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Economic Development Implications of Global Trade, Transport Investments, Climate Change, Environmental, and Urban and Rural Policies Summary and Research Agenda

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Conference Background and History

Since 1989, the International Conference on Transportation and Economic Development—which is primarily organized by the TRB Committee on Transportation and Economic Development (TED)—has been the venue where transportation and economic development issues, both policy and technical, are discussed in a substantive context. There have been four such conferences, in 1989 in Williamsburg Virginia, 2002 in Portland Oregon, 2006 in Little Rock Arkansas, and 2011 in Charleston West Virginia. At these meetings, in addition to most of the consultants and academics doing work in the field, the various regional transportation and economic development agencies (such as the Appalachian Regional Commission and Delta Regional Authority) along with national associations (such as the National Association of Development Officials and the American Association of State Highway and Transportation Officials) are typically represented. In addition, most of these groups have also sponsored previous conference(s). No other venue has as diverse a sponsorship base. Each of the four previous conferences also had substantial attendance from outside the U.S. This is partly because CODATU (Cooperation pour le Développement et l'Amélioration des Transports et Periurbains) has been a partner organization with the conferences. Because of this broad sponsorship and participation, the FHWA will be able to leverage a great amount of knowledge for a fairly small investment.

The 2014 I-TED conference covered the following thematic areas:

- Economic development implications of alternative transportation funding and financing strategies.
- Economic development potential of passenger transport and freight rail infrastructure.
- Assessing the economic development effects and community change of transit-oriented development.
- International, national, and regional economic development impacts of the Panama Canal expansion.
- Linkages of international trade, economic development, and transportation corridors and facilities.
- Economic development implications of transportation disinvestment.
- Climate change mitigation effects on transportation investments and sustainable economic development.
- New perspectives on economic impact evaluation.
- Economic development within the context of MAP-21.
- Transportation improvements and market competitiveness

Acknowledgement of Sponsors

The ITED2014 Conference co-chairs would like to thank the following sponsors for their invaluable contributions of time, professional expertise and financial resources. Without these contributions the ITED2014 International Transportation and Economic Development Conference would not have been possible.

The Federal Highway Administration
The American Association of State Highway and Transportation Officials
The Delta Regional Authority
The Economic Development Research Group
The Appalachian Regional Commission
The Maryland National Transportation Center
REMI, Inc.
The American Public Transportation Association
Cambridge Systematics
CDM Smith
The Center for Economic Development and Research, University of North Texas
The Federal Reserve Bank of Dallas
The TRB Committee on Land Development
The TRB Committee on International Trade and Transportation
The American Logistics Aid Network
The Transportation Research Board

Conference Planning

Conference Planning Co-Chairs

Greg Bischak, Co-Chair TRB Committee on Transportation and Economic Development and United States Department of Treasury
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Conference Planning Committee

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Daniel Graham, Imperial College of London
James Gillespie, Virginia Transportation Research Council
Duncan Stewart, Center for Transportation Research Austin
Michael Bomba, University of North Texas
Tim Feemster, Foremost Quality Logistics
Mary Cearley, Texas A&M Transportation Institute
Jordan Bertling, Texas A&M Transportation Institute

Key Outcomes of the Conference

There were two broad objectives of the conference which produced two related outcomes. First, the conference successfully brought together private sector stakeholders in transportation sectors, international representatives, state and local transportation officials, regional development agencies and transportation researchers to highlight and discuss key policy issues emerging within different transportation modes, promote cross fertilization of thinking and identify major challenges and discuss potential solutions. The conference plenary and panel sessions summarized in this report is testimony to the diverse array of stakeholders who contributed to the content and policy discussions at the conference. From these interactions the participants and rapporteurs identified many new directions of policy analysis and future research. We commend the summaries to the reader to fully appreciate the range of these contributions.

Second, many of the panels developed well formulated new research topics that emerged from the give and take of the panel discussions and debates. Highlighted below are some of the salient topics that were identified by the conference organizers from the proceedings. While not an exhaustive list of potential research topics, the subjects presented below will provide ample opportunity for advancing new research proposals on the relationship of transportation and economic development for the Transportation Research Board to consider. Some of the ideas are fundamentally cross-cutting in that they will require collaboration with other Transportation Research Board committees, while others can be pursued by TED Committee individually. An accompanying document entitled “Compendium of Papers Submitted to ITED 2014” is presented as a separate attachment. This compendium contains full papers that were submitted to ITED2014.

Suggested Research Emanating from the I-TED2014 Conference

Climate Change and Economic Development

The following ideas were put forth by panelists:

1. There is a need for more integrated approaches to modeling climate change related economic impacts, gathering data on climate change transportation-impacts; and to examine mitigation strategies through planned efficient mode shifting and land use patterns.
2. There is a need for better understanding of climate change mitigation effects on transportation investments and sustainable economic development, particularly the role of transportation in high-density urban development as a mitigation strategy.
3. Conduct a meta-study of all of TRB’s standing committees research efforts and strategies and cooperative research projects on the economic development implications of transportation Greenhouse Gas Reduction strategies for improving fuel efficiency, reducing carbon content in fuel, reducing transportation demand including the role of land-use patterns of development. Relevant committees might include:

- A0020T Special Task Force on Climate Change and Energy
- AD000 Planning and Environment Group
- ADC00 Section – Environment and Energy
- ADC20 Transportation and Air Quality
- ADC70 Transportation Energy
- ADC80 Alternative Transportation Fuels and Technologies
- ADD40 Transportation and Sustainability
- Many Climate Subcommittees
- Many National Cooperative Research Projects

Airports and Economic Development

The panelists proposed two broad ideas in this category:

- Further exploration into the linkages of economic drivers of airline passenger miles using longer time series of data.
- Further exploration of linkages between airports, airport delays and metropolitan economic structure in ways that it leads to contributions to the literature and practical recommendations for planning and policy

Disinvestments and Disruptions

The ideas presented in this session include the need to focus on:

1. Models of travel demand that better assess shifts in demographics, lifestyles and travel behavior.
2. Research for quantifying qualitative and “livability” factors associated with different uses of infrastructure.
3. Case-based research for how property markets and business cost structures change after disinvestment.
4. Overcoming barriers for states and metropolitan organizations that still lack data or resources to implement “investment management” paradigms in planning and programming.
5. Methods for determining “optimal” investment levels

Economic Competitiveness, Productivity, and Transportation Infrastructure

Panelists proposed the following idea:

1. A proposal to NCHRP for a comprehensive analysis of the state of the art and points of consensus within the literature about measuring the economic effects of improved accessibility, agglomeration and economic development.

Site Selection and Freight Logistics, Inland Ports

This section compiles the ideas from two breakout sessions which are summarized below:

1. The site selection process as it pertains to foreign trade zones, inland ports, distribution hubs and intermodal terminals all exhibit the centrality of supply chain reorganization as a vital factor in siting. General ideas include a meta-analysis and synthesis proposal to assess the

state-of-the- practice and state- of- the- art in preparing for such emerging considerations. The relevant committees could include:

- International Trade and Transportation
 - Freight Committees
2. Most of the presentations and panelists, corroborated by the tour, point to a common and overarching theme—value of introducing supply chain efficiencies via multiple mechanisms including operational methods. Formal research indicating how these technologies may be considered as valuable for freight movement, how they may be evaluated and how inland ports and distribution hubs can contribute to regional economic development.

The New Energy Boom and Transportation

Freight transportation related developments like those in the energy sector are an integral manifestation and part of economic development. On one hand, the energy sector boom leads to associated development and demographic effects. On the other hand, this induced demand creates challenges for the transportation infrastructure. According to some of the presenters, a key conclusion is that there is a considerable gap in the sophistication of the analyses of oil and gas impacts outside of formal transportation planning process and the analyses conducted for long-range transportation plans. The panelists provided the following ideas:

1. There seems to be an opportunity to integrate some of the lower-cost best practices from research work in North Dakota and Texas to planning process of other regions.
2. There is a need to understand that energy sector developments presents multiple research issues from planning to funding and to understanding the extent of economic impacts.
3. Another idea put forth by the panelists, is the need for cross regional studies of transportation infrastructure financing approaches to address the energy boom and identify best practices in the Bakken formation of North Dakota, the shale gas in the Marcellus Shale formation in Appalachia, and shale oil in Texas.

Light Rail Transit, Transit Oriented development: Value Capture and Community Development

The ideas suggested are listed below:

1. Transit oriented development (TOD) patterns affect local economic growth and can change the price of land and housing. They can also present a potential revenue source through property value capture to support transit operations. According to the panelists, this topic is ripe for a synthesis topic.
2. Other suggested case-based research ideas include the exploration of corridor specific spatial effects and regional examples using enhanced and restricted employment data sources.

Impacts of New Financing and Pricing Strategies on Economic Development

The sessions pointed to varied implications of alternative funding strategies that could be the subject of extensive future research agenda. These issues range from evaluation methods that are multimodal, to policy assessment and simulations of behavioral and economic impacts of alternative

funding mechanisms. It is important to understand that the economic implications and impacts of alternative funding scenarios will be quite different. Few tools have the capability of addressing these endogenously. It is unlikely that tolls can be considered on the same footing as other types of charges and fees. Hence policy sensitivity in relation to behavior, macro and regional modeling could be a vital area for research going forward.

Innovations in Transportation Project Economic Development Appraisal

Panelists offered many ideas. Among them are:

1. The need to develop extensions of matching methods like propensity score estimation techniques to determine how improvements in urban transport networks performance affect productivity in for combinations of pricing, roadway investment and transit investment strategies. In this context, a vital research need mentioned is to extend current unimodal appraisal methods to allow for an assessment of the relative rates of return on investment of a portfolio of road, transits and multi-modal investments.
2. Develop a systematic framework for social accounting of the total rate of return for competing transportation project investments, including social benefits in fuller economic effects models.

Cross Border Global Trade (Policy, Logistics, Security and Economic Development)

Research ideas presented by the panelists include the following:

1. Models can be a basis for future analysis of optimal staffing deployment and other policy options to improve logistical efficiency at border ports. Research is needed the development of a simulation model that the CBP can use to analyze scenarios involving changes in staffing levels, traffic volumes, etc.
2. Designing a social networking service among export-oriented companies for firms with shared sectoral interests, activities or backgrounds with the aim of developing assessment tools for small and medium sized enterprises which could take into account risks, costs and ways to promote the supply-chain integration.
3. An assessment of least cost paths for intermodal flows connecting production-consumption regions.
4. Trend analysis on data from Border Crossing Information System (BCIS) impact of staffing, infrastructure and bridge capacity, primary and secondary inspection facility capacity, and hours of operation on wait times.

National, Regional and Local Studies of Freight Transportation on Economic Performance

Three areas of research are suggested:

- A Cooperative Research Project study aimed specifically at investigating the linkages between productivity, accessibility and agglomeration within individual industries and supply chains.
- Increasing amounts of public data and economic data are becoming available. Many of these data sets could be mined to study industry differences in economic performance and transportation needs/reliance.

- The panelists also pointed to a large role for economic development organizations (EDO) to be aware of how to maximize benefits of logistical clusters, inland ports, and intermodal hubs. Hence a suggested research need could be how best to engage and empower EDO's.

Seaports

One of the most important research needs identified by the panelists in the seaports session is the need for a best practice study in funding seaport infrastructure to facilitate export and import trade flows and to ensure resiliency to natural disasters. Other research areas suggested by panelists include:

- Research is needed on how to handle the truck-container chassis with the shipping lines as they are trying to get out of the chassis business.
- Research on how to handle drayage in light of truck driver issues
- Research on forecasting market trends particularly as it influences commodity exports and imports via ports.

Opening Plenary Session

Katie Turnbull, Texas A&M Transportation Institute

Greg Bischak, Co-Chair Transportation and Economic Development Committee, TRB

Michael Morris, North Central Texas Council of Governments

Victor T. Vandergriff, Commissioner, Texas Transportation Commission

James Tymon, American Association of State Highway and Transportation Officials

Debra Miller, Cambridge Systematics and Surface Transportation Board

The ITED2014 Conference opening plenary session, began with a welcome by Greg Bischak conference Co-chair, who set the stage for the two-day program of presentations, debate and discussions. Mr. Bischak noted that the 2014 International Transportation and Economic Development conference was the fifth such conference to examine the dynamic relationship of transportation investments and international, national and regional economic performance. Mr. Bischak singled out the host sponsor, the Texas A&M Transportation Institute, which was central to organizing this conference. The conference organizers also want thank the Dallas Federal Reserve Bank for their assistance, the Federal Highway Administration, and the other sponsors for their support of this conference. The aim was to bring together private sector stakeholders in transportation sectors, international representatives, state and local transportation officials, regional development agencies and transportation researchers to highlight and discuss key policy issues emerging within different transportation modes, promote cross fertilization of thinking, and identify major challenges and discuss potential solutions.

Several sessions will examine how the increasing tempo of international trade and changing flows are generating new demands for infrastructure investments (air, seaports, shipping, rail, intermodal facilities, and the Panama Canal expansion). A special session on China addresses major transportation plans and the impact on sustainable development. Other sessions examine how public transit investments are playing an increasingly important role in reshaping the competitive dynamics of cities and promoting transit-oriented development. Several sessions examine North American trade and transportation impacts on regional and national development, as well as site selection, cross-border trade and the role of inland ports. Transportation researchers examine new techniques for project evaluation to assess their impacts on competitiveness & productivity. The new energy boom in the US and Canada is placing new and unexpected demands on transportation infrastructure.

One overarching theme throughout this conference is how to fund and finance transportation infrastructure in an era of financial constraints. Several panels explore innovative, alternative financing approaches. A key issue is the economic impact of disinvestment that is being felt acutely by state and local governments and how governments are intentionally or unintentionally disinvesting in transportation infrastructure. Implicitly governments must reckon with an old truism: *“there is no such thing as a free lunch.”* This truism espoused by the economist Milton Friedman and the ecologist Barry Commoner spans the political spectrum and helps to concentrate attention on two major contemporary issues: How to finance our transportation infrastructure in an efficient and equitable way. How should we address the challenge of climate change mitigation and the adaptation to its effects on our transportation infrastructure? These and other topics are explored here to make a modest contribution to the national and international dialogue on financing and developing a sustainable transportation infrastructure for the future.

Mr. Bischak introduced Katie Turnbull, the Executive Associate Director of the Texas A&M Transportation Institute, and Chair of the Transportation Research Board Technical Activities Council. Ms. Turnbull recognized all the staff of the Texas A&M Transportation Institute who helped plan and organize the conference, and welcomed the distinguished panel members of the opening plenary. Ms. Turnbull then introduced Michael Morris, Director of Transportation, North Central Texas Council of Governments.

Mr. Morris began his comments with a background of the Dallas-Ft. Worth metroplex region. As it is the largest region in the US with no direct access to the sea, transportation is key for economic growth. The region has the longest light rail system in the country and has experimented with congestion pricing. The metroplex would be the 15th largest economy in the world if it were a separate country. He noted that the region continues to face many challenges due to population growth and has addressed those with innovative strategies involving mixed use development and a multi-modal transportation system to minimize automobile travel and address regional land use patterns. The region has three intermodal hubs with a fourth in the planning stage, and an air cargo airport and logistics hub. The region is just beginning the environmental work on a high speed rail system. Mr. Morris mentioned three challenges for consideration by the conference attendees. His first challenge was to significantly raise the profile of the transportation infrastructure's importance to economic growth and document the need for increased financial resources for such investment. He suggested that the country is moving in the opposite direction, and under investing in the transportation system. The second challenge involves the Commerce Clause of the Constitution. Under Commerce Clause, the nation has the responsibility to move the mail, and by extension today it has the responsibility to move goods in regard to the Interstate Highway System. As a result, he suggested that general revenue should be used to support transportation since there is a benefit to the overall economy. The third challenge is to recognize and explore new logistic connections resulting from energy and climate change realities that make it more advantageous to produce goods at home.

Katie Turnbull then introduced Victor Vandergriff, Commissioner of the Texas Transportation Commission.

Commissioner Vandergriff highlighted his background in the private sector and public policy issues in Texas. As an appointed, not elected official, he recognizes the challenges of finding needed revenue for transportation. The current fiscal environment in Texas is not conducive to generating new revenues. The State of Texas has generally relied on the use of debt for funding new investments. A focus for the immediate future is the need to address transportation infrastructure, particularly to support the energy sector in Texas. The energy sector is booming across the country and the increased truck traffic has had major impacts on the state and local roads. It has been estimated that \$1 billion will be needed to address this issue, which requires determining state and local priorities. Commissioner Vandergriff noted that there is not enough money or debt capacity available to address this multi-billion dollar backlog of projects. He emphasized that developing a business process provides a straightforward means to plan and address the needed investments. Transportation, he noted, is a statewide issue and goes beyond roads to include ports, airports, transit and railroads. He emphasized that while it is necessary to invest in new interchanges, there is a bigger impact on the economy from investments in ports to take advantage of the expanded Panama Canal and global trade. The High Speed Rail service from Houston to Dallas would also be a major catalyst for economic growth. Addressing the growth of traffic at the Texas-Mexico border crossings is also important.

Greg Bischak then introduced Jim Tymon, Chief Operating Officer and Director of Policy and Management of the American Association of State Highway and Transportation Officials. Mr. Tymon has extensive experience working on transportation matters in Congress.

Mr. Tymon opened his presentation with an overview of the sobering statistics about transportation fiscal constraints facing the nation- spending more than we bring in and the imminent prospect of the highway trust fund going broke by August 2014 if nothing is done. In recent years, the Congress has closed this gap by transferring about \$50 billion from general revenues to close the funding gap since 2008. Against this backdrop, Mr. Tymon addressed recent discussions on whether there has been a decrease in vehicle-miles-of-travel (VMT) as some in the research community have argued. He indicated that there has been no decrease but rather a “flattening-out” of VMT at about a growth of 1 percent per year. Further a projected population growth will drive increases in VMT. We are facing a funding crisis at the federal level, such that spending on transportation is exceeding revenue. He went to explain the process for spending down the Highway Trust Fund, indicating that the federal government will not be able to reimburse the states for spending. In the long run, 2015 and after, states will not be able to put forth any new projects due to a lack of revenue. As many as 6,000 projects will be delayed or cancelled, affecting between 600,000 and 1 million jobs nationally. He cited a number of examples. Discussions in Congress still seem to focus on a short run solution with another transfer from the general fund. However, support is seen in Congress for a solution involving corporate tax reform that creates a revenue stream and there are a wide range of alternative financing means beyond an inflation-adjusted gas-tax which does not seem to be on the table.

Mr. Bischak introduced the concluding speaker for the session, Debra Miller of Cambridge Systematics and the recently confirmed member of the National Surface Transportation Board. As the former Director of the Kansas Department of Transportation (KDOT), Debra Miller has a great deal of experience in developing innovative strategies to bridge the gap between revenue shortfalls and the demand to manage the transportation system. Ms. Miller focused her presentation on some ideas about how to make economic analysis practical for managing transportation financing. In her experience, the leadership of transportation agencies generally does not incorporate economic considerations into their decision-making on transportation projects. She completely agrees with the notion that decisions concerning transportation projects must include some economic criteria. Project selection activities should include some economic screening criteria. In her experience, there are a range of agency activities that should include economics. Lots of elected officials now push back on the idea that spending on transportation is an investment. She noted that there is a need for a different leadership that understands this concept. It used to be an accepted notion that in order to bring economic growth to a community, a new or significantly expanded roadway was necessary. In past practice, the message to local communities about whether roadways would have an impact was not completely clear because transportation professionals did not completely understand it themselves. That has changed over the years due to a great deal of research on the subject. Nonetheless, the communication of these advances and their importance in managing these issues has been a problem. The application of economic analysis at the staff or agency level has been extremely uneven. Ms. Miller highlighted the example of TIGER projects in integrating economic analysis with project selection and management. She liked the Program as it required an economic analysis and required people to work together. While there has been progress in using economic analysis, it still needs to see a lot more emphasis. She made the point that the transportation and economic analysts in the audience need to proselytize to others within their agencies. Lack of

understanding, resources, and technical expertise is not always available. She also noted that we should not look for perfection. Ms. Miller recognizes that there is generally political resistance to changing the project selection process because there will be different winners and losers. Ms. Miller referred to her experience from her time at KDOT to illustrate this process. The Kansas Legislature mandated the adoption of a very rigid data driven process for initial project prioritization which required a transparent process. All data was placed on the KDOT website. The process involved recruiting a large statewide group that wanted a practical understandable process. However, they could not readily resolve the conflicts between urban and rural priorities. Nevertheless they did succeed in avoiding the most contentious issues with local communities by ensuring that they had great deal of dialogue with local communities. In the end, KDOT did manage to develop spending goals for regions within the state and establish a goal to select the best projects within the region.

Breakout Sessions Summary Session A

A1: Economic Competitiveness, Productivity, and Transportation Infrastructure (1.5 CMs)

Moderator: Stefan Natzke, of the *Federal Highway Administration*, opened the session by noting that past research has shown that the transportation system plays a critical role in the country's economic growth by making and enhancing connections between individuals, firms and markets, thus improving the business productivity and overall economic growth. However the relationship between the transportation system and economic growth is complex. We, as professionals in transportation and economic development, often struggle to communicate the good work that researchers do to show the positive impacts of transportation investments on economic performance. Being able to communicate and translate these findings to general public and political leaders is difficult. The answer to what are the economic benefits of transportation is complex and technical, and takes more effort to estimate than some decision makers expect. We hope that conferences like this one help to advance the state-of-the-art, and to formulate and communicate the research findings to the public-at-large and decision-makers. The four presentations in this group will explore issues surrounding productivity and competitiveness, the relationship between accessibility, mobility and productivity. Mr. Natzke noted that he would take questions immediately after each presentation.

Economic Growth, Productivity and Competitiveness: How Are They Connected?

Glen Weisbrod, of *EDR Group*, opened the session by noting that productivity is the central concept of impact and benefit metrics. Yet, there are other concepts such as accessibility and mobility, that are required for careful analysis but also make communicating the research findings more challenging. Communication is important and researchers are improving ways to communicate and generate timely research for decision-makers.

Notably a few recent studies are worth reviewing.

- NCHRP 02-24: Assessing Productivity Impacts of Transportation Investments
- SHRP2 research program: Development of Tools for Assessing Wider Economic Benefits of Transportation
- Assessing the Economic Value of Highways using Longitudinal Employment and Household Database (LEHD) Data, for the Federal Highway Administration

These studies bring to light that there are wider economic benefits of transportation investments that can be measured. This requires disentangling interlocking concepts. Also there are different conventions, for instance researchers and practitioners in the UK and US, have differing definitions of wider economic benefits which need to be understood when reviewing the concepts. Key interrelated but separate concepts involve:

- Productivity- what do you get out for what you put in.
- Competitiveness- input cost for what you get out.
- Economic (development) Impact - growth in economy by exporting more, import substitution and additional income generated per inputs.

Transportation effects on productivity occur through different channels of the production and distribution. Labor markets and commuters are affected by changes in access to employment opportunities that may enhance the match of specialized skills, improve reliability and lower transportation costs. Capital goods and suppliers are affected by freight delivery to match suppliers, improve reliability and lower costs. Supply chain effects lower the inventory and stocking effects.

Note also that economic impacts are measured differently than economic benefit cost analysis. Economic impacts are measured by the value added and job growth from local productivity improvements plus the growth related to inflows of investment and relocation of economic activity. Economic benefits are measured by the value of the productivity growth plus the non-monetary benefits including travel time savings and environmental and social benefits.

When and how do the benefits occur? And what are the drivers of productivity related to transportation? There are generally little or no productivity impacts from personal travel and social and environmental benefits, although they are benefits that can be measured other ways, but not through productivity gains. There are productivity gains from traditional travel user benefits such as reduced travel time for business and work. These are the narrow productivity benefits. The added productivity gain for business or work-related travel derive from wider benefits that are due to enhanced reliability, accessibility and improved intermodal connectivity which provide access to broader markets over larger geographical areas.

The state of knowledge does provide a narrative scheme for communicating the impacts of transportation investments on the economy. First there is the standard user benefit perspective that measures travel time and cost savings and safety improvements. Second there are the wider transportation benefits arising from reliability, accessibility and connectivity. Third, there are the elements of productivity benefits arising from efficiency, technology and agglomeration effects. Finally, there are the economic impacts on output, employment, income and GDP.

Question - How does economic productivity improve or impact regional competitiveness? Is regional competitiveness an outcome of economic productivity?

Answer - You need to review what the composition of industry is in your area. By reviewing your mix to ensure you are working on promoting items that are the most beneficial.

Congestion Evaluation Best Practices

Todd Litman, of the *Victoria Transport Policy Institute*, started off his presentation by noting that traditionally State and regional entities have been focused on reduction of congestion and its' associated costs. Travel time savings, that is congestion reduction, usually represents 60% to 80% of the benefits of such investment. The question is how to properly calculate the cost of congestion. Most of the literature is from studies done abroad. Asia, Europe, Canada which have good coverage of best practices on congestion reduction.

There are a wide variety of key congestion indicators. Not all of them are comprehensive or multi-modal in scope. But a key question is whether these indicators are being measured at the multi-modal level? Are they considering delays not just to car travel but people overall? For instance, there are separate level of service (LOS) measures for roadway and multi-modal service but neither is comprehensive in measuring congestion. There is the traditional travel-time index which measures

average peak to off-peak travel speeds, but this is neither comprehensive nor multi-modal. Likewise congestion costs provide a monetary value of delay plus additional vehicle costs but it is comprehensive and multi-modal only if it measures passengers rather than just vehicles. The average time spent per commute is a comprehensive and multi-modal metric. The relevance of these different measures is demonstrated in a scenario with shifting from car lanes to bus lanes, and evaluating the kind of impact that would happen to congestion. Indicators like travel time index (congestion intensity) and delay (congestion cost) can show differing results.

Rankings of congestion are sensitive to the type of measurement. For example, comparing congestion intensity (i.e. travel-time index) to congestion costs (delay per commuter) generates significantly different rankings. In such a comparison, while the greater Los Angeles Metro Area is ranked first in congestion in both rankings, the greater New York Metro area goes from 2nd in congestion intensity to 13th in congestion costs. In general, more compact urban regions tend to have more intense congestion but lower congestion costs than the sprawled auto-oriented regions. He also points to comparative baseline speed in making inferences.

