1 Promises and Pitfalls of Senate Bill 375 as a Model for Regional Planning Coordination- Elisa Barbour ................................................................. 3
2 Penny Wise Pound Fuelish: New Measures of Housing and Transportation Affordability- Maria Choca Urban ........................................................................................................................................................................... 5
3 Freight and Livable Communities: Does Economic Sustainability still matter for Transportation Decision Making?- Jason Bittner ................................................................................................................................................................................................ 7
4 Four Decades of Planning for Livable Communities: Insights from Freiburg, Germany- Ralph Buehler ........................................................................................................................................................................................................... 9
5 TOD 3.0: Aligning Partners in Real Estate Development and Transit Implementation- Ian Cartoni ................................................................................................................................................................................................ 11
6 Reversing Urban Sprawl: A Reclaimability Approach to Reviving Downtown Brownfields- Maria Chrysochoou ................................................................................................................................................................................................ 13
7 Real-time Ridesharing for Livable Communities- Jason Conley .......................................................................................................................................................................................................................... 15
8 The Strategy of Alternative Fuels for Urban Transit: Phase 1: Life-Cycle Assessment of Alternative Fuel Buses- Elaine Croft McKenzie ................................................................................................................................................................................................ 17
9 Understanding the Impact of Different (and New) Housing Choices on Older Adults’ Mobility in the Community- Dick Myrick ........................................................................................................................................... 20
10 Implementation of Active Living Policies by Land Use and Transportation Agencies- Jennifer Dill .................................................................................................................................................................................................. 22
11 Urban Design Strategies for Integrating Safety and Livability- Eric Dumbaugh ........................................................................................................................................................................................................... 24
12 Multimodal Corridors: Making Transit and Nonmotorized Modes Work in Highway Corridors- Michael Carroll ........................................................................................................................................................................................................... 25
13 Rating Urban Street for Pedestrian Facilities Based on User’s Perception- Aimee Flannery .................................................................................................................................................................................................... 27
14 Multi-Objective Optimization Model for Urban Street Design- Aimee Flannery ........................................................................................................................................................................................................... 29
15 The Pedestrian and Bicycling Survey (PABS) Approach- Ann Forsyth ........................................................................................................................................................................................................... 31
16 ITNAmerica®: Network Connectivity through Social Enterprise and Information Technology- Katherine Freund................................................................................................................................................................................................ 33
17 Effectiveness of Traffic Calming for Speed Management in Small Rural Communities to Enhance Safety and Quality of Life- Shauna Hallmark ........................................................................................................................................................................................................... 36
18 Programs that Match Seniors with Volunteer Drivers- Sara Hendricks ........................................................................................................................................................................................................... 38
19 Using Open Data to Develop Multimodal Trip Planners for Livable Communities- Edward Hillsman ........................................................................................................................................................................................................... 40
20 Issues in Data Collection, Methodology and Analysis of Transportation-Based Economic Development: The District of Columbia and the Great Streets Development- Christopher Hooton ........................................................................................................................................................................................................... 42
21 Effect of Roadway and Roadside Design Features on Observed Vehicle Speeds- John Ivan ........................................................................................................................................................................................................... 43
22 The CAST Walkability Audits: A Citizen-Powered Neighborhood Assessment of Walking and Biking Safety- Deb Johnson-Shelton ........................................................................................................................................................................................................... 45
23 Eagle River (Alaska) Central Business District and Residential Core Study: A Case Study of Applied Livability Principles- Christopher Tiesler ........................................................................................................................................................................................................... 47
24 Lower Don Lands: A Sustainable Waterfront Development near Downtown Toronto- Varanesh Singh ........................................................................................................................................................................................................... 49
25 Driving Smart: Car2Go in Austin and Beyond- Katherine Kortum .......................................................................................................................................................................................................................... 51
26 How to Define Community Context and Translate the Information into Indicators to Evaluate Different Transportation Solutions- Leigh Lane ........................................................................................................................................................................................................... 53
27 Yes, They Do Walk in Suburbia: Suburban Multifamily Housing and Trips to Strips- Nico Larco ........................................................................................................................................................................................................... 55
28 What Makes a “Complete Street” Complete? Defining Completeness Based on Context and Public Participation- Michael Lowry ........................................................................................................................................................................................................... 57
Promises and Pitfalls of Senate Bill 375 as a Model for Regional Planning Coordination - Elisa Barbour

Organization: UC Berkeley
Email: ebarbour@berkeley.edu

Contributing Authors: Elizabeth Deakin, UC Berkeley

Summary:

Our presentation provides findings from data analysis and interviews with stakeholders involved in implementing California's Senate Bill (SB) S75 (2008), legislation mandating transportation and land use planning to reduce greenhouse gas emissions (GHG) from the transport sector. SB 375 helps implement earlier state legislation, Assembly Bill (AB) 32 (2008), which calls for reductions in greenhouse gas emissions by 2020 in line with levels recommended by the international scientific community. SB 375 requires the state's urban regions to plan for more efficient development to help achieve the state's climate policy goals.

Dubbed “the nation’s first law to control greenhouse gas emissions by curbing sprawl,” SB 375 has since gained national attention, and through the federal inter-agency Partnership for Sustainable Communities and upcoming reauthorization of the federal transportation law, the SB 375 approach may be extended nationally. Under SB 375, Metropolitan Planning Organizations (MPOs) must develop “Sustainable Communities Strategies” (SCSs) – development scenarios deemed capable of achieving mandated GHG emissions reduction targets for vehicles and light trucks. With MPO governing boards comprised primarily of local government representatives, SB 375 strengthens the framework for coordinating state, regional, and local plans and priorities. An SCS must be consistent with the mandated state emissions reduction target under SB 375, and with the MPO's long-range regional transportation plan (RTP), and also with California housing law requiring local governments to plan and zone for housing in amounts and types that accommodate projected population growth.

The California Air Resources Board (CARB) – charged with implementing AB 32 – has defined a three-pronged strategy for transportation, which comprises 37 percent of total GHG emissions in the state: improving fuel efficiency, improving vehicle efficiency, and reducing vehicle travel. The first two strategies are projected to account for 91% of targeted emissions reductions from transportation by 2020. CARB considers the third strategy – reducing vehicle miles traveled (VMT), the goal of SB 375 – to be critical in the long run, because increases in VMT could eventually erode emissions benefits from technological improvements. Absent interventions, statewide VMT will double from 1990 to 2030.

SB375 builds upon both regional and local precedents. The MPOs for the four largest metropolitan areas in the state, as well as several smaller ones, have developed "blueprint plans" examining strategies for infill, compact growth, and transit-oriented development. As of 2009, about 38% of the cities in the "blueprint regions" had brought their local plans into conformity with the blueprint plan. In addition, more than three-quarters of cities had adopted or were in the process of adopting climate policies and plans. These activities lay the groundwork for the development of SCSs.

Many city planners we interviewed indicate that adopting local climate policies helps them to coordinate and prioritize existing smart growth policies and programs. Another motivation for local government action is that the state's stringent environmental review laws now require project by project review of climate impacts. However, if a local government develops a climate action plan that meets state standards for GHG reduction and mitigation, it can rely on the plan and avoid project by project analysis. The resulting time and cost savings are potentially large.

Nevertheless, obstacles to achieving SB 375 goals remain formidable. In spite of the important role that some policymakers expect SB 375 to play in addressing climate policy goals, its means are relatively modest. SB 375 provides no state funding and few mandates for SCS development or implementation. The law does not require local governments to alter land use decisions to comply with the SCS, and some local governments seem disinclined to cooperate. The law does
offer streamlined environmental review for certain infill development projects, but the inducement depends on local interest in infill development in the first place. In addition, recent state budget cuts for transit and redevelopment, made in response to the economic downturn, threaten the viability of ambitious infill and transit-oriented development strategies. In our interviews, local planners complained that the costs of providing additional or upgraded urban infrastructure and services, such as sewers, transit, and parks, are very high, but such investments are needed to support infill projects and ensure their acceptability to current residents. Furthermore, many regional agencies, such as transit agencies and water and sewer districts, have not been actively engaged in efforts to redirect resources to infill sites, and their leaders sometimes seem disinclined to make such reprogramming a priority. With few direct incentives available for infill development, our interviewees expressed concern that regional negotiations over SCSs may become zero-sum conflicts, as some communities are called upon to accommodate higher shares of regional population growth without the funds to support such growth, while other communities not targeted for TOD may be disinclined to reallocate resources to assist their densifying neighbors.

Reflecting SB 375’s modest provisions, CARB recently adopted first round emissions targets for MPOs which actually accommodate an increase in total GHG emissions under the law. The targets call for each large region to reduce per capita GHG emissions, but total emissions reductions are undercut by projected growth in VMT. CARB estimates that annual CO2 emissions from passenger vehicles and light trucks – the emissions covered by SB 375 – will increase by 10% from 2005 to 2020, and by 18% from 2005 to 2035, based solely on the SB 375 targeted reductions. CARB expects its other policy measures will be sufficient to achieve called-for reductions from the transportation sector to meet AB 32 goals in 2020. However, the evolving policy casts some doubt over the role that land use and transport measures will play in the overall program.
People have a variety of reasons for deciding where to live: public safety, quality of schools and other public services, the time it takes to get to work, the mix of amenities nearby like stores and restaurants, and last, but certainly not least, the character and cost of the community. The typical home seeker weighs all of these factors to strike the right balance for his or her family when choosing a community.

In an effort to bring the American dream of homeownership to more people, however, our society has enabled and encouraged growth in places where low land costs deliver relatively inexpensive housing but where sprawling, single-use development adds significantly to the cost of carrying out the daily tasks of getting to work or school, running errands and enjoying an evening out. Unlike house payments, transportation costs are difficult to track because they are paid in disaggregated ways: monthly car payments, semi-annual insurance premiums, weekly fill-up at the pump and periodic maintenance. As a result, Americans only grasp the magnitude of these expenses after committing to a community.

The Housing and Transportation (H+T®) Affordability Index offers transportation cost data for 161,600 neighborhoods across 337 regions of the United States and provides proof that compact development can significantly reduce household travel costs.

The H+T Index challenges conventional wisdom about affordability and demonstrates that the combined cost of housing and transportation places the vast majority of communities in this country beyond the reach of median income households. Two out of three communities (69%) are considered affordable under the traditional definition of housing costs at 30% of income. That shrinks, however, to just two out of five (39%) when both housing and transportation costs are considered and a 45% affordability benchmark is applied.

The Index also shows that a community’s location, character and design are better predictors of overall affordability than household size and income. Compact, walkable, mixed-use communities with convenient access to public transit and employment centers may initially appear expensive because of higher housing costs. But after applying the H+T Index, these places can often make for more affordable living than less dense exurban communities because households can own fewer cars—the single biggest expense in a household transportation budget—and still maintain a high quality of life.

Important findings include:

- Families who pursue a “drive ‘til you qualify” approach to home ownership in an effort to reduce expenses often pay more in higher transportation costs than they save on housing;
- Residents of “drive ‘til you qualify” zones are most sensitive to jumps in gas prices because of the distances they must drive;
- The longer distances associated with sprawl also translate into more congestion on our highways, less leisure time with families as workers spend more time in their cars getting to and from jobs, and higher greenhouse gas emissions;
- Density is strongly correlated with auto ownership and VMT;
- Household transportation cost savings from residing in a compact neighborhood rather than a dispersed community can range from $1,580 per year in Little Rock and $1,830 in Minneapolis to $3,110 in Chicago, $3,610 in Phoenix and as high as $3,850 in Boston;
•Aggregate regional transportation savings through 2030 range from $239.8 million in a small region like Charlotte to as much as $1.1 billion in San Francisco and $2.1 in Phoenix if 50% of projected population growth could live in more location efficient places.

These facts suggest that regions need to change the way they plan for and accommodate growth so as to preserve affordability at the household level and sustainability at the regional level. The Index demonstrates the need for performance measures rooted in the realities that confront households trying to make ends meet and that regions confront in balancing growth with the cost and quality of life, the amount of Greenfields lost to development, traffic congestion, infrastructure costs, improved economic competitiveness, and reduced carbon emissions. Finally, it provides a quantitative tool for new federal policy redefining affordability in America that better reflects economic reality and provides an objective basis for regions to make the necessary changes.
Summary:

Livability, as it applies to transportation investment, is not well defined. In many respects, it is analogous to the Supreme Court Justice Potter Stewart’s famous declaration that “…I know it when I see it.” An emerging community of academicians, advocates, and planners tend to think about livability in terms of “complete streets” – namely streets that provide adequate pedestrian and bicycle access, limit the need for automobiles, and enhance the community’s walkability for shopping, recreation, and entertainment. These approaches “give everyone multiple travel choices for meeting their daily needs affordably, safely, conveniently, and efficiently.” Inherent in the complete streets concept – and notably often overlooked – is that these businesses and entertainment destinations still need to be serviced by delivery vehicles. Products and services require a freight system capable of delivering goods in a timely manner.

The National Center for Freight and Infrastructure Research and Education (CFIRE) at the University of Wisconsin-Madison operates with a research theme of Sustainable Freight Transportation Infrastructure and Systems. This work has resulted in both hard side and soft side transportation research with much of this effort directly related to the policy impacts of transportation investments. To define sustainability, CFIRE adopted a “triple bottom line” approach. This line includes social, economic, and environmental sustainability measures. Among the critical concepts included in these policy-oriented works, are the concepts of megaregional development and urban access.

Approach

The authors explored whether increased urbanization and the development of mega-regions will be sustainable with respect to freight transportation. To accomplish this objective, the authors characterized current freight patterns in urban areas and associated those movements with economic and environmental costs. The authors will eventually prepare outreach and educational materials in the context of current efforts targeting livability performance measures.

In the Fall of 2010, the University of Wisconsin-Madison, with assistance from CFIRE, sponsored the development of a Transportation Management and Policy colloquium exploring livability as a concept in transportation decision making. To fully ensure that our society continues to prosper, the concepts of livability must include freight access, urban delivery, and intermodal connectivity. These considerations will help reflect modern society’s needs, demands, and expectations.

In this poster, the authors outline the principle issues related to incorporating freight related transportation priorities into the livability framework.

Observations

The environmental and equity impacts of transportation have been thoroughly researched. In many respects, the lessons from the interstate era demonstrated the shortcomings of decision-making processes devoid of human interactions. We have made great strides in accommodating bicycle and pedestrian modes and limiting the environmental impact of personal automobile travel. However, there are many observations and cautionary tales that need to be included in these discussions.

Among the primary considerations identified for freight in an era of Livability are:
- Access management and delivery availability
- Emissions (both during delivery, in congestion, and at ports/terminals)
- Alternative energy systems
- Physical infrastructure accommodations (including freight only infrastructure)
- Decision making criteria to weight freight and passenger projects
- Lane width, geometry, and bridge clearances
- Industrial and commercial development land uses
- Terminal and freight facility location
- Interconnectivity

The authors provide preferred practices for incorporating freight and examples of inadequate accommodations for freight through several of the listed topics. The poster demonstrates the value of including freight related aspects in the broad scheme of livability. It also demonstrates the importance of freight to the economic well being of society as a whole. The authors hope to encourage additional discussion on how to incorporate economic growth, and its freight requirements, with livability.
Summary:

For four decades, the city of Freiburg (population 220,000) has been at the forefront of promoting sustainable transport in Germany. Up to the late 1960s, Freiburg encouraged greenfield development, widened streets, abandoned trolley lines, and built car parking lots. Motorization increased rapidly, transit ridership plummeted, and the city was sprawling. Air pollution, traffic fatalities, and traffic congestion related to the car and other environmental concerns shifted public opinion away from automobile centered growth. Between 1982 and 2007, the number of trips by bicycle tripled, transit ridership doubled, and the share of trips by car fell from 38% to 32%. Since 1990 the level of motorization has stagnated and per-capita CO2 emissions from transport have fallen. Freiburg achieved a more sustainable transport system by (1) successfully integrating land-use and transport planning, (2) coordinating and integrating public transport regionally, (3) promoting bicycling, (4) restricting automobile use, and (5) encouraging citizen participation throughout the process.

Governments at federal, state, and local levels in Germany determine the sustainability of the transport system. Federal gasoline taxes, sales taxes, and regulations make automobile use and ownership expensive and encourage demand for less polluting and smaller cars. Additionally, the German federal government provides matching funds for local public transport, walking, and cycling projects. Federal, state, regional, and local governments interact in a federally mandated bottom-up and top-down land-use planning process. Lower levels of government participate in drafting plans at the next highest level, but are bound by the higher level plans once they are adopted. At each level land-use plans are coordinated with housing, transport, and environmental plans and neighboring jurisdictions. Local governments draw-up the actual land-use plan. The role of the federal government is limited to ensuring consistency of planning techniques, enforcing planning and environmental laws, and formulating broad spatial planning goals. Federal and state governments provide the framework, but cities—like Freiburg—have been developing and implementing innovative policies.

Integrating Transport and Land-Use Planning

Even though Freiburg started implementing sustainable transport and land-use policies in the early 1970s, the comprehensive transport plan of 1979 was first to explicitly call for the integration of both planning sectors. The land-use plan of 1981 prescribed that new development was to be concentrated along public transport corridors. In 2006, 65% of Freiburg’s residents and 70% of all jobs were located within 300 meters of a light rail stop. Freiburg’s most recent land-use and transport plans were developed simultaneously and both postulate the goals to reduce car use and keep trip distances short.

Expanding and Coordinating Public Transport Services

In the late 1960s Freiburg’s city council decided to stop abandoning trolley lines. Fifteen years later, in 1983 the first new light rail line was added to the remaining 14 kilometers of tracks. Since then, Freiburg has opened four new lines with a total extent of 36.4 km in 2008 and supply of light rail service has tripled. In 1984, Freiburg’s public transport system offered Germany’s first monthly ticket—transferable to other users. In 1991, the geographic coverage of the ticket was
expanded to include the city and two adjacent counties. Services, fares, subsidies, and timetables for bus and rail operators are coordinated regionally. The monthly ticket offers unlimited public transport travel within the entire region for about $60. Over 90% of passengers have monthly or annual tickets. Freiburg’s transit system has become one of the most financially efficient in Germany—only requiring 10% of operating subsidies.

Making Cycling a Viable Transport Alternative for All Trips

The bicycle is a feasible option for all trips and all destinations in Freiburg. Between 1972 and 2007 Freiburg expanded its network of separate bike paths and lanes from 29km to 160km. This network is complemented with 120km of bike routes through forests, 400km of traffic-calmed roads (30km/hr or less), and 2km of bicycle streets. Slow automobile speeds in traffic calmed areas encourage more cycling and make it safer. The city requires bike parking in all new buildings with two or more apartments, as well as schools, universities and businesses. Between 1987 and 2009, the number of bike parking spaces increased significantly—including a major bike parking garage at the main train station with space for 1,000 bikes.

Restricting Automobile Use

Many of the policies that promote public transport, bicycling, and walking involve restrictions on car use—such as car-free zones and traffic-calmed neighborhoods. Additionally, Freiburg’s parking policy is designed to make car use less convenient and more expensive. Parking garages are relegated to the periphery of the city center. In residential neighborhoods, parking is reserved for residents only and requires a special permit. On-street parking in commercial areas of the city becomes more expensive with proximity to the center.

Citizen Involvement

Citizen participation has been a key aspect of transport and land-use planning in Freiburg. For example, Freiburg’s latest land-use plan has been developed with sustained input of 900 citizens from 19 neighboring municipalities, and 12 special purpose governments in the region. Citizen involvement and public discourse kept the environment and sustainability of the transport system in the news in Freiburg for decades. Over time, public opinion in Freiburg has become more and more supportive of sustainable policies.

Lessons for the USA

The innovative transport and land-use policies introduced in Freiburg offer useful lessons on how to increase transport sustainability: First, controversial policies were implemented in stages—often starting in neighborhoods were people were most supportive. Second, transport policies were multi-modal and included both incentives for alternatives to the car and disincentives to automobile use. Third, transport and land-use planning were fully integrated—culminating in the simultaneously drafted transport and land-use plans of 2008. Fourth, citizen involvement was an integral part of policy development and implementation—with citizens often driving the sustainability agenda. Fifth, support and collaboration from higher levels of government was crucial to making local policies work. Sixth, sustainable transport policies were long term, with policies sustained over time, for lasting impact.

5 TOD 3.0: Aligning Partners in Real Estate Development and Transit Implementation- Ian Carlton

Organization: TransACT
Email: ian@transactsf.com
Contributing Authors: William Fleissig

Summary:

With support from Reconnecting America, Livable Cities, and the Ford Foundation, Ian Carlton and William Fleissig identified an emerging direction for transit implementation, station area planning, and infrastructure finance to achieve more successful livability-oriented transit corridors. Based on case studies and practitioner interviews, Carlton and Fleissig have determined that an emerging TOD era, ‘TOD 3.0,’ is focused on coordinating transit planning and real estate development potential because (1) fixed-guideway transit infrastructure is becoming the corridor armature that defines sustainable and livable communities and (2) real estate development is a principal funding source for local livability-related infrastructure. By combining seldom-coupled standard practices into a cohesive strategy, ‘TOD 3.0’ enables more people over larger geographic areas to access the benefits of more livable places and equitable communities.

We posit that transit-served corridors of walkable, high-quality, mixed-use communities that reflect TOD principles are the future models of livable communities. However, built TOD to-date has a mixed track record, with most examples achieving neither their anticipated community benefits nor real estate return expectations. Our research has identified a consistent disconnect between the real estate development community and the transit planning world that has contributed to the mixed track record of existing TOD. A previous era, coined ‘TOD 1.0,’ exhibited isolated transit infrastructure implementation and real estate development processes that resulted in one-off real estate projects built only when markets and regulations fortuitously allowed development. Subsequent to 1991’s ISTEA, which called for the inclusion of land use criteria in the New Starts funding process, ‘TOD 2.0’ exhibited greater regulatory coordination focused on TOD outcomes, though TOD projects still occurred on a one-off basis when markets fortuitously allowed. A paradigm shift that aligns transit implementation with real estate development potential to maximize livability-related improvements, which are often funded via real estate development, is required to achieve consistently livable TOD in the future.

We believe the next evolutionary step of TOD, ‘TOD 3.0,’ will be a coordinated transit implementation and real estate development process requiring multidisciplinary transit corridor-based land-use and financial planning from the outset. Because new real estate development funds a large portion of livability benefits, transit planners must become aware of the economic development and real estate development potential of their station location options. Our survey of current practice suggests that several transit projects have achieved a heightened level of real estate awareness in the early planning stages that have led to the siting of transit facilities in good or great real estate markets. Market alignment has allowed for high-quality, livable communities to emerge around transit. Incorporation of real estate development potential in the transit planning process was often spurred by the need to finance a significant portion of the transit capital costs from real estate development related revenues (e.g. Tax Increment Financing, Assessment Districts, Joint Development). This process, commonly referred to as value capture, can become a critical tool to align transit planning with real estate development. Real estate developers are often expected to fund local infrastructure needs, public art programs, affordable housing, or other livability benefits. Carrying this out along an entire transit line calls for greater planning coordination and the implementation of transit corridor financing districts that can capture value and distribute livability benefits along corridors. Because not all stations will
have significant real estate development opportunities, funds generated in ‘high-value’ station areas can cross subsidize livability benefits (i.e. preservation of affordable housing, streetscape improvements, public service enhancements) in other station areas along the transit corridor. Also, because development projects are typically burdened with significant up-front livability-related infrastructure costs and the first projects in a station area are disproportionately burdened, TOD is often unattractive to real estate investors. Thus, ‘TOD 3.0’ leverages local finance districts as a means of transforming large up-front costs into smaller, distributed, ongoing costs. Successfully orienting ‘developer exactions’ toward transit station area livability goals is a minor adaptation of current assessment district and tax increment district practices. Such modifications to existing practice can be facilitated and/or required by policymakers, transit agencies, public-private partnerships, and – as the critical finance source for transit projects – the federal government.

