LADDERS OF OPPORTUNITY

— Revitalize — Connect — Work —

U.S. Department of Transportation

Connectivity Executive Roundtable:

Summary of Proceedings

U.S. Department of Transportation

April 27, 2015

Message from the Secretary

Fast Lane blog post "Connectivity Roundtable Creates Connections," April 29, 2015

For a very long time, transportation planners have measured the success of our transportation network by looking at its hardware: How many cars can travel across a road and how fast? How often buses do arrive and are they on schedule? What is the pavement condition and how quickly is it deteriorating?

And while these measures are valuable, they ignore the end users of our system —the people. Every day, millions of Americans use our transportation system to reach jobs, schools, healthcare, shopping, friends, and family. How long it takes and how much it costs them to accomplish these daily tasks is an important measure that we call *connectivity*.

Connectivity measures how well the transportation network connects people to the places they need to go. On April 27, 2015, DOT hosted more than 75 State DOTs, Metropolitan Planning Organizations (MPOs), transit agencies, national associations, researchers, and other federal agencies to talk about the importance of connectivity in their daily work. Participants talked with one another and learned more about how to find the data they need, how to interpret it and use it for planning, and how to communicate with constituents and policy makers.

We heard that many transportation agencies define connectivity in different ways. A number of factors affect accessibility, including *mobility* (physical travel), *land use patterns* (the geographic distribution of services and activities), and *mobility substitutes* such as telecommunications and delivery services. Participants also discussed the growing gap between research and measures in practice as well as the need for more standardized tools and data to make it easier to measure connectivity.

This Department is committed to making significant investments to improve the research and state of practice in measuring connectivity. Over the next year, DOT will continue our on-going efforts to support and develop analytical methods for transportation agencies to improve access to opportunity. We will continue to offer technical assistance and capacity building to States, MPOs, and transit agencies interested in approaches that measure how much access disadvantaged populations have to jobs, essential services, and other opportunities, and we will identify policies and projects to increase access.

Ultimately, we all want to build transportation networks that are foundations of strong communities: where people can get to work efficiently, reliably, and cheaply; where main streets are thriving and walkable, and neighborhoods are safe and healthy. The Connectivity Roundtable was a good first step toward empowering planners with the data and tools they need to plan, advocate for, and build projects that can make that vision a reality.

Executive Summary

Goals

The Connectivity Roundtable was an invitational forum intended to advance USDOT's commitment, as documented in the Grow America Act, to assist States and local communities to build transportation networks that provide opportunities for all Americans. States and regions recognize that racial inequality and lack of economic mobility are major barriers to a thriving economy, and that transportation connections to jobs and other opportunities are an important tool for building opportunity-rich communities. The workshop was designed to equip States, Metropolitan Planning Organizations (MPOs) and transit providers with the ability to develop and use connectivity performance measures, particularly for disadvantaged groups: low-income, communities of color, older adults, and individuals with disabilities.

The meeting brought together researchers and practitioners to discuss to what degree their existing transportation networks connect residents to jobs, education, health, government, and other essential services, and to strategize on how to embed this approach into short-term and long term transportation plans. This information is an important tool for convincing decision makers to choose investments that will support connectivity goals.

Approximately 80 people participated in the April 27 roundtable. This included 30 practitioners from State DOTs, MPOs, and transit agencies; 30 researchers, advocates, and professional organizations in the fields of transportation, equity, and connectivity; and 20 federal partners and DOT staff. A full list of participants can be found in Appendix A. Participants had a range of familiarity with connectivity measures: approximately 35 participants indicated they had experience with connectivity measures and 20 said they have not used these approaches before.

Themes

Certain themes emerged during the presentations and discussions.

Overall Considerations

The transportation system is about creating opportunities for activity and exchange between people. Every trip has value to the person choosing to take that trip.

- Transportation and land use are inextricably linked.
    - Transportation connections are easier, quicker, and generally less expensive when origins and destinations are closer together or multiple land-uses are located close together.
    - More efficient land use can help to reduce the distances between origins and destinations.

Development and Definition of Connectivity Measures

- The work of measuring network connectivity is underway but there are gaps and barriers, including:
    - the need for more resources and analysis, including local analysis
    - the need for additional technical assistance and peer exchanges
    - the need to better integrate the growing quantity of data into plans and measures
    - the barrier of proprietary or difficult to find data.
- When asked to vote for the most common, preferred method for measuring connectivity, participants selected:

Number of x (jobs, services, opportunities) within y minutes by z mode (17)
Extent to which transportation is coordinated with land use decisions (9)
Affordable housing, jobs, and good schools accessible by transit (5)
"Accessibility" means different things to different groups. To planners, it means the ability of anyone to connect to destinations. To the disability community, it means the ability to reach and use transportation systems.

- There is not yet a one-size fits all Connectivity performance measure; any suite of indicators should be place-based and should reflect local, collaboratively developed goals and vision for the future of the community.
- We should not let the perfect measure be the enemy of the good. There is already good data that can be used to measure progress and assist in planning.

Use of Connectivity Measures

- Analyzing connectivity requires quantitative data as well as qualitative inputs and feedback from the people who will be using that system.
    - Data gathering and analysis are keys to better decision-making, and can help root out myths and misconceptions.
    - People in a community need to identify local goals and find or create the data, information, and technologies that support decisions to move toward that shared vision.
    - The community must look at the right data points that reflect local priorities, and distill meaningful information from it, which requires public involvement.
- In addition to communicating with stakeholders and end-users, planners need to be thoughtful about how they communicate with policy-makers and political leaders. Using data to impact decision-making needs to be done gradually and thoughtfully, with a respect for the local political context.
- New measures should be integrated into existing planning requirements and connected with processes currently in use to determine how money is allocated.

Next Steps

This Department is committed to making significant investments to improve the research and state of practice in measuring connectivity. Over the next year, DOT will continue our on-going efforts to support and develop analytical methods for transportation agencies to improve access to opportunity. We will continue to offer technical assistance and capacity building to States, MPOs, and transit agencies interested in approaches that measure how much access disadvantaged populations have to jobs, essential services, and other opportunities, and we will identify policies and projects to increase access.

The connectivity conversation is part of USDOT's efforts to build Ladders Of Opportunity. This includes resources to ensure that disadvantaged populations have a chance to enter the transportation workforce; the "Safer People, Safer Streets" program to make communities safer for residents who don't drive; discretionary grants that connect communities to opportunity; interagency efforts to promote place-based sustainable development; and support for equitable surface transportation policies.

Table of Contents

Meeting Agenda

8:30 – 9:00 **Welcome and Goals for the Day**

Carlos Monje Jr., Assistant Secretary for Policy,
Therese McMillan, Federal Transit Administration Acting Administrator

9:00 – 10:00 **Defining Connectivity**

How are communities defining connectivity to ensure access to jobs, education, health care, and other community destinations?

Moderator: Henrika Buchanan-Smith, Federal Transit Administration
Adie Tomer, The Brookings Institution
Kevin Vettraino, Southeast Michigan Council of Governments
John Haley, San Francisco Municipal Transportation Agency

10:00 – 10:30 **Keynote Address**

U.S. Department of Transportation Deputy Secretary Victor Mendez
U.S. Department of Transportation Secretary Anthony Foxx

10:45 – 12:00 **Gathering Data and Tools**

What models and tools already exist to define connectivity for different communities?

Moderator: Brian Gardner, Federal Highway Administration
Anita Hairston, PolicyLink
Andrew Owen, University of Minnesota Accessibility Observatory
John Thomas, U.S. Environmental Protection Agency

12:30 – 1:45 **Connectivity Measures: Putting Information to Work**

What measures are currently being used in your community to evaluate connectivity?

Moderator: Faith Hall, Federal Transit Administration
John Orr, Atlanta Regional Commission
Ron Achelpohl, Mid America Regional Council
Thomas Jasien, Metropolitan Transit Authority of Harris County, Houston, TX

2:00 – 3:00 **Communicating Connectivity**

What are the most effective ways to communicate with decision makers and the public about connectivity?