He then discussed the valuation of travel time, fuel economy and emission impacts. Valuing travel time is a key issue. Most studies conclude that on average motorists are willing to pay 25-50% of [hourly] wages for reduced delay; a minority, including commercial travelers and travelers with urgent errands, would pay significantly more. The value of travel time used for analysis should reflect the travelers affected. A project that reduces delay for all motorists, such as a roadway expansion, should be evaluated based on overall average motorists' willingness-to-pay, while a project that reduces congestion for a particular group, such as value priced lanes, should be evaluated based on willingness-to-pay by those who would pay the fee. Fuel economy usually peaks at 40-50 mph, so reducing extreme congestion (such as shifting from LOS E-F to C-D) conserves fuel and reduces emissions, but eliminating congestion (shifting from level-of-service C-D to A-B) tends to increase fuel consumption and emissions. Safety impacts are also a congestion related issue. Total crash rates tend to be lowest on moderately congested roads ($V/C = 0.6$), and increase at lower and higher congestion levels, while casualty rates (injuries and deaths) increase if congestion reductions lead to high traffic speeds. Although some interventions, such as roadway grade separation, can reduce both congestion and crash rates, some congestion reduction strategies increase total accident costs by increasing traffic speeds and inducing additional vehicle travel. These additional crash costs typically offset 5-10% of congestion reduction benefits.

Generated or induced traffic is another important congestion evaluation issue. Induced vehicle travel increases various external costs including downstream congestion, parking costs, total accidents, and pollution emissions, reducing net benefits.

Economic efficiency analysis is another facet of congestion evaluation. There are large potential benefits from favoring higher-value travel. A roadway becomes more efficient (it provides more value per lane or vehicle-mile) if regulations, pricing or incentives allow higher value vehicles to avoid congestion. A significant portion of motor vehicle travel may have negative net value- its' marginal user benefits are less than their total marginal costs, including external costs. It may be economically inefficient to expand roads to accommodate such travel. In his opinion, serving latent demand for alternative modes can provide direct and indirect benefits. For example, walking, cycling and transit improvements that increase use of those modes provide direct user benefits, plus indirect benefits from reduced automobile traffic.

Sensitivity analysis should be conducted to assess critical evaluation parameters.

Some of the suggestions he makes include:

- Congestion indicators should be per capita
- Measure delays to all travelers to account for the travel time savings.
- Account for generated and induced vehicle travel when evaluating roadway capacity expansions. Induced travel tends to reduce predicted congestion reduction benefits, provides marginal consumer benefits, and increases external costs.
- Account for increased crash costs that result if congestion reductions lead to high traffic speeds.
- Account for co-benefits when evaluating potential congestion reduction strategies, like parking costs, , potential consumer savings and affordability, impact on non-drivers' accessibility, increase safety and health, reduce pollution emissions, and support strategic land use objectives.

Question: The presentation focuses on efficiency but how does this work in the political arena? Large benefits for valuing higher value trips, seems to denote Lexus Lanes, which is a hard political sell.

Answer: This is from a purely technical point, but social equity solutions should be considered during evaluations.

- If efficient and equitable strategies are integrated together we can come up with solutions that work in both areas.
- There are points to using buses and other items to favor social equity.

Todd Littman's' paper is included in the ITED 2014 Compendium of papers.

Revisiting the Relationship between Transportation Infrastructure Investment and GRP Accounting for Spillover Effects

Eirini Kastrouni, of the *University of Maryland*, presented a study on behalf of her co-authors, Xiang He and Lei Zhang, also of University of Maryland. This study revisits the relationship between transportation construction investment and economic growth by accounting for spillover effects. To set the stage, the presentation reviewed key findings from various past studies of the effect of public capital investment on economic output. She notes that a key finding is an overestimation of the impact of public investments on economic growth. In general, geographical disaggregation of data usually results in lower productivity of public capital - spatial correlation – *spillover effects*. When we invest in a particular area the impacts may spillover into adjacent localities. Spillover effects may decrease as the distance increases from the investment location although this relationship depends on the source of spillover effects.

Greater disaggregation allows for a better treatment of unobserved heterogeneity and examination of positive and negative spillover effects. Productivity leakages are largely due to the connectivity characteristics of the transport facilities.

To examine this relationship spatially the authors examined the MSA level transportation investment effects for the U.S. over 29 years to analyze the impacts of the investments on economic growth. The time span was 1980 to 2008. Key data sources were: Highway Performance Monitoring System

(HPMS); Woods & Poole (commercial database); the U.S. Census Bureau, and the U.S. Energy Information Administration. Travel demand was measured by vehicle miles traveled; transportation supply was measured by highway capacity and infrastructure functional class in miles; economic variables were Gross Regional Product; highway investment; retail sales and gas prices; demographic variables were population, gender and employment. The model was a standard Cobb-Douglas production function where total production is a function of labor, capital and total factor productivity. The methodology used panel data to test for fixed effects and random effects. The available panel data was tested for spatial and temporal auto-correlation. To account for the spillover effects from outside of a MSA a non-MSA supply factor was considered.

The key findings are that the non-monotonic relationship between transportation investment and population, Gross Regional Product (GRP) and employment suggests that there may be optimality implications; overpopulated areas may not realize expected economic growth as related to highway investment. In addition, the study finds significant evidence of spillover effects. The estimation results support the hypothesis of economic interaction between neighboring areas, through productivity leakages and migration of production factors.

Question: Growth rate over long or short term? Should try to average the growth rate over the 29 year period and then do 10 year periods to find the reason for the lag of correlation.

Answer: Additional research is being done on the lag of the impact from the investments being implemented.

Use of Accessibility Measures in Analysis of Wider Economic Impacts of Transportation Improvements: An Analytic Review

Ira Hirschman, of *Parsons Brinkerhoff*, opened his presentation by noting the objectives of accessibility measures. He noted that the objective of his paper is to review what we know about accessibility measures to analyze the wider economic impacts of transportation investments. They start off by noting what is accessibility, how is it measured and if there is a way to measure the general accessibility of a region?

They quote prior research noting that the broadest level accessibility measure is effective density. As you can improve transportation and bring travel times down you can effectively create higher densities. However there are other important factors associated with accessibility. Accessibility is market access to labor markets, product markets, etc. Accessibility is also access to the institutions and centers of knowledge production, i.e. knowledge spillovers. Such spillover economic benefits are largely gained from clustering production activities, particularly in the fields of science, technology, engineering, and mathematics (S.T.E.M) sectors. Even though the same densities may exist in areas of the same size, the variations in specialization and clustering is important to the success of the area.

Accessibility measurements have been developed through a variety of models: Gravity models; modified gravity models, agglomeration models, labor market access models and participation models. While models are good at explaining different facets of regional development, they each have limitations, vary in results, and many are very resource intensive. However all of these models seem to focus on accessibility which tends to drive wider economic effects. Common measurement approaches entail: effective market size, zone-to-zone travel time, zone-to-zone generalized cost,

transportation outcomes, and access to major activity centers. In general, the approaches seek to measure certain accessibility effects that arise from enhanced accessibility:

- Directly - Knowledge spillovers, labor market access, labor market matching, producer access, producer/retailer access, consumer access.
- Indirectly- Labor productivity, industry output, labor force participation, wage levels and employment.

The key question is does any accessibility model address inter-regional competition? This review of models is an attempt to frame an answer. He first presented the full gravity model, which in principle, doesn't attempt to posit a relationship between accessibility and economic productivity of a zone within a region. The strength of attraction of a given zone to all other zones is a function of impedance, opportunities, impedance parameter. In practice the zone to zone impedances represent generalized costs and the socioeconomic factors and their variations by zone represent opportunities (strengths or weaknesses). . He provided examples of these models being developed for measuring the effects of transportation investments on changes in accessibility and regional economies, including most recently, the Illiana Corridor, a 47-mile access-controlled highway connecting Illinois south of Metropolitan Chicago to northwest Indiana.

Next, he presented the modified gravity model as a lower cost alternative to the full model. It assumes that the current zonal distributions of activity reflect accessibility, impedance factors, and other factors. Thus, changes in accessibility in a given zone relative to all other zones can be used directly to redistribute activities. If the composite accessibility score in a given zone increases by a given percent, activities also increase by the same percentage in that zone. Finally, the United Kingdom (UK) agglomeration model was presented as another widely developed approach. Building on the New Economic Geography approach, the UK model has been used for transportation investment evaluation, via the Department of Transport's Wider Economic Benefits Transport Analysis Guidance (WEbTag)¹. The approach explicitly posits a relationship between accessibility, effective density, and economic productivity. Improvements that result in increased effective density in turn, yield changes in "GDP" The model assumes that benefits from increased effective density decay fairly rapidly with effective distance – implicit then is the idea that labor market effects are most determinative. Effective density, provides a measure of the mass of economic activity across the modeled area. This measure reflects the accessibility of firms and workers to each other, with the importance of one firm/worker to another declining with increased distance apart. Once effective density has been estimated in the Base and Alternative scenarios, the expected productivity response to the change in the level of effective density between the scenarios is estimated by applying an elasticity of productivity with respect to effective density for each economic sector to the change in effective density. Agglomeration impacts are not captured in user benefits at all, so the full agglomeration productivity impact can be considered to be an additional welfare impact to add to the appraisal.

Labor market models of accessibility are yet another approach to examining the effects of transport changes on regional growth. Generally these approaches model how accessibility improvements may generate larger effective labor market sizes. He also pointed to some examples which use these measures. The last sets of models presented were labor market participation models. In general, he notes that the applicability of accessibility modeling to economic analysis may be most suitable tool

¹ <https://www.gov.uk/transport-analysis-guidance-webtag>

for comparing the long term wider economic impacts of transportation improvements although the profession is far from accepting a general theory of accessibility.

Question: Accessibility and mobility are often posed as polar opposites. Using the concept of effective accessibility makes them relatable. However we define effective accessibility, how might we test the efficient solutions we then attain?

Answer: It can be a better land use pattern or reduction of travel times. Which is more efficient would be the result of lots of other analysis.

Another presenter, Todd Litman, noted that he had a report on his website called "Comprehensive and Multi-modal Accessibility" that addresses identifying efficient solutions. He noted that mobility is a subset of accessibility. We should be measuring the various components. Increase in one could decrease the other. Increased density would cause congestion.

A2: Site Selection and Freight Logistics (1.5 CMs)

Moderator: Tim Feemster, *Foremost Quality Logistics (FQL)* opened the session by noting that the session was aimed at highlighting emerging issues and trends facing the transportation industry currently. Challenges for siting major freight facilities and global logistics today include emerging end-to-end global supply chains, need to serve inland markets, the cost of energy, limitations of rail service (rail lines don't reach all locations), congestion, workforce training, aging workforce, infrastructure funding, and environmental concerns. On average, transportation still commands about 62.8% of overall supply chain costs (it tends to vary by business type). Tim placed all the presentations in the context of a regions' supply chain resilience building. This session features two speakers in addition to Tim Feemster who present different aspects of the site selection process as it pertains to foreign trade zones, inland ports, distribution hubs and intermodal terminals. All presenters point to supply chain reorganization as a vital factor in siting.

Presenters:

Tim Feemster, *Foremost Quality Logistics & American Logistics Aid Network (ALAN)* opened his presentation by discussing all of the emerging trends listed earlier. The main objectives of the presentation were to discuss the key trends impacting siting of Foreign Trade Zones and intermodal freight facilities. He pointed out the significant differences for inbound and outbound logistics costs across industry types. Retail sectors incur the highest inbound costs followed by high tech manufacturing. Emerging retail trends like consumer fulfillment sectors and manufacturing also have the highest outbound transport costs. In the context of global supply chains, he notes that Foreign Trade Zones (FTZs) can provide major cost savings and that not enough companies are taking advantage of these FTZ's. FTZ's relate directly to assembly in the US based on various requirements to qualify and can be vital in supply chain cost reduction. He gave two examples of other ways of supply chain optimization by Walmart (advanced high technology trucks) and Amazon. It was pointed out that large truck companies (JB Hunt, Schneider, Swift, etc.) are moving to containers and thus using rail much more for long-haul shipping. This, he notes, makes access to intermodal hubs more important. He then went on to note that supply chain logistics optimization ends up being highly central to site selection decisions in the current environment.

The top factors in strategic site selection decisions in the current environment pointed out by Tim include:

- Operational (including hours of service regulations, access considerations and energy costs among others),
- Financial (transportation and drayage costs and financial deal structures) and,
- Intangible factors like business climate (tax advantages), brand reputation

John Grueling, Will County Center for Economic Development, Illinois, opened the presentation by introducing the Will County Center. He pointed out that it is a private non-profit Economic Development Corporation (EDC) formed in 1981 to diversify the regions' economic base. The EDC partners with Will County ED Foundation and provides a one stop shop for business assistance in the region.

Will County, IL (outside Chicago) is building the largest inland container port in the US.

- Their economic development organization is private-public working with all municipalities in the county
- Their target industries include transportation/logistics, manufacturing, food processing, and energy production
- Biggest challenge they face is finding public funding for transportation
- They are currently working on the Indiana Highway with IL DOT and IN DOT, a public-private investment which is key to their logistical connections – they completed Tier 1 and 2 environmental impact statements in 18 months.

The Will County Inland Port includes multiple facilities including the major private industrial developer, Center Point with a BNSF intermodal (IM) in Elwood, IL and a big Walmart distribution center (DC), a UP IM yard in Joliet, and is building a 3rd port (Ridge Port Logistics Center). The inland port receives fresh fruit and vegetables in refrigerated cars via rail. Once the port receives the containers (from the west coast), they ship back agricultural commodities like corn, DDG (dried grain), eggs and dairy via container to China.

Strategic considerations in site selection as suggested by John include:

- Synchronization of site and development plans in the larger context of logistics as a targeted industry group and not considered as just another infrastructure element.
- Knowledge of the markets and the final consumers is vital. Johns' examples drew from several facilities planned in Will County region seeking to optimize supply chains for industry clusters serving the area.
- Stakeholder dialogue between railroads, shippers, 3PL's, trucking firms, DC owners, and developers is key in delivering transport infrastructure that serves the region and addresses key deficiencies in the network.

Supporting economic development considerations pointed out by John include:

- Strong government relations program at local, regional, state and federal levels.
 - Workforce development and education/training services are a must.
 - Promote collaborative solutions to multi-jurisdictional challenges, e.g. designated freight/truck routes, overweight permitting and enforcement, zoning and design standards, user-fees, etc.

- A single point of contact regarding development opportunities, incentives, major developments and other information points key to the industry and finally,
- Funding is critical.

Vann Cunningham, *Burlington Northern Santa Fe Railway*, opened the presentation by introducing BNSF facilities. He notes that BNSF has developed many IM facilities in strategically located areas. He too pointed to supply chain optimization as vital to BNSF rail investments and siting decisions. He notes that providing seamless connectivity to the network of manufacturers, suppliers, storage and warehousing and distribution facilities, transporters and retailers is vital for BNSF. He points to “leading edge” factors that are vital for seamless connectivity. They are listed below.

Mr. Cunningham identified three “leading edge” factors vital for site selection. They are:

- A cost-focused perspective driven by network consolidation and optimization.
- A location focused on shared services from infrastructure to distribution.
- A location strategy that is linked to business drivers and operational strategy.

The key points or trends he highlighted in his talk of import to BNSF IM hubs include:

- BNSF used to have 82 IM hubs but now have come down to only 39 hubs. There is also a need for co-locating distribution center facilities at IM hubs to avail cost savings.
- Freight density is critical: A minimum of 9,250 container lifts per year at IM hubs is required in order for IMs to be cost efficient.
- A drayage radius of typically 200-500 miles is vital. 4-5 truckloads can be accommodated into each rail box car.
- Access and connections to key markets and ports is vital.
- Rail super highways (major corridors) are critical to successful long-haul rail – can’t have too many “exits” for picking up/delivering some volumes (akin to major toll roadways).

He closed the presentation by pointing to a variety of economic development services that are vital for aiding siting decisions and the vital role that IM facilities play in driving freight density and that density is a vital factor for rail network decisions.

Questions, Answers and Discussion

Question: What is included in the 62.8% transportation cost?

Answer: It does include all modes plus some other costs that can vary by agreements with 3rd party logistics (3PLs) companies related to inbound and outbound costs.

Question: Do the inland waterways and barges carry containers?

Answer: Primarily not, mostly bulk commodities.

Question: How do you deal with heavy truck weight issues?

Answer: One solution at Alliance Texas was to take over the connecting expressway to help the variety of users and co-locators truck products. At KC Logistics Park (Gardner, KS), the entire logistics park was built to accommodate heavy trucks. Cooperation with State DOTs is very important to allow common rules across city/county borders.

Question: What are the biggest challenges to siting IM/logistics facilities?

Answer: Local/state permitting can be a major obstacle as it took 3.5 extra years to finish the BNSF KC Logistics park based on permitting delays. Also needed are all elements of operating costs (including hours of operation and buffers with residential area) to make it work.

Question: Are public transit and bike/pedestrian connectivity factored into location decisions, especially as it relates to the workforce at major IM facilities?

Answer: Increasingly yes, but it is often a challenge especially to more rural or “land locked” locations.

Question: Are there examples of effective short line railroads connecting to Class 1 IM hubs?

Answer: Yes, examples in Indianapolis, Charleston (SC) for the BMW automotive plant. And the East Coast rail market is a bit different with more rail trips less than 500 miles.

A3: The New Energy Boom: Strategic Infrastructure Investment and Development (1.5 CMs)

Moderator: Keith Phillips, of the *Federal Reserve Bank of Dallas*, welcomed the attendees to the panel and made brief introductory remarks highlighting how the “new energy boom” has increased demand for a range of transportation infrastructure capacities, from county roads, to interstates, to railroads, to pipelines and port facilities. All along this transportation spectrum, state and local officials face the practical challenges of planning to meet these burgeoning needs and to find the financing for enhancing, expanding and maintaining these regional, state and local requirements. While the energy boom is bringing jobs and economic development to these states, the accompanying increased output has stressed the existing infrastructure, particularly for freight via trucks and rail. Moving these resources from where they have been discovered, such as oil in the Bakken formation of North Dakota and shale gas in the Marcellus Shale formation in Appalachia, and shale oil in Texas, to where they are in greatest demand, have significantly increased demand on existing infrastructure. This session featured several speakers who discussed the economic implications of these developments to existing and strategic infrastructure needs in these and other regions.

Consideration of Shale Gas Development Impacts in Long-Range Transportation Planning

Leo Tidd, of the *Louis Berger Group*, opened the session with his presentation which focused on the Appalachian Region, especially shale gas development in New York, Pennsylvania, West Virginia and Ohio, and oil shale development in the Barnett Region of Texas (with its longer history of development). To access Federal funds states and localities must meet planning requirements under MAP 21 which emphasizes performance measures supporting national goals in seven areas: Safety; Infrastructure Condition; Congestion Reduction; System Reliability; Freight Movement and Economic Vitality; Environmental Sustainability; and Reduced Project Delivery Delays. Long-range

20 year plans required 5 year updates. Metropolitan Planning Organizations (MPOs) have different requirements than Non-Metro Regional Planning Organizations (RPOs). The plans require demographic and economic forecasts, as well as financial planning to meet these projected requirements. In the case of hydraulic fracking, water requirements demand significant truck capacity to supply early phase development, with later development to be supplied by planned pipeline capacity. Shale oil and gas development has and will continue to result in 1) increased heavy truck traffic and freight rail movement to supply equipment, water, sand and chemicals; and 2) increased employment and population, which in turn generate additional travel demand. There are a number of planning issues to consider including accelerating road deterioration, linking transportation and land use development for capacity expansion, alternatives routes and modes, air quality and environmental impacts, and environmental justice issues related to the distribution of transportation and land use impacts on low-income and minority communities. The case studies of the state long-range plans show that oil and gas development impacts have not been explicitly addressed in Texas, West Virginia and North Dakota's plans, whereas Ohio's and Pennsylvania's Long-range 2040 plan have factored in the impact of gas development on transportation. These plans have included impacts on baseline forecasts for induced population growth and environmental impacts. However, several states and regions have developed planning forecasts outside of the statewide long-range plans, including North Dakota, Texas and Douglas County Colorado. A key conclusion is that there is a considerable gap between the sophistication of analyses of oil and gas impacts outside of the formal transportation planning process and the analyses conducted for long-range transportation plans. There seems to be an opportunity to integrate some of the lower-cost best practices from research work in North Dakota and Texas. Best practices for addressing shale O&G development in planning include:

- Obtain good baseline data on existing well development activity (permitted wells, drilled wells, production, waste disposal volumes, water usage, and waste disposal locations) to characterize trends.
- Determine whether shale gas development is a large enough a contributor to overall growth that it warrants special consideration in developing population and employment totals for transportation modeling.
- Consider the full spectrum of shale gas-related impacts on transportation, including socioeconomics, safety, congestion, system-maintenance and air quality.

Transportation Systems for Oil & Gas Development: Case Study of the Bakken Shale

Denver Tolliver, of the *Upper Great Plains Transportation Institute at North Dakota State University*, presented his study examining the sparsely populated region of the Upper Great Plains, focusing specifically on the county and township road conditions in North Dakota and their forecast needs for meeting the current and projected demands for shale oil transportation. He discussed the key topics including: an overview of the Bakken shale formation; the nature of the production technologies; key input requirements for oil shale development at the well-head and throughout the supply chain; the derived transportation demands; an analysis of transportation demand by mode use and traffic distribution; key methods and data used in forecasting and key modeling concepts used to forecast demand; highway impacts and planning and conclusions/lessons learned. The Bakken formation's shale-oil development is characterized by tight rock formations with specific hydraulic fracking technologies utilizing horizontal drilling techniques (which are generally more productive than vertical drilling). Key planning challenges are the heavy equipment and supplies

required, the existing road design and capacities, the deterioration of roads, the sharp drop off of production of oil wells (after 3 to 5 years), which in turn imposes a constraint on long-range road building requirements to avoid overbuilding.

North Dakota produces \approx 1 million barrels of oil per day (BOPD). Production may increase to 1.6 million BOPD. Department of Mineral Resources projects 10-14 billion barrels (bbl.) of as a *technically recoverable reserve*, although industry forecasts 20 billion. Overall, the forecast is for 60,000 new wells expected to be drilled during next 20-30 years. The per well requirements (PWR) are typically 2-4 million gallons of fresh water; 3-5 million pounds of sand and/or ceramics and chemicals, fuel, drilling mud, cement, etc. Fracking cost is over \$2 million per well. The outputs are: oil, natural gas, and saltwater with a ratio of 1 bbl. of saltwater per 2 to 3 bbl. of oil. There are about 2,300 truck trips required per well, with outbound oil by truck to rail or pipeline and outbound byproducts (saltwater and waste) shipped by trucks. There are nearly 15,000 miles of pipelines throughout the states. Most new development depends on trucks to rail but forecasts project that up to two-thirds could be transported by pipelines. Rail constrained by capacity for other commodity demands, grade crossings and safety considerations. Pipeline expansion is constrained by fixed costs. He notes that the transportation forecasting challenge arises due to fact that historical traffic trends are essentially useless and there is considerable spatial and temporal variation in traffic. There is a trade-off in trying to address rural roads designed for agriculture products which have poor base layers and the need to provide soil support for oil traffic, to deal with rapid deterioration. Detailed forecasts were developed for North Dakota legislature to address these issues. Databases developed with estimated truck average daily traffic converted to equivalent single axle loads; paved road condition forecasted year-by-year, with the resulting forecast of improvements identified for reconstruction, widening, resurfacing. There is a large-scale investment program in North Dakota totaling \$2.5 billion for the state highway program for the 2013-2015 biennium. Roughly \$930 million are forecast for county and township roads. Current studies include bridge investment needs.

Conclusions: A multimodal transportation system is needed; Different modes may be utilized more/less intensively in different stages of development; rural collector/local road systems may be heavily impacted. Road infrastructure may be entirely inadequate and require substantial upfront investment. Caution must be exercised not to overbuild the road system. While rail can be expanded more quickly at less cost, mostly within the existing footprint, pipeline transport costs are likely to be lower than rail costs in the long run.

The Economic Impact of Investment in Gas Infrastructure in the Marcellus Shale Region

Christine Risch, of the *Center for Business and Economic Research at Marshall University, WV*, presented her analysis showing the dramatic growth of Marcellus shale gas production as the largest shale producer in the US. The study focused on the economic impact of gas infrastructure investment in the states of West Virginia and Pennsylvania. Shale gas in the region has grown from virtually zero in 2007 to 11 billion cubic feet per day in 2013 with exports of gas and ethane principally to Canada, Texas and New England. Marcellus Shale is the world's second largest gas field (compared to Qatar's North Dome field and Iran's South Pars portion of the same field) – estimated at around 369 Trillion cubic feet (Tcf) of gas in place and 141 Tcf of technically recoverable gas. Currently the Marcellus Shale Region constitutes about 20% of US gas production and is expected to grow to 25% by 2015. Marcellus-induced investment is considerable, with investment in Drilling/Production totaling around \$50 billion invested to date; the

Gathering/Processing/Fractionation processes accounting for at least 20 new and expanded facilities, (part of midstream services segment) and more than \$9 billion since 2010; Transmission facilities in pipelines and compression stations amounting over \$9 billion since 2010. These investments have induced economic activity through supply chain activities, transportation, wages and employment and direct consumer markets in electric and gas supplies. This includes Construction/Drilling – labor and equipment; Operations – leasing, field services, utilities, etc.; Transportation – mostly pipeline and some rail and indirect impact of reduced natural gas prices. Recent employment estimates by IHS/Global Insight for West Virginia and Pennsylvania in 2012 total 114,500.