Current practices can be tweaked, combined, and broadly adopted to achieve the transit/real estate partnership that we believe defines the future of livable communities. It is our assertion that best practices adoption, facilitated by new flexibility built into existing transit policies, can generate a livability-focused paradigm shift.
Prioritizing brownfields for development: a GIS tool and indexing scheme for environmental, socioeconomic and smart-growth factors

A key step to promoting smart growth in urban environments is the reclamation of dilapidated, underutilized or abandoned contaminated urban sites, also known as brownfields. Brownfield redevelopment promotes smart growth because it involves land reuse in urban areas, and subsequently leads to economic and community vitality. Brownfields commonly occur within an urban context where basic infrastructure, workplaces and other amenities are already in place. Brownfield redevelopment therefore can be planned in such a way that leads to creation of walkable neighborhoods, favor public transportation, and revive local markets.

Prioritization of brownfields for redevelopment has become important because according to the US EPA estimates, there are approximately 450,000 brownfields in the United States. With the substantial number of brownfields and limited amount of funding, decision makers face the question- which project can be completed with the available funding sources and which projects need to be waitlisted? The lack of decision support tools for prioritization of brownfields for redevelopment is one of the impediments in obtaining maximum benefits from the available funding resources. This research explores a prioritization scheme for brownfield redevelopment using Geographic Information Systems (GIS) implemented to visualize socioeconomic factors, smart growth and environmental attributes of brownfield sites and their surrounding areas. Because socioeconomic, environmental and smart growth related factors tend to be considered when evaluating the benefits derived from brownfield redevelopment, these parameters were chosen as the basis of indexing scheme. Its application to the City of New Haven, Connecticut as a case study demonstrates a general prioritization scheme that can be used by urban planners and public agencies to pinpoint smart growth and environmentally sensitive locations that can be set as priority areas for funding. The indexing approach attempts to consider all the three factors (socio-economic, smart-growth related and environmental) in such a way that they are independent of the end-use, and do not require any site specific environmental investigation aggregation.

Environmental factors for the prioritization scheme were based on rough assessment of the environmental sensitivity and potential environmental risk of a brownfield site. Six environmental variables – site’s past use, zoning (proximity to residential areas), proximity to water bodies, proximity to sensitive receptors (parks, habitats and biodiversity areas), floodplain categorization, and underlying soil type were chosen to assess environmental risks. An Environmental Index Map based on the proximity of the brownfields to the sensitive receptors was generated. Based on the levels of risk brownfields were categorized into three color codes- red, yellow and brown. High risk brownfields were designated by a red code indicating brownfields with industrial past uses that are at a distance of less than 0.25 miles (based on LEED ND) from water bodies and natural diversity areas. Yellow Code indicates moderate risk and represents brownfields with industrial past uses that are at a distance of more than 0.25 miles from water bodies and natural diversity areas. Brown code represents sites with commercial and unknown uses that would need further assessments to assess environmental risks. Also, based on the available zoning information a mixed used potential map was generated representing brownfields with industrial
past uses that are at a distance of less than 0.25 miles from industrial, commercial and residential zones intersection.

Smart growth location mapping is based on transportation and land use variables determined by the Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) Rating System. The variable selection process yielded 6 variables - intersection density, presence of utilities, job housing balance, bus transit, rail transit and the potential for transit. All variables were classified into three classes - high, medium and low depicting a variable’s value range that will have the strongest, moderate, and no positive influence on an area’s capacity to support smart growth development. Indicators of smart growth were scored from 0 to 2. 0 corresponds to a low indicator for smart growth, 1 to medium and 2 to maximum potential for smart growth. Finally, smart growth locations were grouped into two categories - Smart Growth Area 1 with a score ranging from 0.8-1.4 depicting a comparatively lower smart growth potential than Smart Growth Area 2 - the score for which ranges from 1.4-2 and implies higher smart growth potential. The incorporation of socio-economic factors into a general prioritization scheme presented the biggest challenge in terms of selection of variables and data acquisition. Depending on the town and state policies, it may be desirable to use various types of demographics to target distressed municipalities for redevelopment; therefore the type of variables should be determined at the discretion of the authoritative decision makers.

The results of smart growth location mapping for New Haven suggested that 74.1% (14.1 sq. miles) of the town contains the necessary infrastructure and other location specific features that would best accommodate smart growth development. Most of the high and moderate risk brownfields along with brownfields exhibiting mixed use potential in New Haven are already located in smart growth locations. This implies that these brownfields have the potential to be accessible to markets, suppliers, employees and the local labor pool. Also, brownfields representing higher risks are indicative of the environmental sensitivity pertaining to the location of brownfields and possibly urgency to address them. These brownfields are deemed to be areas of concern and exhibit potential redevelopment priority for the city of New Haven.

The goal of this project was to enable, through our visual tool and mapping index, the state government and other public agencies to prioritize brownfields for redevelopment and make decisions that would focus limited funds and other resources on the more promising remediation projects in terms of environmental and smart growth criteria. This constitutes a significant departure from previous decision support tools that aim at assessing the suitability of a particular end use for a brownfield site or to estimate the smart growth potential of a specific project. Application of the GIS tool to the City of New Haven with the available data showed that a brownfields with high environmental sensitivity and smart growth potential could be a potential target area, while the isolated brownfields with mixed used potential could be transformative if redeveloped. At present the major limitation in the application of this GIS tool is the availability of data. Additional data would help in quantifying the potential risks associated with the sites and help in the creation of more refined areas of concerns.
7 Real-time Ridesharing for Livable Communities- Jason Conley

Organization: Avego Corporation
Email: jason.conley@avego.com

Contributing Authors:

Summary:

Much of the public discourse about livable communities focuses on transit-oriented development, and planning for walkable neighborhoods. While these are both important, the concept of livability should also embrace sustainable transportation options that provide connectivity between where people live and jobs. Affordable transportation options such as carpooling and vanpooling provide affordable mobility and access to jobs for the 89% of people who do not live within walking distance of transit stops with regular service frequency. This presentation will introduce the technology created to enable on-demand, real-time ridesharing as a flexible, safe and convenient form of commuter transportation that reduces the number of cars on our roads, saves people money and extends public transit.

Traditional top-down transportation networks are failing us, as illustrated by the increasing number of people who drive alone (76% today, 64% in 1980) and the small number of people (4.7%) who use public transportation to commute to work. Average car occupancy is now 1.5 people per car, and traffic congestion in our communities costs the United States $87.2 billion per year in wasted fuel and productivity and 4.2 billion hours wasted sitting in traffic—not to mention the devastating environmental impacts from CO2 emissions. Building our way out of congestion is an expensive and time-intensive proposition—and will only lead to additional sprawl and increased emissions. A more cost-effective solution is to better utilize our existing capacity—in the form of empty seats in private cars.

Traditional carpooling, however, fails to recognize the increasingly variable working hours of today’s commuters. Many workers’ schedules are simply incompatible with the fixed commuting schedules required for an established carpool. Fortunately, the advent of location-intelligent consumer technology has enabled a new bottom-up approach that uses market forces to reduce the vast amounts of wasted seat capacity on our busy roads. By providing a marketplace for drivers to be matched with riders in real time, Avego’s iPhone-enabled Shared Transport technology essentially enables anyone to run their car as a bus, saving money by picking up riders along their route. Avego combines on-demand ride matching with a price incentive, in the form of an electronic micropayment to drivers at the end of each journey.

This approach builds upon the bottom-up phenomenon of “slugging” or “casual carpooling” in cities such as Washington DC and San Francisco, where cars pull over at dedicated points to pick-up riders so as to be eligible for travel on high-occupancy vehicle (HOV) lanes. It’s a win-win situation for both drivers and riders, tens of thousands of whom use this form of transit, with no major problems reported. However, until now this on-demand ride matching has been limited to just a few routes in a few cities. Avego’s technology makes this possible for commuters on every road. Commuters add the routes and stops to the network, so the network organically expands throughout a community to areas underserved by public transit.

Avego Shared Transport includes a number of additional benefits, including automated payment transaction management, real-time passenger information and comprehensive safety features—everything required of a modern, reliable and sustainable transportation network. Anyone can book a ride online or using any mobile phone and receive notification as the driver approaches the pick-up point. Commuters can define their own preferences in filtering potential ride matches (e.g., by gender, community, social network, non-smoking, etc.). A self-policing, self-correcting
user rating system is provided so people can make informed decisions when they’re matched with someone. And one-time PIN codes enable drivers to verify a rider’s identity upon pick-up.

This presentation will demonstrate how this Shared Transport technology offers a very efficient and cost-effective way of easing traffic congestion, relieving parking problems and expanding commuting options. Evidence will be presented from Avego’s pilot program at University College Cork (UCC), where the technology is being implemented to provide UCC’s 19,000 staff and students with a flexible, reliable and affordable alternative to single-occupancy vehicle commuting to and from the campus. The presentation will also demonstrate how Shared Transport can be integrated with existing public transportation infrastructure, with evidence from the OPTI-TRANS project in Madrid, Spain. There, Avego is working as part of a consortium to develop multimodal traveler information and guiding systems that provides commuters with real-time information about available capacity in public transportation and private cars.
8 The Strategy of Alternative Fuels for Urban Transit:
Phase 1: Life-Cycle Assessment of Alternative Fuel
Buses- Elaine Croft McKenzie

Organization: Northwestern University
Email: e-croft@northwestern.edu

Contributing Authors: Pablo Durango-Cohen, Associate Professor of Civil and Environmental
Engineering, Northwestern University

Summary:

Introduction:
The decisions made at the purchasing phase of infrastructure management have long-lasting
implications for the sustainability and level of service provided by a transit operator to a
community. National Ambient Air Quality Standards and US EPA emissions standards have long
required municipalities to reduce local pollutants (e.g. particulate matter), significantly improving
quality of air for many urban residents. However, reducing tailpipe emissions does not
necessarily correspond to a reduction in greenhouse gas (GHG) emissions, or of total pollutants
over the life-cycle of the vehicle. In order to properly plan for transit operation, infrastructure and
rolling stock costs must be valued in light of their total environmental and economic footprint over
the planning horizon.

We address the issue of strategic bus fleeting by combining decision making models with models
of life cycle assessment (LCA) to fully explore the relationships and tradeoffs between the
economic and environmental costs of infrastructure decisions over the planning horizon. The first
phase of this research is to conduct a life-cycle assessment of alternative fuel transit buses. This
analysis promotes a life-cycle view of strategic decisions, and helps support an understanding of
the multi-dimensional return on investment of different infrastructure and rolling stock options, and
will give decision and policy-makers information necessary to maximize the sustainability of our
transportation infrastructure.

Literature Review:
Many researchers have studied the factors and environmental effects of different alternative fuel
technology in vehicles. Most attention has been focused on the personal automobile, while public
transit and other modes have received less focus (Chester and Horvath, 2009). In a significant
undertaking, MacLean, Heather and Lave (2003) provide an evaluation of automobile
fuel/propulsion system technologies, including a substantive review of previous LCAs conducted
on these technologies.

Within the literature on buses, much of the research has focused on compressed natural gas
(CNG) buses. A review of studies alternative fuel vehicles by Hesterberg et al. (2009) found that
the source of emissions differences were often attributable to fuel production techniques. In a
California Energy Commissions (2007) report, it was found that the source of the hydrogen fuel
had a significant impact on the emissions associated with the bus. A study of fuel cell buses in
Perth, Australia, found that when the fuel pathway is included in a LCA, current hydrogen fuel cell
buses demand more energy and have similar values of global warming potential as diesel buses
(Ally and Pryor, 2007). However, future hydrogen fuel cell vehicles have the potential to
significantly reduce energy demands and GHG emissions (Colella et al., 2005). These results
indicate that the valuation of GHG emissions savings and reduced dependency on fossil fuels will
be critical factors to determining the economic viability of hydrogen as a vehicle fuel.

Methodology:
In this phase of this two part research, we examine the life-cycle economic costs and GHG
associated with an urban transit bus, including vehicle manufacture, vehicle operation, the fuel
pathway, energy generation, and other supply chain inputs. Four transit bus technologies are
examined: Diesel, Hybrid-Electric Diesel, Compressed Natural Gas (CNG), and Hydrogen Fuel Cell (HFC).

The data for this project come from a series of demonstration studies on alternative fuel buses conducted by the National Renewable Energy Laboratory (NREL), a subsidiary of the United States Department of Energy. In studies such as Chandler and Eudy (2009), NREL purchased and operated commercially available alternative fuel buses on existing transit routes in urban areas and evaluated the performance of the buses.

Using a study baseline of 2008, a lifespan of 15 years, and an average mileage of 26,000 miles per year per bus, we conducted a life-cycle assessment of each of the four types of transit bus. Emissions from the manufacturing phase were calculated using EIO-LCA (http://www.eiolca.net). Data on emissions from the operating phase and fuel pathway were gathered from NREL, the California Energy Commission and other sources.

Results:

• All of the alternative fuel transit buses (Hybrid, CNG, HFC) offer a savings of GHG emissions as compared to a diesel bus. The marginal costs of these savings varied from approximately $180 - $10,000 dollars per metric ton, depending on factors such as the cost of fossil fuel and the lifetime mileage of the bus.
• GHG savings from the HFC were highly dependent on whether the hydrogen was produced using fossil fuel or renewable energy sources. In the former case, HFC buses actually had higher levels of lifetime GHG emissions than diesel buses.
• Fuel-dispensing and storage infrastructure for CNG and HFC buses require significant capital investment by transit operators, making a gradual shift away from diesel buses economically impractical. With a fleet of 50 buses, the per-bus infrastructure investment can raise the cost of each bus by 33%.
• Alternative fuel vehicles often have different level of service characteristics (e.g. capacity, speed, maintenance time) than diesel buses. When measured on a per-passenger basis, alternative fuel vehicles may produce more GHG emissions than their diesel counterparts in some markets.

Conclusions:

Switching to alternative fuel buses, especially HFC buses where the fuel is produced using renewable resources can result in significant savings in lifetime GHG emissions. At a projected future price, HFC buses have the lowest marginal cost in terms of $ per GHG units saved. However, this is highly dependent on the ability to produce hydrogen cheaply from non-fossil fuel sources. At current prices, CNG and hybrid buses are much more accessible for struggling transit operators, while still contributing some GHG savings.

Continued technological development into fuel cell technology will continue to increase the options available to transit operators, and increased focus on greenhouse gas reduction will increase the motivation for transit operators to decrease their carbon footprint. To reach our goal of sustainable transportation infrastructure, we need to continue examining the complex relationships between social, environmental, and economic factors in strategic transit fleeting decisions.

References:

Summary:

A transportation system that enhances residents’ mobility is an essential component of a livable community. Different residents may use different modes, but the ideal transportation system can meet the needs of a variety of users – for example, those of different ages and incomes and those who may face different barriers to mobility. As the population ages, and physical or medical issues that may make driving more difficult or impossible for some increase, the role of transportation in sustaining livable communities is becoming more central. In 2010 the U.S. Census estimated that 13.0% of the population is age 65 or older; by 2030 the projection is that nearly one-fifth of the population will be age 65 or older. Aging, and the rapid growth of the older adult population, presents new challenges to society; the population of older adults living today is historically unprecedented. While these challenges an aged and aging population presents are varied, there has been a substantial body of research devoted to examining the impact of aging on mobility (e.g., Dobbs 2008; Rosenbloom 2001), and on the hurdles, including geographic isolation, that many older adults face should they not be able to drive (e.g., Bailey 2004). Other work has documented the negative health impacts of reduced driving and mobility among older adults (e.g., Marottoli et al. 2000). As a result, transportation and mobility are identified as one of key features of some indicators of quality of life (e.g., Spinney, Scott and Newbold 2009; U.S. EPA 2010).

Much of the previous research on transportation options for older adults has taken the form of surveys or case studies of available transportation programs. Less work has proceeded from the perspective of how different housing choices older adults, in concert with any mobility restrictions they may have, make affect their mobility and ability to live independently in the community. Rather than look community by community, we argue that considering different models for older adults’ housing choices is a better approach to thinking about transportation solutions and to enhancing the livability of communities for older adults. In this paper we examine how emerging models of housing communities for older adults and the residents of these communities lead to different combinations of accessibility, availability of activities, and density – key components of transportation “livability” within a community.

The standard housing choices for older adults have been to age in place in the community (a choice endorsed by 79% of older adults today as well (AARP 2008)), to move to a retirement community and to live independently, to move in with family members and to live in their community, or, when necessary, to move to a nursing home or other care facility. These options still exist for older adults today, but they have been joined by new models of housing options as well, notably the rise of active adult/lifestyle or 55+ communities, continuing care retirement communities (CCRCs) that provide support for older adults ranging from none to little to around-the-clock nursing care, and aging in the community with the support of a formal neighborhood association, a “village.” This work examines each of the different housing models for older adults and the transportation options that promote or erode a community’s livability. A variety of different sources of data are used, including an examination of transportation availability for active adult/lifestyle communities and CCRCs within the metro-Boston area, interviews with CCRCs to determine what kinds of
transportation services they provide residents, and interviews with village members, like those from Beacon Hill Village in Boston, MA, and SAIL in Madison, WI, to understand the transportation offerings and challenges they face. The work will also include a review of other kinds of transportation services available at the community level, including paratransit services, private offerings such as ITN America, and other public-private partnerships. This paper will result in a residually or housing community centered approach to thinking about transit solutions to enhance mobility and livable communities for older adults. By focusing on the models of housing choices older adults make, communities may discover other means of providing transportation services to improve the quality of life for their older residents, and the livability of the community for all.
10 Implementation of Active Living Policies by Land Use and Transportation Agencies- Jennifer Dill

Organization: Portland State University
Email: jdill@pdx.edu

Contributing Authors: Deborah Howe
Oliver Smith

Summary:

Background
The extent to which a community has a system of accessible, well-designed and well-maintained sidewalks and bike routes, safe means to cross busy roads, paths, convenient and dependable public transit, and walking or bicycling distance between homes, workplaces, schools and other common destinations, defines the extent to which there are alternatives to the sole reliance on a car for everyday mobility. The built environment is the result of dynamics of land development involving builders, investors, consumers and local government policies, such as zoning and land use planning. In addition, transportation infrastructure and, therefore, transportation agencies, play a major part in this system.

The overall aim of this research was to examine why public agencies adopt actions that support walking and bicycling (active living). Understanding why can then be used to promote reformation of planning and policy processes. Specific research questions included:

1. What actions (e.g. policies, plans, standards, programs, funding etc.) can land use and transportation agencies take to support active living?
2. Which agencies have taken these actions?
3. Why have these agencies supported active living? What factors influence adoption?
4. To what extent is health and active living a motivation for these actions?
5. Why don't more agencies adopt such actions?

Methodology
For the land use side of the question, we examined the adoption and implementation of mixed use and related zoning provisions among U.S. cities and counties. A sample of planning directors from 53 “best practice” and 145 randomly selected mid-sized communities were surveyed. For the transportation side of the question, we inventoried all 50 state Departments of Transportation (DOTs), focusing on statewide transportation plans, along with pedestrian and bicycle plans or guidance documents. We also inventoried the regional transportation plans (RTPs) for 100 randomly selected metropolitan planning organizations (MPOs).

Findings
The surveys of planning directors found a relatively high rate of adoption of innovative land, use, parking and urban design policies that support walking and bicycling. Top concerns motivating adoption included avoiding bad development and promoting economic development followed by livability, creating dynamic centers, and community revitalization. A number of factors were positively related to increasing levels of innovation such as livability, conservation of natural resources, traffic congestion, etc. It appears that policy innovations framed with respect to these factors will gain more momentum; a follow up study could test this hypothesis.

The study demonstrated the importance of the jurisdiction’s master plan in influencing the adoption of innovative policies. State land use legislation was considered to be far less important. The importance of regional and state transportation plans was associated with higher levels of innovation. Lack of planning staff time and opposition from residents are the top reasons (65%) for not adopting policy innovations. This is followed by opposition from the business community (57%) and lack of leadership from elected officials (52%). The basis of opposition to innovative
policies are what would be expected and include a variety of concerns with density, perceived incompatibility in land uses, challenges to single family residential norms, traffic congestion and parking demands all of which were noted by two thirds or more of the respondents. Analysis of adopted DOT planning documents shows that over two-thirds of state DOTs support, or at least mention, the following elements of planning for active living: retrofitting streets with pedestrian and bicycle accommodations; pedestrian- and transit-friendly site designs; crosswalks; bike lanes; multi-use trails and paths; and traffic calming. In contrast, less than one-third of DOTs explicitly support increasing density and mixed-use development, road diets and narrow or “skinny” streets, and rail transit for everyday travel. DOT innovation appears to be highly related to regional differences, the existence of a state land-use agency, and is correlated (positively) with the degree of urbanization, and (negatively) with the amount of roads in the state. Similarly, MPO plans showed the highest levels of support (through funding or encouraging with financial incentives) for infrastructure such as sidewalks, trails, bike lanes and bike paths, bicycle parking, ADA requirements, and access management strategies. A majority of MPO plans did not include provisions for road diets, complete streets, the use of innovative designs, street trees, or pricing of parking. MPOs with larger populations, densities, and geographic coverage showed significantly greater support for active living in their plans. MPOs with residents having higher incomes, proportionately more advanced degrees and commuters that walk, bike or use transit also showed greater innovation.
Summary:

While a great deal of scholarly attention has been giving to the effects of geometric design on crash incidence – particularly in rural environments – there has been comparatively little research that has sought to understand how the design and configuration of communities may influence the incidence of traffic-related crashes, injuries, and deaths, and none that has examined how community design can be applied to integrate safety and livability concerns. That this is so is particularly surprising, since many of the design features that characterize contemporary community design, such as the functional classification of roadways, the disconnection of local street networks, and the separation of residential and retail uses – all emerged as strategies to enhance traffic safety.

This presentation presents the results of a recent study sponsored by the Southwest University Transportation Center that examines the relationship between community design and traffic safety. It begins by briefly recounting the traffic safety assumptions that led to contemporary design practice, and proceeds to examine these assumptions using a GIS-based database of crash incidence and urban form developed for the City of San Antonio, Texas. Through the use of negative binomial regression models, it finds that community design is strongly associated with variations in crash incidence. Arterial thoroughfares, strip commercial uses, and big box stores were associated with significant increases in total, injurious, and fatal crashes, while higher-density communities with pedestrian-scaled retail uses reported significantly fewer crashes and injuries.