Moderator: Simran Noor, Center for Social Inclusion
Arlene McCarthy, Minneapolis-St. Paul Metropolitan Council
Greg Krykewycz, Delaware Valley Regional Planning Commission, Philadelphia
Christina O'Claire, King County Metro Transit

3:00 – 4:00 **Next Steps**

Lilly Shoup, Office of the Secretary of Transportation
Gloria Shepard, Associate Administrator , Federal Highway Administration

Welcome and Goals

Carlos Monje Jr., Assistant Secretary for Policy

Connectivity refers to the ability to connect people to where they live and where they want to go. Those in poverty, older adults, and those with disabilities need connections to opportunities. Poor people are less likely to have cars, and most new jobs are not located in the central city where transit is most available.

The TIGER program has an emphasis on Ladders as well as the newly announced LadderSTEP program. This builds on our work through the Partnerships for Sustainable Communities.

Work that gets measured gets done. Measurement in transportation has been too long about speed to the exclusion of other important measures of access. But we need to be aware that measurements that might work well in one place, might not work well elsewhere. For example, a 10 minute walking commute is possible in New York City, whereas a 10 minute wait for a bus in winter in Montana could be an absolute barrier. MAP-21 places emphases on performance measurements and the GROW AMERICA Act includes an added pilot program on connectivity. With this meeting we hope to gain an understanding of the state of the practice, gaps, and where to build with additional resources.

Therese McMillan, Federal Transit Administration Acting Administrator

Connectivity isn't an easy thing to measure because it is all about measuring transportation's impact on people. In the past the focus has been on the performance of the infrastructure. But with this work, we are asking what is the outcome of the projects we build? Are we having the impact we want? With these measures we will have a better sense of who we are serving and how well. How do we show what our investments are achieving?

The transit interests in this are clear. FTA had $1.4 billion in applications to the $100 million program to modernize bus services across America. It was our most oversubscribed program ever – 14 times more request than the funding available. And that is because it was tapping into an important factor emphasizing ladders of opportunity.

So what's at stake? At DOT we are no longer thinking about just expanding service, but the connections that the services pull together. We want to measure outputs and how we're going to show that the investments are doing what they're supposed to do. How these measurements will give us a better sense of the people we're serving, including youth, people with disabilities, and seniors. People aren't static so our measures can't be static either.

Defining Connectivity

Moderator: Henrika Buchanan-Smith, Federal Transit Administration

Adie Tomer, The Brookings Institution

Measuring connectivity represents the forefront of innovative thinking. We need to look at 'people' measures, not infrastructure. Transit is a "victim" of land use planning and patterns that impact accessibility because transit doesn't work well in sprawl. A Level of Service approach to transportation

planning could lead to excessive building. Transportation professionals need to think more holistically about land use, transportation, and economic development.

The Brookings Institution has evaluated measures of transit service and its ability to connect people to opportunity, and has found that transit serves neighborhoods really well, but performs poorly in creating accessibility across a region. This is due to land use patterns, both planned and geological, that result in sprawl. Providing transit in sprawling regions is very expensive.

Transportation planners and operators can't operate in a silo—economic development plans and land use plans must be coordinated with transportation plans. This can help identify cost savings. For example, in the United Kingdom, the Liverpool Hospital was slated to be relocated to a greenfield location until a formal "accessibility" measure indicated that the resulting transportation costs made it cost-effective to instead rebuild on the site that was already well served by existing infrastructure. We need to start evaluating plans this way and taking a broader view of all the costs and benefits. We now need these measures to be put into practice, rather than looking for more research. We need practical, on-the-ground assessments of project impacts.

In our work, we focused on where you can get in 90 minutes by transit; but this may need to be defined locally, for many people complained about 90 minutes being too long. In Chicago, people may be able to stomach a much longer travel time than in many other places.

Choosing the right measurement approach is critical. The time of travel must be considered also, as it often determines how long the trip will take. It's also important not to just focus on transit; roadways matters as well, particularly considering the growing "suburbanization of poverty." It's also important to consider multiple destinations: there may be good transit to jobs, but not necessarily to other activities and services such as daycare.

Right now, communities must do considerable analysis in order to use New Starts funding to build new transit projects and this increases the project delivery time and costs. On the other hand it can be very easy –too easy even—to get new road projects built. Measuring connectivity could be one step toward leveling the playing field between highways and transit.

For more information, visit the Avenue blog - http://www.brookings.edu/blogs/the-avenue

Kevin Vettraino, Southeast Michigan Council of Governments

SEMCOG started the "Access to Core Services" Task Force in the Fall of 2014. The primary goal is to identify the "Core Services" that people need to be able to reach, and to identify the populations and determine where they need to go. We are still in the process of trying to define and answer what is meant by "connectivity," "accessibility," "core services," "essential services". In order to anser this, we're going out to the community to define them at the ground level. We have a toolkit called "Community Conversations" – and it asks people simple questions like "Where do you need to go?"

We need to understand what works for the people, and what doesn't, and we need top-level buy-in that includes the local elected officials. We look at the location of jobs, parks, schools, affordable housing, and grocery stores. We are interested in measuring travel times, for all modes, transit, highway, bike, pedestrian. It's a challenge because sometimes buses don't run as well as their published schedules. We look at both transit dependent households, as well as the "transit inclined" households where there are more workers than cars. We've also considered broader measures, for instance serving ballparks might not be seen as an essential service, but still important to a region's economic development. It's important to measure what you can today, but consider the long-range planning issues.

John Haley, San Francisco Municipal Transportation Agency

Transit is an irreplaceable public asset. Our goal is to increase ridership and improve on-time performance. We are purchasing new vehicles and working to increase service levels by 10 percent system-wide. Fifty percent of our riders don't own a car and San Francisco is majority-minority so we have a slightly different landscape for thinking about EJ and equity. We offer 24-hour service and the majority of our routes operate 18 hours a day. We have developed performance indicators for each route and we have a dashboard to identify success, but we need to work within our budgets. We focus on connecting neighborhoods, not just the travel time but also the frequency of service. The issue is getting services to the people that need it, and national leadership is needed.

We use Title VI principles when we look at service improvements, including vehicle performance measures, connecting our service plan to our budget, and measuring how well we provide service to people. We have different reasons for making service changes, one of which is the reduction of crowding.

We are very rich in data, and getting smarter and more analytical, but we are constantly challenged by policymakers to do better. We sometimes have an issue of where to put our focus, e.g., how to provide transit service to Giants games, without doing this at the expense of service in other neighborhoods. Our agency started with a "vision zero" approach to reassess our transit system structure. During the process, we held hundreds of public meetings to identify the issues and receive input. A cautionary example on planning, where a consolidation of stops could result in a faster travel time but would result in many people needed to walk more than a quarter mile to reach those bus stops. People tend to be very protective of their bus stops, even if they don't use them often. As part of our service planning efforts, our agency is taking a closer look at the pedestrian and bicycle connections, and signal preemption.

Leadership from our Board led us to develop an Equity Policy that is tied to the budget and helps to explain how we're distributing resources. The goal is connecting neighborhoods with a strong focus on frequency of service. This is accompanied by a big change to the structure of the agency – bringing all elements relating to transport under one organization – merging parking as well. Transit's success depends on solid organizational building blocks like the number of drivers; good training, political elements - Mayoral support, Board of Supervisors, legislative elements - "Transit First" legislation, Vision Zero – as well as system characteristics like signal priority, bus bulbs. Ridership is surging, on-time performance is improving, renewing fleet with FTA support with new buses. San Francisco is a city of neighborhoods – connectivity programs focuses on connecting neighborhoods and measuring with travel time, frequency of services, on-time measures.

Discussion

Is it better to define connectivity first or to get community support for an approach first?
Tomer: Choosing the measurement is really important. The UK had formally implemented official accessibility standards and applied it to official services (where do you put schools, hospitals, how you can walk to them, etc). They decided what the priorities were for people, what should be considered essential services, and then figured out how to extend them through planning.
Vettraino: Two approaches: (1) top down approach to get elected official buy-in. (2) established community conversations with neighborhood groups and residents to get their input on questions such as: Where do they need to get to? What is missing today? Is it access to jobs, grocery stores, parks, schools, affordable/assisted housing? Are they struggling with performance? Time and performance is key especially if someone is going to urgent care. Terms are important on how we get the message across. This applies to all modes: Walking, biking, cars, transit.
Haley: Connectivity is getting the services to people that need it. There's a booming economy in San Francisco, with more demand than they can meet. They have a very aggressive growth plan. But operations are also important: They had unreliable equipment, not enough drivers, etc. Part of meeting connecting objectives is to meet the fundamental purpose of moving people.