Exploring Partnership Models to Promote Sustainable Rural Texas Highway Infrastructure and Energy Development

James Sassin, of *Fugro Consultants, Inc.*, presented his analysis of transportation requirements for shale oil development. The study examines the scale of the Texas oil shale development and its' impact on transportation infrastructure requirements through detailed planning scenario assessment methodologies focused on two case study counties with major shale gas developments in *Fayette County and Karnes County, TX*. Overall the region, known as the Eagle Ford Shale Play will provide \$90 billion in total economic output by 2021. The three transportation assessment scenarios examined are a Proactive Performance Based approach; a Reactive: Performance Based approach; and a Reactive: Status Quo approach. In general, the Proactive approach seeks to strengthen pavement prior to energy developments. The approach seeks to emulate the Road Use Maintenance Agreement (RUMA) used in the Marcellus/Utica Plays region. This involves detailed pavement analysis and design analysis and establishment of a baseline and a post-activity assessment of requirements that will be paid by developer. Generally this approach is estimated to have 7:1 benefit-cost ratio. The Reactive Performance-based approach seeks to assess an impact fee or apply for funding after the damage, albeit before road conditions fall below good or fair conditions. The impact fee attempts to associate the costs with the actual damage but more often than not lacks a real baseline to estimate costs and levy fees. The reactive approach is embodied in pending legislation in Texas. The Reactive performance-based approach often intervenes when road conditions are already judged only fair, thereby incurring higher repair costs than the proactive approach. In practice, the Reactive, Status quo approach usually relies on donations of materials by developer after damage has been done. In addition, where there are fees imposed, the fees are not tied directly to roadway damage. In either Reactive approach, pavement assessments of conditions and testing of life cycle costs must be conducted to develop cost data to estimate fees. Automated surveys and engineering testing is required. In Fayette County, the aim is to seek improved subgrade for roads including those without an existing base. In Karnes County, the aim is to develop a baseline assessment of conditions and develop a forecast of costs to meet requirements. The current legislation pending in Texas is Senate Bill (S.B.) 1747 which would create *County Energy Transportation Reinvestment Zones*. The approach would permit the counties to qualify for maintenance and repairs funds based on number of completed wells, weight tolerance permits, and collected taxes. Counties would need to document road deterioration and contribute up to 10% for road projects. The costs consider planning, construction, reconstruction, and maintenance of roads, bridges, and culverts to alleviate degradation caused by exploration, development, or production of oil and gas.

Question and Answers to Panelists:

Question about Texas Senate Bill (S.B.) 1747-Sassin: Where are the funds going to come from for the other 90% of the requirements?

Answer: That is the very discussion under way. The bill would establish a Transportation Infrastructure Fund (TIF) as a dedicated fund inside the Treasury outside the General Revenue Fund consisting of any federal funds received by the state deposited to the credit of the fund and any required state matching funds, money appropriated to the credit of the fund by the Legislature, interest earned on fund balances, or other revenue or returns from the investment of money in the fund.

Question about impact on Rural Planning Organizations in the Marcellus Shale region; how are the states addressing these needs given the planning requirements under MAP-21.

Answer: Leo Tidd—the state is supposed to provide the support to formulate the plans but at this stage the long-range plan is not adequate to address these needs.

Question: What are the relative benefit-cost ratios of proactive and reactive approaches?

Answer: The reactive experience is best documented by John Barton in his testimony to the Texas state legislature.

Question: How could the data could be used to actually model the requirements given the lack of records on roads described and the lack of detailed trip data.

Answer: We do have traffic count data at county level and we can trend these out using our demographic projections. We also predict routes based on probabilistic modeling and GIS modeling. There are 18,000 miles of roads represented in the state mode. There are uneven load limits among county road and these limits need to be standardized.

Question about the complexity of developing such 20 year forecasts under MAP-21 with 5 year updates given the variations by regions and the different trade-offs between transportation modes (truck to rail; truck to pipeline, etc.). Also how can we improve consideration of industry-government partnerships within such long-term planning frameworks to ensure a better match between requirements, cost-sharing and growth?

Answer: Pipeline planning is really the example or paradigm to examine because over the long-run the pipeline is more cost effective and a clear model of public-private partnership; but it is the short run planning and costs that are more difficult to estimate from the bottom up. It is more labor intensive and diffuse. Partnerships are harder to establish but the county cases do provide insights especially for proactive models.

Question about federal and state funding of transportation for shale gas development.

Answer: Federal allocation has been \$100 million and the state money comes from an extraction tax of 12% on value of production.

Question about the assumed life cycle of county roads: Is it 50 years like once assumed for agricultural commodities and rural road needs.

Answer: The general assumption is 20-30 years of pavement life, but in practice rural roads vary in quality and design—often only with a two-core surface treatment. Counties really focus on investing in production routes and main arterials. Those are more cost effective with typically 20 to 25 year life spans.

Leo Tidd: The financing and management of county roads for oil and gas development in PENDOT is often done with a system of posting and bonding; basically a system of weight permits and inspections.

A4: Airports and Air Transport: National, Regional and Local Studies of Air Transport on Economic Performance (1.5 CMs)

Moderator: Shirley Loveless, *Coleshill Associates LLC* opened the presentation by noting that the presentations cover a wide range of studies on various aspects of the airline industry. The first two papers cover airline delays and operations and the influence of airports on economic growth and metropolitan economies. Since the Airline Deregulation Act of 1978, the decision making of airlines and airports have been based on market realities. Airline strategy, including mergers, has significantly changed in an effort to rationalize routes, capture market share and minimize costs potentially impacting efficiency as well as demand both regionally and in a macroeconomic context. A second set of two papers address macroeconomic trends in the airline industry impacting efficiency and demand. One of the papers explores efficiency trends in the aviation industry by carrying out benchmarking exercises using both parametric and non-parametric approaches. A second paper isolates macroeconomic demand drivers using historical quarterly time series data.

Airport Delays and Metropolitan Economies: Are Airline Delays Good for the Service Economy?

Paulos Ashebir Lakew, *University of California–Irvine*, presented the first paper in this session, co-authored with **Volodymyr Bilotkach, *Newcastle University***. Paulos opened the presentation by pointing to linkages between airport traffic (general as well as air cargo) and urban growth and specifically the correlation to specific types of employment. He notes that airline delays are costly to the economy with delays lowering net welfare. The paper is based on quarterly panel data on airline delays, traffic levels, and employment for 40 periods from 2003 Q1-2012Q4. Both ordinary least squares and two stage least squares panel regressions with Metropolitan Statistical Analysis (MSA) fixed effects were presented, with controls for exogenous city features. The equations were developed as reduced form relations between MSA employment, inbound and outbound traffic, arrival and departure delays and city attributes with a contemporaneous relation between the dependent variables (Employment of various categories) and right hand side variables (passenger and cargo tonnage; > 15 min arrival and departure delays including cancellations). The main data sources used are the Quarterly Census of Employment and Wages (QCEW) from the Bureau of Labor Statistics at the 2-digit NAICs level and airport locational data from National Transportation Atlas Database (NTAD). The five right hand side variables are: a) if the city was a hub city b) slot controlled airports c) destination leisure cities d) proximity of the MSA to a larger MSA measured by a k-mean clustering algorithm (within 150 miles of a larger one) e) weather data from National Oceanic and Atmospheric Administration NOAA Global Historical Climatology Network (GHCN) stations f) January temperature and g) demographic variables were considered as instruments for endogeneity of traffic and delays in the two stage least squares specification.

Key Findings:

- Cross-sectional results show that the frequency and length of delays increase both total employment and service sector employment in a metro area, but impact overall and goods employment more than service sector employment.

- Cross-sectional results also show that extreme weather has a positive effect on total employment
- In the fixed effects specification after controlling for endogeneity, arrival delays and departure delays have somewhat similar effects on employment. Both tend to reduce total employment, service and goods employment.
- Extreme weather delays are observed to have a positive effect on total employment.

The results suggest that the quantitative analysis may be affected by entire metropolitan employment structure and agglomeration economies.

Airports, International Trade and Economic Development

Steven Landau, *Economic Development Research Group* presented the second paper entitled “Airports, International Trade and Economic Development”. Steven opened the presentation by pointing to two motivations or approaches for exploring the role of airports to the economy, namely:

- The influence of air service on national productivity
- Local and state policies that create smart growth districts by airports

He first spoke of the development of a quantitative model of commercial aviation in an effort to approximate productivity based on Dunn and Bradstreet Database, and regional economic data. He used data spread out over 5- year intervals covering the period 1995-2010. The analysis covered 25 domestic airports in 20 metro regions and 15 international airports. Eleven connectivity proxies were considered with three factors (and specifically the top three proxies included number of airlines, domestic non-stop departures and airline hubs served domestics).

In the first part, the analysis was carried out at the 2-digit NAIC sector level and aimed to explore the effect of the top three connectivity variables on jobs (direct, indirect and induced) and value added. In a second part of the study, he explored the role of airports as part of smart growth strategy by highlighting examples of Regional Community Strategies and Regional Transportation Plans from California as well as role of small commercial airports, relievers, and general aviation facilities. He pointed to California as an opportunity to showcase the potential of airports being integrated into regional smart growth strategies and multimodal planning. He went on to use the smart growth exercise as a way to assess the broader economic impacts of such an approach over the 2013-2040 duration. A combination of external analysis based on sectoral wage income elasticities and TREDIS model were used in the impact analysis.

Key Findings

- He found, not surprisingly, that different industries are impacted differently in terms of value added and job related effects.
- As part of the smart growth strategy efforts, he found that state and local incentives (infrastructure, business incentives, etc.) are crucial to the success of Smart Growth.

The presentation concluded by a direct reference to the audiences who could benefit from such an analysis (airport managers, economic development professionals and aviation users). He also noted

that airports need to plan for a new paradigm and that there is a need to rethink their role in regional economies.

Efficiency in the U.S. Airline Industry from 1990–2012: A Stochastic Frontier Approach

Cheryl Roberts, *Leeds University Business School, UK*, opened her paper, by discussing parametric stochastic frontier analysis (SFA) and non-parametric Data Envelopment Analysis methods both of which have been extensively used in the airline literature. Her key motivations were noted to be a) lack of explicit applications of SFA in more recent studies b) use of longer and more recent data time frames and c) the need to explore the changes in total factor productivity (TFP) while using environmental controls and other fixed effects (Sept, 2011 and resultant filing for Chapter 11 bankruptcy). Her research attempts to extend previous literature on SFA of airline cost in a number of ways:

- Utilizes a translogarithmic total cost specification with a cubic time trend, rather than the production function approach
- Extends the timeframe of analysis compared with earlier studies to cover the period 1991-2012.
- Utilizes greater number of airlines than previous studies and includes environmental and dummy variables

Key Findings

Results indicate that:

- Passenger load factors and available seat miles decrease costs
- Bankruptcy (Chapter 11) slightly decreases costs
- The transitory effect of September 11 increased costs, while the permanent effect of September 11 decreased costs

Future research aims to look at subsectors. The paper started out with SFA but ended up discussing the Translog cost function results relative to SFA. An average SFA efficiency of 93.2 over the duration was reported for all airlines over the period. The method of deriving efficiency was not discussed explicitly, but the results would suggest an increase in efficiency over the duration examined, along with a decline in composite TFP indices over the same period.

The Magnitudes of Economic and Non-economic Factors in the Demand for U.S. Domestic Air Passengers

Ju Dong Park, *North Dakota State University* presented his paper co-authored with **Won W. Koo, also from *North Dakota State University***. Ju Dong Park introduced his paper with the two motivations, a) to analyze the effects of economic and non-economic factors on air passenger miles in the entire national industry using time-series data for the period of 2000:1-2012:3 and b) to examine the impacts of variables associated with own airfare, cross-price (competitors), income, seasonality, unexpected event (September 11), and mergers. The paper analyzes the effect of both economic and non-economic factors on air passenger miles. It develops both a theoretical model of demand based on passenger utility maximization. This was subsequently used to specify an empirical model estimated using a double-logarithmic specification. Air passenger miles are used as a proxy for passenger demand and airfares based on Bureau of Transportation Statistics (BTS) data.

Additional supporting data came from several public domain data sources. A seemingly unrelated regression was used along with airline dummies. Results indicate that:

- Own-price has a negative impact on demand
- Income and seasonality (summer and fall), and whether the airline was part of merger increase demand
- The paper provides empirical evidence pointing to price competition amidst airlines.
- This research indicates that there are several factors, both economic and non-economic, that play a significant role in determining the demand for air passenger miles. The top demand drivers are found to be airfares, consumer disposable income and seasonality. Unexpected shocks were also identified to influence demand significantly.

Overall Themes and Issues

- There is a basic temporal mismatch between the airlines' business model (which tends to be short term) and that of economic developers (longer term)
- Strong interdependence between economic development and air policy; if there is more economic development; an area may need a bigger airport, which may lead to more traffic, which may lead to further development, etc.
- Exogenous events (such as September 11) have had a large impact, may also see impacts due to restructuring in certain sectors, such as manufacturing
- Several of the studies in this session incorporated longer time frames than previous work; the longer time periods of study indicate that earlier forecasts may need to be examined for accuracy in today's airline environment.

Ju Dong Park's full paper is included in the ITED 2014 Compendium of Papers..

A5. Light Rail Transit, Transit Oriented development: Value Capture and Community Development (1.5 CMs)

Moderator: John Renne, of *University of New Orleans Transportation Institute*, opened the session by noting that many communities in the US are utilizing a wide array of tools for revitalization, thus making their urban environment a more livable one. One strategy is the use of public transportation systems that increases accessibility to jobs and affordable housing. Successful public transportation services give rise to significant changes in development patterns along the system, especially around stations. These transit oriented development (TOD) patterns affect the local economic growth and can change the price of land and housing. They can also present a potential new revenue source through property value capture to support transit operations. This session will feature both academic research and practitioner perspectives on TOD.

Transit Oriented Development and Housing Price Impacts: Evidence from Beijing China

Ming Zhang, of the *University of Texas Austin*, presented a study on behalf of his colleagues, Xiangyi Meng and Lanlan Wang, both of Central University of Finance and Economics in Beijing. The study addressed the policy of Transit-oriented development (TOD) to promote the concentrated development around transit stations with high-density, mixed-use, and pedestrian-friendly environmental design; it is a widely promoted strategy for land use-transportation sustainability. The key research questions addressed in the study are: does the market appreciate with

proximity to transit? To what extent does transit affect the local property market spatially and monetarily? Answering the questions provides economic justification to TOD and helps operationalize TOD towards success. The study is designed to address the questions and contribute to the field in two ways. First, it reports evidence from China, where little is known to the outside world on the market response to transit access in China due to the major transit boom in the last two decades. Second, it examines variations in transit access premiums among bus rapid transit (BRT), light-rail transit (LRT), and metro-rail transit (MRT). The study utilizes a sample of 8,601 housing sales in Beijing and applies the hedonic price modeling method. The empirical analyses include two parts. First, it examines the spatial extent to which transit systems may or may not have an influence on home price. This is done by drawing concentric rings around transit stations and examining whether transit has an independent influence on price in the indicated location rings, while controlling for the effects of other factors. Second, it estimates housing price models for the region and for the market segments along 11 transit lines.

Results show that rail exhibits more consistent, determinate influence on housing price than bus. MRT's impacts are larger on average than LRT's. The impact zone extends to one mile from stations for MRT but to ½-mile for LRT. Homes near MRT enjoy a proximity premium of 248.31 Yuan (or US\$39.41) per square meter for every hundred meters closer to the station. For LRT, the premium is 110.71 Yuan (or US\$17.57). The market appreciates proximity to one BRT line but not to other two. The study concludes that technologies play a role. BRT seems to be more context dependent, as one line exhibited negative effects, while 2 lines exhibited positive effects. MRT results show a stronger independent effect that extends up to 1.6 km from station, with a larger property premium than LRT and BRT. Yet, the TOD context is critical to realize and maximize access benefits regardless rail or bus.

He notes that future research should examine corridor specific spatial effects and add variables on housing features and amenities.

Beating the Great Recession: A National Analysis of Home Values in TODs from 1996 – 2012

John Renne, of the *University of New Orleans*, first presented a literature review on emerging trends in the real estate market showed that since 2004 Transit Oriented Development (TOD) has been rated as one of the best investments in real estate. He presents a summary of findings from a meta-analysis of residential and commercial property value impacts. There are synergetic benefits when walkability investments to rail station are analyzed.

Renne presented a TOD Index® - A new tool for measuring TOD price performance. The index has national coverage with reliable data on over 2,000 fixed transit precincts with monthly data on average home sales per square feet back to 1996. The index compares TODs, Hybrids and Transit Adjacent Developments (TADs) and includes a total of 2,033 station areas in database across 20+ metropolitan areas in USA. The index methodology involves the following components. First, it includes a rail station location data from the National TOD Database. It is merged with Zillow Real Estate Research data at the zip code level. He develops a typology to identify TODs, Hybrids and TADs across all stations in the United States. He notes that the zip code is the lowest unit of geography available to study at this time, but still worthwhile in discriminating between home values across station typologies.

Renne and Ewing developed a typology as measured by a ½ mile from the station to identify the type as TOD, Hybrid or Transit Adjacent Development (TAD).

This study utilizes a minimum benchmark definition of TOD that accounts for density, land use diversity and walkable design. All stations were categorized on a TAD – TOD spectrum based on the following point-based system:

- Greater than 30 jobs or residents per gross acre = 1 point
- Not having 100% of land uses as either residential or commercial = 1 point
- Average block size less than 6.5 acres = 1 point

Each station was assigned a score from 0 – 3 points and then categorized as follows:

- TAD = 0 or 1 points
- Hybrid = 2 point
- TOD = 3 points

Of the, 4,399 stations in the database in 2010, 32% were TADs, 31% were Hybrids and 37% were classified as TODs.

The report goes on to show how each typology performs with respect to travel, vehicle ownership, economic indicators, and built environment indicators. Here is a summary of the key findings:

- TODs had approximately 3.5 times greater share of transit, walking and bicycle commuting (see chart below)
- TODs had half the level of vehicle ownership
- Households in TODs spent a smaller share of their income on housing and transportation costs. Despite TOD households having a median income of approximately \$17,000 less than TAD households in 2010, the median household in a TOD had similar levels of income left compared to TAD households after accounting for housing and transportation expenditures
- Nearly three-quarters of TOD households are renters as compared to less than half of TAD households

TODs are defined by being denser, mixed-use and walkable with following built environment factors:

- TODs are eight times denser than TADs.
- TODs are more mixed use, with a greater share of jobs in the health care, entertainment and service sectors.
- As compared to TODs, TADs are nearly 4 times further away from CBDs.
- TODs are more walkable, measured by average block size, percent four-way intersections and intersection density.

The study examined the effect of land values in TOD, Hybrids and TADs. He finds that TODs have outperformed TADs by 112 points over the period. The data shows that TODs are correlated with higher levels of sustainable travel and more money for household purchases after housing and transportation costs. Now the data shows that it makes sense for home owners to buy in TODs as land values appreciate faster over time. Even though TOD is beating the market, especially post-

recession, we won't see large-scale implementation of TOD across the US unless we can find new investment vehicles to allow such development to occur.

The Effect of Light Rail Transit on Employment: Evidences from a Longitudinal Quasi-Experimental Design

Wei Li, presented on behalf of his coauthors, **Joe Mendez and Qiuyue Zhu**, *Texas A& M University*. The study examines the benefits of public transit which have been generally found to be beneficial as a crucial travel mode in the largest and densest cities which provides the most service at peak travel times in the most congested travel corridors, and produces environmental advantages and mobility for the disadvantaged. In addition, the policy objectives of public transit benefits have consistently highlighted improved access to jobs as the authors note in the successive transportation bills from ISTEA in 1991 to SAFETEA-LU in 2005.

However the empirical evidence is not consistent in documenting these benefits, so the study focuses on the question of the transit benefits of job growth. Several studies highlight the differences in the empirical findings:

- Weak relationship between access to jobs and employment participation (Thompson et al. 1997)
- Six metropolitan areas: Transit accessibility played no significant role in explaining the employment status of TANF recipients. (Sanchez et al. 2004)
- Boston, MA: Job access had no statistically significant effects on the labor participation (Cooke, 1996)
- Portland, OR: No causal relationship between increased access to public transit and increased labor participation. (Sanchez, 1999).
- Chicago, IL: Suggested that unemployment rates were similar among African Americans, regardless of job accessibility from their residences (Ellwood et al. 1986)

To address these inconsistencies, the study focuses on the Dallas light rail system (61 stations with 85 miles) to investigate the effect of light rail transit on local employment. The key research question: does employment density near light rail transit stations grow faster than the area further away? In addition, does the effect of light rail transit on local employment vary by earning levels and industry types?

The authors rely on propensity scoring to evaluate the differences of the treatment group and the control. The selection of the treatment group was based on Census block groups in proximity to transit measured as 1/4 mile from light rail station from planned and previously opened stations. The selection of the control group was based on a full matching propensity score method derived from employment characteristics such as labor force participation rates by age, demographic characteristics [population, per capita income, educational attainment, and vacancy rates], distance from future and previously opened stations distance from highway on/off ramp.

The propensity scores are calculated to identify an appropriate control group which is determined through a logistic regression. Determining the average treatment effect on the treated group involves estimating the difference between the mean outcomes of the treated census block groups with the

mean outcome of the matched control census block groups. This difference in means acts as an unbiased estimate of the treatment effect on each outcome.

Employment variables include total employment density which is measured by earnings \$1,250 a month for low-income residents; \$1,250 to \$3,333 a month for median income residents, and; above \$3,333 a month for high income residents. In addition, the model estimates employment density by industry, including retail, accommodation and food services, other services sectors opportunities for low-income employees and opportunities for high-income residents in information, finance, technology, and management sectors.

The findings from the Dallas pilot study are inconclusive regarding the effects of light rail transit on employment but provide useful guidance for future research. Key research topics to explore are as follows: Are areas near stations are more resilient to economic recession? Is overall job growth and low-medium earnings job growth in near station areas are truly faster than the rest of city? Are the small Mama-Papa shops near LRT stations hiring champions? How many years before it is possible to detect significant employment benefits of LRT? Future research might carry out more city-based case studies, and perhaps carry out analyses on restricted access employment data.

DART's Role in Transit-Oriented Development

Jack Wierzenski, of the *Dallas Area Rapid Transit*, presented an overview of several specific projects within the metro area and a 700 square mile area encompassing 13 member cities: Plano, Richardson, Rowlett, Garland, University Park, Highland Park, Dallas, Glen Heights, Cockrell Hill, Irving, Farmers Branch, Addison and Carrollton.

The presentation began with detailing DART's role in TOD by leading the way in early stages of LRT planning to incorporate TOD objectives into station area planning of transit, land use, pedestrians, and cars usage. DART was able to leverage its' real property assets to develop future revenue streams with TOD. It directed and concentrated TOD and urban infill around transit facilities to develop new ridership enhance value and maximize function of transit facilities. In addition, it identified potential funding sources for added amenities through TIFs, PIDs, bond projects, and grants.

At the center of the effort is a light rail system expansion with 64+ stations planned through 2018 involving the Rowlett Corridor (2012); the Southeast corridor (2009-2010); the South Oak Cliff Extension (2016); the 2nd Downtown alignment (TBD); Irving/DFW corridor (2011-2014) and the Northwest corridor (2010). Currently the multimodal DART system is comprised of 87 miles of light rail, 61 stations, 130 bus routes, 35 miles of commuter rail, and paratransit and rideshare and ITS. Within the urban Dallas center city, a 1.6 miles streetcar is planned. Further there is a currently bicycle and car sharing programs in place.

DART is involved with economic development with the objective to build and operate a safe, efficient and effective transportation system that, within the DART Service Area, provides mobility, improves the quality of life, and stimulates economic development. The total value of existing and planned construction is \$5.4 billion. It is estimated by UNT center for economic development research that DART has stimulated growth in property value of nearly \$1 billion over the 1993 through 2013 period.

Millennials constitute the largest share of the population growth associated with build out. Another demographic group that DART is considering its planning efforts is its impact on the aging population. Americans are living longer, but are they driving longer? How can we best extend the time span of independent mobility? Trends indicate that there are more women than men. There is the phenomenon of empty-nesters downsizing who want the flexibility to not drive later – with available income/savings. Furthermore, safety and security are likely to be a significant determinant in housing and shopping choices. One of DCTA's best ridership days in 2013 was on the Senior Citizen Days at the State Fair – They appear to be “voting with their feet” for Transit. For this group, accessibility and elevators become selling points.

Key TOD planning principles are greater density than community average, reduced parking including converting surface parking to structured parking; developing a quality pedestrian environment with a mix of uses, a defined center with transit integrated with TOD. This has evolved into a focus on smaller office and retail space near transit, with retail leveraging internet sales to reduce inventory requirements while maximizing returns on the retail experience. In residential development, homeownership is declining and apartment living is on the rise.

The key development players are the Transit Authority, the city and the developers. At the center of this initiative are member Cities and their partnership with DART to attract economic development by planning for TOD. The key is to establish relationship to promote development, maintain communication and coordinate land use goals with transportation goals. This involves zoning/development approvals, funding TIF Districts, PID and securing grants from COGs STEP, CMAQ, and EPA. Obviously the developers seek to make a profit. They help refine the vision of destination developments, coordinate investments and utilize DART assets to create new revenue streams.

Question & Answer Session Raised Issues for Further Research

- Government plans for encouraging value capture to fund diversified transit system in both China and the US case studies.
- More research on data needs to improve analysis of TOD effects.
- Research on the economic impact of walkability.

Poster Session and Pre-Conference Networking Reception (1.5 CMs)

The Federal Reserve Bank of Dallas hosted a reception for participants at their Dallas headquarters. After welcoming comments from Keith Phillips of the Federal Reserve Bank and Greg Bischak, Conference Co-chair, the participants were invited to enjoy the refreshments and take in seven research projects presented in the form of posters.

A summary of the presentations follows.

Visualization of Freight Data: An Applied Approach to Disaggregation and Dynamic Display of Commodity Flow Based on County-to-County Trade Data and National Level Freight Data.

Stephen Fitzroy, EDR Group

Stephen Fitzroy's presentation focused on a process for obtaining and integrating freight data from various sources and, using a software tool called vFreight, which arranged and presented the data using a variety of visual mapping formats. The data disaggregation is available down to the county level.

High Speed Rail and Area Economic Development: International Experience with HSR Supportive Strategies

Naomi Stein, EDR Group

High Speed Rail transportation is growing worldwide with the recognition that it has the potential to create significant levels of economic development. However, in many cases the success of HSR requires additional policies and activities to sustain that economic development. Ms. Stein's presentation described potential activities that would support HSR such as improved management strategies and an improved understanding of the wider economic benefits of transportation.

