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International Transportation and Economic Development Conference 2018

Summary and Proceedings

June 6–8, 2018
Washington, D.C.
The Transportation Research Board is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to provide leadership in transportation improvements and innovation through trusted, timely, impartial, and evidence-based information exchange, research, and advice regarding all modes of transportation.

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Preface

CONFERENCE OVERVIEW

On June 6–7, the Standing Committee on Transportation and Economic Development of the Transportation Research Board (TRB) held the 6th International Transportation and Economic Development Conference (ITED 2018) at the National Academies of Science Building in Washington, D.C. TRB convened the conference with the support of the National Transportation Center, University of Maryland, and the Federal Highway Administration of the U.S. Department of Transportation. The conference featured four plenary sessions, a keynote speaker, presentations on current projects and programs over 12 concurrent breakout sessions, a poster session, two workshop sessions, and ancillary meetings.

The ITED 2018 provided the opportunity for discourse, collaboration, and the exchange of information on a wide range of topics, including:

- Current and emerging influences on domestic supply chains and their implications for transportation, sustainability, resilience, and economic development planning;
- Planning for mega-regional connectivity and the role of economic development;
- Transformative technologies- economic aspects in the context of automation, autonomous systems and the role of big data and big data techniques to address economic aspects and lend economic insights and finally; and
- Understanding more about revenue strategies and methods to finance economic development.

The 2018 ITED attracted approximately 118 participants from the United States and other countries.

REPORT ORGANIZATION

This report presents the proceedings from the ITED 2018. The report follows the general conference agenda. The presentations by speakers in the four plenary and 12 general sessions are summarized. A list of the posters presented in one session is provided in Appendix A and the Final Program is provided in Appendix B.

PUBLISHER’S NOTE

The preparation of this report was supported by TRB. The views expressed in this summary are those of the individual speakers and discussants, as attributed to them, and do not necessarily represent the consensus views of the symposium participants, the volunteer organizers, the TRB, or the National Academies of Sciences, Engineering, and Medicine.
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Welcome Remarks

Sharada Vadali, co-chair of the planning committee of the International Transportation and Economic Development (ITED) Conference and co-chair of the Transportation Research Board (TRB) Standing Committee on Transportation and Economic Development, opened the conference by welcoming all participants and thanking all the patrons, federal agency supporters, and plenary speakers of ITED 2018:

- Federal Highway Administration (FHWA) of the U.S. Department of Transportation (DOT);
- Appalachian Regional Commission (ARC);
- National Transportation Center at University of Maryland (UMD);
- Indiana DOT;
- Economic Development and Research Group; and
- Regional Economic Models, Inc. (REMI).

Vadali also thanked the volunteers of the planning committee of the ITED 2018 and the TRB staff for their efforts, professional expertise, and contributions in bringing the conference to fruition. A special thank you was given to UMD’s National Transportation Center for its overwhelming support of the conference as well as collaborating TRB committees. Finally, Vadali thanked the World Bank, Organization for Economic Cooperation and Development–International Transport Forum (OECD), National Association of Development Organizations (NADO), the U.S. Census Bureau, and U.S. Maritime Administration (MARAD) for their support of the conference and for contributing toward program development.

The tri-fold mission was to serve as an avenue to promote peer exchange, to facilitate networking opportunities, and to provide a platform for contributing to broader research agenda of the committee. Vadali provided a brief history of five previous ITED conferences and related it to the 2018 conference theme, Relationships Between Multimodal Transportation and Economic Development: Policy, Infrastructure, and Technology. Linkages between transportation and economic development are becoming increasingly complex and influenced by both external and internal stimuli. These aspects were addressed further in the plenary and technical sessions to explore new approaches and provide greater insight.

Vadali concluded her opening remarks by introducing Greg Bischak, who briefed the audience on the influence and trends of megaregional economies on the reshaping of global supply chains, transportation infrastructure, and the development and productivity of national economies.
Keynote Session

Derek Kan, Undersecretary of Transportation for Policy, Office of the Secretary of Transportation, U.S. DOT delivered the keynote for the conference during a working lunch. Darren Timothy, Chief Economist, Office of the Secretary of Transportation, U.S. DOT, and Chair of the TRB Standing Committee on Transportation Economics introduced Kan.