What about locations without elected official support?
In Houston there are political challenges including Federal legislation that is a challenge for specific streets. Different government agencies run programs and consolidated services that the transit cannot serve. The zoning and sprawl is a challenge in Houston.
Tomer: Not all of the answers are about transit. We need to think about rebuilding the roadway. Roads are just as much or more so the reason why we're talking about connectivity. It's the built environment that creates a 'choice' to either own a car or move outwards.

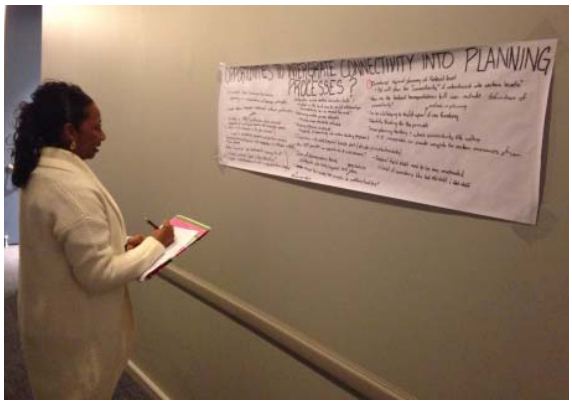
How did you build Title 6 into your program?
Haley: Applied it in all of the programs. San Francisco is fortunate in that it has a set of very engaged riders and citizenry. So we looked at key indicators in the neighborhood and identified 5 or 6 neighborhoods for areas to improve transit services. We focused on the whole system and where we could improve services. We're trying to do things in a smarter, more analytical way. We used a dashboard of how we look at some of the lines. Constantly challenged by policymakers to plan better for the future growth that's coming.

How can communities ensure certain demographic groups are not being left out of the conversation?
Tomer: For colleagues that do work on the suburbanization of poverty, the question is what does it mean people who are relatively low income are moving to areas without strong traditional government services? It's not just a question of jobs; it could be daycare. MPOs can be a great resource – they're all in it together. We need to think regionally, and tracking social or economic concerns will help lead us to find better performance measures.
Vettraino: You want to make sure your population can get where they need to go. That means looking at transit dependent (more workers than cars, elderly, youth, income/ poverty rate – does our land use allow for other modes?) and transit inclined households. You want a better understanding of needs and looking at efficiencies/ inefficiencies of those routes.

We've been talking about the "Reasonable amount of [travel] time;" how do we define success?
Tomer: With 90 minutes we got lots of push back. But that will be defined by each community.

Haley: SFMTA has a dashboard that includes things like travel time, but it says that everyone should be able to get around under an hour (though it is a compact city). No one is expected to walk longer than a .25 mile to a transit stop. If you consolidate stops, but every stop has a constituency. You also need to consider to topography and the fact that not everyone can walk it (e.g., seniors).
Henrika Buchanan-Smith, FTA: We need to think about the impact on people. This is a local question because connectivity in Detroit is different from in San Francisco. You're measuring what connectivity will be for you locally. Core services to go to will also vary by neighborhood.

We've discussed the fact that defining connectivity is a values driven exercise. Can you elaborate?
Christina O'Claire, King County Metro: Should measures connect low-income people to low-income jobs in the same neighborhoods? How do you choose where to connect low-income populations to? We're receiving pressure to define the destinations where people need to go. How can we accurately place emphasis on someone who's an aerospace engineer vs. someone's who's a masseuse.
Kevin Vettraino, Southeast Michigan Council of Governments: Detroit is going through the same thing, and we don't have the answers. We're hoping to get community buy-in early to uncover as much. It's a real challenge.
Onyemaechi Nweke, US Dept of HHS: In this issue it's important to underscore making connections with other sectors (e.g., economic development, housing, etc). Poverty is not hereditary – connecting people to low-income jobs will take more than a road network – you need housing, job training, etc and other things you don't have control over.
Albert Santana, City of Phoenix: As planners, we are victims of having too much information and need to focus on the importance of demonstrating value of transit through stories. Phoenix went through a recent exercise to measure the impact on people. We have numbers, ridership, economic development, etc., and we partnered with Parks and Rec, Housing, Human/ neighborhood Services, etc. But when we looked at a corridor that was near a school, we had children write cards/postcards to write how their lives will change with a new light rail – e.g., how they can go to the library, etc. You have to have a story to tell – not just numbers. Small changes can have a big impact and make a powerful narrative.



Simran Noor, Center for Social Inclusion: Having the meta framework is incredibly important. But the stories are also really important.
Jason Reece, Kirwan Institute: We need to be attentive to ex-offenders, which is a large portion of the male workforce. It wasn't on the radar of Sustainable Communities grantees. We need to integrate the re-entry of men and women. We also need to recognize NIMBYism. This is not just a question of rational arguments about cost/time savings – the issue is deeper than that.
Kate Sylvester, Baltimore City DOT: We can deal with transit and look at infrastructure, but the bigger issue is how we prioritize where these investments are going – this is where the real inequities are. See the need for "corrective investment." How do we deal with those realities?
Carol Tyson, United Spinal Association: We need to be aware of the Accessibility vs. Connectivity issue. We have to be careful that talking about accessibility more broadly will end up losing sight of services to people with disabilities.

Keynote Address by U.S. Department of Transportation Secretary Anthony Foxx

Below is a summary of Secretary Anthony Foxx's remarks.

I define Ladders of Opportunity as utilizing transportation to improving everyone's lives each and every day. The purpose of this meeting is to find a way to measure the catalytic impact of transportation investments – where transportation, land-use, and economic development intersect. Every civilization builds its values into its transportation system and we need to be clear on what our changing priorities are.

We should think not just of the transportation system throughput, but what happens in between origins and destinations. One can think about transportation as throughput – it's one way that projects can score highly if it can move more people. But we can also think about building a system that is focused on people. Not just the throughput, but what happens at point A and B. This may be a less precise measure, but one that is more meaningful to people and measures quality of life.

I grew up in Charlotte, NC at the intersection of I-85 and I-77. When the highways were put in place, they bifurcated the neighborhood. And while the project probably scored well in terms of throughput, it affected the community that was there because it put a barrier in place that made it difficult for folks to see the freeway itself.

We need to define a measure that DOT can use that doesn't ignore the negative impacts of transportation, but measures the revitalization and catalytic impact of the investment. We know from the analysis in Beyond Traffic that the system demands will increase in the future at the same time as we face an infrastructure gap now. We need to focus on creating a system to show transparency and accountability.

Gathering Data and Tools

Moderator: Brian Gardner, Federal Highway Administration

Anita Hairston, PolicyLink

Equity means that a project has "Just and fair inclusion" for all participating, prospering, and reaching full potential. We need to recognize that minority groups will become majority in 2042. Regions around the country can use this information to make the case for inclusive growth in their region and encourage people to mix and mingle to lift everyone up. Connectivity analysis can show what the opportunities are for people in a region to access resources to participate/ prosper/ achieve full potential.

Agencies have tons of data already, now it is time to frame and communicate what the data is really saying and use that data in decision-making. The PolicyLink Equity Atlas designed to be more than a database, but used to align decision making with the models and tools for analysis. The model just launched with a commute time indicator in addition to other indicators like car access (without a vehicle). Through the project we have noted that there is a data limitation on people with disabilities.

Andrew Owen, University of Minnesota Accessibility Observatory

The Accessibility Observatory work considers every trip worth the travel – it is not about the bus, but about the destinations. We define accessibility as measured by the ease of reaching valued destinations. Our models use a Cumulative Opportunities Accessibility approach that counts up the things you can

reach (e.g., number of jobs) within a certain timeframe. For example, jobs access to transit looks at the ability to reach employment within 60 minutes in a region.

For more on the Accessibility Observatory visit: http://access.umn.edu/

John Thomas, U.S. Environmental Protection Agency

Through the Partnership for Sustainable Communities, HUD, DOT, and EPA created the Sustainable Communities Indicator Catalog. The database captures the full range of indicators and measures that grantees are using and puts them all in one place with examples, data sources, and the most common ones.

EPA created the Smart Location Database to tell a different story about Connectivity. Connectivity is about the differences and the gaps between equitable places. The online tool identifies places that are particularly well connected and where it is easy to reach destinations. The tool pulls from national datasets and includes a clip and ship feature to highlight a particular region and export the data. The tool includes transit accessibility as one of the indicators.