These findings suggest that safety and livability are compatible design objectives; indeed, many of the design features current promoted to enhance livability, such as pedestrian-scaled retail uses and a departure from functionally-designed street networks, may be useful as a means for reducing crash incidence. It further suggests that many urban traffic safety problems may be addressed – at little or no cost to the public – though the safety-conscious administration of local land use codes. This presentation concludes by outlining three strategies for doing so. Specifically, it calls for land development codes that manage the tension between speed and access on urban streets, that reorient access-related commercial and retail uses to lower-speed thoroughfares, and that adopt a network-level perspective on land use and speed management. In so doing, it is possible to design communities that are simultaneously safe and livable.
Multimodal Corridors: Making Transit and Nonmotorized Modes Work in Highway Corridors -
Michael Carroll
Organization: Dowling Associates, Inc.
Email: mcarroll@dowlinginc.com
Contributing Authors: Christopher Ferrell, Herbert Levinson

Summary:
Successful and balanced multimodal systems are important components of livable communities. TCRP H-36 Reinventing the Interstate: A 'New Paradigm' for Multimodal Transportation Facilities, studied and identified the transportation facility and land use combinations that lead to successful multimodal freeway corridors - corridors that serve and are served by balanced transit, freeway, and non-motorized systems. A combination of case study and statistical analysis were employed to compare the performance and designs of various existing multimodal freeway corridors. Previously, little was known about the facility design characteristics and land use conditions that favor multimodal systems built within freeway corridors. Many U.S. cities have built multimodal freeway corridors-freeways and high-capacity transit lines running parallel in the same travel corridors. Up until now, the benefits of these projects are largely seen in terms of cost: transit infrastructure built using spare freeway rights-of-way can be a cost-effective alternative to assembling a right-of-way from scratch. But multimodal configurations built on previous models of multimodal freeway corridor development - the so-called, "old paradigm" - have yielded mixed results. Transit tends to generate the highest ridership in dense, pedestrian-oriented, mixed-use environments, while freeways encourage low-density, auto-oriented development that discourages pedestrian and transit activities. Many multimodal systems built in freeway corridors were designed with transit stations that optimize automobile access and circulation, often leaving transit, pedestrian, and bicycle access to stations - important components of a livable environment - as an afterthought. Based on the findings of this research, a typology was developed that describes successful multimodal systems and their surrounding corridors. The typology was then applied to survey the freeway corridors around the U.S. to identify locations where "new paradigm" facilities are feasible. This typology represents the foundation for a proposed "new paradigm" for planning, designing, building and operating multimodal freeway corridors. New paradigm transit facilities are built with the following goals:
• Enhancing corridor capacity and performance without adding freeway capacity by building and operating transit lines in existing freeway corridors
• Building transit systems that attract high ridership levels and encourage corridor livability
• Transforming a corridor’s land uses and activities to a more transit-oriented pattern.
These goals are achieved through encouraging "market-segmentation" between transit and freeway. Market-segmentation is achieved using the following principles and techniques:
• Market-Segmented Transit and Freeway Designs (Multimodal Coordination): Station and interchange spacings along each facility are designed to give each mode an advantage either in long-haul or short-haul corridor trips.
By dividing the travel market within the corridor, each mode has the opportunity to thrive and potentially increase the total carrying capacity of the corridor.
• Market-Segmented Urban Form: The development of separated, distinct land...
use and urban design environments for each mode. Transit station areas should have high-density, mixed-use, pedestrian-oriented land uses and urban design characteristics. Freeway interchange locations should have lower-density, separated uses with street designs conducive to smooth traffic operations and freeway access.

• Market-Specific Station Access: Corridors that focus on providing freeway-competitive transit speeds should prioritize auto and bus access to their stations. Corridors that focus on maximizing transit line access to corridor land uses should encourage bicycle, pedestrian, and bus access to stations; discourage auto access; and place stations as far from freeway interchange ramps as possible to reduce conflicts between automobiles and nonauto uses.

• Market Segmentation Through Constrained Freeway Capacity: Putting a low ceiling on the carrying capacity of the freeway can give the transit line an operational advantage, particularly for long-haul corridor trips.

• Coordinated and Distinct Intermodal Operations: The new paradigm incorporates two approaches to maximize interoperability between transit line, freeway, and other modes.
  1) Intermodal Connections Limited to Key Locations: The new paradigm encourages intermodal transfers stations to be built at end-of-the-line (terminal) locations and key midline locations where existing bus lines, freeway facilities, and/or bicycle and pedestrian routes converge, effectively dividing the corridor into separated travel submarkets.
  2) Intermodal Intelligent Transportation Systems: Intermodal transfers between freeway and transit can be facilitated and encouraged by employing real-time traveler information systems that provide information on corridor traffic conditions (congestion and incidents), transit schedule and schedule adherence, comparative corridor travel times (freeway versus transit), and station and destination parking availability and costs.

This presentation will focus on providing an overview of the TCRP H-36 research project and the new paradigm, a presentation of case study multimodal freeway corridors, and the policy implications of the new paradigm.
Summary:

The Complete Street Act of 2009 requires all road users including, motorists, transit users, pedestrians, and bicyclist, be accommodated and allowed to use the roadways. To fulfill these requirements it is imperative to identify the roadway factors that influence the quality of service provided to each user. This paper presents the results of a research study conducted to predict Level of Service (LOS) ratings for urban streets for the pedestrian facilities based on the users’ perception of the quality of service. The data used in this study was collected for the NCHRP 3-70 research study. The data for the pedestrian mode was gathered using the video simulation techniques from Tampa, Florida and San Francisco, California. Ten video clips were shown to 145 participants, ranging in age and gender, at four locations: Oakland, CA; Chicago, IL; New Haven, CT; and College Station. The participants were asked to rate these clips for the pedestrian facilities on the scale of 1-6 with 6 being equal to the level of service (LOS) rating “A” and 1 being equal to LOS “F”.

The pedestrian LOS rating model presented in NCHRP 3-70 is a function of a range of roadway geometry and operational variables which are resource consuming to obtain especially, at the transportation planning level. The objective of this research study was to provide the transportation/traffic engineering community a simple but effective tool to rate urban streets for pedestrian facilities based on the users’ perception of the quality of service. The methodology for developing this tool was as follows:

- Using the graphical analysis technique visualize variation in the dataset of the dependent variable (i.e., LOS ratings) with respect to each independent variable (i.e. roadway geometry and operational data). Based on the results of this analysis categorize the roadway variables such that maximum variation in the LOS rating with respect to these variables is obtained. For example, based on the results of a Box plot sidewalk width data was compressed into two categories, less than or equal to 5 feet and greater than 5 ft.
- Conduct Correlation analysis to select the roadway geometry and operational variables that significantly influence the LOS ratings.
- Classify urban streets based on the LOS ratings as a function of the selected roadway variables.

The results of the correlation analysis indicated sidewalk width, number of traffic lanes, presence or absence of barriers between the pedestrians and the roadway traffic, and the same directional traffic volume as the significant variables influencing comfort level of the pedestrian. The correlation analysis showed that on urban streets with greater than 5 ft wide sidewalks and barriers between the pedestrian and vehicular traffic, pedestrians have higher level of comfort. In contrast, higher numbers of traffic lanes and heavier traffic volume cause impedance to the safe movement of the pedestrians. The data showed a significant decrease in the pedestrian ratings for the quality of service for the number of through lanes greater than two and traffic volume greater than 1500 vph.

For urban street classification, this study utilized the Regression Tree modeling technique. Regression Tree model is a flow chart like structure where each branch represents an outcome and each leaf represents a decision. The advantages of using a Regression Tree over other regression technique are that a Regression Tree captures non-linear effects, allows complex interaction between variables, and is easier to interpret. The significant explanatory variables, sidewalk width, number of traffic lanes, and traffic volume, influencing level of service were used...
to build a Regression Tree model for urban streets ratings. Since the results of the correlation analysis between the independent variables indicated sidewalk width and barrier to be highly correlated; the variable barrier was excluded from the model to avoid multicollinearity effects between the variables.

The Regression Tree model selected sidewalk width to be the root node, indicating sidewalk width to be the first variable explaining the most variation in the LOS rating dataset. The dataset with the sidewalk width less than 5 ft was further partitioned based on the number of traffic lanes and traffic volume. The tree model rated urban streets with sidewalk width less than or equal to 5 ft and with one traffic lane as “B”. The urban streets with sidewalk width less than or equal to 5 ft, traffic volume less than or equal to 1500 vph, and with number of lanes two were classified as “C”, and with number of lanes three were classified as “D”. While, the urban streets with sidewalk width less than or equal to 5 ft, traffic volume greater than 1500 vph, and with number of lanes two were classified as “D” and with number of traffic lanes three were classified as “E”. The urban streets with sidewalk width sidewalk greater than 5 ft were classified as “B” or “C”.
14 Multi-Objective Optimization Model for Urban Street Design- Aimee Flannery
Organization: George Mason University
Email: aflanner@gmu.edu
Contributing Authors: Cerasela Cristei, Asma Ali

Summary:
For decades transportation legislation actions have demonstrated the desire to plan, design and operate multi-modal surface transportation systems. The push for multi-modal operations stems from several key concerns including environmental impacts, natural resource scarcity, rising fuel costs and dependency on foreign oil, and the declining health of Americans due to their reliance on personal automobile travel. However, it has been determined that the methods needed by engineers and planners to design such facilities are currently lacking in their ability to reflect travelers’ perceptions of service by mode which is needed to successfully design such multi-modal transportation systems. In addition, design guidance does not include methods by which engineers and planners can weigh the range of potential alternative designs to optimize the design of streets to comfortably accommodate all modal travelers.

The purpose of this study was to develop a Multi-objective Optimization Model to support the design of Complete Streets and to identify optimal urban street designs that achieve a pre-defined level of service rating for travelers on an urban arterial including auto, pedestrian and bicycle modal users, while meeting geometric design standards. To achieve this goal, existing Cumulative Logit Level of Service (LOS) Models were utilized for the auto, pedestrian and bicycle modes that incorporate traveler’s perceptions of Level of Service and provide a distribution of perceived LOS to assist decision makers.

The objective function and the constraints for the Multi-objective Optimization Model were developed using the existing Cumulative Logit Models for auto, pedestrians, and bicycle modes. The variables used in the model were found to be statistically significantly correlated to traveler’s perception of LOS including: Space Mean Speed (SMS) and Median Presence (MP) for the auto mode; Number of Traffic Lanes (NL), and Sidewalk Width (SWC) for the pedestrian mode and Number of Traffic Lanes (NL), Bike/Shoulder Width (BW) and Posted Speed Limit (PSL) for bicycle mode.

The objective of the Multi-objective Optimization Model was to design an urban street so as to minimize LOS D or worse (E or F) provided to auto, pedestrian, and bicycle modes on urban streets for a set of constraints. Conversely, optimize the urban street design so as to maximize LOS to D or better provided to auto, pedestrian, and bicycle modes. Thus, the set of optimized geometric variables obtained for an urban street design will accommodate all modes simultaneously with the user perception taken into account.

The sets of constraints in the model were based on the level of satisfaction of the users of auto, pedestrian, and bicycle modes which can also conflict with each other. For example, auto drivers perceive a higher level of satisfaction when the average travel speed is higher or equivalent to the posted speed limit and the roadway has multiple lanes. By contrast, pedestrians and bicyclist perceive a higher level of satisfaction when their facilities adjoin streets with low traffic speed and fewer traffic lanes.

The main constraint of the optimization model was as follows:
Optimized ROW = Given ROW
Optimized ROW = Median Width + (No. Traffic Lanes X Traffic Lane Width + SW Width + Grass Strip + Bike Lane Width) X 2

The Right of Way (ROW) constraint was developed to reflect the state of the practice and established standards by governing bodies such as the American Association of State Highway and Transportation Officials (AASHTO, 2004). In addition, a set of new decision variables as well
as of a set of non-decision variables were added to aid the design of a Complete street and livable community. The sensitivity analysis using the multi-objective optimization model was conducted for the following scenarios:

- For a given Right of Way width obtain optimal number of traffic lanes with optimized lane width, median width, sidewalk width, and bike lane width
- For a given Right of Way width and given number of lanes obtain optimal lane width, median width, sidewalk width, and bike lane width

For example, for a 100 feet ROW width and three traffic lanes in each direction, the model provided optimal lane width for the traffic lanes to be 12 feet, sidewalk width to be 9 feet, and bike lane width to be 5 feet on each side of the road. The model did not provide a median in this case.
Summary:

1. Background: Need for Better Survey Tools
Many communities are interested in promoting walking and cycling. However, few communities know how much of such nonmotorized travel actually occurs in their communities. And existing data sources have limitations for local communities, such as:
   – National-level surveys typically measure only one kind of travel, such as commuting, or do not provide data for small areas
   – Regional travel surveys occur infrequently and may record few walking and cycling trips
   – Local-level surveys vary greatly from place to place in terms of quality.

This poster reports on the development and reliability testing of the Pedestrian and Bicycling Survey (PABS), a new survey to assess local walking and cycling behavior, suitable for use by local governments. PABS was designed to be economical and simple for a local jurisdiction to administer using a random (cluster) sampling approach with surveys either mailed, or mailed with an internet option for response.

PABS allows communities to answer such questions as:
   – How much walking and cycling is occurring in my community?
   – What is the purpose of walking and cycling trips?
   – Who is completing the bulk of the walking and cycling trips?
   – How often are people walking and cycling?

2. Methods: Reliability Testing + Sampling Pilot
The four-page mail-out/mail-back questionnaire was tested to see if the questions produced similar answers when people took the same survey multiple times (this check for reliability across administrations is called “test-retest reliability”). Did people answer the same questions in a similar way when those questions dealt with stable or habitual behavior?
   – An early version was tested with 100 people; the final version with 87.

With the exception of some surveys focused on physical activity from a health perspective, this is the first survey we know of to report reliability data for a survey focused on walking and cycling. PABS therefore provides an important baseline for improving travel behavior.

In addition, the random sampling strategy (a two stage cluster sample) was tested in San Jose (CA) using readily available mailing lists.

To make it easy for local governments to implement the survey, the team developed an implementation manual, which is available at: http://www.designforhealth.net/health/PABS.html

3. Findings: The Survey and Sampling Worked, but Good Recruitment is Essential
The San Jose field test showed that:
   • Most survey questions achieved adequate to excellent reliability.
   • The PABS questionnaire was able to measure walking and cycling modes well, detecting more active travel than the American Community Survey, which is often used as a metric of walking and cycling.
   • The survey can effectively be administered and analyzed without considerable resources.
While the amount and type of personnel required will vary by location, the San Jose pilot was administered and analyzed by a local coordinator, a local research assistant, a collection of volunteers to address and mail, a research assistant to enter the data, and a research assistant to analyze the data. (The research assistants each worked, on average, 100 or so hours on their respective tasks).

The two stage cluster sampling approach was cost-effective in a large city. In a smaller city, a simple random sample might be as appropriate and would ensure that there would not be any missing areas.

A good strategy for increasing recruitment is essential. Achieving high response rates for any type of survey with the general public is always a challenge. As is outlined in the accompanying manual, a number of simple strategies can help increase response rates including approaches to raising awareness about the survey.
16 ITNAmerica®: Network Connectivity through Social Enterprise and Information Technology

- Katherine Freund

Organization: ITNAmerica
Email: Katherine.Freund@ITNAmerica.org

Contributing Authors: Richard Fortinsky, PhD
Jackie Vine, MA
Alan Fried, MS

Summary:

Background
ITNAmerica is the first national, non-profit transportation system for America’s aging population. Founded in 1995 in Portland, Maine, as the model Independent Transportation Network® (ITN), ITNAmerica became a national organization in 2004. Research and development of the economically sustainable ITN model was funded by the Transit IDEA program, the FTA, AARP, and numerous private philanthropies. In 2005, The Atlantic Philanthropies funded the national rollout with a $3.5 million grant. ITNAmerica now has 16 affiliates in 12 states, with a total of more than 1,500 dues-paying members.

Methodology
Most older Americans depend on the automobile for transportation. This dependence poses serious safety and mobility problems for diminished capacity older drivers, who rely on private automobiles for access to necessities of life. The problem is compounded by where older people choose to live. More than two thirds of seniors live in rural or suburban communities that lack the density for traditional mass transit. Older people who stop driving become dependent on favors from family and friends for as long as a decade. Women who stop driving outlive their decision by ten years; men by six. Those who continue to drive face limited mobility and the highest fatal crash rate per mile driven of any group except teenagers. ITNAmerica’s solution to this growing national problem was to create a consumer-oriented, economically sustainable model in a defined geographic area, replicate the model in other defined communities, and connect communities (affiliates) into one, efficient national system with shared brand and business rules, unified database and sophisticated information system, ITNRides™, that is now a Microsoft Success Story (http://www.microsoft.com/business/success/?StoryID=290). ITN maximizes individual choice and recreates the comfort and convenience of private vehicle ownership by using automobiles to provide service 24/7, for any purpose. People who use the service become dues-paying members of the organization and open Personal Transportation Accounts™ to pay for rides. ITN keeps fares reasonable by charging roughly half the true cost of rides and covering the balance through a diversified base of voluntary local community support. Through innovative payment plans automated in ITNRides™, ITN integrates previously inaccessible private resources to help fund rides, storing resources in Personal Transportation Accounts and sending members monthly account statements. No money changes hands in the vehicles; transfers and charges are processed automatically in the database. ITN’s CarTrade™ program helps seniors trade their vehicles to pay for their rides; the Transportation Social Security Program™ gives volunteers transportation credits in the system when they drive others; and the Road Scholarship Program™ encourages volunteers to donate these credits for low-income riders who cannot afford their share of the fare. Sustainability is supported by very efficient dispatching of volunteer and paid drivers using the Geographic Information System in ITNRides.
Background
ITNAmerica is the first national, non-profit transportation system for America’s aging population. Founded in 1995 in Portland, Maine, as the model Independent Transportation Network® (ITN), ITNAmerica became a national organization in 2004. Research and development of the economically sustainable ITN model was funded by the Transit IDEA program, the FTA, AARP, and numerous private philanthropies. In 2005, The Atlantic Philanthropies funded the national rollout with a $3.5 million grant. ITNAmerica now has 16 affiliates in 12 states, with a total of more than 1,500 dues-paying members.

Methodology
Most older Americans depend on the automobile for transportation. This dependence poses serious safety and mobility problems for diminished capacity older drivers, who rely on private automobiles for access to necessities of life. The problem is compounded by where older people choose to live. More than two thirds of seniors live in rural or suburban communities that lack the density for traditional mass transit. Older people who stop driving become dependent on favors from family and friends for as long as a decade. Women who stop driving outlive their decision by ten years; men by six. Those who continue to drive face limited mobility and the highest fatal crash rate per mile driven of any group except teenagers.

ITNAmerica’s solution to this growing national problem was to create a consumer-oriented, economically sustainable model in a defined geographic area, replicate the model in other defined communities, and connect communities (affiliates) into one, efficient national system with shared brand and business rules, unified database and sophisticated information system, ITNRides™, that is now a Microsoft Success Story (http://www.microsoft.com/business/success/?StoryID=290). ITN maximizes individual choice and recreates the comfort and convenience of private vehicle ownership by using automobiles to provide service 24/7, for any purpose. People who use the service become dues-paying members of the organization and open Personal Transportation Accounts™ to pay for rides. ITN keeps fares reasonable by charging roughly half the true cost of rides and covering the balance through a diversified base of voluntary local community support. Innovative payment plans automated in ITNRides integrates previously inaccessible private resources to help fund rides, storing resources in Personal Transportation Accounts and sending members monthly account statements. No money changes hands in the vehicles; transfers and charges are processed automatically in the database. ITN’s CarTrade™ program helps seniors trade their vehicles to pay for rides; the Transportation Social Security Program™ gives volunteers transportation credits in the system when they drive others; and the Road Scholarship Program™ encourages volunteers to donate these credits for low-income riders who cannot afford their share of the fare. Sustainability is supported by very efficient dispatching of volunteer and paid drivers using the Geographic Information System in ITNRides.

Findings
Research findings from a Centers for Disease Control and Prevention study demonstrate that ITN is used to transport older non-drivers and younger visually impaired adults for a wide variety of purposes that maximize quality of life. Among 1,557 ITN members who used the service between January 2004 and December 2008 (mean age 79.6 years; age range 22 to 104; 58,736 rides originating at home), 83% took at least one ride for healthcare purposes, accounting for 46% of total rides. Members also used ITN for a full range of ride purposes, including consumer activities, social and recreation travel, trips for worship, intermodal connections, education, employment, and professional services. One-third of rides during the five year study period were provided to members with visual impairment.

An Atlantic Philanthropies-funded evaluation, conducted May 2007 through June 2010, measured the impact of ITN on the quality of life for three distinct groups: 1) ITN customers, 2) family members of ITN customers, and 3) ITN volunteer drivers. The study included customers and family members from five ITN affiliate communities: Charleston, SC; Lexington, KY; Los Angeles, CA; Orlando, FL; and Portland, ME. The sample of volunteers provided rides in those communities as well as in three others: Middletown, CT; East Windsor, CT; and San Diego, CA. Results of the evaluation study provide empirical evidence of the positive impact of ITN on quality of life for these groups.
For ITN customers, transportation difficulty decreased from 64% prior to ITN membership to 49% six months later and 43% one year later. ITN customers who reduced or stopped driving reported an increase in confidence in arranging personal transportation. Moreover, non-drivers increased to the level of drivers in confidence in arranging personal transportation (mean scores were 50.1 vs. 60.3 prior to ITN membership, 68.0 vs. 67.9 six months later, and 70.2 vs. 69.4 one year later, respectively).

Family members of ITN customers worry much less about their relatives' transportation adequacy and safety after their relative joins ITN. Prior to ITN membership, 65% of family members worried whether their relative had adequate transportation; six months after their relative joined ITN, the proportion dropped to 19%. The percentage of family members who worried about their relative's safety when they traveled from home decreased from 70% to 39%. They experience less emotional stress (mean scores decreased from 2.8 to 2.3.) and are less likely to miss work. The percentage of family members who said they had to miss work because they had to arrange or provide transportation decreased from 64% to 27%.

ITN volunteer drivers derive personal and social benefits from this role. More than two thirds (66%) said that volunteering for ITN has affected their quality of life and 36% said that volunteering for ITN has enriched their social lives. Significant minorities are storing ride credits in an ITN account for their own future transportation needs (39%) and are donating their credits to the Road Scholarship Fund for low income riders (38%).

ITNAmerica’s entrepreneurial approach has impacted public policy in several states, including Maine, Florida, New York, Connecticut and Kentucky. A 50-state analysis of policies that remove barriers or create incentives for the use of private resources for community mobility is underway by ITNAmerica. Other research and development projects include ITNEverywhere™: A Revolutionary Approach to Community Mobility, a suite of software programs that extend ITN’s core business innovations—Personal Transportation Accounts and a flexible approach to private resources—to the general population, and a business plan for ITNCanada.
Summary:

Main streets in small communities function much like main streets in any community with pedestrian activity and bicycles. Much of the pedestrian traffic is often children crossing to community activities such as schools, recreation centers, or playgrounds. However the main street through many small, rural communities in the US is often a high speed state or county highway outside the community. Highways and county roads are characterized by high speeds outside the city limits and then transition into a reduced speed section through the rural community. Consequently, drivers passing through the community may enter at high speeds and then maintain those speeds throughout.