High Speed Rail in Appalachia 2050

Shailesh Chandra, Sharada Vadali, Texas A&M Transportation Institute

This research examines potential increases in industry-specific 'attractiveness' due to changes in transportation network improvements resulting from new highway construction and the proposed America 2050 High-Speed Rail (HSR) plan for the Piedmont Atlantic Megaregion portion of the Appalachian region. The proposed HSR would connect Atlanta with Charlotte North Carolina. Attraction impacts are examined for six industry sectors including, manufacturing, retail, construction, mining, quarrying, oil and gas extraction, health care services, and all other remaining industries combined. *This paper is included in the compendium of papers.* The paper aims to showcase the potential to connect workforce and communities in various sectors to opportunities assuming last mile connectivity issues can be resolved. The paper's focus is not on the cost side.

Impact of Highway Investment on the Economy and Employment Across U.S. Industrial Sectors: A Simultaneous Equations Analysis at the Metropolitan Level

Eirini Kastrouni, Xiang He, and Lei Zhang, University of Maryland

The approach to this study was to examine the impact of highway investment on the economy using a structural equation model. This considered the endogeneity of transportation investment and travel demand. Further the researchers used physical measurements of investment rather than financial measurement. Conducted at the metropolitan level, the analysis used vehicle-miles-of-travel as a measure of highway capacity as well as various measurements of employment, population, population density, adult population, gross regional product and other economic measures for 351 MSAs in the country from 1980-2008. Twelve industrial sectors were reported. The conclusions were: the direct impact of highway investment on economic growth and job creation is very small; highway investment makes most of its contribution to the economy and employment through promoting travel demand; in the long run, doubling highway capacity would produce an additional \$3.5 trillion of GDP for the U.S and would create around 15 to 17 million jobs; and the impact of highway investment on employment varies across industrial sectors.

Assessing the Economic Implications of Maintaining the Texas Portion of the Gulf Intracoastal Waterway (GIWW) at Authorized Dimensions and Improving Locks and Floodgates

Nicholas Norboge, Texas A&M Transportation Institute

The primary goal of the paper was to assess the economic implications of maintaining the Texas portion of the GIWW to its authorized dimensions of 12 ft. in depth by 125 ft. in width and strategic improvements in lock and floodgate infrastructure in high bottleneck areas. The analysis was not shown but the results showed that the average annual cost of dredging is \$21.2 million. This cost would be offset by allowing the increase in operating costs of \$58.7 million to be avoided. The ratio of cost avoided to cost of dredging would be 2:8. The avoidance of \$58.7 million in operating costs results in estimated economic impacts of 119 jobs and \$27.8 million in economic activity. Further, by maintaining the floodgates in the Brazos River, extra costs from delays to barge traffic could be avoided. An additional \$2.6 million in net positive economic activity could be realized if the need to break barge tows is avoided.

TPICS/SHRP2 – C11 Tools

Glen Weisbrod and Steve Fitzroy, EDR Group

The Strategic Highway Research Program has sponsored two projects in recent years that have developed concepts and tools for researchers and planners to enable them to assess the economic impact of proposed improvements to the highway system. The Transportation Project Impact Case Studies (T-PICS) is a database of 100 implemented projects along with an estimate of their economic impact. These impacts can then be compared to similar projects under consideration for implementation. The second phase of this project involves an assessment of the wider economic impacts of projects. Using three spreadsheet tools planners can assess the travel time reliability, market access and modal connectivity of proposed projects. An accounting system has also been developed to convert the changes to these data into economic benefits and data.

The Economic Evaluation Paradox

Todd Litman, Victoria Transport Policy Institute

This paper explores a paradox: negative correlations between indicators of mobility (such as VMT) and productivity (such as GDP), and positive correlations between mobility constraints (higher road use prices or traffic congestion) and productivity. These relationships contradict common assumptions that policies and projects that increase vehicle travel (roadway expansions and lower road user prices) increase productivity and support economic development. This paradox can be explained by the following: First, motor vehicle travel is just one of many factors affecting overall accessibility, and planning decisions often involve trade-offs between mobility and other accessibility factors such as the quality of other modes and land use accessibility. Second, many policies that increase mobility violate efficient market principles, which tends to reduce productivity. Third, motor vehicle travel is resource intensive, so increases in such travel increase various costs, including costs borne by industry. Fourth, increased vehicle travel increases the portion of household budgets devoted to vehicles and fuel, expenditures that generate low regional employment and business activity. This paper examines these issues, describes empirical evidence of these impacts, and discusses their implications.

B1: Impacts of New Financing and Pricing Strategies on Economic Development Moderator (1.5 CMs)

Rabinder Bains, *Federal Highway Administration* opened the presentations in this group by noting that the need to address the issue of alternative finance from different perspectives and examine both the resulting economic impact and the impact on mode choice. The common understanding in the transportation community is that it is almost impossible to raise gas taxes and, therefore, there is a need for alternative financing strategies. However, the choices made may influence planning and development through behavioral impacts on infrastructure users. The first paper explores the intriguing scenario of what travel choices would people make if they only considered market principles and actual travel cost based pricing. The latter two presenters explore various alternative financing strategies and their impacts from micro- and macro-economic perspectives using a case study approach and regional impact assessments.

Economically Optimal Transport Prices and Markets: What Would Happen if Rational Policies Prevailed?

Todd Litman, *Victoria Transport Policy Institute*, presented the first paper of this session. He opens his paper by discussions on market distortions, which lead to suboptimal decisions. Free roads, free parking are all distortions. In this paper, he questions the current premises for planning decisions. The fundamental goal in this paper is to discuss mobility versus access considerations in transportation planning. He notes that planning distortions tend to favor mobility rather than accessibility, and automobiles rather than other modes. Based on consumer sovereignty, he presents the notion of “neutral and responsive planning” that could be driven by comprehensive analysis, unbiased decision making and accessibility between modes and locations.

Analysis and Findings: A major consequence of such distortions he notes is the current project evaluation and impact analysis framework where the evaluation is based on speed (time savings factors) and is more heavily weighed by these factors in relation to costs of or impacts from related linked decisions (like demand for other modes, and impacts occurring somewhere else rather than to the users). A second consequence he notes is the allocation of space to road use and parking, which are not developed for shared use and underfunded alternate modes of transportation. The third consequence is the preponderance of a “self-fulfilling prophecy” where demand for roads and alternate modes is modeled in the absence of priced roadways which lead to distortionary development patterns. As solutions, he promotes in his paper the notion of least cost planning (i.e. implement the most cost effective solution including demand management strategies and alternative modes) as the way forward in decisions involving multiple modes and that projects and modes should be evaluated based on access rather than mobility. In another section, he discusses a related question- i.e., whether road use is efficiently priced following standard neoclassical principles of short run and/or long run cost pricing and the manifestations of price distortions. Based on this analysis, he suggests “appropriate” pricing and suggested values for seven categories of pricing distortions namely congestion, roadway costs, accident costs or risk, parking costs, pollution/emissions, fuel externalities and finally general taxes. He goes on to provide a back-of-the-envelope type assessment of travel impacts (or behavioral reductions in vehicle travel) of these pricing options using elasticities for a variety of scenarios.

Conclusions: He concludes the paper by noting that current levels of mobility are economically

suboptimal. He goes on to note using his scenario analysis that while individual effects of distortions on travel may seem low, the effects are cumulative and synergistic. He uses this analysis to emphasize more neutral and responsive planning and also pricing. *Mr. Litman's paper is included in the compendium of papers.*

Transportation as an Economic Investment: A Case Study of a New Corridor in Des Moines, Iowa, with Financing Options in a Dynamic Regional Economic Model

Fred Treyz of **REMI Inc.** presented his paper, which was co-authored with **Scott Nystrom** also of **REMI Inc.** Fred Treyz pointed out to theoretical developments in the land use components of the REMI Transight Model that is among the commercial models used in U.S. for dynamic regional modeling and simulation of transportation investments. He notes that commuting sub-regional fixed shares in the current versions of the model will need to be changed from their defaults drawn from the Bureau of Census's Journey-to-Work data files since there may be sub-regional biases in travel patterns. He uses this paper to present a new methodology for modeling residence adjustments allowing commuting shares to adjust endogenously to economic conditions so that simulations may more accurately reflect existing location and commute choices while at the same time allowing for policy sensitive analysis in relation to transportation and taxes.

In their modifications, commuting shares from region (k) to region (l) are made endogenous to the model by allowing labor participation rates to adjust to changes in commute distance (D) within certain decay effects and responsiveness of housing costs. The linkages suggested are contemporaneous. Second, the dynamic average commute totals are also approximated based on an estimate of average income per commuter estimated as a function of available or effective employment, total compensation less compensation to federal military labor force, employee and self-employed and employer contributions for government social insurance. These equations formulate the key basis for the determining gross inflows into a region and outflows from a region.

The methodology is applied to a case study in the New York –New Jersey metro area and counties in Connecticut based on an 8-region Transight model to model the impact of Metro-North Railroad and explore the effect of a variety of capacity scenarios for the line linking New York and Connecticut. Total employment, gross regional product effects are modeled for several counties.

Conclusions: The authors close the presentation by discussing the broader implications of the model adjustments first in the context of fiscal policy for addressing income leakages and assessing the strength of border effects (regional and state borders). Next, they discuss the broader transportation planning and policy aspects of it by noting that potential to use it in forecasting sub-regional flows and evaluation of labor mobility based on transport costs and housing choices. The paper has direct implications for transport policy and commuting linkages. The paper by Fred Treyz and Scott Nystrom is included in the compendium of paper.

I-95 in NC - Quantifying the Economic Tradeoffs of Investing and Alternative Funding Strategies.

Paula Dowell, **Cambridge Systematics Inc.** opened the presentation by discussing the I-95 corridor in North Carolina. She noted that I-95 is 182 miles long and is nearing the end of its engineering life and is need of modernization. North Carolina Department of Transportation

(NCDOT) was instructed to conduct an economic analysis of tolling as part of FHWA pilot studies to toll the existing interstate. Her study forms the basis of analysis submitted to the North Carolina legislature for NCDOT. The study compared the economic impacts of three proposed alternatives namely Business-as-Usual (BAU), funding improvements by tolling and funding improvements by other funding methods spread out over five scenarios:

- A. Business as usual (BAU)
- B. No specified funding
- C. Funding via tolls
- D. Funding via tolls with mitigation
- E. Funding via alternative mechanisms

Paula drew attention to the three key elements of the study namely a) stakeholder engagement b) impact analysis of variety of affected communities, shippers and users, and c) screening and analysis of funding options. She presented the stakeholder involvement process at length which spanned seven categories of affected community and included shippers, the trucking industry, economic developers, tourism stakeholders, general public, agriculture businesses and roadway contractors who were all part of focus groups.

User impacts include travel time costs, buffer time costs (impact on truck turns and increase in total trip time) and accident/crash delay costs. Buffer time impacts were only evaluated for the BAU –no build scenario. Crash costs were approximated using INRIX 2012 data merged with NCDOT crash data. Non-user impacts (businesses depending on I-95, retail, hospitality, tourism) like lost sales due to diversion, loss due to higher transportation costs due to time and/or mileage, loss due to loss of drop-ins business along the corridor were also examined.

Conclusions The economic cost of the BAU was determined as a \$67 billion dollars over the 2014-2015 period. Of all the scenarios examined, the no funding alternative BAU pointed to a situation where they were not significantly better or worse based on total economic impacts and all funding options lead to increased economic impacts.

Research Issues

The sessions point to varied implications of alternative funding strategies that could be the subject of extensive future research agenda. These issues range from evaluation methods that are multimodal, to policy assessment and simulations of behavioral and economic impacts of alternative funding mechanisms. Few tools have the capability of addressing these endogenously as noted by Fred's presentation. At the same time, it is important to understand the economic implications and impacts of alternative funding scenarios, and mechanisms. It is unlikely that tolls can be considered on the same footing as other types of charges and fees. Hence modal choice and financial funding policy sensitivity in relation to behavior, macro and regional economic modeling of flows remains a vital area for research going forward.

B2 China Special Session (1.5 CMs)

Moderator: Jason Wang of *Appalachian Regional Commission*, opened the session with general introductions of the four speakers, two of whom represent the Chinese government. He stressed the importance of the need for infrastructure investment in the US. He cited the level of

investments made in China as an example of what is being done in other countries to support economic growth. He expressed his appreciation to the guest speakers, especially those who journeyed all the way from China to be involved in the conference.

Urban Growth and Transportation Development Patterns for China's Urban Transition

Dr. Qisheng Pan, of *Texas Southern University* opened his presentation by noting that the paper focused on the rapid urbanization of China's cities and the problems arising from this phenomenon. China's urban areas may have about 70 percent of total population in the next 20 years. He described major increases in auto ownership that have caused a transition away from a non-motorized, transit oriented city. Chinese cities have different growth and transportation patterns due to a unique cultural history, geographic characteristics and to a different governance system. Dr. Pan focused on suburban growth patterns of Beijing and Shanghai. In Beijing from 1990 to 2010 the central district population density decreased by about 7.3 percent as the density of the suburban areas significantly increased by as much as 139 percent. A similar pattern is seen in Shanghai, although the increase in suburban density is not as great. He emphasized there is a strong correlation between population and auto mode share, such that as the population has grown so has ownership. There is also a strong relationship between income and auto ownership; as income increases so does the desire to travel using autos. He added that the increase in roadway capacity has not kept up with increases in auto ownership causing increases in congestion. In closing, Dr. Pan emphasized the increase in auto ownership that comes with increased income. The auto mode expands choices for residential location and trip making. However, China sees the need for addressing the externalities caused by the shift in mode share to the auto, and is looking for market and regulatory strategies to solve these issues.

Port Economic Development in China

Dr. Xu Ping, *China Academy of Transport Sciences, Ministry of Transport*, noted that his presentation focused on the development of Chinese ports as the Chinese economy has grown over the years. China's share of GDP from foreign trade significantly increased from 38.5 percent in 2001 to 47 percent in 2013. Port development followed with cargo handling capacities of 10.8 billion tons and container handling capacities of 177.5 million TEUs. Ms. Ping cited additional statistics showing the growth of cargo handling and container handling, although the growth rate has slowed over the last few years. Chinese dependency on foreign trade continues to grow although the growth rate has slowed. Future port development will be more sophisticated with additional training of port professionals, deep-water port construction technology, modernizing container transport operations, new information technology and modern loading and unloading technology.

Fiscal Policy and its Economic Effect on Sustainable Transport Development in China

Dr. Yulin Jiang, *China Academy of Transport Sciences, Ministry of Transport*, presented on the topic of the relationship between China's fiscal policy and sustainability. Dr. Jiang began with an overview of the challenges facing China today, including rapid and massive urbanization of its population and significant increases in auto ownership, both leading to major environmental problems. China has begun to address these issues through policies described in the National Transit Priority Development Strategy which seeks to enhance transit services and encourage a larger share of the population to begin using the service. Public transit is significantly subsidized from a national vehicle tax established by China's central government as well as a national tax on fuel. In 2012 the

national government contributed 65 billion Yuan. She went on to describe the scale of transit service in the cities of Beijing, Shanghai, Guangzhou and Shenzhen, with all experiencing increases in urban rail and bus systems and in ridership. However, public transit companies are running deficits in their operations, which are subsequently subsidized. The subsidy ranges from 10 percent of operations costs to 16 percent. The national government has instituted taxation reforms that may deprive local governments of needed revenue and subsequently may have a negative impact on transit agencies. Financial support of public transportation thus has been downgraded as a national priority. Dr. Jiang emphasized that issues surrounding congestion, air pollution from mobile sources, and national priorities for funding capital improvement should be addressed through future policy studies. The central government should make public transport a national priority and allow local governments to make public transport a priority by allowing local taxes to be raised. New funding sources could include congestion fees, a vehicle purchase tax, parking fees and revenues from land sales. She added that pricing of transport should also be examined as part of policy development.

Economic Impacts of High Speed Rail Development in China

Ming Zhang, of the *University of Texas, Austin* presented on the economics of high speed rail (HSR) development in China. He began by pointing out that the presentation content is a mixture of academic work and government and private sector data and information. He proceeded to describe the background of high speed rail services in China, including a comparison with HSR speeds in the US and a map of the service area. Speeds in China are much higher than US. There are 6,500 miles of HSR in China as of 2012, resulting from an investment of \$200 billion, at least in 2010 and 2011. He also emphasized that because of this investment, HSR provides a significant time savings over conventional rail services. A forecasted change in service sector demand in 2020 was used to measure the economic impact of HSR at the national level. Dr. Zhang then moved on to an analysis of the impact at the regional level, focusing on the Wuhan region. The analysis showed reductions ranging from 50 to 79 percent in GDP weighted travel time from surrounding cities to Wuhan. A Morgan Stanley study of the impact on tourism showed significant gains to the service sector in areas such as hotels, restaurants, theme parks and real estate. This study for example, showed a strong positive correlation between fast food establishments around rail stations with rail passenger traffic. There was also a strong positive correlation of passenger traffic with soft drink sales.

A question was presented to the panel on the topic of a national long range urban development plan that intends to shift population and development from inland areas to coastal cities. What is the relationship between this plan and transportation policies on HSR (and other transport infrastructure)? Dr. Zhang commented that there is intent for the development of the transport system to support the urbanization of the coastal cities. He also commented that the plan is not a formally adopted strategy. However, there are policies that indicate which urban areas are intended to be connected via HSR, as well as other urban areas that should be connected by highways.

B3: Land Ports, North American Trade and Transportation and Cross Border Trade (1.5 CMs)

Moderator: Sharada Vadali, *Texas A&M Transportation Institute*, opened the session by pointing to recent trade trends and noting that the movement of people and goods across international borders is critical for global trade and commerce- a trend that is only likely to increase. She noted that cross-border transportation is important within the context of NAFTA and bi-lateral

trade with Canada and Mexico. For example, the \$506.6 billion of bilateral US/Mexico annual trade contributes significantly to the economies of both countries therefore bottlenecks are extremely problematic to host economies, shippers and freight movement. The four presentations in this session explored various aspects of impediments to efficient logistics in US cross border trade. They bring very diverse, state of the art thinking, modeling and applications to address three inter-linked elements of cross-border commerce a) total logistic costs of cross border frictions b) economic effects of wait times and associated impact of specific strategies adopted to combat wait time and c) solutions adopted to address wait time and role of technology to expedite the process, and enable the economic development of host regions.

Competitiveness and Macroeconomic Impacts of Reduced Wait Times at U.S. Land Freight Border Crossings

Misak Avetisyan, Texas Tech University and **Bryan Roberts, Econometrica, Inc.** opened their joint presentation on “Competitiveness and Macroeconomic Impacts of Reduced Wait Times at U.S. Land Freight Border Crossings” co-authored with **Nathaniel Heatwole** and **Adam Rose, of Sol Price School of Public Policy-University of Southern California.** The authors point to the lack of information or impacts on administrative costs like those pertaining to health, processing and security administration. Their presentation estimated the improvements of wait times at the border and economic impact of additional custom inspectors for 12 border ports across the country in terms of gross domestic product (GDP), non-market opportunity costs, and employment effects. Their analysis relied on Custom and Border Protection (CBP) wait time data, truck transportation costs, the General Trade Analysis Project (GTAP) database and other transport data. Using queuing models, they develop elasticities linking the relation between truck wait times and staffing (or how does wait time respond to the addition or reduction of an officer). These relations are vital in the determination of impacts associated with policies. Using that information, they determine the effect on the change in truck transport costs per one customs officer at FY2012 volume levels for all 12 ports.

The transport costs changes are key inputs to a GTAP macro-computable general equilibrium model for modeling cost reduction shock scenarios. A modal substitution version of GTAP developed by the first author in conjunction with Hertel is used to simulate the broader effects of the transport cost reduction changes. A constant elasticity of substitution (CES) function elasticity of substitution parameter ranging between 0.9 -2.8 is used for the analysis.

Key Findings:

They simulate the economic effects of an increase in staffing at the border ports by simulating the effect on costs and broader effects and report the following key findings:

- 1 CBP Officer reduces transport costs by 0.25%
- GDP increases in the U.S. and Canada, while it declines in Mexico and Rest of the World.
- U.S. GDP increases because imported intermediate goods are cheaper => lowers price of U.S. exports

The simulations on potential modal shifts suggest slight increase in truck transportation or shift from rail to truck (for reduction in transport costs by truck) for movements from Canada to US. In all other cases, they find a substitution away from air cargo movements and rail and leading to increased use of truck-based land movements. The analysis presents a combination of analytical

methods comprising of operations research, econometric analysis and macroeconomic simulation modeling to simulate the effects.

Future Research:

Models can be a basis for future analysis of optimal staffing deployment and other policy options to improve logistical efficiency at border ports. The models can also be used to aid investments in personnel, infrastructure & technology as noted by authors. Finally, the use of such approaches can be investigated to study the impacts on risks & law enforcement outcomes.

Measuring Logistics Performance in Intermodal Transportation: An Integrated Decision Analysis Framework

Miguel Gaston Cedillo-Campos, *Mexican Institute of Transportation* presented, “Measuring Logistics Performance in Intermodal Transportation: An Integrated Decision Analysis Framework”, co-authored with **Carlos Daniel Martner Peyrelongue** and **Giovanni Lizarraga-Lizarraga**, *Universidad Autonoma de Nuevo Leon*. The author presented a novel spreadsheet based approach to help small, medium enterprises (SMEs) in emerging markets like Mexico engaged in intermodal transportation improve their logistical efficiency in the context of NAFTA trade. The paper is motivated in the context of reverse globalization trends. It uses an integrated decision analysis framework to modeling the impact of specific improvements on logistics performance which is defined to include time, cost, and reliability of lead times. This framework is used to compare different intermodal freight corridors when an SME is selecting the best path/route to transport their products and also to evaluate the effect of specific improvements on logistical efficiency at SME's. He motivated the concept in the context of logistics hinterlands in Mexico and the context of automotive supply chains by showcasing the location of top automotive manufacturing plants in Mexico (which represents approximately 20% of manufacturing GDP in Mexico). He also pointed out to the trade with Mexico as important because of shortest international transit times (4 days relative 12 days or more with European nations).

The intermodal movement is presented in the context of global chains as the interconnectedness between two vital logistics hubs which may or may not be necessarily be located in the same country. The intermodal move between two zones and its associated cost is (L_i) is then modeled using key performance indices (KPIs) and total cost function comprising of five distinct cost elements (design, management, use, operational and random risk). Transport infrastructure and transport chain related elements are considered as part of operational costs. Operational costs in turn are modeled as function of volume, distance – how far the flows have to travel from hinterlands, average loading and unloading costs and safety stocks. The logistics costs are vital in determining optimal paths. They go on to note that variability is very important for introducing process efficiency in the supply chain which is even more vital for supply chain clusters. The cost-optimized paths are applied using a numerical example.

Key Findings and Future Research

This paper provides a novel approach for path optimization for SME's in emerging markets like Mexico where path costs are defined based on a comprehensive cost indicator that is sensitive to the needs of intermodal moves and risk and variability in supply chains of key global value chains like automotive manufacturing. The authors close the presentation by noting that supply chain visibility is vital and the future research suggested includes:

- Designing a social networking service among export-oriented companies which, for example, share interests, activities or backgrounds to improve trust.
- Developing a risk self -assessment tool for SME which could take into account risk costs;
- Promoting the supply-chain cluster concept and consolidation along the chain to companies.

International Cross-Border Trade and Performance Measures for Reliable Supply Chains

Esther Hitzfelder, *Texas Department of Transportation*, International Cross-Border Trade and Performance Measures for Reliable Supply Chains”. She opened her presentation by discussing trade trends, the extent of trade dependence between Mexico and US and the jobs supported in US states on account of trade with Mexico. She spoke of the interdependence of trade in the context of automotive manufacturing, aerospace and energy sector and Eagle Ford Shale play. In the light of these trends, she emphasized the need for performance and measurement system aimed at reducing logistical inefficiencies. She goes on to describe the Border Crossing Information System (BCIS) that measures wait times at the 10 border ports to develop performance measures.

Linking Economic Development to Secure Border Trade

Scott Brosi, *Transcore*, Linking Economic Development to Secure Border Trade. Scott Brosi presented the case of the Paso del Norte Secure Border Trade (SBT) a public-private partnership demonstration, which uses sensors, cameras, and GPS and biometric scans on trucks used by maquiladoras in cross border trade. He notes that this initiative serves as a template for integrating enhanced security of cross border shipments with improved international supply chain efficiencies with very significant spillovers to and opportunities for economic development. The SBT project is presented as a unique public-private partnership where several manufacturing facilities, trucking companies and distribution centers on both sides of the border came together to make this project a success. Over the 30 months of installation, up to 40 min of crossing time reductions per trip were reported.

Key Findings and Conclusions: Before the improvements some of movements could go as long as 70 min with benefits accruing to carriers and shippers (manufacturers). The other benefits noted are dramatic reduction of all wait times, and economic benefits that could well exceed \$ 6 billion. They also note that this could double the participation in C-TPAT/NEEC, Trusted Trade Programs and could be major economic development stimulation for border communities. Finally, they also report on reductions in air pollution emissions. The conclusion of the demonstration was that the SBT and associated initiatives provide for sustainable integration of homeland security and supply chain efficiencies providing for very significant economic development and increased global competitiveness. It showed that there can be significant benefits from the use of technology and data in the border crossing.

Future Research from this Session:

A common theme running through the presentations is that increased collection, analysis, and utilization of data can have a significant impact on cross border trade efficiency. The models conclude that the reduced transportation costs as a result of the decreased wait times benefits both trading partners and has an impact on other transportation modes e.g., air cargo. Some of the suggestions for future research include:

- Economic impact analysis of changes in border infrastructure
- Risk analysis studies related to the effect of lower wait times on security
- Least cost paths for intermodal flows connecting production-consumption regions.
- Development of an economic simulation model that CBP can use to analyze policy scenarios involving changes in staffing levels, traffic levels, etc.
- Trend analysis on data from BCIS
- Impact of staffing, infrastructure and bridge capacity, primary and secondary inspection facility capacity, and hours of operation on wait times.
- Designing a social networking service among export-oriented companies which, for example, share interests, activities or backgrounds to improve trust and potentially establish a “NAFTA Security Certification” in collaboration with programs as C-TPAT, and other programs.
- Developing a risk self-assessment tool for SME which could take into account risk costs;
- Providing insights about the advantages as a result of consolidation of supply chains along the National System of Logistics Platforms in Mexico.