Connectivity Measures: Putting Information to Work

Moderator: Faith Hall, Federal Transit Administration

John Orr, Atlanta Regional Commission

The Atlanta region collaboratively developed connectivity measures, which they defined as key access to services. The region uses this to identify communities with the most needs in an "Equitable Target Area Base Map." The regions assess if these communities have high quality travel options, and if not they look at adding transit stops to improve accessibility. They also have a performance measure score.

Ron Achelpohl, Mid America Regional Council

Five years ago, the region started doing annual performance reports, including reports on bike and pedestrian accessibility, crash fatalities, multimodal options, etc. They have a performance measure for active transportation, which is the number of TIP projects with bike/ped facilities. They also have public health measures, which includes bike/ped facilities. These public health goals and the formal connection made between their goal and the number of bike/ped projects helped us to avoid reducing the number of bike/ped projects funded through CMAQ. MARC is very excited to start working on a new TIGER planning grant to look at doubling the number of jobs accessible by transit.

Thomas Jasien, Metropolitan Transit Authority of Harris County, Houston, TX

Houston saw bus ridership decline over the past 20 years. The Board wanted to turn that around and increase ridership as population growth increased. After doing listening sessions, they heard from community groups that local bus service didn't work for them anymore. Historically the Houston population had been focused at the center of a hub-and-spoke city layout, but over time the population center of the Houston area had shifted away from that center. In response to this trend, Houston Metro decided to update the transit system layout to be more of a grid network than a hub-and-spoke. It has also extended service hours. This new service layout meets many of the needs more effectively, although some routes may require more transfers than previously needed.

Communicating Connectivity

Moderator: Simran Noor, Center for Social Inclusion

Arlene McCarthy, Minneapolis-St. Paul Metropolitan Council

The Minneapolis-St. Paul Metropolitan Council serves 7 counties as MPO and transit provider. In the Twin Cities, one large concern is about racial equity, particularly in light of projections for disproportionate growth in the population of people of color over the next 25 years. Communicating with policy makers versus the public is very different – there can be pushback from policy makers. The council brought equity into the picture when determining uses of MAP-21 funds. Overall, there is not enough money, and when it comes time to allocate funds, people start to disagree. Using a metrics process helped ensure that points were awarded for equity.

Different people use the same words differently, like "accessibility," but also "equity". In Minneapolis St. Paul, we gave funding to local advocacy leadership groups that represented the underrepresented. As they know the constituents better, they were better positions to carry the message forward. "Quarters of opportunity" resulted in lots of hiring at the agency. One lesson learned in communication is to go to them on their terms in a situation in which they are comfortable.

Greg Krykewycz, Delaware Valley Regional Planning Commission, Philadelphia

For me, regional planning is more about carrots than sticks at the 353 municipalities in the region. One tool is an indicator of potential disadvantage, which every census tract uses and can then be compared to other tracts. We developed a transit score and a connectivity score based on intersection density, and also created a community investment index. The Transportation Improvement Plan uses project evaluation criteria, so every project added to the TIP is evaluated according to those criteria, which include both Multimodal and bike/ped criterions.

Christina O'Claire, King County Metro Transit

In King County, bus riders and light rail riders are growing. We put together a service guideline report with maps on an annual basis about where service investments are going In the next 1-5 terms. This is not just based on current crowding or reliability issues; it's also about investment needs based on land use data, household, jobs, social equity data.

We've also created a missing links map and have evaluated the impact on transit if we invest in pedestrian and bicycle connections. This has an impact on investments. For instance, we built a pedestrian bridge across I-5 to connect to a new transit hub, which resulted in a 10% increase in ridership.

These maps and metrics also help in communicating the benefits of transit when there are ballot measures. We've had measures be unsuccessful because voters said they didn't know where the metro was going, so we're able to use the tool to communicate benefits and help the discussion of trade-offs. King County Metro Transit really believes in moving people. We offer reduced fares to ensure that people not only can get to the metro, but also that they can afford it. We have a large vanpool service as well. We've partnered with the state DOT and local providers to get people out of their vehicles. InMotion is a challenge people to change their mode of transportation.

Next Steps

Gloria Shepherd, Associate Administrator, Federal Highway Administration

MPOs face a dilemma on how to provide connectivity in their regions. Small MPOs sometimes receive less outreach from FHWA and have fewer resources and staff overall, so it might be hard to expect them to produce sophisticated plans, modeling, outreach etc. We are encouraging larger MPOs to act as mentors to smaller ones, and also to incorporate those RPOs into their work because a lot of people still need services in rural areas.

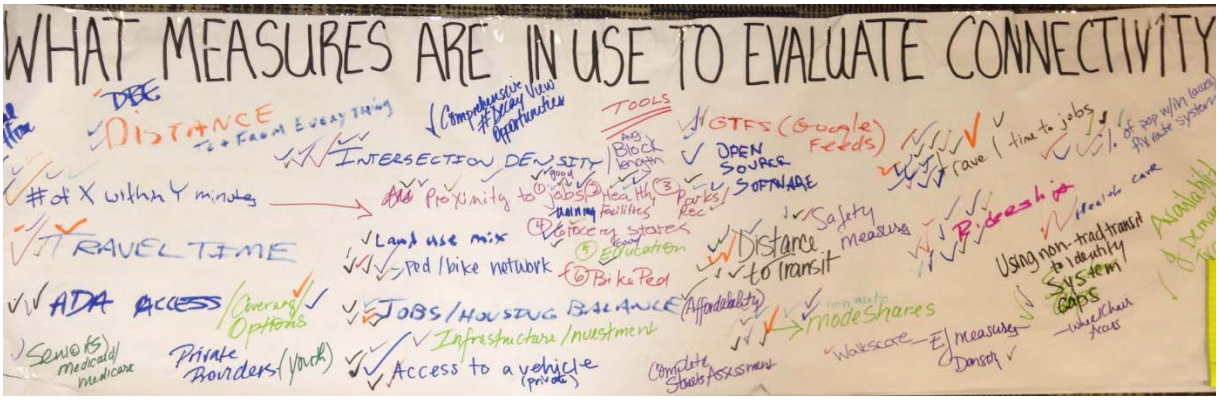
Lilly Shoup, USDOT Policy Office

Thank you all for coming to this summit. DOT staff will be available for any questions going forward, and the Department will post a summary of the proceedings and copies of today's presentations on our website for reference.

Appendix A: Notes from the Group Exercises

Group Exercise 1

Participants were divided into four groups and spent five minutes at four different question areas. The discussion at each question was facilitated by a moderator from DOT.
What measures are in use to evaluate connectivity?
What are the challenges to using connectivity measures?
What are examples of connectivity for project or program evaluation?
What strategies help to ground measures in the experience of local residents/users?
What are the opportunities to integrate connectivity into planning processes?



What measures are in use to evaluate connectivity?

Moderated by: Stephanie Gidigbi, US DOT

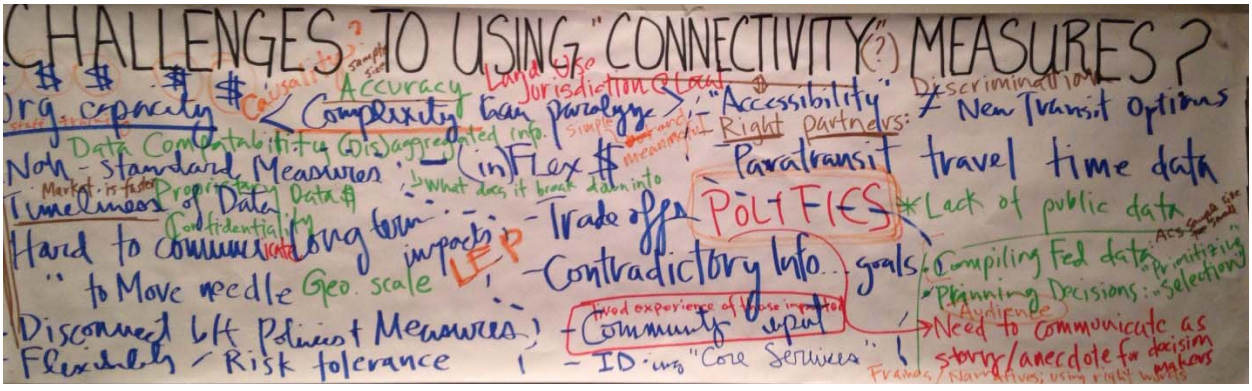
Participants included practitioners from State DOTs, transit agencies, and MPOs, as well as academics, representatives of advocacy groups and philanthropy, and federal subject matter experts. Despite differences regarding their use of data and measurement standards, there was a general consensus that measures should focus on access to essential services (e.g. travel time to jobs). The greatest difference

in perspective was between the academics and the practitioners, with academics focusing on the system, and practitioners on the user. Of the research institutions represented, the majority currently use travel time data and algorithms (# of X within Y minutes) to measure connectivity. In contrast, practitioners more often measure population proximity to transit, jobs, ped-bike networks, health facilities, parks and recreation, grocery stores, and education institutions. Other measures include rates of compliance with federal requirements, for example the Americans with Disabilities Act (ADA), Environmental Justice Orders, and Disadvantage Business Enterprises (DBE) mandates.