Community activities combined with high speed through traffic poses a potential safety problem. At higher speeds drivers are able to process less in their field of view, have less time to react, and more severe injuries or fatalities occur when a pedestrian or bicyclist is struck at higher speeds. The likelihood of a pedestrian dying in a rural collision is more than twice that for a pedestrian struck in an urban area. High speeds also diminish quality of life in small communities.

A project conducted by the Center for Transportation Research and Education at Iowa State University evaluated seven different traffic calming treatments on the major road thru five small rural small Iowa communities. The research evaluated the use of two gateway treatments in Union and Roland, Iowa and five single measure treatments (speed table, on-pavement “SLOW” markings, a driver speed feedback sign, tubular markers, and on pavement entrance treatments were evaluated in Gilbert, Slater, and Dexter. Speed data were collected before each treatment was placed and at 1-, 3-, 6-, 9-, and 12-month intervals after.

A gateway treatment in Roland, Iowa consisted of a set of converging chevrons placed as vehicles entered the community from the east and west. On pavement speed signing and lane narrowing using shoulder widenings were also used. Results of the speed analysis indicate the gateway entrance treatments, which consisted of converging chevrons and a “25 MPH” on-street pavement marking, were reasonably effective. Speeds decreased for all speed metrics for all of the after periods and decreases remained constant over the year data collection period. However, the lane narrowing and on-pavement speed markings within the community did not appear to affect speeds in any meaningful manner.

Union, Iowa was also a gateway treatment community. The treatments for Union include optical speed bars, median and shoulder widening, and driver feedback signs. Entrance treatments consisting of the transverse bars were used at the west, south, and north community entrances. The transverse markings appear to be moderately effective in decreasing vehicle speeds directly downstream of the markings for all three gateways, although none of the differences were large. The lane narrowing using center island widenings did not appear to be effective. The speed feedback signs were very effective.

A single speed table was placed in Gilbert, Iowa on the main through road. The speed table was successful in decreasing speeds for all speed metrics both immediately upstream and downstream of the speed table for all of the after periods. The table slowed speeds in both directions. The effectiveness of the speed table remained relatively constant over time.
Dexter, Iowa also received an entrance treatment similar to several used in European which consisted of red pavement markings and on-pavement speed signing. The treatments were effective in reducing speeds at all three of the locations where they were tested. The effectiveness varied over time with the exception for one location during the 9-month after period when the markings had faded somewhat.

Slater, Iowa had three different areas of concern so three different low cost treatments were applied. A speed feedback sign was used for a northern section of roadway. Due to late procurement, sign malfunctions, and road construction, the sign was only evaluated for one after period. A western roadway section received on-pavement “SLOW” markings. The treatments were not judged to be effective. The final treatment was creation of a center island using tubular channelizers. Two islands were created one block apart. Speeds were significantly reduced with the channelizer islands.

In many cases, even the most effective treatments only reduced mean and 85th percentile speeds by a modest amount. The true effectiveness was their ability to significantly reduce the number of high end speeders (vehicles traveling over the speed limit by 5, 10, 15, or 20 mph). The posted will describe the treatments and their effectiveness.
Summary:

Background: The senior population is growing as a larger proportion of the total U.S. population. Seniors need adequate transportation, not only to maintain their health and vitality, but also to stay active in the community and fully participate in life. The development of livable communities includes providing safe, comfortable, efficient transit service that provides access to destinations of interest from one’s home and provides high frequency service throughout the day and evening. When communities succeed in providing such transit systems, more and more seniors will be able to continue to ride transit to meet their transportation needs. A livable community goal should be that as transit service continues to improve in safety, comfort and convenience, the point at which a senior citizen can no longer ride transit service due to frailty is pushed farther back into the future. This is the point at which volunteer driving programs for seniors provide the needed transportation.

Challenges in incorporating livability factors into transportation programs: The problem that this research project addresses is the documented general lack of transportation options presently suitable for seniors who are no longer able to drive, and particularly those who are too frail to use public transportation. Volunteer driving programs for seniors attempt to meet this need but not without encountering numerous operational challenges.

Seniors are living longer and many prefer to age in place. Current seniors and the “Baby Boomer” population have generally not planned for their future transportation needs. This study found that volunteer driving programs strive to meet the needs of a particular market of seniors. These seniors generally are on a fixed income, which limits their transportation options. Seniors represent a broad range of physical abilities and many develop disabilities in their later years. While travel generally decreases overall in later years, seniors have travel needs that still may include longer distance trips across jurisdictions. Many seniors have difficulty navigating the various available transportation options and their associated eligibility, application, and advance reservation requirements to arrange a ride.

To meet the demand for transportation, many driving programs for seniors have been formed over the last several years and there are now several hundred such programs nationwide. This poster presentation represents research that complements existing implementation guides by examining the challenges that remain and proposing actions for overcoming these challenges and strengthening programs.

Methodology: The project approach included the development of an expert advisory panel; the identification and description of business models and service configurations through review of the literature and agency annual reports, as well as interviews; a legal analysis of liability; and documentation of operational issues.

Findings, case study examples and recommendations: The issues with which volunteer driving programs struggle include a demand for service that is far greater than program capacity. These challenges involve configuring sustainable volunteer driving services within the limitations of scarce resources. While the issues facing volunteer driving programs are varied, the problems that stand out are insufficient numbers of volunteers and the difficulty of programs to obtain adequate and affordable insurance coverage. Protecting the safety of riders and drivers and properly insuring a program are both fundamental to the success of a volunteer driving program.
Providing quality transportation through volunteer driving programs will require the collaboration of transit agencies, commuter assistance programs, Area Agencies on Aging, the volunteer driving programs and community leaders. Support at the state and federal levels will further advance volunteer driving programs for seniors. The available evidence suggests that most volunteer driving programs for seniors have excellent safety records. Regardless, insurers are influenced by perception of risk, specifically that volunteer drivers may lack training, and that riders are an especially vulnerable group. Indeed, seniors are much more likely to sustain serious injuries in an auto accident than are younger people.

This study examined volunteer driving programs nationwide and identified several main service delivery models and the circumstances under which one model may work better than another for different programs. The study provides recommendations to volunteer driving programs for enhancing risk management, recruiting volunteers and supporting their organizations. The study includes case study write-ups and a legal analysis of risk associated with volunteer driving programs. The study findings propose an agenda for action through institutional and community partnerships, to bolster volunteer driving programs and the important transportation services they provide.

Identification of promising directions for future research: Topics for further research include a quantification and characterization of the unmet need for transportation by seniors. Previous survey research has shown that after driving cessation, overall travel decreases, including a decline in trips taken for medical appointments. However, we know less about the differences among seniors. It would be useful to know what factors enable some seniors to maintain higher levels of activity and travel after they stop driving. The use of activity-based travel demand modeling recognizes that demographics, including age, play a large role in determining travel patterns. A better understanding of travel behavior of seniors before and after they stop driving, including the range in differences among seniors and the factors that determine those differences would inform the planning of transportation services and facilities. To develop activity-based models, a richer base of region-specific travel survey data could be collected from senior study participants through the use of GPS-enabled cell phone technology. Another area that would benefit from policy research is the potential conflict between volunteer driving programs and taxicab companies. There is a need to explore and draw an equitable line between the two so that volunteer driving programs, especially those that receive government grant funds, do not infringe upon private enterprise, and that government policies and regulations do not prohibit the operation of volunteer driving programs.
19 Using Open Data to Develop Multimodal Trip Planners for Livable Communities- Edward Hillsman

Organization: Center for Urban Transportation Research, Univ. of South Florida
Email: hillsman@cutr.usf.edu

Contributing Authors: Sean J. Barbeau
barbeau@cutr.usf.edu
Center for Urban Transportation Research, University Of South Florida

Summary:

Problem
Sixty years of investments to support automobile travel have created a dense network on which it is possible to drive almost anywhere in the US. Investments in infrastructure for public transportation, bicycling, and walking have been much more limited, resulting in networks for these modes that often are sparse and less well-connected. A person considering making a trip by driving can assume the ability to reach the destination by car. A person considering making a trip by bus, bicycle, or foot, a resident cannot assume that the mode will connect the intended origin and destination with each other, or that it will do so with a reasonably direct route. If the trip is new, it is necessary to check. As accustomed as people have become to using online trip planners to get directions for driving, such tools are even more important for people who use alternative modes.

Transitioning from communities built around a single transportation mode to those that provide multiple travel options requires an investment not just in new transportation infrastructure, but also in data collection and information systems that can assist residents in being aware of and choosing from new options as these become available. There are significant barriers to providing this information for alternative modes:

• Much transportation infrastructure information is currently embedded in proprietary formats and systems and cannot be easily shared, viewed, updated, or co-mingled without permission from the agency and vendor, and expert data analysis.
• Many jurisdictions lack geographic data on their networks of sidewalks and bicycle lanes, except along major streets (state or county roads for which other agencies collect and maintain data).
• Many maps of alternative infrastructure are confusing to read and use, especially when there are gaps in the network of facilities; this appears to reflect a diverse set of interests among users.
• There is not yet a uniform data standard for sidewalk, bicycle lanes, transit, or non-network infrastructure (benches, shelters, bicycle parking, crosswalks) that supports use of transit and other modes.
• Even if standards existed for data on these facilities, current methods of collecting, coding, and maintaining data are labor-intensive and expensive.
• Something needs to link all of this together, to allow joint consideration of a range of features that affect the feasibility and desirability of using alternative transportation modes, and to generate seamless multimodal trip plans (e.g., cycling to a bus stop, parking the bike, riding the bus, and walking from the bus to the final destination). Most software that does this is expensive, or restricted to use in a single area.

Methodology or approach
Our approach to overcoming these barriers is to work with open sources of data and software:
• OpenStreetMap (OSM) is a “Wikipedia" for geographic information, to which any individual or community can contribute information about local sidewalks, biking, transit, and road
infrastructure via an easy-to-use mapping website. OSM supports data attributes such as stairs, curb cuts, and sidewalk slope, and thus can record data for accessible routes from one location to another for individuals with physical disabilities. It focuses on observable physical attributes, and it is not well-designed to record information on schedules or activity levels.

- The GTFS is an open format for stop/route/schedule data that over 125 transit agencies in the U.S. use to make their data available for public download for use in free services such as Google Transit. It appears to be becoming a de facto standard for data describing transit stops, schedules and route geometry.

- Public-domain datasets vary in spatial and substantive coverage, ending at jurisdictional boundaries, and often including only facilities for which the jurisdiction has direct responsibility. Some agencies restrict access or require attribution for any use of the data. Nonetheless, in some cases these files can serve as skeletons to which additional data can be added.

- The OpenTripPlanner project has become much more capable, comprehensive, and available much sooner than we (or others) had expected. Its developers have demonstrated its ability to work with all of the data sources mentioned above, plus proprietary address or street data to which a municipality may have purchased rights. Our objective is to assess how well the data sources above can support next-generation multimodal trip planners.

Preliminary findings

We have demonstrated the ability to move transit stop data from GTFS into OSM, allow the public to correct the stop locations and add data on supporting infrastructure, and then retrieve the changes for use by the transit agency. Of 3819 stops loaded into OSM, students and other members of the public have edited 110, with 19 of these being relocated by more than 100 meters. We have made the source code for the software that synchronizes data between GTFS datasets and OSM publically available under the Apache 2.0 open-source license and have published the source code on Google Code’s project hosting site.

- Measures of “level-of-service” for walking and cycling require data on traffic volumes, that most jurisdictions measure only for major roads, that the average member of the public cannot easily observe, and that OSM was not really meant to record. Further research is needed to derive meaningful level-of-service measures that only need easily observable data.

- Bicyclists (and would-be bicyclists) have widely differing comfort levels, and expectations for information. Additional research is needed on their information needs, and on how to display information to make it most useful to them.

- Some people navigate by following a line on a map. Others, probably more numerous, navigate by following step-by-step instructions. Where infrastructure closely follows streets, directions can use street names and be clear. Additional research is needed on how to provide clear directions when sidewalks and paths do not follow streets.

- Public-domain datasets require some technical knowledge in order to put them into OSM. Once there, however, they can be augmented and corrected by persons with much lower technical skills.

- Research is needed on how to combine objective data (presence/absence of crosswalk) with subjective data (it is safe to cross at a location).
20 Issues in Data Collection, Methodology and Analysis of Transportation-Based Economic Development: The District of Columbia and the Great Streets Development

Christopher Hooton
Organization: Government of the District of Columbia- Department of Transportation
Email: christopher.hooton@dc.gov

Contributing Authors: Peggy Tadej

Summary:

The poster for the paper Issues in Data Collection, Methodology and Analysis of Transportation-Based Economic Development: The District of Columbia and the Great Streets Development provides selected elements of the analysis and methodology used in conducting the study associated with the paper. Six maps are given in the center detailing key socio-economic data collected for each Great Street Corridor highlighting population, income, poverty, unemployment, vacancy and owner-occupied unit rates for each census tract included for each street corridor. Beneath the six central maps, the 42 selected data points (out of 150) that were used to analyze each corridor are listed according to thematic category.

On the left side of the poster a partial abstract is given and the methodology is detailed. On the right column results are discussed and in the bottom-right hand corner a snapshot profile of 7th St NW/Georgia Ave NW is given.

The goal of the poster is to visually tell the story of each of the Great Streets. Due to volume of data and analysis, it was impossible to include all the information relevant to the study on a single poster. However, what is presented offers a broad understanding of how data was collected, filtered, analyzed and then used to draw policy conclusions. The maps illustrate the data and point the viewer toward initial policy ideas and the method of analysis, applied in the context of the policy goals for the Great Streets development effort, provides the link between a database of numbers and real-world implications.

This poster is based on a study that used an original methodology. The District of Columbia Department of Transportation collected a series of over 150 data collection points to provide insight into the economic, social and transportation impacts of the Great Streets development project. Using these data points, 42 individual performance measurements were selected to allow comparative evaluation of the project in coming years and initial analysis of the current conditions was conducted. The results revealed the need for taking into account a variety of non-transportation issues to maximize the probability of success in development projects.

The Great Streets development initiative is a targeted regeneration effort for 6 designated street corridors in the District of Columbia. Criteria for inclusion as one of the corridors included, among others, a history of policy neglect, low relative development levels and persistent market stagnation in recent decades. Approximately $176 million will be spent in a combination of transportation and infrastructure projects to stimulate the economic development of the areas with the money divided among the six corridors.
Summary:

Background and Motivation
Speeding is one of the major problems confronting traffic safety engineers. According to NHTSA, about a third of all fatal crashes in the United States are speed related. However, very few North American studies have used actual vehicular speed observations in comparing the safety of multiple street and highway locations. A number of studies have focused on the effects of speed change on safety at a given location but these results are not generally transferable to other sites. Most multi-location safety studies have attempted to account for the effect of speed using the speed limit at each location, leading to spurious results due to the sometimes arbitrary and political nature of speed limit selection, and the fact that the actual speeds chosen by drivers traveling on many roads are often much higher than the speed limit.

Why are there so many roads where a high proportion of drivers disregard the speed limit? One possible explanation is that drivers come to different conclusions than the applicable legal authorities about what is the “safe and reasonable” level of speed on these roads. In other words, is the design of the road and its environment projecting the right message to the driver? There are many examples of situations where drivers do not perceive school zones, town centers and primary roads through residential neighborhoods as slow speed areas. It is in this light that the ability to influence vehicle speeds through the selection of the characteristics of the roadway and of the roadside environment could be a boost to improving safety on our roadways. The objective of this project was to close gaps in the knowledge about how various components of the road environment and their interaction affect a driver’s chosen speed and how these speeds relate to the observed crash experience.

Methodological Approach
Closing these gaps requires better information about the actual travel speeds on roads with different design geometries and roadside environments along with the crash experience on these same roads. To do this, we compared crash counts and actual speeds on roads in groups with similar geometric characteristics and roadside environments, controlling for the observed traffic volumes. We investigated combinations of characteristics and environments that are commonly found in Connecticut, as well as some that may be less common, but offer opportunities for isolating the effects of particular elements. An important secondary objective of this research was to identify characteristics that appear to affect driver speed or crash incidence but not the other. We collected data from two-lane road sections in rural and suburban areas, and used generalized linear modeling techniques to analyze the following, controlling for geographic area and traffic volume:

• Variance in observed travel speed by geometric and roadside features
• Variance in crash count by observed travel speeds and geometric and roadside features

Summary of Findings
The findings from this project clearly demonstrate that through careful, intentional selection of roadway and roadside design elements, it is possible to influence the running speed of traffic on a road. It appears that drivers indeed take cues from elements of the roadway and roadside environment to decide how fast to drive and these cues are independent of the posted speed limit and other considerations that might be important to the community for reducing speeds. So the good news is that it is possible to influence drivers’ choice of speed through design of roadway
and roadside elements; but the bad news is that many existing roads cue drivers to travel much faster than the posted speed limit and the community would like. The factors associated with higher average running speeds are wide shoulders, large building setbacks and a residential location. The factors associated with lower average running speeds are on-street parking, sidewalks and a downtown or commercial location. These findings suggest the following recommendations for designing roads with respect to desired vehicle speeds:

1. Wide shoulders should only be used on roads intended for high speed through traffic, such as inter-urban roads in open land. Wide shoulders should be avoided in town and village centers or other areas where high speed traffic would be considered disruptive to the community.

2. Sidewalks and on-street parking should be considered wherever there is potential street activity, such as collections of shops and homes or in the vicinity of public institutions.

By following these guidelines, the road and roadside characteristics can be used to help enforce the desired vehicle running speed.
The CAST Walkability Audits: A Citizen-Powered Neighborhood Assessment of Walking and Biking Safety - Deb Johnson-Shelton

Organization: Oregon Research Institute
Email: debj@ori.org

Contributing Authors: Jason Blair, Christo Brehm, David Richey, Cody Evers

Summary:

Active neighborhoods: Connecting kids to school
National surveys have shown serious increases in overweight among children and adolescents (Center for Disease Control, 2007). This increase in childhood obesity has become an increasing public health concern given its relation to multiple health and psychological problems (e.g., cardiovascular disease, Type 2 diabetes, stress, and low self-esteem). To address these problems major public health efforts focus on two areas thought to reduce the prevalence of overweight and obesity in children: nutrition and physical activity. While schools are often cited as the environment most capable of addressing obesity and related public health concerns, community environments are increasingly seen as a primary influence on childhood obesity (Institute of Medicine, 2005)—environments which are outside the control of schools. National programs such as Safe Routes to School seek to ameliorate obstacles that limit connections between schools and neighborhoods, with secondary benefits of increasing child activity via walking and biking to school. For these efforts to succeed, community infrastructure must permit children safe walking and bicycling between home and school. Indeed, street redesign is emerging as a strategy for public health interventions that increase active transportation choices. Building awareness and a local knowledge base is an essential first step in bridging the divide between built environments as they stand today and the behavior of new generations of pedestrian and biking citizens willing and capable of new active transport lifestyles. This presentation describes a large citizen mapping effort conducted to address these issues.

Community Led Streetscape Assessments

In partnership with the Communities and Schools Together Project (CAST) at Oregon Research Institute — an NIH-funded obesity prevention grant in Eugene, Oregon — parents of elementary school children assessed the safety and accessibility of the built environments surrounding their schools. The goals of the street audits were to: 1) develop community and family awareness of street barriers for child walking and biking; 2) highlight opportunities for active child transport to and from schools; 3) develop and mobilize knowledgeable community members in the nomenclature of built environments; 4) create a community-based dataset and public assessment process for eventual use by city planners; and 5) develop community readiness for Safe Routes to School encouragement and enforcement grant applications.

The assessment involved an audit of the streets and intersections in the Bethel School District on factors related to safe walking and biking conditions for children. The assessment drew from two community-based mapping tools (SEAT and CSAT) developed at the University of Oregon, and that have been tested in other communities. The street assessment relied on participant use of handheld computers running GIS software, which were then uploaded to servers and mapped to the city grid, a process previously described across a series of national conferences. Multiple series of walking and biking assessment events was scheduled among each of the 7 district elementary schools over a 6 month period from April to October in 2009. Members of the CAST Parent Advisory Council (PAC) were trained during the initial pilot assessment in April, and were subsequently assigned to pairs or small groups of new parents at each of the elementary school neighborhood audits—a ‘train-the-trainer’ approach that became termed the “PAC-plus Model”.

The 7 school attendance areas were mapped into zones that parents selected to walk and score.
Results
The Complete Street assessment was conducted by more than 28 members of the CAST Project’s Parent Advisory Council, as well as 33 other elementary school parents in the district, and was facilitated by project researchers, staff, and partners. In all, the project assessed 40% of the 13.5 square mile region of the Bethel School District, or a 5.4 square miles. The area audit captured the living environment of 20% of the households in Eugene, Oregon. Data was synthesized, mapped, and reviewed for accuracy and interpretation by parents and project partners. Results from the study were shared at a public forum involving the school district, PAC members, city and county transportation planners, and other Bethel parents and community members in May 2009.

The Complete Streets tool provided a socially acceptable, efficient, and understandable resource for evaluating streets and intersections for ease of child walking and biking. Streets and intersection ratings were combined with city crash data, enabling parents to determine “hot spots” in their neighborhood. Overall, parents became more aware and empowered regarding their role in the public planning process. Equal emphasis was placed on obtaining a reliable dataset for city planning officials and allowing parents to express their impressions of safe streets based on their knowledge of the community and the skill sets of children to navigate streets and intersections safely.

The community mobilizing process in this public participatory GIS study led to a successful Safe Routes to School grant application, and school-based programming is currently underway in 4 of the 7 district’s elementary schools. The study’s results also influenced county transportation recommendations to add sidewalks around a neighborhood elementary school that was constructed during a time when these amenities were not considered necessary. Additionally, the study’s participatory process and data are being shared in the development of a revised Pedestrian and Bicycle Plan with the City of Eugene.

Findings from the CAST Complete Streets participatory GIS-based audits reflect the needs, challenges and opportunities for participatory approaches when evaluating built environment infrastructure and community capacity for walking and biking. Data from this study is being incorporated into the CAST Community Health Information Database System and will be analyzed in conjunction with other project measures of social and environmental factors influencing community-based childhood obesity. Building awareness and a local knowledge base is an essential first step in this effort. Both the participatory process and audit results are being used to encourage a new generation of pedestrian and biking citizens to adopt more active lifestyles.
Summary:

Eagle River, Alaska is a rapidly growing community located about 15 miles from downtown Anchorage along the Glenn Highway corridor. Approximately 85 percent of the workers in the Eagle River area commute daily to the military bases or other employment areas in Anchorage. Shopping, business and governmental services opportunities are beginning to expand in the central business core of Eagle River. The ability of the existing transportation network to adequately serve the future travel demands has been identified as a primary issue in the adopted CBD Revitalization Plan. The Plan recognizes that the foundation of a vibrant Eagle River CBD is a fully integrated land use and transportation system.