B4: Public Transportation, Clusters and Economic Development (1.5 CMS)

Moderator: Darnell Grisby, *American Public Transportation Association*, opened the session with introductory comments about the session. He also mentioned that the American Public Transportation Association (APTA) has completed a number of relevant studies recently including “The Role of Transit in Support of High Growth Business Clusters in the US”, “Millennials & Mobility: Understanding the Millennial Mindset”, “The New Real Estate Mantra”, and “A New Partnership: Rail Transit and Convention Growth”. It was found that about 1/3 of people prefer real estate located in “walkable” communities, 1/3 of people are auto centric and 1/3 are agnostic (could do either) but only about 10% of market is currently walkable.

He pointed that the papers in the session explore the different facets of the impact of public transportation systems on economic growth and development. One paper also examines the public welfare benefits of transit operational subsidies to maintain reasonable fare for the rider and to provide other public and environmental benefits. These subsidies can also yield net economic benefits.

Making the Business Case for Public Transit Investment—The Twin Cities Experience

Paula Dowell, *Cambridge Systematics*, started her presentation by stating that her study was spurred based partly on the possible threat of reduced transit funding in the Twin Cities. The objective of the study was to evaluate the area’s 2030 transit plan, with a goal of driving private investment to transit corridors. It was expected that investments in transit would be important to create density similar to other world-class cities. She went on to explain the outcomes of the stakeholder interviews and focus group meetings, and then presented the multiple scenarios that were considered for the economic analysis: base, build, an accelerated build case, and a scenario with focus on land use and transit-oriented development (TOD) within ¼ mile of transit stations. The best benefit-cost ratio was obtained for the scenario with TOD/land use emphasis. She pointed out that there were “system” benefits of completing the network of transit projects – bigger than the

benefits of completing the individual segments. She concluded her presentation by stating the study findings would help mobilize the private sector for supporting transit investments.

Multi-modal Planning for High-Growth Business Clusters

Chandler Duncan, *EDR Group*, presented the paper co-authored with **Susan Jones Moses, *Susan Jones Moses, Inc.*** This presentation examined multi-modal planning and public transportation systems that serve high growth business clusters comprised of structurally related industries and services. He described the study motivation, most notably that the failure to provide sufficient capacity for high growth industry clusters has an economic cost. He explained that the paper focused on the professional and technical services, finance, software/information, and bio-tech industries. In high growth clusters, dense land use and limited land for expansion combined with limits on transportation access can lead to congestion and sub-optimal outcomes. He went on to present several examples of high growth clusters they studied in the Boston area (2 cases), San Francisco area (2 cases), Atlanta, Deerfield (Chicago), Denver and Seattle. They found that growing evidence of companies re-locating from Silicon Valley to San Francisco due to the urban amenities and increased transit accessibility. Another key finding was that transit (both private and publicly owned and operated) is an important partner for successful cluster development.

Welfare Implication of Mass Transport Subsidy in Korea

Geunwon Ahn, Sungwohn Lee, Jain Kim and Insu Chang, *Korea Transport Institute.* This study examined the size of mass transit subsidies in Korea and most effective means to implement the subsidy. Currently, private transit companies receive a subsidy from the Korean government based on their operating cost deficit (compared to fare revenue). The presentation discussed the welfare effects of public transport subsidy but also considered the economic, environmental and social benefits of transit. The speakers noted that public transit has an impressive 50% mode share; 17 % (in nation) and 30 % (in Seoul) of transport fare is subsidized. The objective of the study was to investigate whether the conventional belief that the subsidy largely benefits low-income individuals (since they may use transit more frequently) holds true. Then the speakers went on to discuss the methodology for achieving the study objectives. They constructed a transportation-based Social Accounting Matrix (SAM) and found that high-income individuals use transit more than the low-income class and that trip frequency is proportional to income. Also, giving subsidy directly to transit users was found more effective. The speakers concluded the presentation by providing suggestions for subsidy reform, such as raising a fare to cover operating deficit, and give transport users subsidy in response to increased fare.

Darnell Grisby thanked the speakers and a Q&A session followed.

Question to Paula Dowell: How much larger were the system benefits compared to adding up the individual segments?

Answer: About 10-15% larger system (or network) benefit.

Question to Chandler Duncan: How did the streetcar in Seattle (South Lake-Union) help development?

Answer: It helped the area weather the recession better than most areas of Seattle and created a stronger development trend.

Question to Geunwon Ahn: Are discounted transit passes the most effective subsidy policy?
Answer: No, direct subsidies to transit users was found to be the most effective.

B5: Panama Canal

Moderator: Steven Fitzroy, *EDR Group* opened the session by noting that there were four presentations on several aspects of the Panama Canal Expansion including changes in trade flow between Northeast Asia, North America and other U.S. trading partners and competitors.

Update and Review of MARAD'S Phase I Panama Canal Expansion Study

Brian Hill, *MARAD*, started his presentation by describing the role of the U.S. Maritime Administration (MARAD). He pointed out that MARAD is the federal advocate for the maritime industry and serves as a federal administrator for Transportation Investment Generating Economic Recovery (TIGER) and other federal grants aimed at the industry. MARAD ranks 22nd in the world with respect to investments. He highlighted that should federal maritime investment remain below actual needs, the net result would cost 178,000 jobs and \$4 trillion in financial costs by 2040. Then he started presenting a current study on the evaluation of the economic impact of the Panama Canal expansion conducted by MARAD. Today, 95% of world's liquid natural gas (LNG) fleet cannot transit the canal. Upon completion of expansion, 80% of such vessels will be able to transit the canal. Furthermore, the project is expected to facilitate larger vessels passing through the canal, raising current 5,000 twenty-foot equivalent unit (TEU) limits/vessel to 13,000 teus/vessel. This shift to larger vessels is expected to occur over a gradually. The presenter pointed out that the single largest area of impact will be on the flow of containers to U.S. Gulf and Atlantic ports. Traffic bound to Western U.S. will remain at West Coast ports, but containers bound to and from the eastern United States will increasingly pass through Gulf and Atlantic ports. While time might not be an issue for some commodities, most container traffic is more cost sensitive than time sensitive. Mr. Hill concluded the presentation by mentioning that MARAD's final report is scheduled for completion at the end of 2014.

Analyzing the Impact of Larger Ships through Panama Canal on the U. S. Container Imports

Qing Liu, of the *Rahall Transportation Institute*, pointed out that her paper examined the potential impacts of larger post-Panamax container vessel calls at U.S. East and Gulf ports and their economic impacts on containerized imports. Dr. Liu started her presentation by stating that given the many factors impacting commodity flow patterns, the long term impacts of the canal widening remain somewhat unclear. While the exact impact is not clear, it is expected that the expanded canal will influence and reshape maritime commodity flow patterns. For example, New Ocean Carrier coalitions could enhance productivity and efficiency, while reshaping flow patterns. Dr. Liu then presented game theoretic models that include many players that ultimately influence commodity flow patterns. Such models can help better forecasting of flows. In specific, she discussed a case study that was undertaken to evaluate the impacts of larger ships through Panama Canal on the U. S. container imports. The model featured five key players: 1) Ocean Carriers; 2) Port of Los Angeles; 3) BNSF Railway; 4) Port of Virginia, and 5) Norfolk Southern Railway. Dr. Liu concluded her presentation by summarizing the case study findings. In summary, it was found that the Panama

Canal expansion project, while not fundamentally realigning flow patterns, will generally strengthen East Coast ports and weaken West Coast ports.

Panama Canal Expansion on Exports by Gulf Coast Ports

Steven Fitzroy, *EDR Group*, started his presentation by mentioning some facts about the Panama Canal and then, presenting the expected impacts of the Panama Canal Expansion on exports by Gulf Coast Ports. Most current Panama Canal traffic connects the U. S. Atlantic Coast with Northeast Asia. Increasingly, Atlantic and Gulf ports are facing difficult draft and capacity issues to accommodate larger vessels. As also indicated by the previous speakers, the canal expansion and the resulting commodity flow pattern shifts will increase demand for more inland port facilities and enhanced overland access between these inland facilities and their coastal port partners. The expansion will also provide a 40% to 60% cost advantage for larger vessels (13,000-18,000 teus) compared to smaller conventional vessels (5,000 teus). New ocean carrier alliances, coupled with larger vessels all working to create new cost advantages. It is expected that large vessels will schedule 2 to 3 U. S. coastal stops, lifting 8,000 to 12,000 teus per stop. Large vessels may well also serve Caribbean trans-load facility, feeding to and from smaller vessels bound to numerous Gulf and Atlantic ports. He noted that large vessels offer significantly lower fuel cost per container ratio and that “Near Sharing” can influence commodity flow. Mr. Fitzroy offered some additional considerations; for example, that stronger Canadian Pacific ports (Prince Rupert and Vancouver) are influencing container flows bound to and from U. S. Midwestern markets. He concluded his presentation by pointing out that expediting port container thru-put capacity to get containers on and off the terminals as quickly and efficiently as possible is vital. As such, there is a growing need to increase investment in both railroad and barge alternatives to highway trucking.

Effects of Panama Canal Expansion on Exports by Gulf Coast Ports.

Michael Bomba, *University of North Texas*, described the forces that are pushing the expansion of the Panama Canal: changing markets, vessels’ size and capacity, and flow patterns. Some trends in changing markets include the labor unrest in southern California ports that enhanced shipper and carrier interests in alternative Gulf and Atlantic ports. In addition, the majority of U.S. exports and imports growth will be to and from north Asia, while trade intensity between U.S. and Latin America will continue to grow in the future as well. Turning to trends related to vessel’s size and capacity, the trend to larger vessel types applies to all commodity types, including containers, bulk, and others. It is anticipated that the adjustment to larger vessels will show a slower pace of transition in the Gulf. He also agreed with a previous speaker that there are a lot of unknown factors that will ultimately determine the shape of growth patterns in the future. Nevertheless, he discussed some trends that were worth noting. There is a great potential for LNG export growth as well as establishing new trans-shipment centers in the Caribbean, with larger vessels feeding to and from smaller carriers bound for multiple Atlantic, Gulf, and Caribbean destinations. Canal transits will also involve vessels linking Atlantic and Gulf ports with South American west coast ports. Dr. Bomba concluded his presentation by noting that these growth trends support the need for increased investment to enhance Gulf port capacity and efficiency levels and also, suggested that canal tolls can be an important tool for shaping growth patterns.

Questions and Answers to Panelists:

The discussion following the presentations focused on whether the expansion would result in large increases in containerized imports to U.S. ports, the ways that U.S. exports may be affected and the geographic distribution of these impacts on various regions of the U.S. Follow up research could evaluate the environmental and economic development effects associated with changes in U.S. exports and landside infrastructure; evaluating investments for enhancing port capacity and efficiency as well as investment in both railroad and barge alternatives to highway trucking.

Steve Fitzroy closed the session by thanking the speakers and the audience.

C1: Innovations in Transportation Project Economic Development Appraisal (1.5 CMs)

Moderator: Greg Bischak, CDFI, opened the session by highlighting the objective of panel as a forum to examine a variety of economic impact tools which provide some analytic techniques to evaluate the merits of transportation projects. These techniques include MOSAIC which was developed for Oregon DOT's to combine benefit-cost analysis with methods to weigh non-monetary factors in assessing disparate transportation projects. Another analytic method that is explored used a generalized propensity scoring to evaluate the relative effects of highway capacity expansion in 125 US cities on demand, congestion and productivity. Yet another approach is presented using "no-build" or maintenance only as base cases to compare against an investment scenario for I-95 in North Carolina. Finally, applied economic impact methods are presented for assessing the impact of transportation investments in Israel including roads, passenger rail and public transport on changes in firm location and labor supply.

MOSAIC: Oregon's Value and Cost Informed Planning Tool

Sam Seskin, of CH2M Hill, presented the first study on behalf of his main co-author, **Stephane Gros, of CH2MHill**. MOSAIC was developed by the Oregon Department of Transportation as a decision-making tool in the development of plans and projects at both the state and regional level. It was the result of legislation directing ODOT to develop a least-cost planning methodology. Least-cost planning is a process of comparing direct and indirect costs of demand and supply options to meet transportation goals, policies or both, where the intent of the process is to identify the most cost-effective option.

The Mosaic tool is meant to complement—not replace—other models and tools used in the planning process. Its' main purpose is to organize and summarize existing data and measurements so that users and decision makers can compare bundles on an equal footing. The tool combines these data with various assumptions and user inputs to produce 41 Specific Indicators of the bundles' impacts, grouped into 9 categories: mobility, accessibility, economic vitality, environmental stewardship, land use, funding and finance, quality of life, safety and security, and equity. The Specific Indicators that can be expressed in monetary terms are included as benefits or costs, in the benefit-cost analysis (BCA) portion of Mosaic. The Specific Indicators that cannot be monetized are expressed as, or converted into, scores and weighted with user defined weights in the multi-objective decision analysis (MODA) portion of Mosaic.

It also provides a number of "look-up" tables and references to guide users in choosing alternative assumptions. The most critical assumptions to be made before producing results are: the period of analysis (e.g., planning horizon), discount rate, value of time, value of statistical life, and projected growth in real income. These assumptions tend to have a large impact on the outcomes of a BCA.

Users will also need to select a scoring scale and develop weights for use in MODA (by default, the tool uses a scoring scale of 0 to 10 (e.g. 0 may signify no impact, 10 may signify major impact) and assigns an equal weight to all MODA indicators). Unlike BCA results, the MOSAIC results can be used to assess trade-offs between relative performances and costs, and determine the most “cost-effective” bundle(s). The tool also includes tables and charts with average scores by category, helping policy makers assess how the proposed bundles perform against the MODA indicators within each category.

Quantifying the Impact of Road Network Capacity Expansion on Congestion and Productivity via a Mixed Model Generalized Propensity Score Estimator.

Daniel Graham, of *the Imperial College of London*, presented his study by stating the motivations and objectives. The objective of the study is to develop a common framework to study relative effects of capacity expansions on demand, network performance, and productivity. The method involves developing a causal inference approach for average treatment effect (ATE) estimation with longitudinal data where treatments are ‘doses’ of urban road network capacity expansion, assignment is non-random, and the probability of receiving a given dose varies systematically with city characteristics (confounding). The approach quantifies the relationship between expected ‘response’ (i.e. demand, performance, productivity) and dose, net of confounding effects. The method uses a generalized propensity scoring (GPS) adjustment approach that can define the GPS dose and the conditional independence from other confounding factors. The relationship between capacity and productivity is confounded by a set of unique city characteristics which are important for productivity and influence the level of capacity received. The study shows that with longitudinal data from 101 US cities (1982-2007) the GPS can be estimated via a mixed model approach for addressing unmeasured confounding effects, reverse causality and dynamic assignment. The method can be used to derive a dose-response curve and estimate the ATEs. The study used urban data from the Texas A&M Transportation Institute on Metropolitan Statistical Areas. Responses were annual proportional change in demand (as measured by vehicle miles traveled or vmt), network performance (delay per vmt), and productivity (average wage). The treatment was the annual proportional change in network lane miles. The pre-treatment covariates (confounders) were:

- Lagged responses: to capture reverse causality
- Congestion & traffic volume: measured by delay and vmt
- Network scale & mix: network length, mix of freeway / arterial
- Traffic mix: volume on freeway / arterial
- Mode characteristics: public transport patronage, state fuel price
- Economy: productivity, income and economic structure
- Employment, population distribution and growth.

The unobserved (unknown) confounders were the zone / area /region characteristics, road network design, activity/travel behavior. Random city-level effects were specified in longitudinal mixed models.

Key findings were as follows: There was evidence of induced demand (over the range of dose having adjusted for confounding variables) where ATE was more than proportional to treatment for doses less than or equal to 2. On average, a 10 percent increase in lane miles led to a 9 percent increase in vmt net of ‘natural growth’ (estimated 1.4% per annum). Capacity expansions in the

range considered have not in general reduced traffic density (volume / capacity). In general, capacity expansions have not ameliorated urban congestion. The average road user has not experienced change in delay from capacity expansions. There are no statistically significant effects on delay per vmt. Even in the case of large capacity expansions, due to natural growth, congestion has worsened by approximately 3 percent per year. Thus, the evidence shows that urban road network expansions have not induced higher productivity. This finding casts doubt on 'naive' regressions of productivity on treatment (i.e. capacity expansion). The model finds no significant ATEs after having isolated a viable sample and adjusted for confounding factors. There is no change in transaction costs and apparently no scale effects.

Conclusions of the study indicate that causal mixed model GPS approach provides a highly flexible framework for ex-post evaluation of transport interventions. Model findings indicate that urban road network expansions have induced demand but have not ameliorated congestion or raised productivity. Results do not imply that there are no economic benefits from road capacity expansions per se. The results are specific to marginal changes on mature congested urban networks. There is increased mobility with aggregate volume / capacity ratios constant. However, for a network, the generalized costs do not improve and total urban delay rises. Furthermore the scale (increased traffic) effect does not appear to influence productivity. The broader policy implication of the study is that to improve urban road network performance and raise productivity using a combination of efficient pricing with investment in both roads and mass transit.

Modeling the Economic Impact of Business as Usual in Transportation Investment

Paula Dowell, of *Cambridge Systematics*, started her presentation by discussing the motivations. The study was initiated by the North Carolina Legislature which instructed NCDOT to conduct economic analysis of tolling I-95 in North Carolina which is 182 mile corridor. Built in 60s and 70s, I-95 has seen little improvement since completion and has now reached end of engineering life and needs modernization. NCDOT was one of three states that received an FHWA pilot to toll existing interstate for rehabilitation and rebuilding. The study's purpose was to compare economic impacts of the proposed alternatives *Business as Usual*; funding improvements by tolling; and funding improvements by other methods so as to provide information for decision making. The key steps of the study were to engage stakeholders, the public & officials; analyze impacts on freight and logistics, tourism, local traffic, and the economy in general and then screen & analyze funding options. Involving stakeholders ranged from advisory council meetings, surveys of trucking industry and public, interviews and focus groups with shippers, agriculture, economic developers and site selection firms, county engineers, highway contractors, tourism officials and NCDOT managers. Scenarios examined included:

- No-build or Business as Usual (BAU)
- Build - No Specified Funding
- Build - Fund via Tolls
- Build - Fund via Tolls with Mitigation
- Build - Fund via Alternative Funding:
 - 10-Year Statewide Sales Tax - 1/3 of revenue goes to fund I-95
 - Revenue package – Sales Tax (10 year), Highway Use Tax (HUT) and Vehicle Registration Fees
 - Personal Income Tax – Statewide with ~ 1/3 going to fund I-95
 - Motor Fuels Tax – Statewide increase with region's allocated portion funding I-95

Estimating Costs of No-build scenario examined travel-time costs (VHT & VMT), buffer time costs for trucks and total trip time, and crash delay costs. Buffer time costs only estimated for BAU scenario, assumed no impacts until 2020 with 60 percent of trucks affected based on survey data, and a 5 percent increase in congestion by 2020 and 20 percent increase by 2040. Impacts monetized each year for per mile Vehicle Operating Costs and Vehicle Operating Time.

Key Findings

- Employment will grow by an average of 16,000 fewer jobs per year under the no-build or BAU.
- All the funding options examined lead to a net increase in statewide economic benefits relative to no build.
- Of the scenarios examined, no funding alternative significantly better or worse based on total economic impacts.
- Results would have been dramatically different if impacts of BAU were not estimated first.

Evaluating Economic Impacts from Transportation Investments in Israel

Rimon Rafiah, of *Economikr* presented a study on behalf of his co-authors, **Vladimir Simon**, *Israel Ministry of Transportation and Road Safety*, **Shahar Ziv**, *BDO Ziv Haft*. This study presents research on an Economic Impact Analysis (EIA) to a case in Israel which attempts to other economic benefits beyond EIA while avoiding double counting of benefits. The study goes beyond current Israeli transport appraisal guidance known as Nohal Prat which does not take into account the positive long-term real effects to the economy of transport investment. Instead, Nohal Prat focuses on GDP and welfare economic benefits. The first step of the study was to conduct a survey of plant managers, industrial parks, and government grant applications data on the factors affecting firm location, including the availability of land, tax breaks, industrial park managers, proximity to “anchor plants”. Consistent with the firm location literature, the survey found that if the firm has major freight haulage – they do prefer locating in a centrally strategic area with transport facilities. In addition to the survey data, the model approach sought to measure how changes in labor supply that would result of a transportation project similar to the classic Wider Economic Benefits (WEB) model of the UK Department for Transport.

The WEB model identifies three major indirect economic benefits: agglomeration – higher productivity; benefits from increased competition; and changes in labor supply. This study concentrates on labor supply effects to measure how changes in transport cost will change employment as a function of labor supply elasticity. The ideal study transportation project is in an area with low labor force participation or higher-than-average unemployment. The study model seeks to estimate how decreased costs due to transportation benefits improve revenue and thereby induces increased employment, salary and taxes, and related public welfare effects. The study estimated the value of time – user’s perceived value of time, based on a logit model and surveys implemented in Israel. It also estimated transportation costs with/without the project using 4-step model. The study estimated the induced employment effects from transport cost savings using a Berechman and Paaswell’s model (2002) of simultaneous equations calibrated to the Israeli experience in southern Israel. Elasticity with regard to transport for different values ranges between 0.11 and 0.19 – in line with other research around the world. The study also estimated the reduction in out-of-pocket costs for non-business user and the induced increases in tax revenues. Their study included only large scale projects, which influence major areas (such as Tel Aviv district) for both

public transit and freeway/highway projects. It specifically examined a major road project in Israel – Road No. 431 from Modin to Rishon LeZion and from there to Ayalon Freeway.

Key Findings were that the average elasticity in influence area was 15.6 percent. The employment increase was 865 new workers (an increase of about 11% in the steady state growth of employment), as a permanent increase. The estimated benefit increase was about \$4 million a year (i.e. 2% additional benefits). The GDP was estimated to increase by about \$30 million a year. The model framework which presents both traditional travel benefits such as savings in time and vehicle operating costs of a transportation project, as well as the classic elements of EIA: changes in GDP, jobs, wages, tax revenue. The model is easy to implement with available Israeli data sources.

C2: Inland Ports as Regional Generators of International Trade (1.5 CMs.)

Moderator: Michael Bomba, *University of North Texas*, opened the session by noting the focus on factors vital for the development of inland ports that are capable of incubating, sustaining, and maturing into manufacturing centers that promote regional economic development. Inland ports, which seek to combine multiple modes of transportation at a single location with the surrounding land open for the development, can incubate conditions necessary for logistical clusters. However, the process of doing so is highly complex and regional planners frequently do not fully understand their competitive advantages nor do they accept or adequately address their deficiencies. Dr. Bomba also noted that the session comprised of several examples of inland ports from across the county including a discussion of Dallas inland ports like International Inland Port of Dallas (IIPOD) which was also part of a tour.

Logistics Clusters Analysis: Southern Dallas County and Northern Ellis Counties

Subhro Mitra, *University of North Texas, Dallas*, opened his presentation by pointing out that the study focus was the Best Southwest Partnership region (12 cities in Southern Dallas and Northern Ellis counties) inland ports which hosts the IIPOD and noted that the three key objectives of his talk were to present: a) local and regional factors contributing to the development of inland ports like IIPOD which provides customs clearance to NAFTA trade goods to Mexico and Canada b) the impact of the transportation and logistics cluster effect on the economy and c) to analyze important changes in the global economy and its' impact on the logistic cluster in this region. Among the site advantages he referred to include, direct rail configuration leading to faster shipment times and the presence of advanced intermodal facilities including overhead crane operations, freight classification yards, transload facilities and container storage. He went on to discuss IIPOD's job creation effects and location quotient for the Transportation and Warehousing sector in that area in relation to other sectors.

Network Appalachia: Access to Opportunity in the Global Economy of the 21st Century

Scott Hercik, *Appalachian Regional Commission*, opened his presentation by laying out the history of the Economic Development Act of 1965 and John F. Kennedys' role in enabling the region to draw up a comprehensive program for economic development as a response to the economic distress in the Appalachian region (comprising of 13 states) and physical isolation. In this

context, he introduced the Appalachian Development Highway System (ADHS) - a 3090 mile system which was developed to address physical isolation. He also pointed to the work of Marshall University which looked into ADHS and mapped out inland container ports in the region as a way to provide access and connectivity of the domestic Appalachian economy to the rest of the US and international economy for the 21st century global supply chains. He also discussed the emergence and development of the Heartland Corridor by Norfolk Southern Railroad Company. He went on to discuss the development of the Network Appalachia study and pointed to increasing trends in global commodity flows especially US- international trade and Latin American trade and intermodal movements becoming the 21st century mode of choice for container freight. He also pointed to the multimodal, multi-disciplinary, multi-jurisdictional and multi-sector planning and development framework adopted to enhance these goals. He closed his presentation by briefly discussing the Virginia Inland Port which provides access to the network and global supply chain and he termed as laboratory to strengthen and build commerce. He pointed that they 13 inland ports. He closed the presentation that the inland ports as the tools needed for the ARC to run faster in the global economy.

Darrell Coffey, BNSF (presentation not made available). BNSF uses the term “logistics parks” on BNSF railways and he pointed out that BNSF routes all domestic and international intermodal cargo through these logistics parks. He pointed to significant growth in intermodal container traffic. These BNSF logistics parks provide access to 29 of the top 30 markets (intermodal markets) in the country, in addition to modal integration, and superior transportation infrastructure. He pointed to the advantages of combining co-location of warehousing facilities and distribution with an intermodal hub as an effective model for logistics parks and to facilitate imports and exports. He gave a brief introduction to some BNSF intermodal hubs around the country (Dallas-Alliance, Chicago-Joliet, and Memphis).

Inland Port Discussion

Erik Steavens, Texas Department of Transportation, opened his talk by introducing inland ports and discussing 6 characteristics of “successful” inland ports. They include a) market proximity to at least 3 million people within 200 miles b) is major, direct connection to an American seaport via Class I railroad c) has Free Trade Zone status and privileges d) access to abundance of reasonably priced labor and commercial real estate for warehousing and distribution e) has a governing body or consortium with a cohesive management plan and f) finally, has state and local government support. With that background he discusses two successful inland ports- the very large Alliance Inland port (which is a top US Foreign Trade Zone in terms of value of trade and is also FEDEX’s regional sort hub), in Dallas and an inland port in Cordelle, GA which is much smaller and is connected to Port of Savannah via rail (Heart of Georgia and Georgia Central railroads). He closed his presentation by noting that 3 points are vital for inland ports to be successful—the scale, multimodal access (access to rail) and finally, access to a large population base.