Participants also focused on evaluating safety measures for system users, land use, affordability, distance to transit, access to private vehicles, and the intersection of density. Additionally, there was a subsection of the group that focused on tools used to measure data including open source software, general transit feed specification (GTFS), and google feeds.

Complete List:

- Affordability
- Mode Shares
- Ridership
- Walkscore
- Distance to Transit
- EJ measures
- Extent of access to a private vehicle
- Complete Streets Assessment
- Safety measures for system users
- Land Use Mix (# of X within Y minutes)
- Areas for TOD Infrastructure/Investment
- Balance of Jobs & Housing within community
- % of population within access of fixed route system
- Extent of network for Pedestrians and/or Bicyclists
- Proximity to, Jobs, Health Facilities, and/or Parks and Recreation
- Intersection Density OR Intersection Density/Average Block Length
- Use of General Transit Feed Specification and/or Open Source Software
- Average Travel time to destination/specifically travel time to jobs
- Accessibility for people with disabilities/compliance with the Americans with Disabilities Act



Challenges to using connectivity measures

Moderated by: Faith Hall, US DOT

This breakout group identified two categories of challenges: numbers and people. This can also be thought of as a technical/quantitative/data challenge and a challenge of politics, policy, communication, and setting values & goals. Data gathering and analysis are key to better decisions and in order to ensure

that a community is looking at the right data and distilling meaningful information from it – the human element (public involvement) is absolutely critical.

- People identify what the goals for the community / system, etc. are – and the data / information / technology supports decisions that move us toward our shared vision.
- People drive the vision and data helps inform the decisions to achieve that vision.

General challenges

- Physical connectivity is largely determined by two elements: transportation and land use.
    - Transportation connections are easier, quicker, and generally less expensive when origins and destinations are closer together.
    - More efficient land use can help to reduce the distances between origins and destinations.
- Really addressing connectivity challenge requires consideration of both location/land use as well as transportation. The jurisdiction for these is often separate, and transportation is too often an afterthought.
- Lack of organizational capacity, staffing shortages, and lack of training impedes progress
- Too little funding, and lack of flexibility in use of funding
- Definitional challenges including:
    - "connectivity" vs "accessibility" vs "access" vs "equity"– questions of for whom and how, and questions of geography, race, class
    - Most "accessibility" measures do not consider the disabled community / paratransit
    - Identifying which origins and destinations are important
    - Defining "core services"

Data Challenges

- Data choices and definitions:
    - Unclear what data we want
    - Challenges ensuring that the right data being collected and consistently over time
- Accuracy and compatibility issues
    - Lack of standardization reduces compatibility
    - Small sample sizes result in inaccuracy (ACS data sample is small)
    - Geographic scales vary
    - It can be hard to disaggregate data to dig in and understand what the rolled up numbers means and how they're derived.
    - Timeliness of data / once data is available, the market has already moved on
    - Supplementing national level data with locally developed data
- Data limitations
    - Proprietary data is expensive and public data may not be available
    - Compiling national-level data across sources is challenging and may introduce errors
    - Data may be limited due to privacy & confidentiality laws
- Data Gaps
    - Paratransit travel time data is not collected, not factored into "connectivity" analyses.

Use of Data and Measures

- Need to identify causality to direct change
- Need to integrate performance measures into policy making and investments
- Need to continue to track data over long time periods to see changes, if any.

- Roles need to be clearer - What is the appropriate role for public transit provider?
- Complexity can be paralyzing. Measures need to be **simple** but cannot lose **meaning**.
- We should be careful not to get caught up in chasing a new tool, or a new measure, and losing sight of what the big picture goal is.

Communicating to different audiences (public, decision-makers, legislatures)

- Hard to communicate long-term impacts
- Establishing priorities informs selection of measures. What you track should be tied to community-driven vision for the future
- Politics can constitute a challenge and an opportunity
- Community input – must include lived experience of those impacted
- Need to communicate as story / anecdote for decision makers
- Imagery and maps are powerful tools for communication
- Frames / narrative – choose words carefully
- Communication can get bogged down in jargon
- Discrimination and inequality exist and fairness needs to be evaluated
- There may be trade offs
- Planning decisions prioritize and select projects
- Need the right partners (economic development, private sector, other agencies can bring resources to the table)

Outside of scope

- Freight is absent from this discussion

Examples of connectivity for project or program evaluation

Moderated by: Shari Schaftlein, US DOT

General Comment: We should document the lessons learned on how people are building on Program level connectivity measurement.

1) Jobs: Number of jobs with 45 minutes (everyone recognizes this measure will accordion based on local context); total new jobs added to travel shed on annual basis; focus on new job capture by wages; consider travel time by income for journey to work-all modes; note turnover in jobs linked to transit trip time e.g., fired for being late/missing work pre and post improved transit service; Note VA legislature direction on connectivity measure that must be included in the LRTP.

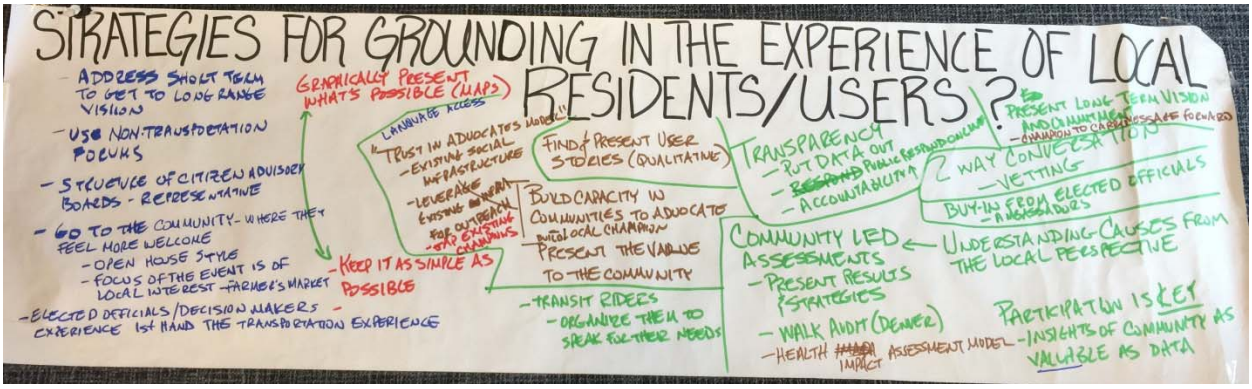
2) Housing Performance: link housing incentives to transportation access; use household/transportation costs in a localized affordability index; be sensitive to unintended consequence of displacement – build in "good enough" level of community/place based investment;

3) Link land use and transportation: flip the perspective from Transportation providers have full burden to solve the access problem to…relocating/new construction siting criteria by institutions must demonstrate and be transparent about all users projected improved or decreased access to their new site – how do the institutions share in mitigating access impacts?

