestrians to fulfill their obligations.
- Additional information is available at the following websites:
 - NCHRP Report 616 –
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_616.pdf
 - FDOT's Q/LOS Handbook
http://www.dot.state.fl.us/planning/systems/sm/los/pdfs/2009FDOTQLOS_Handbook.pdf

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