C3: MAP-21 and Disinvestment (1.5 CMs)

Moderator: Chris Mann, Independent Consultant, opened the session by pointing out that the session was aimed at various aspects of decision making in the public sector investment and, what

could be readily argued as disinvestment in the public transportation systems in the United States. At the federal level there is no long term vision for raising revenues and planning and implementing investments in the transportation system. MAP-21, the current federal two-year reauthorization of funding expires in 2014, and Congress has not adopted new authorization legislation, which is critical for federal, state and local agencies for long term investment purposes. He pointed out that the session hones in on the ramification of these decisions and how state DOTs and local agencies can take steps to mitigate the negative consequences of these decisions. Three presentations made during this session summarize possible action to be taken.

Economic Implications of Disinvestment

Chandler Duncan of the *EDR Group* opened his presentation by noting that the topic was an overview of an NCHRP Synthesis project on issues related to disinvestment in the transport system. With the difficulties of passing new federal reauthorizing legislation, one that included an increase in the federal gas tax, and the same experience in some states, it has also become difficult to maintain the necessary level of spending for maintenance of the existing system, let alone addressing much needed capital improvements. There could be many ramifications, including impacts on economic growth. The presentation began with comments on the definition of disinvestment which is: *“allowing an infrastructure asset to fall below previously accepted standards of condition or performance by either investing resources elsewhere, or simply investing less in the asset.”* Many investment decisions are made in an environment of an aging infrastructure, changing demand, global climate change and fiscal restraints. Additional considerations in assessing disinvestment involve minimum tolerable conditions of the infrastructure, investment gaps between what needs to be invested and what actually is, underinvestment, intentional versus unintentional disinvestment, programmatic investment, strategies, adaptive re-use of existing assets and jurisdictional turnbacks. Mr. Duncan emphasized that user costs become a major issue when disinvestment occurs. These could include cost of operating a vehicle on deficient pavement, cost of operating a vehicle in congested conditions, cost of time lost due to delay, increases in vehicle-miles-of-travel and vehicle-hours-of-travel resulting from diversions to alternate routes due to congestion, cost of bridge detours, and cost of transit interruptions. After assessing these costs, it would be necessary to compare them with the magnitude of the gap in funding caused by disinvestment. This would be a first step in conducting an economic impact analysis. Potential effects of disinvestment are reduced use of the system, increased risk of system failure (like a bridge collapse), reduced access to markets (or increased cost of accessing the same market) and change in amenities. After presenting examples of how these issues are addressed within state DOTs, Mr. Duncan closed his presentation with four takeaways to consider when analyzing a disinvestment decision: compare costs and user benefits of both the disinvested and “invested” program or facility; make reasonable assumptions about the uses (and user costs or benefits) of the asset after disinvestment; make reasonable assumptions about the uses (and user costs or benefits) of the new way the need will be met after disinvestment; and consider multiple investment scenarios with different investment levels.

Suggestions for future research regarding disinvestment include: development of models of demand that better assess shifts in demographics, lifestyles and travel behavior; research for quantifying qualitative and “livability” factors associated with different uses of infrastructure; case-based research for how property markets and business cost structures change after disinvestment; overcoming barriers for states and MPO’s who still lack data or resources to implement “investment management” paradigm in planning and programming; and new methods for determining “optimal” investment levels.

The Economic Development Horror in Prettiness and Other Issues

Martin Weiss of *Martin Weiss Consulting* developed a provocative argument as to whether architectural design, or “prettiness” as he puts it, has value when it is a significant component of a transport project. A related question is whether design should have equal or greater weight in project decision making. In project economic analysis (benefit-cost analysis) all components must be considered and fully understood. Mr. Weiss suggested that design components in relatively large projects may have received too much weight, particularly when the project may be a toll financed facility where the user receives no appreciable benefit. He presented three examples to support his argument; the Paul Sarbanes Transit Center in Silver Springs Maryland, the San Francisco Oakland Bay Bridge, and the Peace Arch Bridge in Buffalo New York. In the case of the Sarbanes Transit Center, a new facility with a high end contemporary design has replaced an ugly but functional center. The original design of the replacement was estimated to cost \$20 million to build and was scheduled to open in 1998. A new design was desired, however, to attract upscale commercial and residential development to the surrounding area. Construction of the new center with the upscale design is estimated at \$120 million and is scheduled to open in 2015. The question presented is whether the benefit of the new design with the delay is worth the increase in cost? In the second example Mr. Weiss compared improvements to the San Mateo Bridge in the southern portion of San Francisco Bay which has a relatively simple post and beam design with the design and construction of the San Francisco Oakland Bay Bridge which includes a tower and cable stays. The San Mateo Bridge improvements involved widening the bridge for seven miles at a cost \$200 million, the Bay Bridge improvements cost \$6.4 billion. Similar to the Sarbanes Transit Center example, the question arises as to whether the cost of the higher end design is worth it. In the case of the Bay Bridge, the toll ranges from \$4 to \$6, while the San Mateo Bridge is \$5. While the users of the Bay Bridge pay a toll, the question again arises as to whether they benefit from the significantly enhanced design. The Peace Bridge example follows the same argument. In concluding his remarks, Mr. Weiss presented two issues that should be considered; what is the opportunity cost of the enhanced design of transport facilities, particularly when the increase in cost is significant and will be passed on to the users and second, does the enhanced design, or “prettiness”, only enhance the quality of life of the residents of a region and the users and not economic development?

New Methods for Assessing the Cost of Delay and Reliability on Major Highway Corridors

(The third presentation encountered technical difficulties with the computer projection. Thus the powerpoint slides were not presented to the audience. These notes however use the slides as background for the proceedings.)

Steven Fitzroy of the *EDR Group* began his presentation with a summary of research needs concerning identifying costs of congestion. He indicated that methods used to estimate the impacts of cost of congestion on commercial vehicles need to be refined by explicitly accounting for differences in the commodity mix at the corridor level. The effectiveness of using commodity composition and relative costs needs to be assessed in attempting to identify high-impact corridors. The focus of this research is to identify the costs of congestion by roadway corridor, so that future decisions on improvements to corridors can be based, at least partially, on reductions in business costs. He presented a brief review of commercial costs including operating, time, and reliability costs for trucking, and time, reliability, and logistics costs related to specific commodities. Mr. Fitzroy

selected eight congested corridors in five of Texas' most congested urban areas to explain his research approach. These corridors include Interstate and US routes in and around Dallas/Ft. Worth, Houston, San Antonio and Austin. He used truck trip data to assess congestion costs. Data included trip origin, destination and direction, truck body type, truck service type and STCC commodity code.

For each corridor, costs of increased fuel consumption due to congestion, time costs mainly in the form of increased cost of driver time; and the impact of congestion on commodities in the form of opportunity costs of commodities were estimated. He also estimated the reliability costs and commodity reliability/logistics cost which are represented by capital lock up, perishability, and supply chain costs. A key factor in estimating trucking costs caused by congestion is buffer time, defined as the difference between the worst travel time (in each corridor) and the average travel time. After calculating congestion and reliability cost for each of the corridors, he compared them to commercial vehicle costs calculated by the Texas A&M Transportation Institute in their latest Urban Mobility Report. In each corridor, commodity-based costs exceeded direct costs and were a greater percentage of congestion costs. The following conclusions came from the analysis:

- When properly measured, costs of congestion on freight corridors provide important cost differences by corridor.
- Effects of delay, reliability and related measures (e.g., perishability, logistics and inventory costs) should be considered.
- Current time-based guidance/valuation of commercial user costs may significantly understate congestion reduction impacts, especially for trade (interstate and international) corridors.

The data in Mr. Fitzroy's analysis shows that while businesses experience costs based on delays to trucking caught in congestion in major metropolitan areas, the costs to businesses can actually be greater when the costs based on the commodities they are transporting are considered.

C4: Freight: National, Regional and Local Studies of Freight Transportation on Economic Performance (1.5 CMs)

Moderator: Glen Weisbrod, *EDRG* opened this session by noting that freight transportation and logistics investments have emerged as important economic drivers for national and regional development, including cluster-based development. The presentations in this session present national, regional, industry specific studies that examine the economic effects of freight transportation investments. The first study focuses on four regional highway corridors in Appalachia and their effects on business location and development. The second study discusses old and new factors in business location decisions. The third study presents a new method of accessibility measurement within the context of supply chains. The final study presents a national level analysis of logistical clusters in the United States.

ADHS Corridors and International Trade, Freight Movements and Economic Development

Dan Hodge, *University of Massachusetts*, presented his paper co-authored with Jason Wang and Julie Marshall, Appalachian Regional Commission. He opened his presentation by pointing to the

link between Appalachian Highway Development System (ADHS) and the connectivity issues by highlighting four specific highway corridors (H, X1, K, and Q). He credited the moderator Glen Weisbrod, with co-responsibility for several of the publications on his own Curriculum Vitae. He pointed that the overarching economic development goals of ADHS lagging areas and to connect ADHS areas to other markets and rest of the nation. He showed maps of Appalachian Regional Commission (ARC) region vis-à-vis inland ports (with one exception, they lie on its periphery), highways, rail, seaports as well as freight statistics - \$, tons, jobs, and spillovers. The corridors are multi-state corridors in various stages of construction, connectivity to freight intermodal hubs and logistics centers, linking several industry sectors and even funding shortfalls in some cases.

- Corridor H spans WV and VA. It is half complete (70 mi remaining, 30 mi under construction now)
- Corridor X1 –in AL; Warrior-Tom waterway connecting 3 major intermodal rail terminals, 65 miles
- Corridor K spans TN and NC. It is $\frac{2}{3}$ done (82 mi done, 46 remaining) and lacks good alternative routes
- Corridor Q spans KY, VA, and WV. It includes economically distressed areas and catering to mining, agriculture, oil/gas industries. It is mostly done with 32 miles remaining.

MAP-21 revised provided revised funding for ADHS in 2012. Previously, ADHS corridors received 80% fed funding but now do have 100% fed share.

Future Research:

Dan Hodge closed the presentation by questioning what the opportunities or potential for ARC could be with MAP 21 provisions. Valid questions from this presentation could include an investigation of the economic possibilities from a fully funded and implemented ADHS.

Business Location in Today's Economy or Does Location Still Matter?

Richard Mudge, ICF Consulting, presented his paper co-authored with **Eric Beshers** also of **ICF Consulting**. Richard opened the presentation by presenting questions about the linkages between business location and sprawl so as to draw inferences for planning. He noted that the research was part of an FHWA funded research project exploring the implications of business location decisions for planning purposes. He differentiated between the old paradigm and the new paradigm. The former focused on factors like agglomeration economies, monocentricity- Central Business District orientation, work trips, and the focus on large, hierarchical businesses, while the latter is driven by technology and communications, emphasis on activities, not industries, and new issues driven by sustainability and reliability. He highlighted access to labor, suppliers, customers, land and the effect these factors have location decisions and mentions a location activity index. He then proceeds to which of six activity location factors were important for retail and manufacturing businesses (access to customers, access to labor, cluster effect, access to supplies, attracted to center, and whether an urban region. is needed. He showed tables of *type of activity* (retail types, manufacturing types) vs. *location factors* (cluster effect? attracted to center? need urban region?), ranking importance of access type on A/B/C scale. He closed the presentation with a series of questions, but not a definitive answer.

Accessibility and Manufacturing — Measurement and Economic Development Context

Sharada Vadali, *Texas A&M Transportation Institute*, presented her paper co-authored with Shailesh Chandra, also from *Texas A&M Transportation Institute*. Sharada opened her presentation by providing the background on the role of manufacturing, how it supports the economy and global trends occurring within the industry. She presented the concepts of agglomeration in the context of supply chains. She notes that few, if any talk about agglomeration in context of a *supply chain*. She notes that supply chains are complex that make it difficult to study import/export accounts and to determine productivity impacts- but that the study of such impacts is important going forward. She presented a manufacturing supply chain and particularly, a hub-spoke system like an automotive chain with the ultimate goal of studying efficiency and productivity within such contexts. A new measure of proximity or transportation accessibility for manufacturing value chain clusters was presented that relies on access to upstream supplier base and downstream buyer base for the intermediate or final product. The concept of a “threshold bound index” (which is behaviorally motivated since automotive manufacturers tend to source inputs from a threshold radius) is presented which is developed in a related paper. The measure is dependent on transport networks and is developed as a ratio of the least cost path (the version of the index is based on time cost, but she notes that other costs may be considered) or shortest network path either upstream or downstream relative to the Euclidean distance. When time related cost metrics are used, the measure approximates the fluidity or speed of movement within the O-D pair. The practical uses of the index are discussed and in particular, in ex-post transport project assessment as well as ex-ante risk assessments from transportation disruptions to upstream links or downstream links. The measure is tested on a segment of the ADHS Corridor X in Alabama. The change in index is evaluated before and after construction of the segment for the automotive industry and finds that the index is able to identify how plants in the same industry sector can be differentially impacted by transport improvements and also whether the beneficial effects manifest along the upstream or downstream connections. She concludes that productivity measurements within supply chains may need to consider such dissimilarities in effects—and the source of gain: i.e. access to input markets or access to final consumer. As such it is noted, that indices themselves are data heavy but are very useful for benchmarking value chains and to identify deficiencies or risks in transport networks.

Conclusions and Future Research:

The indices are generic for any manufacturing industry, but may be extended to different types of manufacturing industries a) regional processing b) labor intensive firms c) innovation and R&D intensive and finally d) energy intensive firm. Each of these industries value different types of access but still connected by transport networks- hence future research could investigate how such industries may differ in their access requirements and how that may translate to efficiencies in supply chains. She also notes that new ways must be looked at to develop other forms of indices that are scalable, more generic across diverse chains, and useful for planning purposes. Another line of research could specifically investigate how to link these measures to productivity and finally how best to utilize these measures in a planning context at local, regional, and multi-state scales.

Spatial Analysis of Transportation and Logistics Cluster in the USA

Indraneel Kumar, of *Purdue University*, presented his paper co-authored with **Andrey Zhalinin and Lionel Beaulieu**, also of *Purdue University*. Indraneel opened up his presentation by noting that Purdue University is the repository of a lot of fine-grained (county-level) economic data and the data is contrasted with Harvard Institute of Strategy and Competitiveness data clusters. He noted that two (university center) grants funded this research. He also noted that a third (university center)

grant made the data more accessible to new data seekers. He uses his centers cluster data driven by EMSI data to present his four key motivations for the research:

- Sheffi's research finds that logistics cluster has a "catalyst role" and is largely resilient to recession shocks (Sheffi, 2012)
- Explore transportation and logistics cluster competitiveness across USA based on 2 research questions
- Can specialization in transport and logistics cluster emerge in micropolitan, non-core, or rural regions?
- What role transport infrastructure has in explaining specialization and jobs in the cluster?

He notes that the multiple names for logistics clusters are a challenge. He uses the data to explore patterns in 3009 counties, using location quotient ≥ 1.2 as indicator of "clustering" and analyzes historical trends in LQ in logistics from 2001-2012 and the trends in regional and local specialization. He presents maps of spatial footprints of cluster specialization across the country to identify distinct patterns. He goes on to identify clusters using spatial statistics and measures of global Moran, local spatial statistics – Local indicators of spatial association (LISA) statistics maps. Regressions were developed for LQ for transport and logistics and jobs as dependent variables on different modes of transportation almost all of which showed some positive association with cluster jobs (rail, ports, airports, intermodal and National Highway Planning Network AADT).

Conclusions and Future Research

Using a variety of approaches, mapping and spatial statistics and regression, he concludes the presentation by noting that transportation and logistics clusters are quite apparent in rural areas and can be attributed to transportation connectivity to multiple modes. He notes that future research should investigate these data, relations and patterns further.

Questions and Answers:

Question for Dan: Interesting contrast between Corridors H and Q. VA portion of Corridor H has little political support in VA. Dan Hodge A: H not as crucial for VA as for WV.

Question for Richard Mudge: What was your methodology - data 'mine'? Survey? Thought experiment?

Answer: Mostly "reading" (lit review).

Question for Indraneel: What is qualitative interpretation of $LQ \geq 1.2$? Meaning of LQ threshold?

Answer: Disagreement between 1.3 (Illinois' choice) and 1.2.

Question for Indraneel: Are there any truly rural "logistical villages"?

Indraneel Kumar A: See Sheffi's book. Indraneel Kumar A: Businesses are already buying real estate parcels along the corridors that we have identified

Question for Sharada: What can you say about the role of these aspects in a 'Smart' freight corridor concept?

Answer: The smart freight concept could in principle be very broad. Concepts like these could certainly be useful for smarter freight strategies.

Question for Indraneel: Why isn't [a certain city in FL] on your map?

Answer: LQ is relative to total employment. Rural information is sparse.

D1: Seaports & Maritime International Trade Flows (1.5 CMS)

Moderator: Mark Burton, of the *University of Tennessee*, opened the session by noting that growing maritime international trade flows have placed specific demands on seaport infrastructure development to accommodate the diverse needs of shipping requirements for carrying bulk goods, liquids and containerized goods. The session focused on these diverse needs with the examination of different demands for the Port of Houston. He noted the session comprises of cross-cutting case studies of the evolving demands for improved efficiencies to support growth in tanker traffic on the one hand, and financing new terminals development on the other. International private sector firms present their forecasts for trade flows and the infrastructure requirements to meet these projections. In addition, the Port of Houston examines its plans and expectations for meeting these longer term needs. The three practitioner's presentations will focus on the Port of Houston tremendous freight capacity growth, driven principally by the energy industry and trade and population growth in Texas, along with challenges to fund this infrastructure. The Port of Houston presents a case study that should be researched further to better understand how it is financing and managing infrastructure capacity growth.

Houston Ship channel Outlook for Bulk Liquid Storage.

Lawrence Waldron, of Vopak Corporation, opened the session with an examination of the *Houston Ship channel Outlook for Bulk Liquid Storage*. Vopak is a multi-national firm headquartered in Rotterdam in the Netherlands, and is the world's largest independent tank storage provider, specialized in the storage and handling of liquid chemicals, gasses and oil products. Vopak worldwide operates 78 terminals with a combined storage capacity more than 31 million cubic meters in 28 countries. The terminals are strategically located for users along the major shipping routes. The majority of customers are active in the chemical and oil industry, for which Vopak stores a large variety of products destined for a wide range of industries. Waldron discussed the expansion of bulk liquid terminals at the Vopak facilities in Galena Texas, which is located in the Port of Houston ship channel, to meet the demands of the energy and chemical industries. Mr. Waldron discussed the full range of bulk liquid market segments highlighting the growth of Liquefied Natural Gas (LNG), petroleum exports (crude and "tight oil"), net petroleum imports and biofuel imports, as well as other bulk liquids. For the Port of Houston, the export growth from Texas, North Dakota and, to a lesser extent, Oklahoma crude have contributed the most to the overall growth in these trade flows. The LNG provides critical feedstock for ethane, propane and isobutene production which are in growing demand, as well as for inputs into the production of a wide variety of other consumer products. Mr. Waldron noted that about 6 to 7 million barrels of storage capacity is projected to be added to Houston Ship Channel by 2018 (about a 15% increase), with about \$4 billion in investment required. This would involve a mix of crude, petroleum product and chemical storage. He pointed out that for the Port there was a need to break logistics bottle necks in getting bulk liquids to terminals. Improvements in rail networks handling tankers and more efficient usage of barges were key investment requirements. He noted the logistics of getting liquid products to and from the terminals was straight forward and the *only research needed was in forecasting market trends*.

Overview of the Structure of the Port of Houston and its Market Reach

Ricky Kunz, of the Port of Houston, presented an *Overview of the Structure of the Port of Houston and its Market Reach* to set the table for a discussion of its' plans for capacity expansion to accommodate the tanker and terminal shipping needs. The Port of Houston is a governmental subdivision chartered by the State which is governed by a seven-member Commission appointed by Harris County, City of Houston and other neighboring cities. It owns and operates 8 public terminals with the Authority operating two of terminals and being a landlord for the Port's six other terminals. The supporting and surrounding infrastructure includes container terminals, city docks and turning basin, bulk handling plant, and general cargo terminals. In addition, there is the Houston Ship Channel and the railroad links and freeways and highways that provide for the commodity flows into and out of the terminals. The port has significant market reach with 8.4% of the US population within 300 miles; 12.9% within 500 miles, and; 45.9% within 1,000 miles. It is supported by three Class I railways (BNSF, UP, and KCS) with direct access to key intermodal hubs. It has 1,400 major trucking firms utilizing the facilities served by 16 interstate highways (575 miles) serving the network of the Port. The economic impact of the Port of Houston is considerable, accounting in 2011 for \$178.5 billion of economic output within the State of Texas, and a total of \$498.7 billion in output for the US economy. Mr. Kunz highlighted the 2013 import and export shares by trade region, with the rank share of imports as follows: Northern Europe (29%), Asia (25% but growing the fastest), the Americas (17%), Mediterranean (14%), Indian subcontinent (7%), Africa and Middle East (3%), all other (4%); and the rank share of exports as Americas (29%), Northern Europe (23%), Africa and Middle East (16%), Mediterranean (13%), Indian subcontinent (5%) and all other (5%). Mr. Kunz showcased the large capital investment being undertaken at the Port of Houston needed to meet the demands of the energy sector, trade growth, and the Panama Canal expansion. Houston ship channel investment for maintenance and net new investment has grown significantly from just under \$2 billion in 2010, to over \$4 billion in 2012, to \$8 billion in 2014. He also credits the Gulf Coast Advantage port consortium (i.e., Mobile and Tampa) as contributing to the growth. Despite the importance of bulk cargo for the port, 70% of its' revenues come from containers so that is the focus of public sector expansion including dredging the 52 mile channel to 45 feet. Private sector is financing the bulk expansion. The Port has explored new ways to finance improvement by reviewing methods used by some other ports (e.g., Port of Pascagoula) that are finding ways to dredge without relying on USACE budgets.

- Research is needed on how to handle the truck-container chassis with the shipping lines as they are trying to get out of the chassis business. This may be a wider problem with other ports in managing the container business.
- Research on how to handle drayage in light of truck driver issues should be explored.

The Seaport Public Funding Challenge

Dan Harmon, of *Texas DOT*, discussed the challenges of finding funding for the 26 ports in Texas in light of fact that Texas DOT only began to get involved with planning for funding of ports since 2001. Nearly one out of five vessels over 10,000 dead weight tons calling on United States ports are served by Texas ports. The competition between ports for this trade is intense. Many states have created port related funding programs to develop the facilities necessary to attract shippers to their state. The Texas Legislature has recognized the importance of Texas ports to the state's economy and the need for Texas ports to remain competitive with ports in other states. In 2001 the

Legislature amended the Transportation Code to create Chapter 55 - Funding of Port Security, Projects and Studies. The Port Authority Advisory Committee works with the Texas Department of Transportation (TxDOT) to implement Chapter 55 to advance the development of Texas maritime ports, and enabling them to compete with ports outside Texas and thereby strengthen the economy of Texas. While no funding has been appropriated to the Port Access Account Fund since it was created in 2001, annual reports since then have identified significant capital projects. In the FY 2013/FY 2014 period, 11 ports provided capital investment port profiles, with 51 projects submitted—which constituted only a small part of their capital activities. State funding requirements for all of these projects at a maximum cost share level of 50 percent from the Port Access Account Fund would necessitate legislative appropriations of \$389,330,700.00. The committee included every eligible project submitted by the ports in the report and did not prioritize any of the projects. The projects range from improving intermodal connections to security enhancements. All are important to our ports, the economy, and the vitality of the Texas transportation infrastructure.² Mr. Harmon sees sustainable funding of ports as an ongoing challenge, but views a series of financing mechanisms as partial solutions, outside of the recourse to general revenues, including Transportation Reinvestment Zones, development of focused public-private partnerships, marine fuel tax, and the Harbor Maintenance fund.

- Research is needed on best practices in funding seaport infrastructure and to ensure resiliency to natural disasters.

D2: Evaluation Considerations in Intermodal and Multi-modal Transportation (1.5 CMs)

Moderator: Dr. Konstantina Gkritza of *Purdue University* opened the session with introductory comments that framed the three presentations as focusing on freight issues.

Freight and Economic Development- Shortline Railroads –Minnesota Department of Transportation Study

Libby Ogard of *Prime Focus LLC* presented on a project in Minnesota that focuses on the importance of shortline railroads to economic growth in Minnesota and efforts underway to strengthen this relationship. She began with a description of current rail services indicating that every county in the state but eight have some level of service from the railroads. She also spoke briefly on the history of rail development and their desire to expand west through the Pacific Railway and Homestead Acts. The goal of the project is to look for opportunities for the railroads, shippers and economic developers to work together more effectively to expand local rail access, thereby encouraging business development, and improve rail and intermodal service options. The state DOT and rail and business communities worked in partnership on the project. She introduced freight rail oriented economic development concepts that recognize the benefits freight rail development brings to the rail and local business community. Shortline rail firms are familiar with their customers, but needed to access additional customers in order to provide the high density development necessary to improve their business. Key predictors of success include; dedication of the state rail agency to support freight rail development; an adequate budget for freight rail; the active involvement of Class 1 rail entities; knowledge resources on rail development; and support

² See **Texas Ports 2013 – 2014 Capital Program** by Texas DOT, < http://ftp.dot.state.tx.us/pub/txdot-info/tpp/giww/port_capital_plan_2013-14.pdf>

from the Governor. Researchers conducted a peer review of ten states to get a sense of how freight rail activities are organized and to learn about their successes and failures. They examined states based on unique characteristics of their rail program. The criteria they examined included economic impacts in terms of economic growth per mile of rail and jobs created per mile of rail. They looked at interagency cooperation and the connection to industrial development trends. They were particularly interested in how to weave rail development programs and projects into overall economic growth programs. A rail shipper tool kit was developed for economic development organizations to give them an idea where to start in establishing freight rail connections with businesses. The study team looked at specific commodities produced in the state to see what could be done to increase the amount of commodities moved by rail. A major element of the study focused on statewide funding programs that could support freight rail economic development. While the shortline rail community invested about \$200 million in improving their infrastructure, they realized the challenge was that existing public funding programs were necessary but not sufficient for rail economic development activities. Funding for planning grants was available, but there were few major sources of funding for capital projects related to economic development. The study recommended an expanded educational program for the public and business community on the need to support large capital investments in freight rail development. They also recommended that the state of Minnesota review current funding programs for possible changes that could provide a better resource for freight rail economic development activities.