4) Document the annual "delta" with investments on the area of walk sheds and bike sheds to transit and define the gradations of acceptance by all users e.g., .25 miles/ten minutes moderately-abled and 3 miles bike shed – relatively flat terrain; note total additional miles of bike lanes/sidewalks added along with crash rate pre/post investment; monitor and manage speeds to ensure comfort for all users

5) Aggregate Measures: delta in travel costs at project and program level; delta in safety measurements

6) EIS Project Level: embed more connectivity related evaluation criteria and apply across all alternatives such as Green House Gases, an expanded EJ/Equity measure, and elements of connectivity Aspirational: move beyond the physical infrastructure connectivity to include "comfort" factors that respond to all users. Lagging organizations would be happy with getting any "socioeconomic" gap factors addressed in the TIP (think incremental); avoid typical Roadway measurements; greatly expand the programming and project level measurement discussion associated with the "end of the line" BRT/Light Rail stations. There is an entire travel shed for these points that could be a "tipping point" for new ridership increase and revitalization – it would blend all modes.



Strategies for grounding in the experience of the local residents/users

Moderated by: Pete Stephanos, US DOT

Use the Community More Effectively to Identify Needs

- Two-way conversations are needed between planners and the community (not just presentations and reactions to presentations)
- Community participation is key – gaining their insights is as valuable as the data traditionally used to make decisions
- Ask the community what they believe are the causes of poor connectivity (from their local perspective)
- Conduct community led assessments and have them present results and strategies for improvement (referenced "walk audit" in Denver). Use the Health Impact Assessment model as an approach to better understand needs.
- Go to the community rather than holding formal public meetings. Utilize opportunities where they will feel more comfortable (i.e. local farmer's market). Use an open house style to engage in informal conversations.

Use the Community to Advocate for Solutions

- Build capacity in communities to have them advocate – build local champions

- Work to better educate local residents of the value to the community that will result from the transportation solution
- Use the "Trust in Advocates Model" to leverage existing social infrastructure (local leaders, church groups, PTAs, etc) to serve as champions
- Organize transit riders as and advocacy group so they can more effectively speak for their needs

Present a Vision

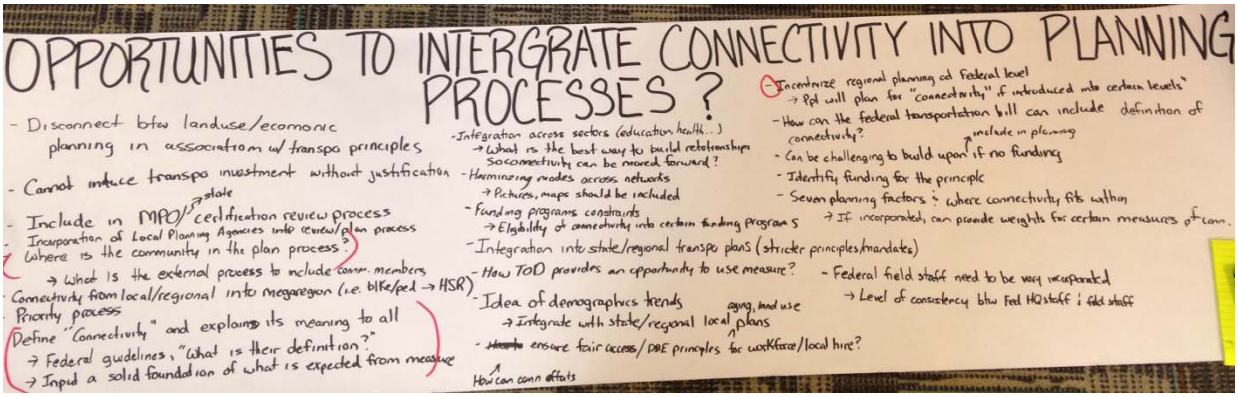
- Present a long term vision of how the investments will improve the community
- Provide short term benefits also – important to get buy-in
- Use very simple and clear graphics to present what's possible (maps, renderings, etc.)
- Keep the measure as simple as possible and have it speak to each person's individual transportation experience

Provide for Increased Transparency

- Clearly present how the system is performing and why and how investments are made in locations that are accessible to all (websites, apps, newspaper, signs, etc.)
- Provide a means for the local community/users to provide input on a website that presents performance information.

Other Items

- Utilize non-transportation forums (housing, education, etc.) to understand and advance transportation needs
- Review the structure of citizen advisory boards to ensure that they are representative of the local community
- Have local elected officials and decision makers experience the transportation experience first-hand that the local community is experiencing



What opportunities are there to integrate connectivity into planning processes?

Moderated by: Justin John, US DOT

Overall

Federal – With more assistance and input from the Federal government, Connectivity has the possibility of moving forward

USDOT should define Connectivity and explain its meaning to all. Federal guidelines of what Connectivity can provide a solid foundation of the topic and explain what is expected from measure

How can the federal transportation bill include a definition of Connectivity?

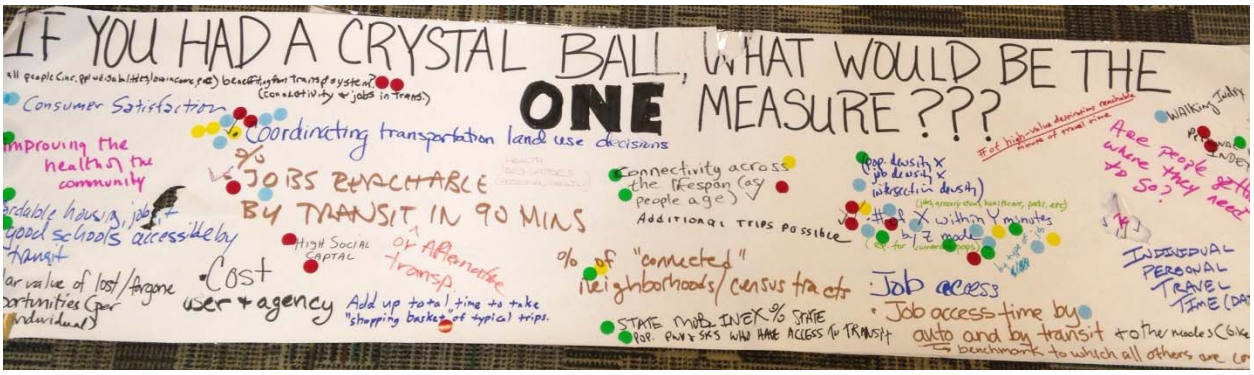
There should be a level of consistency between Federal Headquarters staff and field staff regarding Connectivity
Regional planning should be incentivized at the Federal level because people will plan for Connectivity if introduced into certain levels
Funding
Connectivity can be challenging to build upon in planning if there is no funding
What is the eligibility of connectivity into certain funding programs?

State/Regional/Local
Potential to introduce Connectivity from beyond the local and regional conversation into the mega region discussion (i.e. pedestrian and bicyclists → High Speed Rail). Discussion should not be kept within the community but into the region and beyond
There should be greater examination of how to integrate Connectivity into state and regional transportation plans (can require stricter principles/mandates)
Demographic data and trends are just as vital; Connectivity should integrate with state/regional/local aging and land use plans

Other Items
Include in MPO/State certification review process
Community members, importance of including them in the planning process and provide them understanding of Connectivity
Incorporation of Local Planning Agencies into review/planning process
Connectivity should not only focus on transportation but also looked at across sectors (i.e. education, health…)
What is the best way to build relationship across sectors so connectivity can be moved forward?
How TOD can/does provide an opportunity to use measure?
Many jurisdictions experience disconnect between land use/economic planning in regards to transportation planning/principles. TOD provides an opportunity to better incorporate all topics on the same playing field and invites a more intertwined discussion
What is the opportunity for/How can Connectivity efforts to ensure fair access/DBE principles for workforce/local hire
What about the seven planning factors? Where does Connectivity fit within?

Group Exercise 2:
For the final exercise participants were asked to identify tools and resources needed for implementation of connectivity measures locally and provide recommendations for Federal actions to support connectivity.

Crystal Ball: What is the Single Best Way to Measure Connectivity?
Participants listed possible connectivity measures that could be used as the single best measure of connectivity, and everyone was encouraged to 'vote' for their preferred measure.