It is essential that people and goods move safety and efficiently within and through the business district. Residents of the community should feel "connected" to the area and proud to claim it as their downtown. Unfortunately, the existing transportation system creates barriers for access and circulation, the perception of an unfriendly pedestrian environment, and frustration with congestion that grows with the community. These challenges are expected to continue as the Chugiak-Eagle River area is projected to grow to a population of approximately 55,000 residents and an employment base of roughly 8,100 within the next 20 years. The purpose of this study was to enable the community to develop cost-effective and implementable solutions that address access, circulation, safety, and multi-modal amenities, creating a robust and vibrant downtown core.

Six guiding principles of the study provided a framework for technical analysis and thoughtful planning/visioning techniques could be applied:

1) Develop transportation solutions that support a vibrant downtown, building upon the community’s adopted vision the CBD.
2) Plan a complete, interconnected network of roadway, pedestrian/bicycle, and transit facilities to meet the needs for circulation, access, safety, and aesthetics.
3) Balance community mobility needs with local access needs along the Old Glenn Highway corridor.
4) Build consensus for action among local government officials, Community Councils, business leaders, transportation providers, and residents.
5) Balance short-term disruptions/impacts to businesses with the intended long-term economic stimulus of the downtown core.
6) Develop a set of actionable, cost-effective transportation improvements/solutions with logical sequencing for future incorporation into the Long Range Transportation Plan, the regional Transportation Improvement Program, and the local Capital Improvement Program.

The development of a complete, interconnected network of roadway, pedestrian/bicycle, and transit facilities was a primary task of this study. It was essential to examine transportation system performance under a variety of scenarios that consider new links, improved parallel routes, modifications to intersections, and enhancements of the pedestrian, bicycle, and transit facilities. Solutions must meet the needs for local and regional mobility and reliability, while creating a safer...
and more attractive place for pedestrians and increased opportunities for transit to meet local travel needs. Such improvements will also enhance economic competitiveness with improved access to jobs and a robust business environment to bolster existing markets and develop new opportunities.

The study resulted in the development of four transportation solution strategies as follows:

1) No Plan Strategy – business as usual without a specific long range plan
2) Complete Streets Strategy – use existing Old Glenn Highway corridor with improved collector streets connectivity
3) Couplet Strategy – create a one-way couplet with Old Glenn Highway and Business Boulevard plus the improved collector streets connectivity
4) Main Street – create a one-way couplet with Business Boulevard and a new northbound roadway to the east of Old Glenn Highway plus the improved collector streets connectivity. This strategy would convert the existing Old Glenn Highway corridor into a traditional “Main Street” cross section with on-street parking.

Multi-Modal Level of Service Analysis (MMLOS) was an innovative technique employed to successfully complete the project. This analysis technique estimates a separate mean level of service for each of four modes of travel within the urban street right-of-way: motorist, bus passenger, bicyclist, and pedestrian. Urban streets should be designed to accommodate all users, and this new methodology enabled all participants (general public, stakeholders, and decision makers) to see the changes in LOS from one mode to the other as changes/improvements are made to the design and operation of the urban street. The use of this innovative methodology provided critical insight and helped develop solution strategies and specific improvements that were sensitive to all users.

The measures of success for this study were determined through a closely coordinated process with key business/citizen stakeholders and transportation system providers (MOA, People Mover, and DOT&PF). Stakeholders were guided through the study process to develop feasible options (based on performance, cost, and community impacts) before deciding upon the “best” plan of action. The plan developed a phased, implementable set of improvements to logically move the Eagle River community forward toward a functioning transportation system that will ensure a vibrant future CBD for the Chugiak-Eagle River area residents and business owners.
Summary:

Background:
Globally unique in size, scale, and complexity, the Lower Don Lands (LDL) project entails the master planning of a 308-acre waterfront development located southeast of downtown Toronto. The objective of the project is to promote a sustainable community in which development, transportation infrastructure, and natural resources are integrated and where transit, walking and biking are convenient and safe modes of transportation. Integral to this development is a multi-modal transportation network that supports the objectives while helping connect the waterfront with the rest of Toronto. Upon its implementation, the LDL site will be home to an anticipated 20,000 to 25,000 new residents and 8,000 to 10,000 new employees. The LDL project is a collaborative approach to development taken by Waterfront Toronto, the City of Toronto, and the Toronto Transit Commission (TTC). Waterfront Toronto was established in 2001 to oversee and lead redevelopment, and to be the master planner for revitalizing Toronto’s waterfront with a commitment to creating a dynamic waterfront that prioritizes public spaces, sustainable development, and economic growth.

Approach:
The LDL Design Team led by Michael Van Valkenburgh Associates, Inc took an integrated design approach that included transportation planners, landscape architects, urban designers and leading sustainability experts. The masterplan phase of the project is largely complete and includes a significant transportation planning and engineering component which was led by Arup. To ensure the transportation network meets the site-wide goals, Arup conducted two tasks over the duration of the design process: an urban design study to determine the layout and interaction of various multimodal facilities within the site and an analytical study to determine the mobility impacts within the district. These two tasks reinforced the importance of a robust transportation network as a component of a livable community.

Results:
The integrated design approach taken by the design team produced a plan to create a livable waterfront community supported by a multimodal transportation network. Three of the main components of the LDL master plan – transportation options, live-work-play community and naturalization of the river – are described below.

Transportation Options:
The proposed transportation network supports the goal of creating a sustainable community through the provision of transportation options, access, and connectivity. LDL is representative of the pro-transit shift in transportation and planning policies at all levels of government, but particularly for the City of Toronto. The project implements the sustainable development policies that the City has advocated by making provisions for transit-oriented development and investing heavily in transit, pedestrian, and bicycle infrastructure.
The anchor of the plan is the transit network, which ties in with the light rail transit lines proposed in the surrounding neighborhoods and connects the waterfront with nearby communities. The mobility needs of pedestrians are met with high quality pedestrian amenities and a high degree of access to transit. The proposed bicycle network includes a mix of on- and off-street facilities that
serve the needs of both commuter and recreational cyclists. Strategic placement of on-street parking will contribute to active and vibrant streets, which is necessary for supporting the development in the area, while not encouraging visitors and residents to rely on automobiles.

Live-Work-Play Community:
Rather than designing a residentially-dominated bedroom community, the planning process aimed at creating a mixed-use, transit oriented, live-work-play community in which the employee-based development supports area residents, and public realm amenities provide opportunities for recreation and socialization. The extensive pedestrian, bicycle, and street networks, combined with quality amenities (such as wide sidewalks, promenades, dedicated bicycle lanes, parking) promote an improved public realm. Additionally, the compact and multimodal cross-sections of the streets allow for enhancement of the public realm within the right-of-ways through streetscaping and landscaping. Numerous Keating Channel crossings dedicated to active transportation users provide access to the water’s edge public spaces, reconnecting people to Toronto’s natural resources.

Naturalization of the Don River:
The goals for the design competition that launched the LDL project were to develop an iconic identity for the Don River that accommodates crucial flood protection and habitat restoration requirements and to integrate development, transportation infrastructure, and the river mouth into a harmonious whole. The LDL Master Plan brought together infrastructure, public realm, and scientific approaches to connect the LDL back to the city, lake, and river in a dynamic and balanced relationship. The Don Mouth Naturalization and Flood Protection Project was conducted concurrently with the LDL Master Plan and includes naturalization of the Don Mouth and Don River.

Conclusions:
The project has attracted global interest with its selection by the Clinton Climate Initiative as one of the 16 founding Climate Positive Developments. By promoting compact, walkable communities with extensive access to transit networks, the LDL project is accomplishing the goal that many North American cities have been striving towards – the creation of livable communities that are economically viable and advocate environmental stewardship and active lifestyles.
Car sharing is a specific type of car rental that allows individuals or businesses to rent vehicles by the hour or minute, as opposed to traditional car rentals that are based on day- or week-long rentals. Most car sharing organizations charge a membership fee, a deposit that is refundable upon leaving the organization, hourly fees, and mileage after a certain number of free miles. The car sharing service then handles all costs of ownership, including purchasing, maintaining, insuring, and fueling the vehicle. This type of service draws users who only need a car on an occasional basis, allowing these individuals the benefits of private vehicle access without the demands of car ownership. Whether individuals own their own vehicle or not, car sharing provides them with additional choices for their travel needs affordably and efficiently. In the United States, for-profit and non-profit car sharing organizations are emerging and expanding at high rates. Studies of these organizations have shown that they have the potential to have a significant impact on transportation patterns and, once firmly established, land use patterns as well.

Daimler Auto Group has entered this market with its Car2Go, a car sharing organization with a fleet composed entirely of Smart Fortwo vehicles, beginning with a pilot program in Austin, Texas. Car2Go provides several innovations not yet seen in car sharing operations. First of all, Car2Go allows one-way rentals, whereas other car sharing programs require that the vehicle be brought back to the place of rental. The flexibility and spontaneity provided by Car2Go increase its appeal and will result in significantly different usage patterns than other existing car sharing programs. Secondly, Car2Go also charges users by the minute instead of by the hour as other car sharing organizations do, meaning that short trips are very economically efficient.

This analysis began before Car2Go launched and used new survey data as well as previous literature to compare the Austin market with successful car sharing markets around the country in order to determine the likelihood of success for Car2Go. The results of the analysis confirmed some basic demographic information for Austin: namely, that the general population is younger and more highly-educated than national averages. Previous research has concluded that the young and highly-educated are precisely the groups who are most attracted to car sharing, suggesting that the city as a whole is a prime market for the service. However, the survey data went further to show that specific subgroups, particularly those who live in downtown Austin and those who work and study at the University of Texas campus, are an even richer market for a car sharing operation.

This analysis also looks at Car2Go’s pilot program and public operations which began on Friday, May 21, 2010. A large amount of research remains to be done on the ideal operational characteristics of Car2Go as it moves forward, but the service has begun collecting large amounts of interesting data about the usage patterns of the vehicles and their users. Car2Go has become the fastest-growing car sharing operation in the country, reaching 10,000 members within five months. With a fleet of 200 vehicles in the Austin area, nearly a quarter of them are in motion at any given moment. Additionally, Car2Go has developed an operation that appeals to more than just college students and faculty; approximately 80% of members are not affiliated with the University of Texas. No “typical” user profile has emerged, indicating that the car sharing service is appealing to a broad spectrum of Austin residents. The one-way rental
service has also proved to be advantageous, as very few vehicles require relocation services. Instead, the significant majority of the vehicles are re-rented and driven to another location within 24 hours of the end of a rental. As a direct result of the organization’s successes in Austin, Car2Go plans to expand to several other cities within North American in the next year.
Summary:

This presentation is based on three national highway research projects: two completed and one currently underway. All three of these projects focus on understanding community quality of life considerations as part of transportation decision-making but they differ in terms of their focus. Two of the projects are primarily concerned with defining aspects of community quality of life (what to measure? when to measure?) such that indicators can be identified to inform the evaluation process for different solutions or outcomes. The third project focuses on providing tools to help practitioners define community context (how to measure?). The goals of the presentation are to inform transportation practitioners of the findings of the two completed research projects and build awareness of the on-going project such that they can begin to use these resources to help create livable communities through transportation investment. The following information describes the three projects being showcased by this presentation. The first project was funded through AASHTO’s Standing Committee on Planning (SCOP) (http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1280) and includes an examination of community and social impact assessment practices that can be used to inform the selection of community quality of life indicators. The research leveraged lessons learned from current Community Impact Assessment (CIA) practice along with a rich, in-depth literature review and interviews with scholars both outside and within the transportation profession. It combined information from other disciplines related to public health and safety, housing, neighborhood quality, and social capital to present a framework for understanding social wellbeing which includes measures that can be applied systematically to understand how well a community is functioning. The framework introduced new measures and new data sources to help practitioners identify areas of concern such that transportation projects do not impose additional stressors. Three major domains including social capital, economic and physical health was applied to a case study using real-world data to evaluate the practicality and value of the framework. The proposed quality of life measures provides a quantitative source of information that practitioners can use to supplement more qualitative assessment approaches. Three categories of methodological improvement were recommended for immediate implementation: analyzing traditional data sources in new ways, adopting data used by other disciplines, and utilizing new data sources available from non-traditional sources. The benefits from implementing these additional quantitative assessments included improved community data; improved decision-making processes; effective public involvement; development of flexible design solutions; avoidance of community impacts; identifying partnerships to improve community wellbeing; effective visualization techniques; and identification of performance measures to develop quality of life benchmarks. The second project presented was funded through the SHRP Capacity Research Program (http://shrp2visionguide.camsys.com/index.htm) and included a task that examined how
community context and related indicators can inform visioning processes. The C08 Project (Linking Community Visioning and Transportation Practice) framed some of the critical information necessary for practitioners to prepare for a visioning process, create a vision and implement a vision. This project resulted in the identification of numerous tools and techniques to assist with understanding community context as part of a visioning process through the examination of the following questions:

• What is important?
• Where are we now?
• Where are we going?
• Where do we want to be?
• What have we accomplished?

This project provides an extensive database of over 800 indicators grouped by categories: Economy, Natural Environment and Resources, Mobility, Public Services, Public Health and Safety, Socio-Cultural, Built Environment and Governance. This database can be used by practitioners to identify indicators that reflect common community values reflective of community quality of life considerations.

The last project showcased as part of this presentation is currently underway through AASHTO’s Standing Committee on Environment (http://itre.ncsu.edu/cte/communitycontext/). NCHRP 25-25 Task 69 (Identification of Tools and Techniques to Define Community Context as Part of the Transportation Project Planning and Development Process) specifically seeks to inventory tools that can assist environmental planner/practitioners to comprehensively and systematically define community context. Currently researchers are collecting tools and methods from many disciplines including public health, community development, environmental science, landscape architecture, historic preservation, urban design, as well as from community members and neighborhood organizations to help define and describe community context. The inventory of tools/methods will be synthesized to create a user-friendly index of resources organized such that practitioners can identify the best tool to use for their particular circumstances. The index will be organized to include such elements as the scale of the transportation project, the type of environmental study (CE, EA, EIS), the discipline expertise and stakeholder involvement needed to use the tool, its relationship to the key decision points of the environmental decision process, the substantive issues incorporated (context components) and potential social, economic, cultural and environmental impacts, as well as the spatial and temporal requirements of the tool or technique.

All these research projects provide useful and insightful information to both practitioners and researchers regarding defining community context particularly as it relates to identifying indicators that can be measured to evaluate desired livability goals and objectives. Combined they provide practitioners with information on the what, when, and how to consider quality of life considerations as part of different phases of transportation decision-making.
27 Yes, They Do Walk in Suburbia: Suburban Multifamily Housing and Trips to Strips- Nico Larco

Organization: University of Oregon
Email: nlarco@uoregon.edu

Contributing Authors: Jean Stockard, Bethany Johnson, Amanda West

Summary:

Multifamily housing has been the largest growing housing market in the United States since 1970 and currently comprises one in five units in suburbia (U.S. Census Bureau 1973 through 2007). This housing type is often located around commercial strip malls and typically acts as a buffer between the strip malls and adjoining single-family home neighborhoods (Moudon and Hess 2000; Hess 2005). Contrary to what is typically considered the norm in suburbia, this proximity between multifamily housing and ‘daily use’ commercial areas creates a strong potential for walking and biking to occur in suburbia. The actual site design of a vast majority of these developments, however, continues to adopt the detached and enclaved single-family home development pattern, significantly reducing connectivity in these developments, and challenging the potential for increased walking and biking (Larco 2009).

This study investigates whether connectivity in suburban multifamily developments affects residents’ rates of walking and biking to their local commercial area. This is a localized study, but given the generic nature of multifamily development around the country, we suspect the results of this study may be applicable nationally. Our hypothesis was that increased connectivity would result in increases in walking and biking.

Methods

To test this hypothesis, we studied 14 multifamily housing developments in Eugene, Oregon. In 2001 Eugene revised its multifamily housing code to include specific language on street network requirements, parking design, and pedestrian infrastructure, which increased the connectivity of later developments. We chose 8 developments built before the code change and 6 built after the change. We created connectivity ratings for each development that were based on criteria such as the presence and networked degree of pedestrian paths both internal and external to the developments, the pedestrian network node density, route directness, and access point distribution around the site. A composite score that included all of these criteria was derived for each site and the sites were ranked accordingly. A natural break in that ranking separated the well-connected developments from the less-connected ones. Both groups of sites were similar in size, number of units and distance to comparable local commercial areas (LCA) that included pedestrian magnets such as banks, grocery stores, post offices and restaurants.

Using a direct marketing database, we gathered addresses for all residents and sent a survey to each household (1,493) in these developments asking about their transportation modes and frequency, attitudes toward travel modes, ease of walking and biking, housing choice, and personal information. Surveys were sent to all residents at the same time in order to eliminate any differences in responses that might be caused by weather. A total of 229 surveys were returned and analyzed. While this response rate did raise some questions as to how well the survey responses were representative of residents in general, given the strength of many of the results outlined below, we do not feel that this is a major concern.

Results

Contrary to popular perception as well as studies regarding mode choice in suburbia, residents reported a substantial amount of active transportation trips (walking and biking) across both well-connected and less-connected developments. We analyzed the results of the survey
using both descriptive statistics and regression models. Across all sites more than a third of all trips to the LCA are active transportation trips (38%) with most of those trips being walking trips.

In addition, travel mode use and connectivity are significantly associated as residents of well-connected sites are significantly more likely to walk and less likely to drive to the LCA than residents of less-connected sites. Almost half (43.0%) of the trips to the LCA were walking trips for residents of well-connected sites versus less than a quarter (23.7%) for residents in not well-connected sites.

Looking at resident travel choices instead of total trips, we found significantly more residents choosing to walk and bike in the well-connected sites. Almost three quarters of residents (73%) in these sites use active transport to the LCA at least once a week as opposed to only 58 percent of residents in less-connected sites. In other words, the well-connected sites are correlated with more individuals considering and using active transport as a viable form of transport to their local commercial area. In addition, a significantly larger number of residents in well-connected sites (20%) ONLY walk or bike to their local commercial area as compared to residents of less-connected sites (9%).

Further statistical analysis using regression models revealed that these differences in travel mode were not correlated with resident demographic characteristics or attitudes toward a particular mode, but were highly correlated with the connectivity of the built environment in which the person lived.

Implications

Residents of suburban multifamily housing do walk and bike to their local commercial area and they do so at significantly higher rates if they live in a well-connected development. Increases in active travel have been associated with improved health, reduced rates of obesity, and increases in independence (Frank, Sallis et al. 2006). In addition, if active travel is replacing auto trips, it helps reduce green house gas emissions and traffic.

To create environments that foster increased active travel, planners must encourage developments that are well connected internally and to their surroundings. Zoning codes throughout the country often include provisions such as mandated buffers between dissimilar uses as well as limitations on direct connections between developments (especially to commercial areas). These codes also often lack provisions for pedestrian networks as well as the need for connections to adjacent development.

The result is that many suburban multifamily developments are dominated by parking, have little infrastructure that supports active travel, and have little to no connections to adjacent properties. Moreover, following engrained suburban development practices, planners often review and evaluate proposed suburban multifamily housing projects without sufficient attention to adjoining development. Plan reviews are often based on documents that only show land use designations and not actual site designs of adjoining property, negating any evaluation of potential connections between properties. To capitalize on the latent potential for active travel in and around suburban multifamily developments, planners will have to re-evaluate their codes as well as their perceptions of the amount of walking and biking that can occur in suburbia.

The Oregon Transportation Research and Education Consortium (OTREC) generously provided funding for this research.


What Makes a “Complete Street” Complete? Defining Completeness Based on Context and Public Participation - Michael Lowry

Organization: University of Idaho
Email: mlowry@uidaho.edu

Contributing Authors: Michael Dixon, Kevin Kingsbury

Summary:

BACKGROUND
The concept of “complete streets” is gaining momentum as a way to make communities more livable. A complete street accommodates all users, including pedestrians, bicyclists, and transit users. Furthermore, a complete street considers the needs of children, elderly, disabled persons, and those using the street as public space for leisure and socializing. If a street does not meet these diverse needs, then it is not complete.

Despite the growing enthusiasm, there is very little guidance to assess “completeness.” For example, many communities have streets without pedestrian benches, shade trees, or other amenities. Does this mean those streets are “incomplete”? The National Complete Streets Coalition states, “Since each complete street is unique, it is impossible to give a single description [of completeness]. A complete street in a rural area will look quite different from a complete street in a highly urban area.” But for communities trying to prioritize improvements, a “know it when you see it” definition isn’t clear enough.

It has been suggested that the Highway Capacity Manual’s Level of Service (LOS) can be adapted to assess completeness. However, although LOS might be useful for assessing the quality of service for a given demand, it falls short when demand is suppressed or unobserved (latent demand). For example, if a non-capacity enhancing amenity is added to an “incomplete” street, such as a bike rack, then volumes may increase but LOS will decrease. Likewise, since LOS emphasizes the flow of users, an amenity like a bench or sculpture is considered an “obstacle” which can potentially reduce pedestrian LOS.

Various demand-free assessment tools, or audits, have been developed to assess “walkability” or “bikeability.” The audits evaluate amenities and design not in terms of capacity but in terms of user satisfaction. Audits are advantageous because they encourage proactive planning rather than reactive “predict and provide” planning. In other words, an audit tells a planner if a facility satisfies expectations, not because of warrants from demand predictions, but because there is a vision for what the facility ought to be.

METHOD
This presentation/abstract introduces a novel way to define and assess completeness using a four dimensional audit for automobile, transit, pedestrian, and bicycle users. The results of the audit can be plotted on four axes to depict the street’s “status quo profile.” By having all four axes on a common scale between zero and ten, the plot readily illustrates if the profile is dominated by one of the four user groups. For example, a status quo profile with a perfect diamond shape suggests an equal score for all user groups, while a kite shape suggests that the street is more favorable for one of the user groups.

The most significant innovation of our approach is the use of “desired profiles” which a community can create for the street types they define depending on context and function. The desired profiles provide a standard to which a status quo profile can be compared in order to calculate a completeness score. For example, if the results of an audit show a low pedestrian score, but the desired profile for pedestrians is also low, then the street can still receive a high completeness...
score because it meets the expected standard for that particular context and function. On the other hand, if a street exhibits discrepancies between desired and status quo profiles, then the street will receive a poor completeness score. Any community can develop their own set of desired profiles, which we call the community’s complete street “scheme.” A community’s scheme is their normative complete street typology. In our case study, a focus group of citizens from the community developed 16 desired profiles for 16 street types by considering four levels of context (high, medium, low, and very low urban significance) and four levels of function (arterial, minor arterial, collector, and local). The citizens also helped customize the audit for their community by providing preference weights for various street attributes related to amenities and design.

CASE STUDY RESULTS
We audited 67 streets and used the community’s scheme to calculate completeness. All of the streets exhibited deficiencies and 20% received a low completeness score. The majority of the low scores were for local streets with missing sidewalks and arterials with little or no transit amenities. The results also revealed that some streets, due to context and function, actually received completeness scores better than expected. The community participants gave valuable positive feedback. They enjoyed the instructive exercise of weighting amenities and helping to define desired profiles for their community. City leaders said the plots of the profiles made it easier to identify problems and that in general the process was insightful for prioritizing improvements.
Effect of Suburban Transit-Oriented Developments on Residential Property Values - Shishir Mathur

Organization: San Jose State University
Email: shishir.mathur@sjsu.edu
Contributing Authors: Dr. Christopher Ferrell

Summary:

OVERVIEW
Public transit systems are most effective in the presence of high volume of potential ridership. This ridership generally requires high density development at the ends of the system and along transit corridors. The development of Transit Oriented Developments (TODs) is increasingly being used to increase transit ridership.