A question from the audience focused on the possibility of using highway trust fund revenues. Ms. Ogard responded that there are many components to a freight rail economic development project and the significant challenge is to align the limited financial resources from different programs with these components in terms of amount and availability, so that a complete project can be delivered and be successful.

A Framework for Determining Highway Truck Freight Benefits and Economic Impacts

Zun Wang of the *University of Washington* presented a methodology for assessing benefits of truck freight movements and their economic impacts. The University of Washington undertook this project for the state of Washington. She began her comments by emphasizing the need to better understand the benefits of highway improvements to the movement of freight. The challenge is to have the correct tools to quantify direct and indirect benefits. Direct benefits are primarily cost savings to truck operations. Indirect benefits are the wider impacts to economic growth. The research objective for her project consequently focused on developing a process and quantitative tools that can measure these impacts. The project included three technical groups focused on urban goods movement, impacts on rural economies and a global gateway group focused on the international aspects of goods movement. They identified three direct impact areas including travel time savings, truck operating cost savings and impacts on mobile source emissions. The other economic impacts examined were employment changes and regional output. She went on to describe the technical process which involved an application of a travel demand model (TDM) specified for truck movements to calculate the direct impacts. The output of the TDM was then used as input into a Washington state computable general equilibrium model to assess employment and economic output impacts. Economic impacts were measured at the county and state levels in both the short run and long run. The results of the application of the methodology revealed that improvement in truck flows had a positive impact on the productivity of the transportation system. This improvement also had a positive impact on truck operating costs. Dr. Wang went on to describe a case study involving the widening of an interstate highway by two lanes (one in each

direction) currently being considered by the Washington DOT that carries about 9,000 trucks per day. Truck traffic in this area is expected to increase by 30 percent over the next ten years. The study used a build/no-build approach with a twenty year planning horizon. Total direct benefits from the improvements over the planning horizon are estimated at \$24 million. A productivity increase is expected to be about 3.24 percent at the county level 0.26 percent at the state level. The price for truck services decreases in the short and long runs while total truck service sales increase. There are also improvements in employment in both the short and long run. In her conclusion, Dr. Wang noted the limitations of using travel demand models with a long planning horizon, including limited truck and freight data and underlying land use data which remain fixed over the analysis period.

Advancements in ICT and its Implications for Travel Behavior: A Case Study of South Korea

Dr. Sungwon Lee of the *Korea Transport Institute* followed with a presentation on the implications of information and communication technology (ICT), particularly cell phones and internet, on travel behavior in South Korea. He referred to market forecasts of smart technology devices that show significant increases in their sophistication and use, which will profoundly impact lifestyles, and in particular trends in travel. Some studies have indicated that the need to stay connected for travelers will be important, especially for business travelers. He added that travel time under congested conditions or under conditions where the traveler is not connected via ICT presents a disutility. To the extent this can be mitigated, that is, travel time can be made more productive, traveling by modes other than automobiles can be more attractive. Dr. Lee went on to present bus ridership data showing intracity ridership increasing while intercity ridership is decreasing. Rail ridership is also increasing. He also reviewed current bus and rail services that provide some sort of ICT. He presented a snapshot of who travels, their preferred mode, and their use of technology. The vast majority of travelers on public transportation use their smart phones or other technology some or all of the time even though Wi-Fi connections are often slow. They typically use their devices for business, searching the internet or staying connected, that is answering text messages. The research question is, therefore, how would much improved information and communication technology impact the use of public transportation service? In other words, could the provision of vastly improved technology offset the disutility of the longer travel times experienced by using buses? Dr. Lee went on to describe the stated preference survey methodology employed, key explanatory statistics, basic utility functions for automobile and bus users, and output data. The study surveyed 240 automobile users. The study found that the provision of an ICT amenity on public transport can have a positive impact in terms of attracting travelers away from automobiles to public transport. Providing higher ICT connectivity in mass transit could attract car users by making travel time more enjoyable or productive. However, reducing travel time is still the most powerful policy measure for modal shift towards public transportation.

D3: Climate Change Policy-induced Effects on Transportation Investments and Economic Development (1.5 C.Ms)

Moderator: Andreas Kopp, World Bank, opened the session by noting that the session would examine the economic development implications of climate change mitigation strategies for transportation investments and mobility options in the developed and developing worlds. The session would examine policies to guide demand to low-emission modes and technologies which must be part of investment programs and projects dedicated to economic development. This session

confronts these issues by examining how public policies in the different regions of the US and in other nations have sought to reduce transport demand in order to mitigate greenhouse gases and to plan for new transportation infrastructure that recasts the economic geography of cities and countries.

Economic Impacts of Climate Change on Surface Transportation: The Case of the North East Corridor in the United States

Marwan Madi of *CDM Smith* presented on behalf of his co-authors **Victoria Adams, Mark Gerner, Scott Siler, and Cenk Tunasar** of *Booz Allen Hamilton*. The objective of the study was to examine the climate change impacts on transportation using a macroeconomic analysis of the Northeast Corridor (NEC) in the US with a focus on the direct, indirect and induced effects on the reliability of passenger rail and air, the potential infrastructure damage to multi-modal systems, and potential solutions. The study analyzed the effects on regional GDP and regional employment, as well as the effects on passenger trips, revenue and the systemic effect on the rail, highway and air passenger systems. Climate change affects rail systems and highways through extreme heat and cold due to warping, cracking and derailments; sea level rise and increased precipitation, and hurricanes leading to flooding, highway and track erosion and route disruption. Air transportation likewise is affected by extreme heat and cold due to climate change which reduces performance caused by weight restrictions, route disruption, flight cancellations and delays and de-icing operations, and due to forecasts of sea level rise, increased precipitation, and hurricanes which also cause flooding, damage, groundings and route disruption. The northeast mega-region of the United States, stretching from Portland Main to Norfolk VA, is the focus of this study which examines forecasts of such climate change events and their economic impacts on these two modes of transportation. The regional economy amounts to nearly \$3 trillion dollars of GRP and, based on predictions from the National Oceanic and Atmospheric Administration (NOAA), is projected to be affected by a 9 percent increase in storms over the 2015 to 2050 period due to climate change. Booz Allen Hamilton used the DIME (Dynamic Impact Macroeconomic) regional input-output model to analyze economic and employment losses from storm impacts. The study was limited to intense storms, and did not account for other climate change scenarios. The disruptions to transportation are likely to produce impacts of 121,000 jobs lost and almost \$18 billion in regional income losses. In addition, the study looked at mode specific impacts on rail and air service, with rail being most affected by extreme heat and sea level rise, while aviation would be most affected by increased precipitation and storms. These impacts would likely lead to mode shifting from one to the other. The study concluded that there is a need for more integrated approaches to modeling these impacts, and to examine mitigation strategies through planned efficient mode shifting.

Macroeconomic Impacts of Proposed Climate Change Mitigation Strategies on the Southern California Economy

Michael Lawrence, of *Jack Faucett Associates*, presented a study on the on behalf of his co-authors, **Adam Rose** and **Dan Wei** of the *University of Southern California* and **Scott Williamson** of *Citizens for Transportation*. The study seeks to support the State's climate action goals through coordinated transportation and land use planning by MPOs to meet regional greenhouse gas (GHG) emission reduction targets. From a current output from transportation sources of 168 million tons of CO₂ in California, the state seeks to implement transportation reduction strategies (TRS) by improving fuel efficiency, reducing carbon content of fuels and

reducing transportation demand. The study sought to identify TRS policies in transportation systems and land use investments and estimate the microeconomic and macroeconomic impacts. Macroeconomic policies were rated in terms of cost effectiveness for GHG reductions including employee and employer commuter options, public transit, car and ride-sharing, bicycle and pedestrian options, low-emission vehicles, parking management strategies, congestion pricing; and land-use options, including high-density urban growth centers. High-density urban growth centers had the largest impacts followed by car-sharing and parking management. Next, the study used the REMI TranSight model to examine the macroeconomic effects of net changes due to these policies on employment, GRP and disposable income. Macroeconomic inputs of the selected GHG reduction policies included:

- \$5 billion in public & private investment 2012-2035 (RTP Invests \$500 billion),
- \$3 billion in additional transit fares and parking fees paid by businesses & households, and
- \$38 billion in fuel and vehicle savings to businesses & households.

The study also modeled an offset of 42 percent of public sector cost reductions and then applied a 50/25/25 split for the Southern California (SCAG) region, Rest of California, Rest of U.S. and the effects of fuel and vehicle savings on increased consumption in other sector. The policy bundles yielded:

- Employment impacts of 71 jobs per year,
- An increase in GDP of \$94 million (\$4.3 million per year), and
- An increase in disposable personal income of \$72 million (\$3.3 million per year).

The aggregate macroeconomic impacts of these policies and changes yielded average annual effects of:

- An increase of 14000 jobs per year in Southern California (SCAG region),
- An increase of 900 jobs per year in the Rest of California,
- An increase of 3000 jobs per year in the Rest of U.S,
- \$22.6 billion GDP growth, and
- Additional job gains from productivity and competitiveness enhancement of a more efficient and cleaner transportation system (network benefits: 3,400 jobs per year, amenity benefits 442 jobs per year.

Insuring Development Through a Low-Carbon Transport Sector

Andreas Kopp, *World Bank*, presented a study co-authored on with **Rachel I. Block** and **Atsushi Iimi**, of the *World Bank*. The session focuses on how the transition to a low-carbon transport sector can secure transport's role as a driver of economic development, particularly in the developing world. In general the report finds that technical change in the transport sector has to be combined with behavioral change to achieve the transition to low-carbon transport. Furthermore, directing infrastructure investment towards low-emission modes avoids a high transport cost future for developing countries. A general finding is that reduction of greenhouse gas (GHG) emissions in transport requires a broad reform agenda. Of particular importance is the nature of fiscal policy implementation to ensure that the transition is self-financing and public finance is more efficient in the developing world. Transport drives development through integration of poor agriculture into the

market economy; opening up trade opportunities for regions and nations; driving the spatial and sectoral transformation towards more and better jobs and generating agglomeration economies and functioning labor markets in cities.

Data analysis of developing nations shows that without policy action the sector will become the dominant consumer of fossil fuels based on an extrapolation of current trends. However, even under optimistic assumptions on technical change of engine technologies, emissions will not be drastically reduced, although technological change in biofuels and fuel cells technologies may bring potential for deeper reductions (see IPCC scenarios and projections). Carbon pricing is essential to induce behavior changes, although most scenarios project that transport sector will be the main emitter in 2035 thru 2050 even with reductions. Technical change has to be combined with behavioral change to achieve the transition to low-carbon transport. Studies show that early infrastructure investment in low-emission modes pre-empts later inertia. It is not enough to change the composition of infrastructure because demand-side incentives are needed.

Financing requirements for green transport will add to often existing funding deficits. Incremental costs for the adaptation to climate change are estimated to increase from \$1.6 to \$26 billion annually, substantially higher with accounting for closing infrastructure gaps and maintenance deficits in developing countries. Mitigation costs are estimated to be \$ 100 billion annually between 2010 and 2020, reaching \$ 300 billion in 2030 (IEA), with no change in mobility patterns. In general transport has been neglected by carbon finance. In the Clean Development Mechanism only 31 of 7414 registered projects are in transport and the investment share in transport is lower than 0.4 percent. The GEF approved 28 transport projects in 20 years, attracting only 6.4 percent of all resources. The Country Programs of the Clean Technology Fund received only 16.7 percent of total investment for transport on average.

Incentives based on narrow climate change agenda are insufficient to induce modal shift and even high carbon prices will lead to small changes at the gas pump. A broad reform agenda is required that focuses on congestion costs, health cost mitigation and efficiencies of improved land use policies to encourage shift in modes. Decarbonizing fuels alone will not achieve results. In addition, implementation of fiscal incentives will lead to fiscal surplus, GHG emissions reductions and generate benefits for developing countries.

Q&A and Discussion:

Question: With respect to developing countries, how do we move forward especially in the face of the slow uptake of carbon pricing.

Answer: One immediate opportunity is to focus on mass transit in the highly urbanized places because it will reduce overall transportation costs and GHG emissions. Increasing the load factors will decrease costs and reduce fiscal strains on transportation investments. It provides a strong, reinforcing signal to change behavior. Adaptation and mitigation costs alone require a lot of additional investments costs and won't work in the long run without fiscal incentives to change demand for carbon intensive modes. Transport investments have largely ignored carbon financing schemes, although a carbon tax will directly and indirectly alter behavior on the demand side and reduce the burden on households to pay (as compared to pure mitigation strategies). A transitional strategy is required to remove fuel subsidies and stimulate demand side solutions, while the carbon tax can relieve fiscal pressures and create those incentives. Meanwhile one must recognize that rural

areas do need roads to promote development so the reform needs to be balanced by examining the co-benefits of the transportation strategy.

Question for Mike Lawrence: Did you examine road pricing and congestion pricing? Answer: There was no road pricing, or distance fees. Only parking fees were considered in the Regional Transportation Plan.

Question for Mike Lawrence: Did you model inland rail movement from ports over roads in dealing with port emission problems.

Answer: There was only incremental changes in movements out of the port of LA.

Question for Mike Lawrence: Did you consider the effects of land price disparities in modeling the cross-cutting land use scenarios in the policy bundles?

Answer: TOD and mixed use development, parking pricing, and priority growth centers were the policy channels through which this was reflected.

Question about cross county comparisons and the lessons that might be learned about land use and transportation investments across modal systems?

Answer by Kopp: High density development and planned settlement patterns for urban development coupled with a pricing system that removes fuel subsidies are key to adopting a low-carbon, lower-cost transportation systems. These approaches alter behavior. Rural transportation investment should be seen as a means to remediate poverty, stimulate growth and provide mobility. Taken together these policies should have equal footing since the bottom 40% of the household income distribution can then benefit from such a balanced overall reform strategy.

Question from the panel: Is there any overall set of consensus recommendations for TRB? Answers:

4. There is a need for more integrated approaches to modeling climate change impacts, gathering data on climate change transportation-impacts; and to examining mitigation strategies through planned efficient mode shifting and land use patterns.
5. There is a need for better understanding of climate change mitigation effects on transportation investments and sustainable economic development, especially the role of transportation in high-density urban development as a mitigation strategy.

D4: Alternative Financing Frameworks – Evaluation (1.5 C.Ms)

Moderator: Jim Gillespie, Virginia TRC, opened the session by noting that, transportation planners are examining a wide range of new financing and evaluation methods to meet current and future transportation needs. This session examines a variety of approaches to support new transportation financing plans, including methods to test public acceptance for tolls to finance transportation, and new methods to analyze alternative financing approaches.

An Economic Case for Freeway Management or, “The Artist Formerly Known as Congestion Pricing”

Michael Brown of *Metroanalytics* began his comments by indicating that there is no such thing as a managed freeway in America. He believes that tolling, as a solution to congestion, may have the highest benefit/cost (BC) ratio of any transport investment opportunity available. To build our way out of the congestion problem only works for a short time and ultimately fails. To decide our way out is technically easy, though politically impossible, at least for now because congestion may negatively impact nearby arterials. Political sentiment about tolling may reach a “tipping point” – to use Malcolm Gladwell’s term – but a marketing campaign could help it along. How might congestion be addressed? One solution would be a combination of congestion pricing and extended ramp metering, with storage lanes and a tolled bypass lane. This would require decent free alternative arterials to create elasticity. Why is congestion pricing politically impossible? This is perhaps due to fear of congestion on (parallel) side-streets, and because tolls are viewed as a tax. Free freeways are viewed as a tradition, “an institution.” The key to changing people’s minds is to convince them that they will be better off. Mr. Brown then presented a series of graphics of metropolitan Salt Lake City showing potential congestion scenarios along major freeways. In one scenario, when the traffic on I-15 becomes congested, 30 percent of the vehicles divert to parallel routes, whereupon they also become congested. Also note that a toll on one route drives diversion, possibly as much as 30 percent, onto untolled alternatives (he presented the examples of tolls on I-215 and I-15) However, if a computer-managed system imposes or raises tolls, or turns on ramp meters, such that the volume-to-capacity ratio (V/C) never passes 95 percent, approximately 5 percent of vehicles divert to another route, but 25 percent choose to remain on the roadway because traffic flow hasn’t collapsed. Therefore, tolling, with ramp metering, is better than building an extra \$3 billion of new capacity to obtain \$2 billion worth of extra peak-period through-put. Freeways flow much faster, parallel routes slightly faster.

Part two of the presentation focused on the economic perspective of tolling. Mr. Brown presented a table of economic benefits and impacts and compared the benefits of “blind tolls” (taxes) with congestion pricing. He compared the 30-year societal benefit, 30 year gross regional product, and total new jobs created over the period. In all cases the benefit of congestion pricing significantly exceeded tolls. In an effort to present a perspective on the economic analysis, Mr. Brown’s concluding slides compared the average costs to consumers of phone service, electric bills and health insurance with current estimated user taxes paid by consumers. In all cases consumers paid less in user taxes than all of the other services.

Enhanced Understanding of Road Finance by Incorporating Behavioral Economics Research

Rabinder Bains substituted for **Karen White**, for this presentation. **Both are employed by the Federal Highway Administration.** Her presentation focused on the application of concepts of behavioral economics to decision making on route choice. That is, how does behavioral economics affect when, where, and how people travel. Economists made – or used to make – certain assumptions about people’s behavior. Behavioral economics introduces a number of concepts including mental accounting, illusion of control, framing, bounded rationality, endowment and loss aversion while the decision maker is limited by incomplete information and lack of time for making decisions. Behavioral concepts show the difficulty of ‘selling’ tolls, starting from a position of where tolls do not exist. The endowment effect describes the position that travelers like their current

routine. Loss aversion simply indicates that they value what they have now and a toll would only represent a loss to them. The traveler firmly believes that he or she has a solid grasp on their commuting routine and want no interference from outside. There is an additional barrier to adopting tolls created by the media and other outside influences that affects the framing of the issue. Overall the mental accounting by drivers, places a bias against tolls, that is, while certain rationality can be exhibited in the decision to adopt tolls, drivers will still be biased against them. Dr. Bains continued with a discussion of an experiment centered on commuting in Orlando Florida and Atlanta Georgia using a behavioral economics methodology. There were essentially three scenarios, two lab based, one involving a simulator, the second based on a lottery game, and then a real-world scenario incorporating the use of GPS to track drivers. A comparison of the outcomes of the driving simulators and the lottery based decisions with the GPS scenario indicated that drivers incorporate certain risk aversions in choosing a travel route.

Using Benefit-Cost Analysis to Understand the Costs and Benefits of Public-Private Partnership Projects

Patrick DeCorla-Souza of the *Federal Highway Administration* began his presentation with a question to the audience as to who has heard of the term value-for-money (VFM) analysis. VFM is a traditional, though somewhat narrow and limited, way of evaluating financial impacts of proposed public-private partnership projects from the procuring agency's point of view. FHWA has developed a VFM analytical tool called P3-VALUE. FHWA is also developing a broader benefit/cost analysis (BCA) tool to accompany P3-Value. This new BCA tool will assist in evaluating non-financial impacts of P3s. Issues that may make such an analysis different revolve around cost efficiency, risk transfer, earlier delivery and service quality.

Mr. DeCorla-Souza demonstrated a five step process for FHWA's BCA framework by using an example of a widening of a four lane highway by one lane in each direction for ten miles with all lanes tolled and an analysis period of 50 years. The process begins with the identification of procurement alternatives, including both conventional (such as design-bid-build) and P3 (design-build, finance-operate-maintain) approaches. Costs and benefits are defined by public and private sector approaches and by impact category including costs, risk transfer, schedule, and service category. Risks include pure risk (of an unforeseen event), parametric uncertainty (a risk whose probability can be estimated) and long-term systemic risk (e.g., the risk of an economic recession or other 'sea change'). He emphasized the need to account for risk on both the *cost* side and the *benefit* side. Cost estimates adjusted for risks are made for the entire analysis period in step three. In step four benefits are estimated for mobility, vehicle operating cost reductions, safety, positive environmental impacts, and fuel reduction for the base case and P3 options. Then the net present value is determined for the options. In step five, the risks are evaluated for their impact on net benefits. Mr. DeCorla-Souza finished his remarks by describing the next steps in the project. They include refining the BCA methodology, developing a primer on P3 evaluation using BCA, developing a guidebook for practitioners, and enhancing the P3-VALUE tool to include a BCA option.

A number of questions and comments were made in response to all of the presentations. For Mr. DeCorla-Souza, the question was raised as to what is the cost of government losing control of the project to the private sector. A follow up question asked whether this is an ideological judgment.

Mr. DeCorla-Souza indicated that this may be a decision that will be part of the decision-making process.

In response to Michael Brown's presentation, audience and panel members commented on various aspects of his example. The first comment indicated that some networks are less "friendly", that is, there are fewer alternative routes, than the Salt Lake City example. Mr. Brown agreed with this comment. Also regarding Michael Brown's presentation, a panel member commented that the backward-bending part of the speed-flow curve represents a "bottleneck". Another audience member added that the initial bottleneck occurs at one specific location. An audience member asked whether breakdowns can be avoided with more driver information. The Virginia DOT attempts to achieve the same result on I-66 without tolls by opening the shoulders to traffic and/or by communicating with drivers via variable message signs. Michael Brown commented that yes, that's part of it. Signs are needed ahead of the metered ramps to give drivers a chance to make an appropriate decision.

E1: Integration of Economic Impact Analysis into State and Regional Transportation Planning Processes (1.5 C.Ms)

Moderator: Paula Dowell, *Cambridge Systematics* opened the session with an overview slide presentation on concepts and issues involved in conducting economic impact analysis (EIA) as part of the traditional transportation planning process. Her comments focused on the importance of using EIA to more completely inform planning decisions for state DOTs and MPOs. She stressed that while the EIA process is data driven, it is crucial that the process be transparent to technical and policy communities. This presents a formidable challenge since measuring economic impacts requires complex computer models that many in the policy and engineering community see as black boxes, thus not totally accepting of the results. A second and related issue is communicating the results in a coherent manner. Ms. Dowell ran through two examples explaining how the Michigan Department of Transportation and the Atlanta Regional Council (ARC) managed their processes. The ARC example involved the application of EIA in a funding proposal in the state of Georgia called TSPLOST. She indicated that the economic impact analysis was not influential in obtaining support for TSPLOST, but ARC staff conducted a debriefing to find ways to improve the technical analysis as well as how to communicate the results to be more effective in future policy applications. **Caroline Mays** of the **Texas DOT (The Economic Case for Freight Investments in Texas)** and **Jon Lee** of the **Florida DOT (The Economic Return on Transportation Investments)** presented their experiences in applying EIA in freight planning and statewide transportation planning work with an emphasis on return on investment.

Many in the audience contributed their thoughts and questions during the question and answer portion of the session. Most focused on their challenges in introducing EIA in the planning processes in their offices. They noted the resistance to accepting EIA results by engineers and other analysts who are not comfortable working with analyses that involve potential impacts of spending based on statistical outcomes. Another difficulty was communicating the concept of return on investment. It was noted that ROI means different things to people in the public sector versus the private sector. As for future research some suggested that it was important to conduct more investigation into the use of EIA as a performance measure.

E2: International Trade Related Economic Development and Transportation (1.5 C.Ms)

This session presented three papers covering different aspects of international trade from the emergence of African markets to linkages in the Eurasia markets and finally, the economic evaluation of a transnational project from the Trans-European Network Program.

Moderator: Peter Ogonowski of *CDM Smith*, opened the session with introductory comments about the speakers pointing out the geographic and subject diversity of the presentations.

Understanding U.S.-Sub-Saharan Africa Trade Corridors

Dr. Michael Bomba, *University of North Texas* presented a study co-authored with **Dr. Terry Clower**. He started the presentation by stating that he became interested in Sub Saharan Africa through Transportation Research Board (TRB) committee work. Currently, most U.S. imports from Sub Saharan Africa are petroleum-related, while most U.S. exports to Sub Saharan Africa come from Texas and are related to petroleum production infrastructure. As a result, some trade corridors have evolved between the U.S. and Sub Saharan Africa such as the corridor from Houston/Galveston to Nigeria. Michael Bomba concluded the presentation by pointing out some possible research areas in this topic. These include investigating the impact of Sub Saharan Africa network improvements on trade levels and patterns, and discerning if the African populations in the United States influence trade corridors.

A Fixed Fehrman Belt Link between Denmark and Germany in Importance for Economic Growth in the Danish Capital Region

Brian Gardner Mogensen, *Grontmij-Denmark*, introduced the topic of investigation in his paper- the Fehrman Belt Link. This is a tunnel that will connect the German island of Fehrman with the Danish island of Lolland with expected completion in 2021. The fixed link across the Fehrman belt is one of the highest prioritized projects in the European road and rail network. It is part of the European Union's Ten-T program. The tunnel would be about 11 miles long (18 km) and cost, as of April 2014 about 41 Billion Danish Krone (about \$8 Billion US Dollars or about \$5 Billion Euro). This is a critical link as Fehrman is already connected to the German mainland and Lolland is already connected to the Danish mainland both by high capacity rail and highway. The tunnel would provide a much improved connection between the large commercial areas of Copenhagen and Hamburg and, in effect would establish a Malmo-Copenhagen-Hamburg corridor. The connection between Fehrman and Lolland is island is currently provided by a ferry with limited capacity and operating characteristics. The tunnel would carry automobiles, trucks, passenger trains and freight trains. Some of the travel between Germany and Denmark and Sweden (Sweden is connected to Denmark by a recently completed bridge) is a result of widely varying prices of standard retail products (e.g., alcohol, cigarettes) and the differences between taxes at retail levels and incomes taxes. Mr. Mogenson concluded the presentation by summarizing the study findings. The tunnel would result in a substantial increase in tourism in the Copenhagen area and would allow for better distribution of trade amongst the Danish ports as well as increased use of the Copenhagen international airport. He also mentioned that Denmark has no general accepted method of calculating dynamic effects of transport investments and would like to benefit from the related expertise in the U.S. (in particular, through the SHRP2 program).