Kan referenced the American Society of Civil Engineers report card on infrastructure and the mismatch between demand for infrastructure and the funding required to meet those broad needs to highlight an infrastructure funding backlog needed to support the economy. The 2013 report card cited a need for $1.5 trillion in infrastructure investments across all sectors to bring the nation’s near-failing infrastructure to a good condition. Kan introduced to the audience the federal government’s infrastructure initiative with a goal to stimulate at least $1.5 trillion in new investments with minimal of around $200 billion in direct federal funding. The initiative utilizes existing federal resources and augments with new tools meant to support state and local governments funding needed for infrastructure improvements. This federal funding is directed to not just transportation infrastructure, but also to broadband, drinking and wastewater, power generation, and more.

Kan emphasized that the initiative supports partnering across funding sources to meet the expected shortfall funding gap. He spoke of different federal programs such as

- Transportation Infrastructure Finance and Innovation Act loans;
- Infrastructure for Rebuilding America (INFRA) grants (large grants are those in excess of $25 million to be applied toward a project); and
- Railroad Rehabilitation and Improvement Financing.

He also spoke of the Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grant program to support projects across modes like roads, bridges, ports, transit, and rail that are multimodal and multijurisdictional projects and more complex than typical funding transportation programs. BUILD, previously known as the Transportation Investment Generating Economic Recovery (TIGER) grant program, includes 10 rounds of National Infrastructure Investments to fund projects that have significant local and regional impacts. He also noted that the grants seek to help communities revitalize their surface transportation systems while also increasing support for rural areas.

According to Kan, the National Infrastructure Investment grants aim to support the administration’s commitment to fixing the nation’s crumbling infrastructure and rebuilding America by creating opportunities for all levels of government and the private sector to fund infrastructure by using innovative approaches to improve the necessary processes for building significant projects and increasing accountability for the projects that implemented. He emphasized the hallmarks of the program: expediting project delivery, creating a greater impact on the economy, enhancing accountability standards, and attracting opportunities for rural America and its connections to regional and urban economies. With respect to rural provisions, he noted that 25% was set aside for rural projects and mentioned that state and local governments would have to contribute their own funds to the project as part of the grants programs.

Kan concluded by addressing a need for tools enabling smarter investments with limited federal dollars. He then took questions from the audience.
PLenary Session 1

Transportation and Supply Chains of the Global Economy

GREG BISCHAK
Community Development Financial Institutions Fund, U.S. Department of the Treasury
Moderator

TONY PADILLA
Maritime Administration, U.S. Department of Transportation
Speaker

JOSE LUIS IRIGOYEN
World Bank Group
Speaker

ROBERT ATKINSON
Information Technology and Innovation Foundation
Speaker

Summary and Transcript

Structured as a panel discussion, the Opening Plenary Session addressed the dynamic role of transportation in trade and the influence on the global economy. The moderator of the session, Greg Bischak, spoke as an industry expert member of the TRB Standing Committee on Transportation and Economic Development and not as an official of the federal government. He opened the conversation by noting that ever since the recovery from the financial crisis there has been renewed growth and shift in merchandise trade and transportation services. He pointed to reengineered and even to regionalization trends of supply chains in key manufacturing sectors in East Asia, the European Union (EU), North America, and elsewhere including developing nations. After discussing the format of the conversation, he posed five questions to the panelists and opened the floor to audience questions. The answers to the questions have been summarized and issues highlighted.

Q1: What macro factors and mega trends are contributing to these changes in supply chains globally and how are they affecting regional development?