TOD, apart from providing the transit ridership, has also gained popularity as a “smart growth” tool that addresses the problems of traffic congestion, pollution, and other ills of auto-oriented sprawl-like development. TOD’s increasing popularity is evident in efforts at all levels of government to promote the coordination of transportation and land use.

The Federal government, through ISTEA, TEA-21 and most recently, SAFETEA, has reinforced the need to integrate land use and transportation planning, and provide public transit. Other federal programs like the “Livable Communities Program” and the “New Starts Program” have given additional impetus to the development of public transit coordinated with land use.

At the state and regional level too, the last three decades have seen a dramatic increase in the number of new rail-based public transit systems. There are three general categories of rail transit systems: Heavy rail (for example, Bay Area Rapid Transit- BART), commuter rail (for example, METRA in the Chicago area) and light rail transit (for example, Santa Clara VTA, and Portland TRI-MET).

While the development of TOD is a desirable planning goal, the development of successful TODs often encounters several barriers. These barriers include: a lack of inter-jurisdictional cooperation; auto-oriented design that favors park and ride lot over ridership generating uses; and community opposition. Like any new high-density development, TODs are likely to face community opposition. This opposition may be more vocal in suburban areas where residents of predominantly single-family neighborhoods may feel that the proposed high-density, mixed-use development will bring noise, air pollution, increased congestion and crime into their area.

Community opposition has been instrumental in stopping many TOD projects in the San Francisco Bay Area. These include plans for Rockridge, Ashby, North Berkeley, and Pleasant Hill Stations of the BART system.

While the community opposition to TODs has been pronounced, very little research exists that indicates whether this opposition is well-founded. Economic theory suggests that if a TOD has a negative effect on the surrounding residential neighborhoods then that effect should lower the housing prices in these neighborhoods. Similarly an increase in the housing prices would mean a positive effect of TOD on the surrounding neighborhoods.

THE STUDY: METHODOLOGY AND APPROACH
This study, using hedonic regression method, estimates the impact of suburban TODs on surrounding single-family residential neighborhoods. It can be safely assumed that the impacts of the TOD would be more strongly felt on single-family homes that are relatively close to a TOD — we suggest roughly within one-half mile — with the impact likely to dissipate after that. The study objectives and the economic theory suggest following TOD selection criteria:

- Suburban location
- Substantial single-family residences within one-half mile radius of the TOD
• Good mix of uses, including residential, office and/or commercial uses within the TOD
• All or major portion of the TOD built
Based upon these criteria four TODs -- Ohlone Chynoweth TOD in San Jose, Pleasant Hill TOD in Contra Costa County, Downtown Hayward TOD in the City of Hayward in Alameda County, and Bay Meadows TOD in the City of San Mateo in San Mateo County -- were chosen for further analysis.

STUDY FINDINGS
This study finds that the Ohlone Chynoweth TOD positively impacts the surrounding single-family residences. For homes within 0.5 mile of the TOD, every 100 feet decrease in distance of a single-family home to the TOD increases the home sale price on average by $10,150. As the average single-family home price for this distance band is approximately $660,000, this translates into a 1.5 percent increase in home prices. However, the remaining three TODs do not have any effect -- positive or negative -- on the prices of surrounding single-family homes.

This study will be of interest to the following audiences: local, regional, state and national transportation policy makers as they plan, advocate, and allocate funding for TODs; and the technical staff of the jurisdiction and the transit agencies as they measure the benefits of the TODs.
All levels of public officials and professional staff can use the study results as they educate the existing residents about the potential impacts of TODs. Furthermore, accurate estimation of the monetary benefits of the TODs will help in assessing the use of these developments as an economic development tool.
Implementing Complete Streets: Lessons Learned
Barbara McCann
Organization: National Complete Streets Coalition
Email: bmccann@completestreets.org

Contributing Authors: Suzanne Rynne, American Planning Association
Susan Handy, UC Davis

Summary:
Implementing Complete Streets: Lessons Learned
State and local governments across the country are adopting Complete Streets policies, making a commitment to ensuring that all future projects account for the needs of all road users. Twenty-three states and more than 140 local jurisdictions nationwide have adopted Complete Streets policies, and the USDOT has named Complete Streets policy adoption as one of its key performance measures for its own success.

Methodology:
The National Complete Streets Coalition and the American Planning Association conducted interviews and analysis with local experts about the development of Complete Streets policies and effective implementation strategies. Case study communities were selected using an inventory of the 80 known complete streets policies passed by the end of 2008. Planners, transportation engineers, and others generously shared their time and insights with us through extensive telephone interviews and document reviews. The new report Complete Streets: Best Policy and Implementation Best Practices discusses successful strategies and draws out lessons learned in how to systematically create complete, sustainable streets. The report provides lessons learned about developing and adopting a complete streets policy, and an extensive look at how to implement policies and integrate a complete streets approach into everyday practice.

Findings, lessons learned, and observations:
The research project identified a number of findings that apply across many case studies. This poster focuses on findings of greatest interest to a TRB audience, with photographs from example communities.
(1) Complete streets policies are a valuable tool in changing transportation priorities, establishing a new ideal for street function, and communicating with the public. Over and over again, interviewees talked about how the complete streets policy development process provided a new frame for the discussion of transportation needs in their community.
(4) Linking achievement of complete streets to funding eligibility helps institutionalize complete streets practices. In many communities, complete streets implementation is occurring by changing the criteria for spending existing funds. Funding requirements attached to new sources of money, such as mainstream transportation bond measures, have jump-started complete streets implementation in several communities; control of a funding stream, and a clear intent to use it to create a multi-modal network, helps create visible on-the-ground projects that build community support. Specialized pots of money can also help speed complete streets retrofits in areas with extensive deficits. But if an attitude persists that this funding and these projects are separate from traditional ‘highway’ funding programs, selection criteria, and project standards, the balancing act necessary to create a complete streets network will not take place. Non-motorized and transit accommodations are likely to remain underfunded, and ‘highway’ projects will continue to miss opportunities to create a multi-modal network.
(7) Successful implementation reaches beyond the initial policy document to include changes to zoning codes, plans, standards, manuals and procedures. Complete streets implementation is successful only if an initial policy statement is followed by changes across the transportation
planning process. An initial resolution may be followed by adoption of an ordinance, revision of zoning codes, inclusion in mode-specific plans, and in some cases even the creation of a new design manual.

(9) Successful implementation at the local level is often marked by empowering planners and engineers to think through creative approaches to each project, with continued data collection and research to confirm success. Many places with complete streets policies are marked by a political and organizational culture that helps planners and engineers feel confident that they can try out new ideas as they aim for a multi-modal goal. They discourage the traditional ‘cookbook’ design approach that relies heavily on following design standards and avoiding ‘rocking the boat’. Instead they may use more general guidelines, or cross-sections without specific width requirements, as in Charlotte, North Carolina. This experiential approach is most often accompanied by close monitoring of projects to see if they meet the expected results for traffic flow, safety, and community acceptance.

Performance Measurement
Performance measures are an important tool in the implementation of complete streets policies, yet they remain a challenging area. Performance measures may be used in several different ways to facilitate the implementation of complete streets policies (See Table). First, performance measures can be used for needs assessment, to identify problems in the system and to assess their relative severity. In this case, performance measures are applied system-wide usually as a part of the planning process.

Redmond created a comprehensive monitoring system in its Transportation Master Plan. The Mobility Report Card measures a wide variety of indicators. Measured each year and publicly posted on the Internet, the Report Cards allow the City to spot trends and see how they are progressing toward their goals.

Second, performance measures can be used to prioritize proposed projects for funding in the programming process. The methods in this application may be similar to those used for needs assessment.

Third, performance measures can be used in impact assessments as a part of the development review process. In this application, forecasts of the probable impact of proposed development projects on the performance of the street system are used as the basis for impact fees or other exactions, such as requirements to provide bicycle and pedestrian facilities. For example, in Sacramento, traditional level-of-service standards for the impact of development on vehicle traffic have been relaxed to accommodate development that may improve conditions for other modes.

Fourth, performance measures can be used to evaluate the effects of a policy or project on the performance of the system and to assess whether it achieved its goal. These “before-and-after” studies are important for building a base of evidence on the effectiveness of the complete streets approach and can be instrumental in justifying further investments in complete streets projects. When operating under a complete streets framework, jurisdictions can measure traffic volume of all modes, note any modal shift, and the number of crashes and injuries incurred by all roadways. Seattle, New York City, and Charlotte North Carolina have all used this approach.
31 Green Modes of Transportation for the Delivery of Fast Food in Connecticut’s Mixed-Use Developments- Peter Miniutti
Organization: University of Connecticut
Email: peter.miniutti@uconn.edu
Contributing Authors: Cynthia Reynolds

Summary:

Research Team:
Peter Miniutti, Landscape Architecture, Principal Investigator
Edvin Yegir, Communication Design
Dimo Dimov, Business Management
Wesley Marshall, Civil and Environmental Engineering, Transportation Systems
Joseph Bivona, Landscape Architecture

Project Overview

With air pollution continually rising and fossil fuel supplies dwindling, the use of the automobile in American society is becoming more and more difficult to sustain. The issue has gained prominence, but productive solutions are difficult to come by, and even more difficult to fund. As members of academia, we have the opportunity to research alternative modes of transportation with funding from various granting agencies. By doing so, a new strategy could be developed before our increasingly outdated systems crash. The University of Connecticut's Center for Transportation and Urban planning (CTUP) is providing much needed help and funding for such research projects.

The Green Modes of Transportation in Connecticut's Mixed Use Developments grant provided by the CTUP promotes their work towards implementing smart growth transportation principles as well as interdisciplinary cooperation. The 'delivering green' study is a research endeavor which professors at the University of Connecticut (UConn) have undertaken as an idea-to-implementation project. The case study focuses on the food delivery sector of Downtown Storrs (a commercial center on the UConn main campus); reviewing the existing practices and investigating potential alternative systems. Currently, the Downtown Storrs food delivery service generates anywhere from 136-272 deliveries per day; on some of the busiest days topping 1000 delivery trips. With this highly utilized system relying on privately owned cars and trucks, this sector contributes approximately 100,332 lbs of carbon emissions each year. This study theorizes that the use of zero/low emission vehicles such as pedal bikes or electric cars for deliveries could have a significant impact on the carbon footprint, without compromising the quality of delivery services.

The case study of Downtown Storr's food delivery was a joint effort between professors and students from the University of Connecticut. Their expertise include graphic design and communication, business management, transportation and environmental engineering, and landscape architecture. Each team member contributed toward the project in a unique way, together designing a sustainable food delivery system for Downtown Storrs.

Communication Design

The graphic team designed a range of logos for the project which could be used in marketing strategies to raise awareness of environmental impact among the food delivery clientele. Various applications of logos were also explored including display at bus stops around campus, clothing of the delivery personnel, and decals on the delivery vehicles themselves. With these preliminary explorations completed, the logos were then analyzed through survey of students on the UConn
Students were surveyed in a two-step process. They were first shown a selection of logos and asked to respond to what they saw without any prior knowledge of the project. This served to identify which logos would most likely convey the appropriate message to those seeing it displayed around campus. For the second portion of the survey, the project was explained to the same students, who were then asked to respond to the logos based on visual appeal and message clarity. The responses were tabulated and the feedback used to further develop the various logos into a smaller set from which the team leaders could choose a graphic representation of the project.

**Business Management**

The business management group performed an analysis of the existing business models and potential application of low emission vehicles in the delivery sector. Business owners were found to be apathetic towards issues of sustainability, but were aware of the importance of 'green practices' in the eyes of their clientele. As an opportunity to improve their marketability, businesses were willing to consider participation in a 'green' delivery system if it were cost effective. However the implementation costs intimidated most business owners, outweighing the perceived benefits of a 'green' public image. The main issues were the small scale of the businesses making capital for such a project scarce, and the fact that the current system costs very little; investment ends with the hourly wages paid to the drivers, and in some cases an insurance policy. The vehicles used for delivery are owned by the delivery personnel, mostly college students working their way through school. Thus the investment costs of obtaining low emission vehicles were prohibitive to business involvement in a new delivery system. As a potential solution, the model of a third-party delivery service was explored, and is seen as an effective alternative for the Storr's Downtown/UConn campus area. The delivery service would be built using low emission vehicles, and local restaurants would pay into that service instead of their own drivers.

**Transportation Systems**

Using GISystems technology, the transportation group analyzed delivery quantity and destination factors to determine the most efficient route management and vehicle selection methods for a delivery service to utilize. Based on a scenario of one, two and three item deliveries, it was found that by using gas efficient vehicles the delivery sector could eliminate 119,686 lbs of carbon emissions each year relative to the carbon emissions of the same trips utilizing standard fossil fuel vehicles. The use of pedal bikes is the most fuel efficient method, however concerns of speed and manpower indicate that their use may be limited to on-campus dormitory deliveries. Looking beyond which vehicle is chosen, the studies show that it is essential to maximize the number of deliveries per trip to create an efficient and sustainable delivery system.

**Landscape Architecture**

As project managers, the landscape architecture group worked on the various aspects of the project with the individual groups, coordinating efforts and assisting with research and graphic production. The work to date on this grant project is a prime example of the benefits of interdisciplinary teams to the advancement of sustainable transportation systems. By working with all groups concurrently the group was able to guide the research into the needed areas in order to produce information for sharing between disciplines; ensuring that each group had the data necessary to complete their work. The unique melding of experience with both graphic representation, land use and circulation relationships, and management allowed the facets of the project to coalesce into a new business strategy for the food delivery sector.
32 Value of Transit: Paying for Place-Making- Abigail Osei-Asamoah
Organization: University of Connecticut
Email: abo09001@engr.uconn.edu
Contributing Authors: Garrett Bolella
Nicholas Lownes

Summary:
In recent years, national transportation planning and policy has shifted from the traditional automobile oriented approach to a more sustainable, people centered approach. Rising highway construction and maintenance costs, concerns about air quality, and ever increasing highway congestion precipitated this shift. A well-developed transit system has the ability to foster the creation of livable neighborhoods and communities. A well patronized transit system would also lead to a reduction in congestion and, eventually, to the reduction of vehicle emissions. Public transit stops have the potential to develop into centers of community life which rejuvenate and strengthen communities. This is commonly referred to as “placemaking.”
A previous study by Yannes et al., investigated the value people placed on placemaking in a public transit system using choice experiments administered in a stated preference (SP) survey. The study presented is a significant extension and expansion of the previous study. In this new study, the survey team used mobile electronic devices to deliver an in- person intercept survey. This shift to an electronic intercept survey format allowed for personalized scenario building, resulting in better estimates of control service parameters. It also improved the reliability of results by increasing the plausibility of the hypothetical scenarios presented to respondents. A conditional logit model was estimated from the survey response data to identify which tradeoffs the public is willing to make for specific transit service attributes and placemaking features. This study employed four levels of placemaking. Several digital images from Urban Advantage, a company that creates photorealistic visualizations of rich, walkable environments, were used to represent the different levels of placemaking. The selected images captured the various levels of placemaking by including different combinations of on-street parking, shorter building setbacks, street trees, improved lighting, street lamps, and larger sidewalks. The study found that the public values some combinations of placemaking variables over others, suggesting that people may subcategorize placemaking elements as either functional or aesthetic. Additionally, a person’s income and house ownership status were found to affect the person’s willingness to pay for functional improvements (such as wider sidewalks and on street parking) and what may be considered aesthetic improvements (such as reduced building setbacks and trees and greenery). The results also revealed that the public places a high value on the reliability and comfort of transit systems.
Public transit is a key method for increasing sustainability in the transportation sector; transit can decrease emissions harmful to the environment and increase social equity by providing improved mobility. Given the limited resources available to build and operate public transit, it makes sense to meet multiple sustainability goals simultaneously. Transit that is accessible by non-motorized means and serves multiple trip types can potentially reduce vehicle usage and increase mobility for everyone. This research assesses whether transit systems with high non-motorized access rates and non-work trip usage are meeting social and environmental goals and what factors impact non-work and non-motorized access rates.

Eight criteria were used to choose 17 metropolitan regions that represent a range of transit conditions in the US. Non-parametric correlations were calculated between non-work usage and non-motorized access and a dataset of 30 continuous and 11 categorical variables that measure regional characteristics, transit efficiency, land use, rider demographics, and transit operations and design. In-depth case studies, including site visits and interviews, were done for Denver, Colorado; Minneapolis/St. Paul, Minnesota; and Sacramento, California.

The correlations and case studies both confirm that transit system with high non-work usage and non-motorized access are not meeting social or environmental sustainability goals. These systems primarily serve low-income riders, are less well funded, and provide limited service. Only systems with higher per capita funding levels meet social goals and higher funding is correlated to higher income riders. However, having higher income riders does not imply that social goals are met. Regional policies regarding operations and design of transit can increase usage for non-work trips and non-motorized access and are necessary to ensure both social and environmental goals are met.
34 Methodology for Citing an Intermodal Transportation Facility in the Upper Valley Region of Vermont and New Hampshire: Lessons Learned in Fostering Livability - David Saladino
Organization: Resource Systems Group
Email: dsaladino@rsginc.com

Contributing Authors: Christine Walker, Upper Valley Lake Sunapee Regional Planning Commission

Summary:

The Upper Valley region of Vermont and New Hampshire is a vibrant and diverse micropolitan region. The region's economy is driven in large part by the presence of Dartmouth College, the Dartmouth Medical School and regional medical center (New Hampshire's largest private employer), and numerous high-tech companies with ties to the college and medical center. The region sits at the crossroads of two Interstates and is served by a regional airport, an extensive local public transit system providing fare-free service, numerous regional public transit connections, two intercity coach providers, and a well-used Amtrak station. With all of the transportation options currently provided in the region, the Upper Valley lacks a central hub where travelers can seamlessly transfer between modes to make efficient multi-service trips. To address this identified need, a comprehensive planning effort was conducted in 2010 to develop a detailed assessment all of the current transportation services in the region, identify the optimal location for an intermodal transportation facility, and develop preliminary engineering plans for the facility. The site assessment was a two-phased effort that examined close to 50 potential sites across the region. The assessment was highly detailed and included metrics based on specific site characteristics, transit serviceability, reductions to vehicle delay, emissions, and vehicle miles traveled (through the use of a regional microsimulation transportation model), impacts to adjacent neighborhoods, and site-specific construction costs. Although initially focused on providing transportation connections, the investigation of various sites stimulated an important regional discussion on the connection between transportation and land use and their fundamental relationship to community and livability.
Summary:

This poster reports on the initial findings from research aiming to identify performance measures for complete streets in California. The concept of complete streets has been promoted in order to encourage walking and bicycling by providing safe spaces to do so, especially in urban areas. Yet, many transportation agencies lack the ability or resources to ensure such facilities are built. In the case of California, performance for key goals is measured on an annual basis – yet no measures exist to track pedestrian and bicyclist safety or mobility. This project was sponsored by the California Department of Transportation to develop measures to fill this gap. As reconfiguration of the roadway is prohibitively expensive in most cases, this study focuses on roadside design features that can enhance user safety and mobility. The research is being conducted on San Pablo Avenue, a 9.5-mile State Route that runs through six cities and two counties along the east side of the San Francisco Bay. Although entirely urban, the route varies in terms of employment and residential densities, and contains a variety of roadside design features.

The project examines pedestrian and bicyclist safety and mobility from two angles. The first is the through analysis of 11 years of pedestrian and bicyclist crash data (a total of 437 reported injury crashes) and its relationship to the roadside design features along the corridor. The second is through pedestrian and bicyclist intercept surveys that will measure perceptions of safety and walkability/bikability given a range of complete streets features; this survey is in progress.

To date, the safety analysis has found that previously identified major contributors to pedestrian safety (e.g., the presence of sidewalks, number of traffic lanes, and traffic speed) continue to be the most influential forces. After controlling for these major influences, the researchers have been unable to identify combinations of roadside design elements that further contribute to completing a street and are significantly related to pedestrian safety. In particular, design elements that may create a more comfortable or pleasant environment for walking, such as street trees, landscaping, and public benches, have yet to show a significant connection to actual traffic safety. In this same vein, street trees, which have been previously targeted as potential traffic safety hazards, seem to have no negative effect on safety.

Through the intercept surveys, these features will be examined for their impact on mobility and perceptions of safety and comfort among pedestrians and bicyclists. Although they have thus far been found to be neutral in terms of actual safety, they may encourage walking and bicycling along the corridor, thus contributing to overall public health goals for communities that choose to install them. The surveys will help the researchers understand the overall value of such features to roadway users.

These results may be both encouraging and discouraging for complete streets advocates. They seem to reinforce what the literature has found about pedestrian safety – that a handful of factors are the major influences, and that those influences are so strong that they cannot be mitigated through roadside design features. One of these influences is the presence of sidewalks, which is a critical part of a complete street. However, beyond building sidewalks, the major influences for
actual safety seem to have less to do with roadside design features, and more to do with reducing automobile level of service (LOS) so that LOS for other modes may be improved. Along those lines, however, pedestrian and bicyclist mobility and perceptions of safety may be significantly related to the presence of roadside design features, thus making them an important part of a complete street from a different angle. The intercept survey will inform the study about the impact of such features on mobility and perceptions of safety.

Next steps for this research include examining bicyclist injury crashes along San Pablo Avenue, as well as analyzing the results of the intercept survey. The project aims to use this greater understanding of current pedestrian and bicyclist safety and mobility to create defensible and reliable performance measures for Caltrans’ urban roadways. These performance measures can then guide future roadway design to be wholly, rather than just technically, “complete.”
36 The “Fix This Tool”: Empowering Citizens to Spatially Assess their Active Transportation Environment- Marc Schlossberg
Organization: University of Oregon
Email: schlossb@uoregon.edu
Contributing Authors: Ken Kato
Dana Maher
Cody Evers
Christo Brehm

Summary:

Supporting livable cities is a key priority of the Obama Administration, fully embraced by the US Secretary of Transportation, and necessitates increased active transportation (walking and cycling) in communities across the country. Transportation data that supports active transportation planning is lacking for most communities. With the increasing pervasiveness of smartphones that are graphically rich, spatially accurate, and simple to use, it is now possible to approach transportation and livability data collection in a new way by engaging citizens directly in the process.

This poster describes the development and testing of an iPhone-based transportation livability audit tool called the Fix This Tool. The Fix This Tool is specifically designed to engage and empower citizens across the country to easily collect active transportation data in order to help local communities and transportation agencies meet the needs of the livability era. The tool requires no training, is spatially specific, and focuses both on the subjective perception of place as well as some of the objective variables that may be important to note.