Transportation Investments in Argentina: Impacts on Social and Economic Development

Haydee Lordi, World Road Association-PIARC Argentina, presented the impacts of deploying a Bus Rapid Transit system supplemented by ITS to serve the La Matanza corridor in Argentina on social and economic development. La Matanza (equivalent to a county in the U.S.) is just southwest of Buenos Aires. It was once comprised of small villages and towns but the portion near Buenos Aires has become urbanized and functions as part of the commercial Buenos Aires area. The corridor currently has about 2 million people (in comparison, the general Buenos Aires area has about 14 million and provides 40 percent of Argentina's GDP). Both Buenos Aires and La Matanza are expected to increase in population by some 5 to 10 percent by 2050. La Matanza currently is a center of production of parts for the transportation industry (mostly auto) and provides a labor supply for Buenos Aires. However, transportation is relatively deprived and access and connectivity is poor in much of the corridor. The proposed Bus Rapid Transit lines would connect La Matanza population centers with Buenos Aires industrial and commercial centers. To maximize the lines' utilization, some Transportation Demand Management strategies are proposed as well. The main objective of the study was to provide a detailed analysis of the transport infrastructure in the Metropolitan Area of Buenos Aires (AMBA) in Argentina and to propose solutions to optimize the existing system capacity, without resorting to strategies focused on expanding capacity, especially road capacity. Haydee Lordi then summarized the main study findings. The financial evaluation based on different alternatives suggested gave reasonable results which would render the BRT system in the Metropolitan Area of Buenos Aires area as a viable mass transport system in economic and financial terms and especially applicable as a way of converting the existing infrastructure directed at the private vehicle into an infrastructure capable of housing sustainable mass transport systems.

Peter Ogonowski thanked the speakers and an extensive Q&A session followed.

Question to Lordi: How will the Argentina project be financed?

Answer: It would be part of the overall national Transportation Improvement Program which also supports rail, air, etc.

Question to Mogenson: Please provide more details on the tunnel, e.g., mode, speed.

Answer: The tunnel will carry both freight and passenger; probably not suitable for High Speed Rail.

Question to Mogenson: Why are there so many bicycles in Copenhagen?

Answer: Bicycling is part of our culture.

Question to Mogenson: Are German companies evaluating the impact of the tunnel on Germany?

Answer (Mogenson): A consultant in Hamburg is conducting a study. We are providing some data.

Question to Bomba: What are the implications of increasing US production of shale oil on sub-Saharan Africa trade?

Answer (Bomba): We don't know yet. A lot will depend on the quality of the produced product because refineries have different operating characteristics.

Question to Bomba: Would you agree that these (trade with improved infrastructure, trade with developed ethnic Sub Saharan Africa populations in US) are good topics for a World Bank study?
Answer (Bomba): Yes, I agree.

Question to Bomba: The Chinese seem to be using in-kind and barter investments in sub-Sahara Africa because concerns with corruption. Is there movement in the U.S. toward that mechanism?
Answer (Bomba): Probably the US movement is more towards public-private-partnership type mechanisms.

Question to Bomba: Is there a relatively large New York to South Africa trade related to ethnic South Africans in New York City?
Answer: Probably there is at least an indirect influence. It would need to be studied.

Question to Mogenson: Will congestion pricing affect the traffic in the Hamburg to Copenhagen to Malmo corridor?
Answer: There is already congestion pricing in place in the corridor and the construction of the tunnel would not directly change the various congestion pricing policies; for example, the ferry charge will become the tunnel toll.

Peter Ogonowski closed the session by thanking the speakers and the audience.

[E3: SHRP2 C11 and TPICS Tool Demonstration \(1.5 C.Ms\)](#)

SHRP2 Project C11 Tools and Transportation Project Impact Case Studies (TPICS) Demonstration

Stephen Fitzroy and Naomi Stein, *EDR Group*, conducted a demonstration of SHRP2 C11 and TPICS tools. This session was actually a workshop presented by the developers of TPICS for the Strategic Highway Research Program (SHRP2 project C03 project) sponsored and funded by the Transportation Research Board. As introduced in the poster session at the beginning of the conference, this tool was developed to enable early planning analyses of potential investments in highway improvements by planners for state DOTs, metropolitan planning organizations and other local governments. The consultants walked the audience through the databases that make up the core of TPICS and demonstrated the use of the spreadsheets that convert estimated operational improvements of proposed projects into economic impacts. Tools developed under the SHRP2 C11 program reflecting assessment of reliability, access and connectivity impacts.

[Closing Session](#)

Chris Mann, *Independent Consultant*, closed the conference by thanking everyone and also thanked the Chinese and Korea contingent who came all the way, as well the tour organizers and participants. He called upon four speakers to summarize the conference presentations as well as speak to future research. The speakers included Stefan Natzke of FHWA, Michael Lawrence of Jack Faucett Associates, Rabinder Bains of FHWA and Dan Hodge of Donahue Institute. Stefan Natzke noted the development of a new FHWA TED portal, while Michael Lawrence presented a research agenda for exploring climate change related issues. His ideas are presented in the outcomes session as part of the research agenda. Rabinder and Dan summarized some of the key themes from presentations related to alternative finance and logistics, respectively.

Conference Statistics and List of Participants

Date: April 9-11, 2014

Location: Sheraton Hotel, Dallas Texas

Attendance:

- Number of participants: 143
- Public Sector: 28
- Private Sector: 42
- Non-profit organizations and policy organizations: 26
- Educational/Research Institutions: 47
- Domestic: 128
- International: 16
- Number of continuing education credits earned: 527

Table 1. ITED 2014 Attendee Roster

Last Name	First Name	Agency
Kevin	Adderly	Federal Highway Administration
Geunwon	Ahn	Korea Transport Institute
Bret	Allphin	Buckeye Hills - Hocking Valley Regional Development District
Al	Alonzi	Federal Highway Administration
Taha	Alyousef	The University of Akron
Paulos	Ashebir Lakew	University of California, Irvine
Misak	Avetisyan	Texas Tech University
Rabinder	Bains	Federal Highway Administration
Edwin	Bastian	BBC Chartering USA, LLC
Greg	Bischak	CDFI Fund, US Department of the Treasury
Michael	Bomba	UNT Center for Economic Development and Research
Amy	Bratt	Valley Metro
Stacey	Bricka	TTI
Eric	Bridges	North Central PA Regional Planning & Develop. Com.
Scott	Brosi	Transcore
Michael	Brown	Metro Analytics
Glenda	Bumgarner	Ohio Department of Transportation
Mark	Burton	University of Tennessee
Grant	Bush	IMCAL Regional Planning Commission
Anthony	Byett	ECPC Limited, New Zealand
Miguel Gaston	Cedillo-Campos	Mexican Institute of Transportation
Shailesh	Chandra	TTI
Linda	Cherrington	TTI
Terry	Clower	UNT Center for Economic Development and Research
Darrell	Coffey	BNSF
Bob	Cuellar	TTI
Vann	Cunningham	Burlington Northern Santa Fe Railway
Patrick	DeCorla-Souza	Federal Highway Administration
Bill	Dingus	Lawrence Economic Development Corporation
Patrick	Donovan	Rahall Transportation Institute
Paula	Dowell	Cambridge Systematics
Chandler	Duncan	Economic Development Research Group
Hisham	Eid	University of Texas at San Antonio
Christopher	Ewen	Brandocular
Tim	Feemster	Foremost Quality Logistics
Stephen	Fitzroy	Economic Development Research Group
Ed	Fritz	Wyoming DOT
Adam	Fulton	Regional Economic Models, Inc.
Brian	Gardner Mogensen	Grontmij A/S
James	Gillespie	VDOT - VCTIR
Nadia	Gkritza	Purdue University

Daniel	Graham	Imperial College London
John	Greuling	Will County Center for Economic Development
Cerisse	Grijalva	Southwest Council of Governments
Darnell	Grisby	American Public Transportation Association
Hamid	Hajjafari	University of Texas at Arlington
Tom	Hammons	City of Carrollton
Dan	Harmon	TxDOT
Scott	Hercik	Appalachian Regional Commission
Brian	Hill	MARAD
Ira	Hirschman	Parsons Brinckerhoff
Esther	Hitzfelder	TxDOT
Daniel	Hodge	University of Massachusetts
Terri	Hollingsworth	Delta Regional Authority
Thatcher	Imboden	Hennepin County
Derek	Jaeger	Port of Portland
Greg	Janes	Jacobs
Yulin	Jiang	China Urban Sustainable Transport Research Center
Jerry	Jones	IMCAL Regional Planning Commission
Susan	Jones Moses	Susan Jones Moses Associates
Eirini	Kastrouni	University of Maryland
Amy	Kessler	North Central PA Regional Planning & Develop. Com.
Won	Koo	North Dakota State University
Andreas	Kopp	World Bank
Indraneel	Kumar	Purdue Center for Regional Development
Ricky	Kunz	Port of Houston Authority
Steven	Landau	Economic Development Research Group
Michael	Lawrence	JFA
Jonathan	Lee	Cambridge Systematics
Joung	Lee	AASHTO
Sungwon	Lee	Korea Transport Institute
Wei	Li	TTI
Todd	Litman	Victoria Transport Policy Institute
Qing	Liu	Rahall Transportation Institute
Giovanni	Lizarraga	Universidad Autonoma de Nuevo Leon
Dina	Lopez	Mid-Ohio Regional Planning Commission
Haydee	Lordi	World Road Association - PIARC Argentina
Shirley	Loveless	Coleshill Associates LLC
Donald	Ludlow	Cambridge Systematics
Marwan	Madi	CDM Smith
Christopher	Mann	CRM Transport Planning
Mark	Marek	TxDOT
Julie	Marshall	Appalachian Regional Commission
Caroline	Mays	TxDOT

Eric	McClellan	CDM Smith
Reannan	McDaniel	UNT Center for Economic Development and Research
Chad	Miller	University of Southern Mississippi
Deb	Miller	Cambridge Systematics / Surface Transportation Board
Jim	Miller	Sandag
Kristi	Miller	TTI
Subhro	Mitra	University of North Texas at Dallas
Maarit	Moran	TTI
Michael	Morris	North Central Council of Governments
Richard	Mudge	Compass Transportation and Technology Inc.
Stefan	Natzke	Federal Highway Administration
Nicolas	Norboge	TTI
Scott	Nystrom	Regional Economic Models, Inc.
Elizabeth (Libby)	Ogard	Prime Focus LLC
Peter	Ogonowski	CDM Smith
Qisheng	Pan	Texas Southern University
Brian	Park	HDR
Ju Dong	Park	UGPTI - NDSU
Karen	Pawloski	Buckeye Hills - Hocking Valley Regional Development District
Ryan	Phelps	Madison County Council of Governments
Keith	Phillips	Federal Reserve Bank
David	Plazak	Transportation Research Board
Rimon	Rafiah	Economikr
John	Renne	University of New Orleans
Christine	Risch	Center For Business and Economic Research - Marshall University
Bryan	Roberts	Econometrica, Inc.
Cheryl	Roberts	University of Leeds
John	Ruggieri	RTKL Associates Inc.
James	Sassin	Fugro Consultants, Inc.
Samuel	Seskin	CH2MHILL
Matt	Shands	MnDOT
Zamira	Simkins	University of Wisconsin-Superior
Christopher	Slijk	Federal Reserve Bank
Cy	Smith	AirSage
Mike	Smith	Western Carolina University
Brian	Solis	City of Virginia Beach
Erik	Steavens	TxDOT
Naomi	Stein	Economic Development Research Group
Leo	Tidd	Louis Berger Group
Denver	Tolliver	UGPTI - NDSU
Fred	Treyz	Regional Economic Models, Inc.
Bill	Triplett	Delta Regional Authority

Katie	Turnbull	TTI
James	Tymon	AASHTO
Sharada	Vadali	TTI
Victor T.	Vandergriff	TxDOT
Leslie	Wade	Parsons Brinckerhoff
Lawrence	Waldron	Vopak Corporation
Jason	Wang	Appalachian Regional Commission
Zun	Wang	University of Washington
Glen	Weisbrod	Economic Development Research Group
Martin	Weiss	Martin Weiss Consultants
Jeffrey	Wendt	North Lake College
Jack	Wierzenski	Dallas Area Rapid Transit
Chris	Williges	HDR
John	Wilson	MnDOT
Ping	Xu	China Academy of Transportation Sciences
Hua	Yang	North Texas Central Council of Governements
Ming	Zhang	University of Texas at Austin/Wuhan University

Appendix A: Summary of Tours

International Inland Port of Dallas and Loreal Distribution Center Tour

The ITED conference, which was hosted by the Texas A&M Transportation Institute and The Transportation Research Board Committee on Transportation and Economic Development attracts delegates from around the nation and the world to discuss emerging issues linking transportation services, transportation infrastructure, to regional economic development.

Objectives

IPOD as a logistical cluster and regional distribution hub for container traffic has been a vital economic development driver in the region. The tour of the IPOD facility afforded the opportunity to showcase emerging evaluation issues centered on productivity efficiencies in intermodal supply chain movements and the vital role that inland ports and infrastructure in streamlining movements.

Summary

The ITED participants toured the International Inland Port of Dallas (IPOD), and specifically the Union Pacific (UP) Intermodal facility. Boasting rail services by the Burlington Northern (BN) and UP and access to five interstate highways, IPOD hosts facilities for several companies like FedEx, BMW, Whirlpool, Home Depot, Quaker Oats, Unilever and other major businesses. IPOD is a public private partnership serving as the third phase of development in the North Texas region's emergence as a key logistics and distribution center (along with DFW International Airport and Alliance Texas). The tour was spearheaded by the Center for Economic Development, University of North Texas.

Initiated with UP's investment of a major intermodal facility in 2005, and despite the slowdown in industrial development associated with the Great Recession, IPOD now covers more than 7,000 acres with 12 million square feet of industrial development built or under construction. Conference attendees visited key logistics facilities demonstrating how inland ports are an increasingly important supply chain element and can promote regional economic development. Participants had the opportunity to interact with industry and economic development professionals as well as observe how truck biometric scan technology was used specifically. The IPOD was noted to serve truck and rail container movements between Dallas and Houston, Los Angeles, cross-border flows coming from Mexico, NAFTA trade flows to Canada, and other regions. The tour showcased specifically how the introduction of technology at various locations in the terminal was able to introduce logistical efficiencies and safety within the cargo flow supply chain all of which are key productivity drivers in port-based environments leading to efficiency in trade flow movements and container throughput. Figure 2 shows the IPOD UP Intermodal Terminal location in Southern Dallas and its vital connections to national transportation networks via Interstate 20 and Interstate 45 and existing freight rail lines. Figure 3 shows the container yard at IPOD which processes intermodal containers movements. Figure 4, Figure 5 and Figure 5 show several technological elements used to maximize speed and flow of processing times and consequently, throughput at entry/exit points, cargo transfers from one mode to the other. In addition, the tour participants also had an opportunity the back -end state of the art "mission control" central command like room from where the entry/exit can be monitored as well as a location where all bio-metric scans are screened for clearance.

Delegates of the International Transportation and Economic Development (ITED) conference also toured the L'Oreal's national distribution center in close proximity to the Union Pacific Intermodal

facility. Grant Pearson and Hélène Prichonnet masterfully served as tour guides of the L’Oreal facility, during which they were peppered with a wide range of questions about the supply chain network supported by the Dallas distribution center. The L’Oreal facility drew particular praise from several tour participants regarding the operational balance between logistic efficiencies, workplace safety, and environmental sustainability.

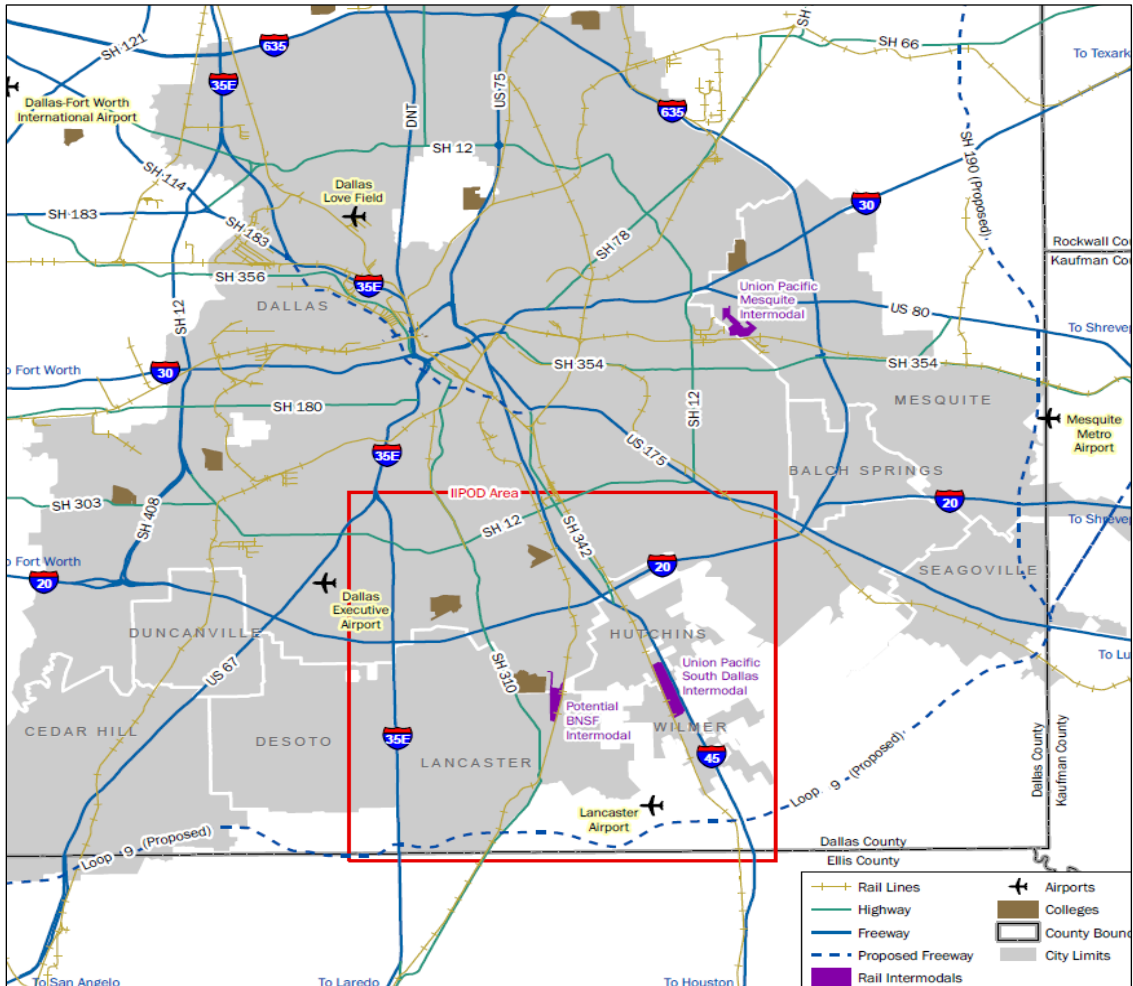


Figure 1. Location of IIPOD in Southern Dallas Relative to Major Interstates (Source: IIPOD)



Figure 2. Container Yard at IIPOD



Figure 3. Truck Processing and Clearance at IIPOD Gates



Figure 4. Cranes Optimizing Cargo Transfers

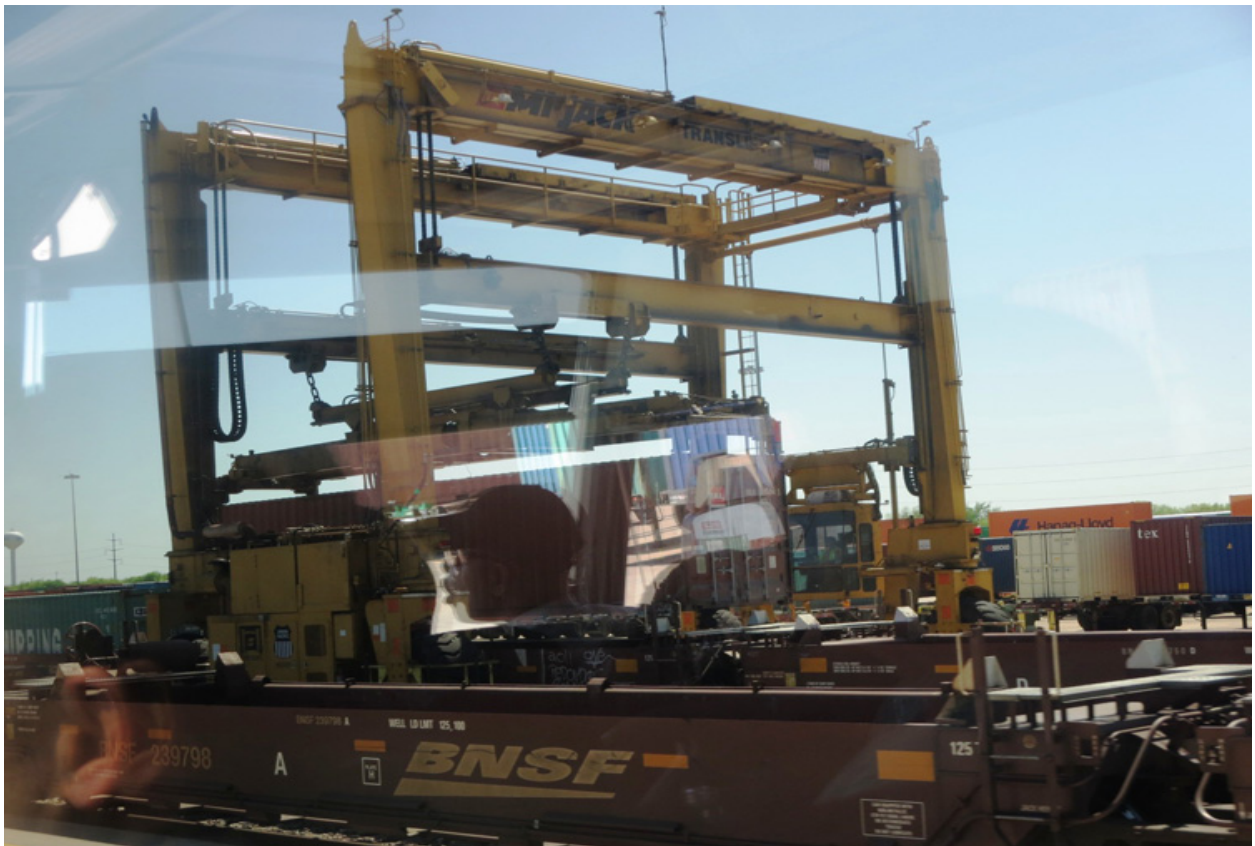


Figure 5. IIPOD Cranes Use GPS to guide Containers

Practitioner's Workshop: Using Economic Census Data Products

Instructors: Donald Ludlow, AICP, Cambridge Systematics and Stacy Bricka, Texas A&M Transportation Institute

The purpose of the Economic Census Data Workshop was to introduce attendees to the various data bases and tools developed by the United States Census Bureau for use in a variety of economic analyses projects. The workshop was geared for professionals with economic analysis, transport planning and management responsibilities. Material covered in the three and one-half hour session included databases such as the American Community Survey and the Service Annual Survey, and database search tools such as the American FactFinder. The instructors focused on databases that could be used for freight analysis projects, including the source of the data, advantages and limitations and how to access the data using search parameters provided by the Census. Examples of applications discussed during the session included methods of coupling the data with GIS tools to provide a geographic visualization. Other data sources presented included county business patterns and foreign trade. The instructors also presented an overview of the Transportation User's Guide to the Economic Census, a NCHRP funded project. Approximately 20 people were in attendance.

ITED- Dallas Area Rapid Transit (DART) Tour of Mockingbird Station and Downtown Plano

Objectives

The DART tour was placed as a follow on the two public transportation sessions held earlier in the day namely session A5 focusing on light rail transit, value capture and community development and session B4 linking public transportation to clusters and economic development. The aims of the tour were to showcase two premier TOD sites on the 85 mile DART System, Mockingbird Station and Downtown Plano as excellent examples of how the investment in rail has been the catalyst for sustainable development abutting transit stations.

Summary

Mockingbird Station opened in 1997 and is currently surrounded by several mixed use developments, the Bush Presidential Library and Southern Methodist University. This part of the tour was led by Jack Wierzinski of Director of Economic Development at DART.

Downtown Plano has seen a resurrection of their old Downtown to becoming a thriving residential and entertainment hub with their latest residential and retail project under construction as well as another planned project just announced. The downtown Plano tour was conducted by Christina Day, Director of Planning for the City of Plano. Figure 6. Mockingbird Station DART the Mockingbird Station and Figure 7. Transit Oriented Development at Mockingbird some of the transit oriented development opportunities made possible by the station. Figure 8. Transit Station - Downtown Plano shows station at downtown Plano. Jack Wierzinski presented the history of Mockingbird Station and noted that the station has made non-automobile based commute

opportunities possible for Dallas that was not possible before. He discussed the transit-oriented development (TOD) and mixed use developments in and around the area—which contains of retail, restaurant, and cinema space, office space and loft apartments; as well as parking for cars. He pointed out the developer (UC Urban and Hughes) had a major role to play and had to pay for all road improvements and for the full cost of connecting the project to the rail platform. An example of the TOD, he pointed out is shown in Figure 7. Transit Oriented Development at Mockingbird The area around Mockingbird Station is surrounded by lots of retail development geared for everyone. The Southern Methodist University is right across the highway from the station so the station attracts students as well as a variety of users.

The Downtown Plano station and surrounding area present a very different development in comparison to the Mockingbird Station. In the case of Downtown Plano, the station connects to the historical village that blends in history with a more urban concept. Ms. Day pointed out how the station has metamorphosed the small historic downtown to a mixed use environment with a combination of high density housing and historic surroundings. She pointed to the developments as an excellent public-private partnership example.



Figure 6. Mockingbird Station DART



Figure 7. Transit Oriented Development at Mockingbird



Figure 8. Transit Station -Downtown Plano