Number of x within y minutes by z mode (17)
Coordinating transportation land use decisions (9)
Affordable housing, jobs + good schools accessible by transit (5)
Connectivity across the lifespan (as people age) (4)
Personal Mobility Index (number of places you can get to) (4)
High Social Capital (2)
Are all people (incl. people with disabilities, low income, etc.) benefitting from transportation system? (2)
Consumer Satisfaction (2)
Improving the Health of the Community (2)
Percent of "connected" neighborhoods/census tracts (2)
State mobility index (2)
Population density x job density x intersection density (2)
Percent jobs reachable by transit or alternative transportation in 90 minutes (2)
Dollar value of lost/forgone opportunities (per individual) (1)
Add up total time to take "shopping basket" of typical trips (1)
Job access time by auto and by transit (1)
Walking Index (1)
Health Indicators (Personal Health) (0)
Combined total cost to user and agency (0)
Additional trip possible (0)
Job access (0)
Number of high-value destinations reachable/minute of travel time (0)
Individual Personal Travel Time (Daily) (0)

Tools Needed for Local Implementation

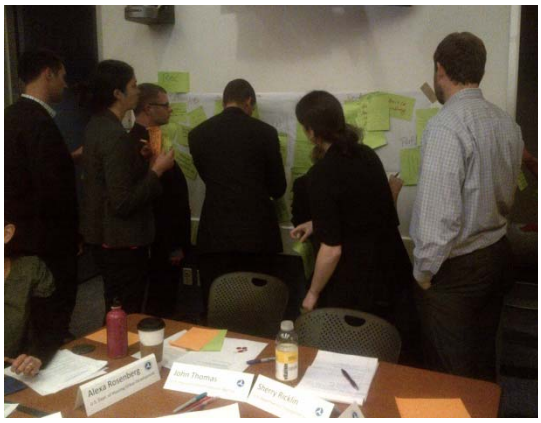
Several tools were identified that could support local planners' effort to enhance connectivity.

Standardized, multimodal data

Shortage of data is one significant barrier for improving planning, and certain themes emerged on where data is most critically needed. Open source maps of the infrastructure are needed, and should include transit, walking access, bicycle access, ADA accessible sidewalks, and roads. Standardized data is also needed to evaluate usage, including pedestrian and bicycle counts, travel times on small geographic scales (block to block), transit schedules, and ridership. Information is also lacking on demographics, particularly employment data, and it's important for this data to be standardized to align with the data on infrastructure and usage. Certain opportunities to address these challenges were identified, including a role for USDOT to define common terms, provide model surveys and templates, and set standards for

collecting and formatting data in order to enable combining and mining data sets. There is also an opportunity to link smart phone data and the meta-data on user characteristics into the traditional data sources.

Open and available online models



Easy to use, free, open source online connectivity tools would improve local understanding of their own connectivity challenge and enhance their ability to increase connectivity. Ideally, this would be a data portal with clean, processed, data tables of transportation land use and demographic data in a single online location that consolidates the various toolkits and data resources currently available. The tool should facilitate visualizations in order to identify connectivity gaps and improvements to the public.

Collaborate across agencies and disciplines

Participants had ideas for improving cross-agency and cross-discipline collaboration, including using civil rights offices to facilitate engagement, and creating a standard engagement tool on connectivity. Federal interagency collaboration should include creating comprehensive federal datasets and integrating major data sets from DOT, EPA and others. The Federal government should use funding, leadership, and technical assistance incentives to push agencies forward, and could also require a standard and public format for TIPs and STIPs.

Funding

Funding needs include funding for local tool development, data gathering, and research on connectivity. Participants also suggested that USDOT should make more funding directly available to MPOs, and should incorporate equity and land-use factors into competitive grant criteria. Additional funding for Transportation Alternatives Program, funding for improving ADA accessibility, and more flexibility in State of Good Repair program funds would also help to achieve some of the connectivity goals.

Research

More research is needed on quantifying the economic value of connectivity to the region as well as the economic impacts of specific investments. Case studies should be compiled, including areas that use measures effectively as well as studies of companies who select a location based on connectivity. This could lead to a matrix of connectivity characteristics.

Recommendations for Federal Actions to Support Connectivity

Link transportation and land-use decision-making through DOT and HUD planning requirements

Linking land-use and transportation decisions could include integrating DOT and HUD planning requirements along with AFFH, FHEA, and Title VI and EJ work. Changes to TIP requirements could include requiring consideration of connectivity or other social factors that tie into connectivity. Incentives could enhance transit-oriented development and low parking ratios around stations

Use Connectivity measures at the Federal level
Several ideas were suggested around a USDOT performance measure on connectivity, which could include a system performance measure that would consider total trip travel time and/or travel time reliability rather than just delay. Important measures for disability access include travel time for paratransit and sidewalk accessibility.

Participants suggested means by which the Federal government could use grant funding and MPO certification reviews to promote connectivity. For instance, USDOT could require connectivity measures as part of MPO certification reviews or could evaluate the connectivity impacts of all Federally-funded projects. Some participants also remarked on the importance of keeping Federal requirements flexible to apply to local context

Participants also discuss potential requirements that could improve planning processes and outcomes, such as requiring MPOs boards be more representative of their jurisdiction, including more representation of people of color and low income populations.

Standardize definitions and identify best practices
There was a strong desire to have clear definitions and minimum standards provided at the Federal level for connectivity, accessibility, equity, and Environmental Justice. Participants also identified a Federal role in establishing a standard connectivity measure for access to jobs and health facilities

Participants requested more Federal guides and best practice documents, including guidance on the appropriate criteria for determining connectivity and minimum standards of connectivity. Best practice guides could include advice on engaging disadvantaged populations and ensuring their representation in data sets, and addressing equity in transportation planning. Participants also noted the need for guidance on best practices designed for non- transportation agencies to consider transportation impacts. USDOT should support education efforts on connectivity, including direct State DOTS on connectivity, and a peer exchange program between MPOs and partners who have expertise. USDOT could also recognize early adopters at the State and local level through awards.

Create Models and Use Data
Participants noted the need for technical support, models, and data to improve connectivity, and particularly noted that such systems and data should be freely available. This could include a connectivity scoring model for use in grant applications and better geospatial data on job locations and workforce participation.

The Federal government has an opportunity to support these efforts through open data policies, requiring participation in the general transit feed specification, establishing data standards and definitions for consistency across regions, and opening up HHS/CMS data on health outcomes and equity data at block group level.

Funding
In addition to funding for developing and using connectivity measures themselves, participants suggested the use of funding for regional cooperation and multimodal planning, which could function as an incentivize for local jurisdiction cooperation. Existing funding programs could be expanded or made more flexible to support connectivity, including funding for transit and planning, and flexibility in Surface Transportation Program funds and Congestion Mitigation and Air Quality Program funds, to support

land-use planning. Participants also noted that the use of Federal funds for data warehousing would support measurement and data collection efforts.

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Appendix C. Read Ahead Paper

Introduction

Every day, millions of Americans use the transportation system to reach jobs, schools, healthcare, and retail shopping. How long it takes and how much it costs them to accomplish these daily tasks is what defines their level of connectivity. Unfortunately, far too many communities in America possess inadequate transportation options, resulting in an inability to easily access these critical services. This paper addresses various ways to measure these levels of connectivity, and some positive steps that communities can take moving forward.

Equality of Opportunity

Connectivity is particularly important for people who don't always have mobility, particularly low-income and economically disadvantaged populations. Research shows that environmental justice (EJ) communities have longer, more unreliable commutes. One study found that African Americans spend more time than any other group getting to work. On average, African American commute times are 15 more minutes than Caucasians. The author noted that in cities, African Americans continue to live significantly further from jobs centers as a result of historic racial residential segregation.[1] This mismatch between where the jobs are and where people live results in longer commute and more costly commutes, if there is a way to get there at all.

Transportation and economic opportunity are deeply interconnected. Transportation is second to housing as the largest expense for American households, costing more than food, clothing, and health care. Costs by mode of transportation also vary widely. Public transit costs typically run from $800 to $1500 per worker, per year, while average car costs exceed $6000 per year. These costs can impact low-income families disproportionately. While the average American household spends 18% of its income on transportation, this share is as high as 33% for low-income households.[2] Costs are higher for families living in areas with sprawling land-use patterns and high automobile mode shares.