Through initial development and testing, we found the tool to be intuitive for people to use, data robust, and that the combination of features available on a smartphone-based tool provides a rich set of opportunities for both citizen and public agency to be engaged in improving their active transportation system. That said, it is clear that active transportation data can be complex and ‘messy’ and will require new approaches toward use than traditional, objectively assessed regional scale measures used for transportation modeling.
37 Universities as Catalysts for Retrofitting Communities Toward Livability: The Sustainable Cities Initiative- Nico Larco

Organization: Sustainable Cities Initiative (SCI)  
Email: nlarco@uoregon.edu

Contributing Authors: Marc Schlossberg

Summary:

Many communities and cities are desperately interested in moving toward a sustainability and livability context, where in part, active transportation plays a more central and important role in meeting local transportation needs, and where city design better supports transit. Simultaneously, there is an incredible amount of energy and know how about such issues embedded within Universities, from faculty research to courses across disciplines that address some aspect of the built environment. Thus, there is great potential to match the community need with University resources, and even though there are many applied courses and other engaged applications, the connections between town and gown are often quite weak and isolated by discipline.

The Sustainable Cities Initiative (SCI) at the University of Oregon is an effort to radically alter the function of the public university to serve the public good by catalyzing community change specifically related to the emerging livability and sustainability agenda. SCI is cross-disciplinary, bringing together students and faculty in planning, public policy, architecture, landscape architecture, business, law, and journalism (so far), to work together and to work directly with communities to help accelerate changes toward livability that the nation so desperately needs.

This work is carried out through a variety of efforts, including:

• Sustainable City Year (SCY): This is a program that asked a simple question: “what would happen if existing courses across a University that had some connection to livability and the built environment all worked with the same city over an entire academic year?” The result after the first year was that 16 professors from six disciplines dedicated 24 courses to work with the City of Gresham (OR) on a variety of transportation and other livability projects. In all, it is estimated that 100,000 hours of student and faculty time were given to Gresham, which has been significantly impacted through the diversity and depth of work and ideas. Projects ranged in topics from streetscape design, light rail and public transit planning, urban ecology, and economic development. Five cities in Oregon applied to be the focus for the 2010-11 academic year, clearly illustrating the urgent demand and need for ideas and expertise in this topic area.

• Policy Engagement: SCI has been directly engaged in national policy issues, reviewing legislation for key members of Congress, submitting White Papers to federal transportation agencies, and meeting directly with Congress members and staff about key upcoming legislation focused on livability.

• Research: SCI faculty enjoys a national reputation as experts on transportation and livability, having recently been the focus of RITA’s livability newsletter, core to OTREC’s growing national reputation as “The Livability UTC”, and through more traditional research outlets and networks. A recent White Paper on “Transit Livability” prepared for the FTA has recently been turned into funded research with the goal to provide the FTA a series of performance metrics for assessing how well the nation’s transit systems serve the livability needs of their communities.

In short, the Sustainable Cities Initiative (SCI) is a cross-disciplinary effort integrating research, education, service, and public outreach around issues of sustainable city design. SCI represents an original and fairly radical re-conceptualization of the research university as catalyst for sustainable community change. The truly multi-disciplinary, applied learning, and engaged
community orientation makes SCI a new model for Universities around the world. (SCI was recently one of five organizations internationally nominated for a prestigious Globe Forum environmental award, and several Universities in the United Kingdom are organizing to send a delegation to Oregon to see SCI’s work first hand.)

This model combines scientifically rigorous research and exceptional student instruction and transforms them into something more: a robust, energetic, state of practice and knowledge catalyst for helping cities transition to more sustainable practice. Specifically, SCI tackles issues related to multi-modal sustainable transportation systems, climate change, healthy communities, sprawl and its impacts on land and energy consumption, economic development and ecological health and restoration, by advancing a three-prong strategy of research, civic engagement and community collaboration.
38 Moving from “Complete Streets” to “Complete Communities”: A Study of Customer Mode Choice at 20 San Francisco Bay Area Retail Pharmacy Stores- Robert Schneider

Organization: UC Berkeley
Email: rschneider@berkeley.edu

Contributing Authors:

Summary:

This study of customer travel behavior at 20 San Francisco Bay Area retail pharmacy stores suggests that major increases in walking and bicycling for routine shopping trips will require the transportation profession to expand its emphasis beyond “Complete Streets.” While “Complete Streets” efforts help improve pedestrian and bicycle safety and comfort, they focus mainly on the street environment. These efforts are unlikely to create major shifts in travel behavior outside of urban centers unless broader “Complete Communities” strategies are adopted. “Complete Communities” strategies should improve roadway conditions for walking and bicycling and also modify community land use patterns, change individual and cultural perceptions of non-motorized transportation, reduce street crime, and use automobile parking pricing strategies to promote walking and bicycling.

A mixed-methods approach was applied to understand why people choose a particular mode of transportation for multi-stop tours. Travel data were gathered from an intercept survey of 1,003 customers at Walgreens retail pharmacy stores in 20 San Francisco Bay Area neighborhoods in fall 2009. These data included the location of the respondent’s home, the location of all stops made before and after visiting the store, and all transportation modes used between each stop. Respondents also reported their socioeconomic characteristics, attitudes towards transportation and the environment, and perceptions of neighborhood traffic safety and personal security. These responses were analyzed using a mixed logit discrete choice model. Follow-up interviews were conducted with 26 survey participants to gain a deeper understanding of factors that influenced their transportation decisions. While the survey and interviews also addressed public transportation, this poster focuses on walking and bicycling.

Approximately 90% of survey respondents at all stores believed that reducing automobile use is a good way to improve the environment. However, customers at certain stores were more likely to act on their environmental values—more than 55% of customers at three San Francisco stores walked or bicycled, but more than 85% of customers at seven suburban stores arrived by automobile. What explained these differences in travel behavior? Survey and interview responses showed the importance of “Complete Streets”. Study participants enjoyed walking in areas with sidewalks or other pedestrian pathways and little or no traffic. They liked to bicycle on low-speed, low-volume streets and on pathways away from traffic. Many interviewees said that they would bicycle more if there were separated spaces for bicycling on streets. In contrast, missing sidewalks, fast traffic, difficult street crossings, and a lack of barriers to separate bicycles from cars may have impeded walking and bicycling to stores. In addition, model results showed that more bicycle facilities within one-half mile of a store were associated with a higher likelihood of customers bicycling to the store. However, mode choice decisions were motivated by many factors beyond those typically targeted by “Complete Streets” strategies. Time and cost were statistically-significant factors associated with retail pharmacy store mode choices. Of customers who traveled on a tour that was longer
than two miles, 77% used an automobile as their primary travel mode and 9% walked or bicycled. However, for tours shorter than one mile, 22% drove and 78% walked or bicycled. After controlling for travel characteristics (e.g., tour distance, number of stops, number of bags being carried) and socioeconomic characteristics (e.g., gender, income, automobile ownership, student status), several store area characteristics were associated with walking and bicycling. Customers were significantly more likely to walk to stores surrounded by greater employment density, greater population density, and metered on-street parking and located closer to a transit station. Customers were more likely to bicycle to stores surrounded by greater employment density and metered on-street parking and with more bicycle parking. People who perceived a high risk of crime near the store were significantly less likely to travel by public transit, possibly because of danger when walking to and waiting at bus stops. These model results were supported by interview responses. Some interviewees living in low-density neighborhoods suggested that driving provided access to a dispersed set of activities in a reasonable amount of time. Many interviewees living in compact neighborhoods said they walked more because it was convenient and because driving and parking was a hassle. Suburban participants who had free parking at most of their activity destinations drove regularly, and some reported avoiding traveling to San Francisco because of expensive parking. Personal security concerns deterred several interviewees from walking to bus stops, the store, and other locations in high-crime neighborhoods.

In addition, attitudes towards walking and bicycling showed a statistical association with mode choices. Individuals who reported enjoying walking were more likely to walk to the store, and respondents who thought their neighbors had a negative view of people who bicycled were less likely to bicycle to the store. These model results were echoed by interviewees. Some said they enjoyed getting exercise and being “environmentally friendly” when they walked to stores and other errands. Others reported that bicyclists were “risk-takers”, part of a “counterculture”, “too poor to own a car”, or that they would feel self-conscious if their neighbors saw them riding a bike on local roadways. Therefore, individual and cultural attitudes are important to improve in order to promote sustainable transportation.

This study underscores the importance of a “Complete Communities” approach to promote walking and bicycling for routine shopping trips. In addition to “Complete Streets,” compact, mixed-use neighborhoods should be promoted to make it convenient for people to walk or bicycle to their entire set of daily activities. Social marketing campaigns could help change the view that walking and bicycling are primarily recreational activities and only a mode of transportation for people who can’t drive. Increased police enforcement could be used to reduce street crime. Parking policies should be revisited to limit off-street parking and increase on-street parking prices to reflect market rates.
Summary:

Chicago is known for its transit. It is a part of the City's history. Some of its active transit system is more than 100 years old. Yet there is an opportunity to increase ridership at many stations and increase development in the areas around the stations. To address this, the City of Chicago and Chicago Transit Authority (CTA) partnered together to create a model to encourage transit friendly development at CTA stations. This typology study was the result of that partnership and provided a classification of all 144 of the CTA stations—19 of which are actually outside the City of Chicago—and described appropriate development opportunities for each classification.

Objectives of the Study

The typology study had three specific objectives:

• Encourage transit friendly development in the vicinity of CTA rail stations and other CTA transit nodes.
• Provide a tool for elected officials and private developers to attract appropriate, desired development to station areas.
• Identify opportunities for development of CTA- and City owned properties.

All 144 CTA rail stations were included in the study, including two new planned stations. The opportunity for new infill development varies at station areas. Vacant parcels and development sites under public and private ownership offer an opportunity to reinforce and enhance a neighborhood’s character or typology with transit friendly development. In some cases the holdings, especially by the City, create a foundation on which development partnerships can be built.

A Word About Transit Oriented Development in Chicago

One of the premises of the Typology Study was that Chicago already is transit oriented. Certainly in the heart of the City, but also in neighborhoods throughout the City, there is a rich network of transit including CTA bus and rail, Pace bus, and Metra rail. The term transit friendly development (TFD) has been adopted in the City of Chicago to acknowledge the uniqueness of transit and land use in Chicago. TFD focuses on a more specific set of guidelines including accessibility, connectivity, scale, and a series of development incentives and partnerships focused in the area immediately surrounding the station. Defining station typologies and developing TFD guidelines inform how that station area should be developed to be consistent with the goals of CTA, the City, and individual neighborhoods.

Features Unique to Chicago

The history of transit in Chicago has created certain features of the CTA system that are unique when compared to other transit systems. These unique features create special challenges—and opportunities—to encourage transit friendly development (TFD).
Neighborhoods – Chicago’s array of diverse neighborhoods is well serviced by rail and bus transit. The rich fabric of transit throughout and Chicago is not common to other cities. Nonetheless, many neighborhoods around stations are mature and have few if any vacant parcels. 

Configuration – The Chicago Transit System is elevated for the most part. These elevated rail lines and stations have few direct connections to adjacent buildings. The stations are closely spaced—in some cases only blocks apart—serving a greater density and mix of uses on the blocks right next to transit stations. 

Land Use Pattern – Chicago’s land use patterns are concentrated in a very high density core, served by the “Loop,” to a much greater extent than most other major metropolitan areas. Most other major metropolitan areas have a smaller downtown core and higher density nodes of development around the periphery, creating other opportunities for higher density TFD at those outlying stations. 

CTA Ownership – Because the transit system is elevated above streets, for the most part, rail lines and stations lie within public rights-of-way. Portions of the Orange, Blue, and Red Lines were built by the City of Chicago and are operated and maintained by the CTA, leaving very few CTA-owned parcels to leverage for TFD. Large stretches of these two new lines run parallel to, or are within the rights-of-way of either commercial rail lines or interstate divided highways. This is significantly different than new transit systems built in other metropolitan areas where excess land was purchased around stations for the explicit purpose of TFD construction. 

City Ownership – Some station areas within the City of Chicago are adjacent to undeveloped properties owned by the City, as a result of the elimination of blighted conditions throughout the years. This creates the potential for larger scale developments, not normally found in urbanized areas. 

Overall Organization
Generally the CTA rail stations fell into categories which include those in the downtown core, those that are defined by the activities around them, those that serve neighborhoods, and stations that predominantly serve employment districts. Four overall categories of stations were defined as either Downtown Core, Activity Center, Neighborhood or Employment District. 

Seven Typologies
From these four categories came the following subcategories to better define the station areas and a more refined definition of the seven typologies used throughout this study: 

• Downtown Core 
• Major Activity Center 
• Local Activity Center 
• Dense Urban Neighborhood 
• Urban Neighborhood 
• Service Employment District 
• Manufacturing Employment District 

Conclusion
Assigning each of the CTA rail stations one of seven typologies is a significant component of a broader initiative by the City of Chicago which includes the following: 

• Using the recommended guidelines from the station area typologies to consider a series of zoning code changes to support and implement transit friendly development 
• Creating a similar discussion about typologies for bus corridors 
• Expanding the reach of transit friendly development to a corridor perspective by initiating corridor studies along a few key arterials in the City 

The typologies that have been assigned each station inform developers and elected officials as to the potential development types that should be considered in these station areas and provide planners and designers a set of guidelines by which this development should occur. 

Recommendations
Based on the typology guidelines and the conclusions of this study the following recommendations were offered: 

• Identify station areas where property ownership is such that aggregation and other incentives can be leveraged to encourage future transit friendly development 
• Identify infill development opportunities where existing development around the station is less dense than that which is envisioned by the station area’s typology
• Encourage development around intermodal and park-and-ride stations that makes better use of the land surrounding the station while improving integration among transit functions and better connectivity to the station
• Create standards and templates by which existing surface parking can be converted to structured parking with at least as much station oriented parking integrated with transit friendly multi-use development
• Examine and evaluate station connectivity for all modes focusing especially on connections to existing surrounding development and potential future development
• Actively look for ways to better connect the stations to the community at street level and to the adjacent buildings at platform level
• Incorporate walkability, integrated mixed-use buildings, and open space into station areas
• Refine TFD Guidelines and incorporate them into the appropriate municipal codes, especially the City of Chicago Zoning Code
Summary:

Can estimations of neighborhood “walkability” be affected by how distances to walkable destinations are calculated? How would walkability estimated using “as-the-crow-flies” Euclidean distances compare to using grid-distances? Our project involved developing a “walkability” regression model calibrated with data collected for Ames, Iowa. Ames has a population of 52,000 and is home to Iowa State University. Data either collected or derived included:

• walk scores as calculated by the online web tool “Walk Score” for 245 sampled locations in Ames;
• coordinates of commercial amenities downloaded from Google Earth that are within 1-mile of each of the 245 sampled locations;
• euclidean distances to each amenity from each sample point;
• “idealized” grid-distances to each amenity from each sample point;
• aggregated number of amenities within four distance categories;

The online web tool will calculate a measure of walkability for any address based upon the Euclidean distance to various commercial amenities – closer destinations are weighted more than destinations further away (maximum 1-mile). Our first step was to create a contour map of walkscores of the city of Ames based on the Walk Score website. Within a 3-mile radius of the ISU campus, we sampled 245 walk scores online and created walk score contours via an Ordinary Kriging method found in ArcINFO’s Geostatistical Analyst extension.

Next, a multivariate linear regression model was calibrated to predict walk scores using four predictor variables based on the number of commercial amenities found within Euclidean distance bands around a given walk score sample location (245 locations):

• within a 0.25-mile band;
• within a 0.25-mile to 0.50-mile band;
• within a 0.50-mile to 0.75-mile band;
• within a 0.75-mile to 1.00-mile band;

Coordinates of commercial amenities were determined by searching on Google Earth, downloading the KML files, and extracting latitude and longitude coordinate information. The coordinate data was then imported into ArcINFO as a point shapefile and the Generate Near Table tool in ArcINFO was used to locate businesses within 1-mile of each walk score sample point. After joining this table with the walk score attribute table, over 24,000 records were generated, one for each business within 1-mile of each of the 245 walk score sample points. These records were aggregated to produce the number of businesses within each Euclidean distance category for each sample point.

Through Least-Squares Regression, the following linear model resulted:

\[ Y = 0.5978 \times X_1 + 0.4970 \times X_2 + 0.2998 \times X_3 + 0.2742 \times X_4 \]

Where:

• \( Y \) = predicted score for walkability;
• \( X_1 \) = the number of amenities within a 0.25-mile band;
• \( X_2 \) = the number of amenities within a 0.25-mile to 0.50-mile band;
• \( X_3 \) = the number of amenities within a 0.50-mile to 0.75-mile band;
• \( X_4 \) = the number of amenities within a 0.75-mile to 1.00-mile band;
Two “goodness-of-fit” measures for a regression model are the R-Square value and the %RMSE. The R-Square value is the percentage of total variation in the sampled walk scores that can be explained by our linear model. Our model has a high R-Square value of 0.94. Another “goodness-of-fit” measure to consider when calibrating regression models is “Percent Root Mean Square Error” or %RMSE. It is a measure of how closely the walk scores predicted by our model above match the actual sampled walk scores.

Our model only achieved a %RMSE of 39%. The lower the %RMSE, the closer our predicted values would be to the actual sampled walk score values from www.walkscore.com. We would have wanted a smaller %RMSE so that our sensitivity analysis of the effects of Euclidean versus Manhattan grid distance would be more powerful.

The number of amenities within each distance band was then recalculated based upon an idealized Manhattan grid-distance. The resulting “Manhattan grid” walkability scores for each of the 245 locations in Ames were then compared to the “Euclidean” walkability scores based on our model.

Finally, we were interested in the possible relationship between walk scores and the amount of sidewalk coverage in Ames. With a sidewalk polygon shapefile supplied by the City of Ames, we calculated the amount of sidewalk area found inside each walk score category boundary. While there is some apparent association between the percent area covered by sidewalk and walkscore category, we attempted to further assess the association by disaggregating the study area into 100-meter square grids and calibrating a univariate linear regression model to predict walkability based on percent of sidewalk coverage within each grid cell.
Summary:

Livability is a broad topic that can encompass many different issues and themes. Therefore, it can be difficult to quantify and to analyze. However, livability must be properly considered and analyzed in order to make good planning decisions on how best to maximize livability and to optimize livability investments.

In previous work for TCRP (in Salt Lake City), Chicago RTA, NJ TRANSIT, and Portland Metro, RSG has been able to successfully quantify “non-traditional” transit attributes, such as protection from the weather, lighting, real-time information (either at a stop or on the web), transfer quality (distance, protection from the weather), HVAC performance, maps/schedule information, comfort, cleanliness, proximity to amenities, onboard WiFi, etc. RSG has also used artistic renderings of neighborhoods and stations/stops so that the land-use attributes can be incorporated into user preferences and perceptions.

Using these techniques, RSG believes many livability issues can be quantified so that decisions can be made on the value of investing in what creates the “most livability for the buck.” Livability comprises myriad aspects that are both tangible and amorphous, ranging from concrete projects such as infrastructure to ephemeral but critical notions of community cohesiveness. This paper suggest that for many aspects of livability, the same advanced techniques used in RSG’s recent transit studies to evaluate non-traditional attributes can be applied to other aspects of livability planning, such as understanding preferences for different types of land-use and valuing those attributes (e.g., How much value do sidewalks provide? What about a tree-lined street versus one devoid of trees?).

This paper will also present the results of RSG’s recent transit studies that have quantified various non-traditional attributes. Examples include the value of well-lit bus stops versus unlit stops, the value of real-time information at a station on a digital sign versus a web-based real time information system, among many other examples. While, transit alone does not constitute livability, it is applicable to all of the six Guiding Principles of the Livability Initiative listed in the calls for paper and on FHWA’s website, and therefore is a critical component of livability. The paper will present our findings on the values of non-traditional attributes and how they can be used to create a transit livability evaluation. The paper also envisions ultimately conducting more research on other types of livability attributes as noted previously.

From our transit research RSG has found that non-traditional attributes contribute a significant amount to transit mode choice. For example, travelers are willing to trade about 5 minutes of travel time for real-time arrival information and about 4 ½ minutes for a modernized station/stop design; premium onboard amenities can be worth 4 minutes or more. These attributes can also have strong interaction effects depending on trip length, wait time, transit mode, and the type of transit environment (highly dense areas versus less dense suburban land use). The longer the wait at a transit stop, the more real-time information is worth to a traveler; similarly, the longer the trip, the more valuable onboard amenities become. These transit findings on their own can produce values that can be used to help measure, evaluate, plan, and ultimately increase livability.
42 How to Define and Measure Livability Factors-
Elizabeth Sanford
Organization: Cambridge Systematics
Email: esanford@camsys.com
Contributing Authors: Joanne Potter, Cambridge Systematics
Cheryl Little, E Squared Inc.

Summary:

Livability is a concept that integrates community, environmental, economic and transportation goals. Being strongly correlated with quality of life considerations, livability has been a feature of planning for years. However, the comprehensiveness of livability has proven challenging to define and operationalize in practical ways.

As Federal, state, and local governments embrace livability as a value, how do they ensure that the notion won't collapse under its own weight - or result in plans that are interesting, but not actionable?

This presentation will explore and advance the current state of practice about livability in transportation planning. The session will explore two broad definitions, the first from the US DOT Strategic Plan FY 2010-FY 2015, "Transportation for a New Generation", where livable communities are "places where transportation, housing, and commercial development investments have been coordinated so that people have access to adequate, affordable, and environmentally sustainable travel options", and the second from the conference's definition of transportation for livable communities - "a transportation system that works with land use to give everyone multiple travel choices for meeting their daily needs affordably, safely, conveniently, and efficiently." The session will examine how transportation planners have successfully framed the concept of livability and what lessons can be learned to further refine this concept.

The authors will discuss three examples of how planners at different levels are working to incorporate livability into transportation decisions:

1. Designing performance measures of livability - Both federal and local governments are working to define livability performance measures that are flexible, focused, and actionable. How do efforts of the Interagency Partnership and performance measures developed with the FHWA support action on the ground?

2. Collaborating across disciplines to establish common objectives for livability - Is it possible to develop a common vision among practitioners in transportation, ecology, and community development? What can we learn from the work of environmental resource agencies and transportation agencies attempting to conduct integrated planning? How does climate change fit in? The results of interagency workshops give clues to the opportunities and obstacles involved in working across disciplines.

3. Equity as a guiding principle for place-based definition of livability - How do planners ensure that full access and opportunity are embedded in community plans? The session will highlight a regional initiative in the Richmond metropolitan area to prioritize brownfields and abandoned properties for redevelopment, a state planning initiative, and EPA's EJ Showcase Communities Initiative to explore effective means of incorporating equity in distinct communities' plans.
Summary:

Cycling continues to experience climbing levels and garner attention for its acclaimed ability to achieve various environmental, health, and congestion-mitigation benefits for communities. While the growth in both cycling and transit may be in small part attributed to bicycle and transit integration, it is difficult to measure. Given the variety of bicycle and transit integration strategies to employ—increased parking at stops, increased bicycle capacity on the transit vehicle, shared bicycle infrastructure, to name a few—which ones are more cost effective? Which strategies will yield the highest number of cycle transit users?