Low-income communities have lower car ownership rates than higher income areas. Households with annual incomes of less than $25,000 are seven times less likely to have a car than those with higher incomes in a typical community, 20-40% of the population cannot drive due to age, poverty or physical impairment and so depend significantly on walking, cycling and public transport.[3]

While low-income families rely more heavily on transit and non-motorized travel, low-income areas have less access to infrastructure to support these modes. For instance, 89 percent of high income neighborhoods have sidewalks while only 49 percent of low-income neighborhoods do. These disadvantaged areas also have less street lighting, fewer cross walks and much less traffic calming measures.[4] This disparity has major safety implications. Low-income census tracts have more than

[1] Parks, Virginia. *Density for All: Linking Urban Form to Social Equity*. 2014.
[2] FTA Report No. 0030 Transportation Needs of Disadvantaged Populations
[3] http://www.vtpi.org/compstr.pdf
[4] Gibbs K, Slater SJ, Nicholson N, Barker DC, and Chaloupka FJ. *Income Disparities in Street Features that Encourage Walking* – A BTG Research Brief. Chicago, IL: Bridging the Gap Program, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago, 2012. http://www.bridgingthegapresearch.org/_asset/02fpi3/btg_street_walkability_FINAL_03-09-12.pdf

double the fatality rate (10.4 per 100,000) from traffic collisions as high income areas (5 per 100,000).[5] Likewise, areas where more than 30% of the population live in poverty rate above 30% experience 12.6 traffic deaths per 100,000, compared with to 3.8 deaths per 100,000 in areas with less than 5% poverty.

And while low-income communities often have access to transit, in many cases only small portion of jobs in the region are accessible by it. A study by the Brookings Institution found that the average job is accessible by transit in less than 90 minutes to only 27 percent of American workers. The results vary from 64 percent of the population possessing job accessibility via transit in Salt Lake City to a mere 6 percent of the population in Palm Bay, Florida. In these communities where transportation options are limited, employment may be difficult to maintain or access.

Defining Connectivity

Connectivity, or accessibility, is the degree to which the transportation system provides access to essential services and other destinations. In other words, how well the transportation network connects people to the places they need to go. A number of factors affect accessibility including mobility (physical travel), land use patterns (the geographic distribution of services and activities), and mobility substitutes such as telecommunications and delivery services.

The discussion of connectivity is framed by who you are trying to provide access to, what they need access to and by what mode of transportation they seek to use. With this in mind, we can conclude that every community is different because each has different target demographics, different services those people seek and different modes of transportation they wish to use. The needs of young men of color in urban America are different than the needs of elderly retirees in a rural community. The former may be seeking additional access to jobs via rail, while the latter may be seeking additional access to health care services via car. These two scenarios require different approaches in order to achieve optimal results.

For example, in Washington D.C., the District Department of Transportation (DDOT) wanted to improve the number of transportation options available in the city. To do so, they created a Mobility Index[6] to identify existing neighborhoods' accessibility and connectivity. To construct this index, DDOT measured the availability of bike lanes, fixed rail transit, and high frequency bus routes across the entire city. This allowed DDOT to measure the level of connectivity across multiple high capacity nodes, and create a multi-modal index to help target investments where they might be most needed. Similarly, the Delaware Valley Regional Planning Commission (DVRPC) created a tool and methodology to assess the appropriateness of various modes and intensities of transit service throughout their region called the DVRPC Transit Score Tool.

Gathering Data & Measurement Tools

There is an old adage that "what gets measured, gets done" and this can certainly be applied to the evaluating the performance of the transportation sector. Connectivity is an important component to assess how well the transportation system is functioning and serving the people using it. This is an especially important gap to fill as we transition to a performance-driven transportation planning process.

[5] Maciag, Mike. "Pedestrians Dying at Disproportionate Rates in America's Poorer Neighborhoods." *Governing*. August 2014. http://www.governing.com/topics/public-justice-safety/gov-pedestrian-deaths-analysis.html

[6] The Mobility Index is defined by the number of future transportation options available in a given place (pg. 88)

MAP-21 introduced performance measures into the transportation system, requiring State and local transportation authorities to set standards for continuous improvement in the safety, maintenance, and operations of transportation facilities. In line with this approach, the Administration included funding for a Connectivity Pilot Study in the GROW AMERICA Act, the results of which could eventually be used to inform a possible national connectivity in transportation measure. Such a national measure would allow investment in the areas and projects that are doing the most to promote economic mobility by improving access to jobs, education, and essential services through transportation infrastructure.

This effort builds on work in the academic community, which has developed connectivity measures that can be of use to state and local governments. For example, the Accessibility Observatory[7] at the University of Minnesota has developed an integrated, multi-modal accessibility evaluation system that can be applied nationwide. The Observatory creates a weighted average of accessibility, giving a higher weight to closer jobs. Jobs reachable within 10 minutes are weighted most heavily, and then jobs are given decreasing weight as travel time increases up to 60 minutes.

Putting Information to Work

Merely collecting these metrics for informative purposes is not the primary goal for this exercise. The connectivity data can also be used in regional plans as metrics by which localities can make infrastructure investment decisions. Atlanta has demonstrated that these metrics can be useful in helping to plan for its long-term future. In 2011, they developed the Equitable Target Areas (ETA) Index to identify potential environmental justice (EJ) locations in the Atlanta region. ETAs were developed based age, education, median housing Value, poverty and race. The parameters from the Index were then used to measure the impacts of Plan 2040[8] investments and programs in ETA communities. By combining Plan 2040 with the ETA Index, in particular the GIS[9] tools incorporated from the Index, researchers were able to identify transportation and socioeconomic relationships with the goal of addressing future connectivity issues in the Greater Atlanta area. Additionally, the Southeast Michigan Council of Governments has used connectivity measures to inform a connectivity task force which was established to help ensure that access to core services such as health care facilities, employment centers, parks and recreation opportunities, and education and social support facilities are part of the transportation planning and community engagement process.

Communicating Connectivity

Connectivity is not just a conversation to be had behind closed doors, but can generate metrics and data to deepen engagement with the public. These concepts can provide an analytical framework that transportation agencies can use to have a meaningful conversation with disadvantaged communities about what transportation services are working and what isn't working in their daily lives. Connectivity measures can also be an important tool to make the public engagement process more meaningful and strengthen the connection average Americans feel between their tax dollars and improvements in local infrastructure. When people realize that their tax dollars are allowing an individual to access 50% more regional destinations, it will affect their attitudes towards transportation policy and may make him or her amendable to future expansion of funding. Additionally, this information can help make the case for

[7] http://access.umn.edu/
[8] Plan 2040 is a combination of Atlanta's regional transportation plan and regional plan incorporated into one document
[9] Geographic Information Systems (GIS)

improved connectivity to legislators, as elected officials can be swayed both by the statistics as well as the changing opinions of their constituents.

Los Angeles has demonstrated that public education can increase support for infrastructure initiatives and improved connectivity. In 2013, Reconnecting America and the California Community Foundation released the Los Angeles Equity Atlas[10]. The Equity Atlas is an online interactive tool whose main component is a "frequent transit" tool, which overlays the transit network on different measures, such as education, food, and jobs and the workforce. This provides to the public a current image of performance within Los Angeles County and identifies areas with gaps and assets in individual communities, along corridors, or in station areas along the frequent transit lines. This has helped to build increased support for public transit in Los Angeles.

Building on Progress

DOT is committed to making significant investments to improve the research and state of practice in measuring connectivity. In addition to hosting a summit of stakeholders, practitioners, and researchers to share institutional and analytical best practices, we will be compiling a Summary of the Proceedings report to advance the state of practice around connectivity. Over the next year, the Department will continue our on-going efforts to support and develop analytical methods for transportation agencies to improve access to opportunity and continue to offer technical assistance and capacity building to States, MPOs, and transit agencies interested in developing and deploying approaches to measure the degree to which disadvantaged populations have access to jobs, essential services, and other opportunities and identify policies and projects to increase access.

Conclusion

One common theme across all of the literature on connectivity is that transportation projects must help to erase barriers to economic inclusion. To this end, DOT is proposing a few potential next steps to advance the state of practice around connectivity. We are convening this summit of stakeholders to share institutional and analytical best practices. We are also seeking to identify the state of the practice to better understand the institutional and analytical challenges transportation agencies face as they work to improve access to opportunity. Finally, we wish to develop and share analytical techniques so that State DOT's, MPOs, providers of public transportation and local transportation agencies can more easily measure the degree to which disadvantaged populations have access to jobs, essential services, and other opportunities and identify policies and projects to increase access. Hopefully, these steps will improve access for Americans to the critical services and jobs that will improve their lives in significant ways.

[10] http://reconnectingamerica.org/laequityatlas/index.php