To fill a current void in the literature about integrating bicycling and transit, this paper describes and assesses four common bicycle and transit integration strategies, develops a framework for evaluating each of the strategies, and conducts a preliminary cost effectiveness assessment. The cost effectiveness assessment comprises costs and cyclists’ preferences for each of the strategies. The preferences were gathered through stated preference surveys from focus groups in five case study communities and calculated with the Analytic Hierarchy Process, a multicriteria decision-making tool. Results of the cost effectiveness measure suggest that bicycle on board transit is most cost effective. However, the limited growth potential for bicycles aboard transit requires further consideration of the alternatives. The overall importance that cyclists assigned security suggests that there is considerable room for creative solutions to improving the favorability of the three additional strategies, thereby addressing some of the inherent capacity limitations of the most popular strategy, transporting the bicycle with the rider on transit.
Summary:

BACKGROUND
Highway 92 is one of the most significant corridors in Douglas County. High levels of accessibility, combined with large tracts of vacant land, made the corridor a popular location for new development at the beginning of this century. In response to emerging growth pressures, the County applied for and was awarded a Livable Centers Initiative (LCI) grant to develop a plan for the Highway 92 Corridor.
Consistent with the LCI’s objectives, the resulting Highway 92 Corridor Plan recommends a series of accessible, walkable, mixed use centers that put jobs, shopping, residences, civic places and parks all within close proximity to each other. Supporting the corridor vision is a multi-modal network of streets and off-road trails. This network is an important part of the plan and is critical to its success because it represents:
- The framework for the development of walkable, pedestrian-scale blocks;
- The confluence of the public and private realms that creates valuable spaces for people to interact;
- Safe, comfortable facilities for walking, bicycling and riding transit, and
- A series of street connections that distributes traffic efficiently and provides alternatives to travel on US 92 itself.
The Highway 92 Corridor Plan sets a clear vision and plan for the corridor. The transportation network recommendations follow sound network planning principles and are consistent with the land use and urban design context.
The Plan recommends over 50 intersection, sidewalk, streetscape, trail, transit and street network projects. While each project is important to the overall development concept for corridor, practical considerations require that each project must be phased in over time. Further, national and regional shifts in market conditions since the initiation of the study have created the need to carefully consider the market impact of each project.
In response to this need, the County applied for and was subsequently awarded a Supplemental LCI grant by the ARC. The Highway 92 Corridor Supplement LCI Study allowed the County to move forward with a more focused set of tasks for implementation, including:
- Further analysis of the costs, benefits and impacts of the network recommendations;
- A better understanding of the relationships between transportation projects and market demand, culminating in a
- ‘Game plan’ for implementation that includes prioritization, phasing, cost and responsibility.

METHODOLOGY/APPROACH
The Study Team’s approach to the Highway 92 Corridor Supplemental LCI Study revolved around a careful balance between the four main factors that affect implementation of the recommended transportation projects.
1. Livability
2. Mobility
3. Market impact
4. Physical/environmental constraints.
The Study Team used a series of innovative, low-cost, qualitative and quantitative methods for evaluating the value of each transportation project in the Highway 92 Corridor. For example, instead of traditional corridor-based automobile level of service measures, the Team used areawide quality of service standards. The areawide approach balances automobile measures of LOS with consideration the vehicular capacity of an entire interconnected network of streets, rather than a single arterial. The quality of bicycle, pedestrian and transit networks were also taken into account and quantified.

To demonstrate the benefits of an interconnected, multi-modal network, a comparison of the mobility impacts of the recommended network versus making capacity improvements to US 92. SYNCHRO and other analytical tools were used to derive evaluation measures, which could included delay on Highway 92, areawide volume to capacity ratios and access to bicycle and pedestrian facilities.

The point of this effort was threefold:
1. To draw a clear nexus between the proposed network and corridor mobility benefits.
2. To establish evaluation measures that can later be used to gauge network performance as the plan begins to come online.
3. To get a better sense of the relative importance of each individual project to overall network performance.

A host of qualitative measures were also used to evaluate the recommended transportation projects. For example, each project was evaluated for its ability to:
- Promote design at a human scale (streets, blocks, etc.);
- Connect to open space and public places;
- Provide gateway treatments and other ‘branding’ elements, and
- Contribute to a mix of uses and building orientation.

FINDINGS/RESULTS

The end result of this careful evaluation is a clear set of project priorities stratified by near team (two to five years), mid-term (five to 10 years) and long term (beyond 10 years) time frames. The objective, transparent and comprehensive process resulted in broad approval and support of the recommendations by staff, citizens, property/business owners and elected officials.
45 Coordinating Livability, Accessibility and Mobility in Rural America: What Works? A presentation of best practices and “lessons learned” from NCHRP 582 “Best Practices to Enhance the Transportation-Land Use Connection in Rural America”- Hannah Twaddell

Organization: Renaissance Planning Group
Email: htwaddell@citiesthatwork.com

Contributing Authors: -- Jared Ulmer, currently with University of Washington, formerly with Renaissance Planning Group
-- Dan Emerine, currently with Washington, DC Office of Planning, formerly with ICMA Smart Growth Network
-- Barbara Yuhas, ICMA Smart Growth Network
-- Sam S

Summary:

A wide array of research is available on the subject of integrating land use and transportation to promote urban livability, but relatively few studies have investigated integrated planning approaches in rural communities. To begin filling this gap, TRB published in January 2008 NCHRP 08-52, “Best Practices to Enhance the Transportation-Land Use Connection in Rural America.”

The study identified a planning framework and best practices, illustrated by 12 case studies, for coordinating transportation investments and programs with land use strategies in order to achieve rural community development goals that optimize regional mobility, improve local accessibility and enhance community livability.

Based upon surveys and analyses of demographic and economic trends in rural America, the study identifies three types of rural communities, each of which faces a distinctive set of accessibility, mobility and livability issues:

1) Exurban communities exist on the fringes of most US cities. Many of these communities have shifted from a local economic base to some level of dependence on accessibility to jobs and services outside of the community. They are primarily concerned with improving connections to jobs and services in adjacent urban centers, by providing higher-speed transportation facilities, and/or locating jobs and services within closer proximity of residential areas.

Exurban communities are growing at an above-average rate of five percent per year. Livability issues tend to focus upon oft-conflicting desires to preserve local culture and green space while also embracing new people, jobs, and opportunities.

2) Destination communities are in locations that feature natural amenities such as mountains, lakes, or beaches, attract seasonal residents, retirees, and tourists. Located primarily in the West, Upper Great Lakes, and New England, the economic base in these communities has shifted from traditional rural industries (agriculture, manufacturing, or mining) to a service-based economy built around providing access to natural amenities and support of a recreational or leisure culture.

They tend to focus on regional mobility strategies to bring visitors into the community, as well as multi-modal connections within the community to improve accessibility for tourists and employees.

Destination communities are growing at an above average rate of six percent per year. Their livability issues center around the need to keep from “killing the goose that lays the golden egg,” i.e. protecting the natural assets that are attracting rapidly growing numbers of people, jobs and traffic.

3) Production communities are typically found in remote areas such as the Great Plains, Corn Belt, Mississippi Delta, and Appalachia. They depend upon a single industry that has experienced
decline, such as agriculture, manufacturing, or mining. It is difficult to diversify their economic base and to access far-away job centers. Production communities seek strategies to improve connections between local producers and target markets, and/or to cultivate new economic engines that can thrive within the existing transportation framework.

With a below-average growth rate of two percent per year and a loss of jobs, their livability issues are focused urgently on the desire to keep the community alive, with sometimes-conflicting desires to resuscitate traditional industries and/or to create new ones. The study recommended the following planning framework and best practices to address rural accessibility, mobility, and livability at three scales:

1) Set the regional framework for optimal development patterns by coordinating growth management, preservation, and access management strategies.

2) Improve local accessibility to daily needs such as jobs, shopping, services, and health care, through practices such as development standards and plans to promote mixed-use, walkable community centers, reinforced by transportation improvements to street connectivity, pedestrian and bicycle facilities, and transit services.

3) Enhance community livability through practices such as context-sensitive roadway design techniques that complement natural and built environments, and by coordinating access management and community design strategies to manage traffic and improve aesthetics along key commercial corridors.

In addition to coordinating initiatives across geographic scales, the processes by which rural communities achieve results featured several common elements:

- Collaborative (often regional) partnerships;
- Active public engagement and education;
- A focus on quality of life and long-term sustainability; and
- Strong local leadership (both grassroots and government).

Case studies for 12 communities discuss the key issues, catalytic events, and planning processes involved in coordinating land use and transportation strategies to improve mobility, accessibility, and livability:

- Burlington, Iowa (Main Street revitalization)
- Cutler-Orosi, CA, (Community development charrette)
- Edgartown, MA (Transit-oriented development)
- Hayden, CO (Community visioning & scenario planning)
- Hutchison, MN (Reclaiming Main Street from a state highway)
- Lincoln City, OR (US highway as community gateway)
- Moss Point, MI (Post-Katrina community-wide re-invention)
- Northwest Vermont (Regional scenario planning & visioning)
- Sedona, AZ (Community-based transit)
- Traverse City, MI (Community-based car sharing)
- Unity, ME (Linking downtown revitalization & rural preservation with greenways & transit)
- Abingdon/Damascus, VA (Virginia Creeper Trail tourism development)

The study Advisory Panel included the following members:

- Shelley Mastran, Chair, preservation planning consultant & co-director of NEA “Your Town: Citizens Institute on Rural Design” program
- George Smith, CALTRANS (AASHTO Liaison)
- David Boyd, MSA Professional Services
- Charles Carr, Mississippi DOT, Public Transit Division
- Stephen Hoesel, MIDAS Council of Government (Iowa)
- Polly McMurtry, Vermont DOT
- Rosemary Monahan, EPA Smart Growth Program
- Melisa D. Montemayor, Texas DOT
- Beth Osborne, Rep, Sen. Carper (D-DE)
- David Sears, USDA
- Elizabeth Fischer, FHWA
- Kimberly Fischer, TRB Liaison
- Chris Hedges, Project Manager, National Academies
Summary:

There are many benefits to students walking or cycling to and from school. Schools built in walkable locations near housing help unite neighborhoods and community life because there are easily accessible and can serve as a community crossroad. However, in today’s climate of liability and legal considerations, school and school districts have instituted policies that discourage or prohibit walking and bicycling to and from school even in walkable communities with neighborhood schools. While Safe Routes to School programs are developing and flourishing in many communities around the country, some communities are discovering barriers to active transportation due to school policies. A policy that discourages or prohibits bicycling or walking can stop a Safe Routes to School program in its tracks. There is a great variety in what school walking and biking policies do and do not cover. Some schools have no formal policy, while others have a policy that includes a complete ban on biking with no explanation as to why the ban is in place. Our approach to researching this topic was two fold. First, legal and liability concerns were researched through case law, existing state policy and school personnel’s legal duty of care toward students. Second, 165 schools and 25 school districts in Middlesex County, New Jersey were surveyed to obtain current school policy or lack thereof for students walking and/or bicycling to and from school. Policies tended to fall into two categories, official school district policy and individual school procedure. No school districts in Middlesex County had policies about walking to school. Policies regarding bicycling were different. Although many school administrators did not know if a policy existed, a significant number of policies delegate the decision to allow or prohibit the use of bicycles to the principal or building administrator. In this situation, individual school rules become official policy. However, there is evidence that this created confusion when some principals within the district grant student’s permission to ride at the same time others in the same district prohibit it. In addition, some school administrators noted that individual school policy changed when school principals changed, leaving school personal and parents confused as to current policy. Working with a collection of existing walking and bicycling to school policies, the poster will present the reasons behind barrier policies including land use, urban form and liability concerns. The poster will also showcase positive examples of model walking and biking to school policies including details regarding how model policies can support livable communities.
Summary:

This paper is intended to develop an enhanced four-step travel demand forecasting framework that is sensitive enough to assess the impact of smart growth strategies in enhancing transportation and environmental sustainability of our communities. The refinement focuses on individual travellers’ destination choice and mode choice decisions that play significant roles in shaping the overall travel pattern of a transportation system. When modelling the destination choice decisions, we developed different discrete choice models for different trip purposes, taking into account the impact of various land use attributes on intrazonal and interzonal trip making behaviour. In addition, we also developed separate mode choice models to capture the influences of land use on mode choice behaviour. The enhanced modelling framework was tested in the Greater Buffalo-Niagara area in New York, using the 2002 Buffalo household travel itinerary survey data as the input. The modelling results indicate that the balance and diversity indicators of land use in terms of the population and employment distributions have a significant impact on destination and mode choice decisions. The balanced and diverse land use will encourage more intrazonal trips, shorter travels, usage of transit and non-motorized modes, and thus will help reduce the overall vehicle miles travelled.
48 Methodology for Assessing and Reporting the Impacts of Transit Investment on Community Sustainability and Liveability- Desmond Bliek

Organization: Halcrow Consulting Inc
Email: rita.medeiros@halcrow.com

Contributing Authors: Peta Wolmarans, Halcrow Consulting, inc.

Summary:

The Gas Tax Fund (GTF), a key component of the Building Canada infrastructure plan, provides funding for municipal transportation infrastructure that contributes to the sustainability and livability of Canadian communities. As a recipient of Gas Tax funding for its capital projects, TransLink is required to report annually on the impacts of Gas Tax investments on sustainability and livability of the Greater Vancouver area. TransLink initiated the development of a reporting template which sets out the indicators and methodologies to be used in annual reporting. The reporting template and methodologies developed are unique in that they enable post-implementation reporting across a range of livability considerations.

4. Methodology:
Methodologies for assessing the greenhouse gas and air quality impacts associated with transit improvements are well documented, however, approaches to monitoring and reporting on other sustainability and livability impacts are not as well defined, understood, or codified.

As a starting point, the key impacts associated with transit improvements were identified in cooperation with federal, provincial and regional agencies. These included environmental, social and economic impacts, and covered issues such as physical activity; social inclusion; disabled accessibility; transit-land use integration; public realm quality; pedestrian connectivity; safety; security; journey quality; enhanced property values, and efficient goods movement.

Indicators, metrics and methodological approaches for measuring and reporting these impacts were developed by Halcrow and TransLink, with reference to academic research and global best practice. A critical consideration included data requirements and collection methods for reporting purposes, and the need to enable applicability across a range of different types of transit investment (e.g. from new vehicles, to Light Rapid Transit schemes; or bus infrastructure such as bus lanes). These methodologies were developed into a reporting template designed to provide guidance and enable a consistent and transparent approach to impact assessment.

5. Findings, Lessons Learned and Observations

A benefit is that the template enables assessment and reporting in respect of the full range of sustainability impacts and livability benefits in a single reporting framework. The template also includes a one page summary table which allows quick review of the range of impacts of infrastructure investment. The template was piloted as part of the Gas Tax reporting process in 2009 and was refined, based on the experience of the users.

The presentation will include a high level overview of the methodologies used for the performance evaluation of key livability indicators. It will also focus on the following observations and lessons:

- Assessing the impacts of transit investment necessitates the ability to be able to accurately forecast the impacts under a "without scheme" scenario, which constrains the range of impacts which can be assessed.

- Data and resource availability was a crucial factor in template development and refinement. The utilization of existing data collection and management systems was maximized in order to improve efficiency and reduce resource demands. Where data was unavailable or only partially available, proxies provided useful indications of trends.
In the early years following transit infrastructure investment, GHG reduction benefits may be slow to be realized, while other livability impacts may be more keenly felt within the communities affected. Follow-up reporting in subsequent years is necessary in order for the full range of livability impacts to be confirmed. However, it should be noted that in successive years following implementation attribution of livability benefits to the transit investment directly may become more difficult to demonstrate.

Not all effects are quantifiable. In some cases (such as in respect of impacts on the public realm), the possible range and extent of qualitative improvements require assessment. The template includes metrics which enable this.

In many cases, qualitative observations played a useful role in ‘telling the story’ and complementing the account provided through quantitative assessment. In addition, a clear definition of the project scope (both in terms of service and geography) is required in order to ensure that all impacts are assessed within a consistent frame.
49 Moving Goods and People in Urban Centers: Reducing transportation impacts with shared-use services- Erica Wygonik

Organisation: University of Washington
Email: ewygonik@uw.edu

Contributing Authors: Anne Goodchild

Summary:

Introduction
While urban planning has begun to consider the relationship between land use patterns and traffic demand, much of the work in this field has focused on personal travel. Communities must also be able to move goods efficiently to thrive. This research examines alternative transportation services to move goods and people and reduce the environmental impact of travel without negatively influencing economic well-being. These services also support social goals by providing residents additional flexibility in meeting their daily needs efficiently and by providing mobility-challenged residents access to goods and services.

Communities and businesses are starting to carefully examine the benefits of aggregating personal vehicle trips into shared-use vehicles including school busses, goods movement, and vanpool services. Shared vehicles incur fewer vehicle miles travelled (VMT) when compared with corresponding individual trips (see the work of Cairns (2005)). However, delivery and transit vehicles have larger societal costs per mile travelled, including greater emissions of greenhouse gases and more significant infrastructure degradation.

The research described here uses grocery store shopping in Seattle, Washington as the first case study to quantify and compare the CO2 emissions due to personal versus shared-use travel and identify the conditions under which CO2 emissions savings could be realized. The results of this study inform policy development as communities attempt to encourage economic development while minimizing environmental impact.

Project Scope
Grocery store shopping is used as a case study as it is a regular activity for most households and is highly regional (most shoppers visit a proximate store). Advances in computing technology and logistics management have enabled cost-effective on-line consumer shopping. Additionally, most grocery shopping is currently done in a traditional retail environment, in which consumers drive personal vehicles to and from supermarkets. A 2008 Nielsen survey showed the average household made 97 trips to grocery, super center, or warehouse stores in the preceding year, or approximately 2 trips per week. This rate of shopping corresponds to 25 million trips annually by Seattle households alone. Addressing the transportation option chosen for this trip type will have significant implications for the greenhouse gas emissions.

Research Methodology
The developed model compares CO2 emissions of individual driving versus shared-use vehicles utilizing land parcel and zoning data. Travel costs are calculated using the Network Analyst tool in ArcGIS along with customized network decision variables to allow for optimization based on financial cost, time, or emissions. Costs are estimated from publicly available data and reflect values of time, hourly wages, and mileage costs. Emissions estimates are developed using EPA MOVES model emissions factors.

Calculating shared-use distance travelled is influenced by the logistical details of the service. Delivery service schedules dictated by customer preference will include households distributed throughout the service area, while delivery service schedules dictated by the service provider will have the households geographically organized, to obtain logistical efficiencies. Customer-
directed service was estimated by random sampling of the households within the service area. Provider-directed service was estimated with proximity-assigned samples of the households. These two methods of selecting customers reflect a best case and worst case in terms of logistical efficiency. Although a customer-directed service would allow customers to dictate their delivery time, a delivery service would assign customers to routes as efficiently as possible given fleet size and time constraints, so this worst case does not reflect the expected outcome in all cases. The provider-directed service represents a best case for logistical efficiency with customers highly concentrated spatially.

To estimate the distances traveled and the associated CO2 emissions, routing tools within ArcGIS Network Analyst were used. Customer-directed service and provider-directed service were estimated using the household sampling techniques described above.

To complete the routing estimates, the Network Analyst Closest Facility tool was used to calculate the distance traveled to each grocery store for each household in the sample. The StreetMap North America network was loaded for use with Network Analyst. Output from Network Analyst includes the one-way distance traveled for each residential unit and the one-way CO2 emissions associated with each residential unit’s grocery store trip when the trip is optimized for shortest time. These outputs were doubled, to reflect round trip distances and CO2 emissions.

To complete the routing estimates, the Network Analyst Routing tool was used to calculate the distance traveled by one delivery vehicle starting and ending at the study grocery store and serving a sample of 35 households (estimated truck capacity). The analysis reordered the stops to identify the fastest route to serve the given households, but kept the first and last stops (the grocery store serving as the depot) constant. Output from Network Analyst includes the distance traveled for each delivery vehicle and CO2 emissions associated with each tour, with the route optimized for shortest time.

Outcomes
The analysis of grocery delivery demonstrates a significant reduction in vehicle miles traveled and CO2 emissions is shown when personal vehicle travel is replaced by delivery service. These reductions are largest when the delivery service serves a proximity-assigned set of customers. In this case, delivery service can reduce CO2 emissions by 80-90 percent, compared with 17-75 percent reductions when customers are randomly assigned. This analysis considered the relationship between personal vehicle travel replaced by one delivery vehicle. This unit of analysis allows for scaling according to adoption level, but it does not reflect the efficiencies gained by larger customer populations served by a fleet of delivery vehicles. In these situations, reductions in CO2 emissions are expected to fall between the randomly-selected and proximity-assigned cases, since customers within a self-selected delivery window can be grouped by the provider into proximity-based routes.

Works Cited


Summary:

As the understanding of the value of transportation expands beyond its role of providing mobility and we start to focus on how it affects livability, new criteria and metrics are needed to assess the performance of transportation systems. While conventional metrics are primarily concerned with mobility and the monetary costs of transportation, our research focuses on creating and testing a framework for assessing the sustainability of the broader aspects of transportation systems in terms of environmental, social, and economic outcomes. Working towards sustainability concurrently advances livable communities, and vice versa.

Our results show the performance of the (a) fifty states and the (b) fifty largest urbanized areas with respect to the economic and financial indicators that we outlined in our metric. The economic components we assessed are: (1) Transportation is affordable for individuals, (2) Transportation system provides efficient movement of people & goods for economic activity, (3) Transportation finance is locally self-sufficient, and (4) Transportation system does not contribute to economic vulnerability of society. Our analysis will also consider how the economic performance is related to the urban characteristics of these places, such as population density and travel mode shares. The initial results exhibited regional geographic patterns in performance for the fifty states which suggest that regional attitudes may be responsible for affecting land development and transportation patterns. To better understand the urban characteristics and physical infrastructure of these states, we examined the spatial distribution of population and commuter mode shares. Using these measures to compare our results, we found that the best performing states had a larger portion of population residing in central cities and the surrounding metropolitan area. Furthermore, with an exception for the most rural, states with more modes of transportation available performed better.

Next, we looked at the fifty largest urbanized areas, which consist of the core city and adjacent dense development. These areas were also evaluated for their performance using similar variables to our analysis at the state level. Again, we found a relation between better performing areas with more diversified transportation mode choice. Observing additional descriptive parameters, population density and vehicle ownership show little correlation with our results while lower vehicle-miles traveled per household lead to more favorable performance.

In terms of the economic components that we identified, a better performing state or urbanized area is one that has lower total out-of-pocket transportation costs per households, greater economic growth than vehicle-miles-traveled growth, and where gasoline expenditures are a smaller burden on the overall economy. Describing some of our observed trends for the urbanized areas: households which spent more on transit had a lower total transportation cost; most urbanized areas averaged a 1:1 ratio between gross domestic product growth to VMT growth, but the best performing saw a 20% reduction in VMT with 10% growth in GDP while the worse saw a 200% growth in VMT with a 25% growth in GDP; using the average price of gasoline from 2007, in some cases expenditure on fuel makes up 4% of GDP. Altogether, these measures assess the economic concerns from the transportation perspective that includes personal and overall economic quality.

Data quality issues are the major limitation to our work and for developing performance measures in general. The types of data necessary to properly evaluate transportation systems in terms of...
sustainability and livability objectives are sparse to non-existent. Where available, data are often inconsistent or still insufficient. Our research endeavor, coupled with these gaps in information, highlight the need for standardizing data and collecting new data across a range of scales. Currently, the most available data is for congestion, monetary costs, and economic indicators because those concerns have been the focus of historic transportation planning. As we begin to shift attention towards planning for sustainability and livability, there is a need for a complimentary shift in data collection.