The panelists offered two basic views to this question. One reflects the shifts in global trade changing rapidly over the last 25 years and trade volumes that would continue to increase annually at about 4.2% through the period 2015 to 2030. From this point of view, the United States and the developing world are at inflection points, with a multitude of factors influencing transportation and supply chain shifts. The contrary viewpoint is not whether trade would grow, but if it would grow faster than the gross domestic product (GDP) going forward. One panelist pointed at technological and policy reasons to explain why a slowdown in trade may be possible. Panelists’ points are broken down by Supply and Demand and Technology and Policy shifts.
SUPPLY AND DEMAND

On the demand side, panelists referred to the role of population, population density, and urban concentration as the top factor driving both transportation and supply chains globally. Drawing attention to global urbanization trends and the shift in the location of top megacities by 2030, with 27 of these 33 megacities projected to be in Asia, especially South Asia and Southeast Asia. They also note the shifts in geographical composition of global trade flows between north and to a rebalancing of north–south flows as well as west to east shifts toward the Pacific regions. These shifts in production and consumption regions and the rise of new domestic consumption-based demand are spurring the developing economies. A 2014 survey conducted by the Pacific Institute shows that 53% of exports from the developing nations are going to other developing countries. India, for instance, was essentially driven by a 70% domestic consumption demand and now Indian transportation sectors have increasingly responded to such changes externally by opening up market access via the development of logistics zones.

Furthermore, with the growing populations in and around megacities, the rise of middle class, and economic and population growth from the demand side may motivate an increase in the demand for transportation and goods and services. India’s transportation demand has been forecast to increase by almost 300% over the next 15 years due in part by the shifting and growing populations. A related factor pointed out was the reconfiguration of trade rules motivated in part of the shifting composition of trade as well as the rise of trade blocs.

The enormous rise in e-commerce and its influence on distribution systems is another key factor on the demand side. E-commerce is a global phenomenon and its increasing adoption and success are related to trust and security, particularly increased cybersecurity issues. It is a trend that may affect the world.

On the supply side, a factor is the size of the infrastructure needs globally relative to developing countries. Asia’s infrastructure needs are approximately $2 trillion dollars every year until 2030, in comparison to the United States $1 trillion investment package over 10 years. Given this, panelists felt that trends and developments in Asia and elsewhere in the world will continue to influence the United States than ever before. The modern infrastructure demands also present a more-complicated set of technological and security issues. Natural disasters and cybersecurity threats pose risks for transportation-related disruptions in trade flows. A disruption in 2014–2015 at the port of Los Angeles–Long Beach resulting in the United States losing 1% of GDP and a decline of 18% in exports. This led to rerouting cargo to the Canadian and East Coast ports, creating a loss of market share and shifts in supply chains. Ports serve as economic generators and chokepoints in the regional and local economies due to congestion effects of cargo throughputs. Managing cargo throughputs and flows better position ports to compete worldwide due to these global macro-economic trends.

TECHNOLOGY AND POLICY

As another factor of the supply side, a survey of multinational corporations points to increasing adoption of “smart factors” in contrast to the role of cheap labor. Technological issues are making it difficult to understand how the future could evolve. The adoption of Industry 4.0 and data exchange methods, including artificial intelligence (AI), may challenge the conventional development path that emerging economies typically go through. This will require economies to
develop in terms of the digital economy and jobs of the future. It could lead to a scenario where it can no longer be assumed that traditionally labor-intensive jobs will relocate to developing countries. Digitization factors as a mega trend and a major motivation for the World Bank and other agencies who are currently examining its implications for jobs in the future. Technology pathways could be a leading factor to leapfrogging development paths in developing and emerging economies due to quicker and innovative logistical changes brought about via technology.

Other technological facts that may influence better efficiencies in the supply chain and better monitoring of future transportation and economic development include:

- The development of block chain may reduce transaction costs and assure monitoring of trade and associated transactions. Some examples include developments in distributed ledgers used by companies like Walmart that enabled the tracing of salmonella in mangoes back to the produce farm, and the tracking of the shipment of roses in the case of Maersk Line.
- The increased use of larger container ships.
- The development of autonomous vehicle and freight systems as some of the potential contributing centripetal factors.

Shifts in policy, such as a rise in protectionism, are not necessarily new. Although, coupled with factors like technology and “big initiatives” like the huge investments in connectivity (like those occurring in China) can influence the flows and accelerate efficiencies but the net effect on flows and transportation all need to be re-examined. Another factor in policy are labor costs and the effect on the overall production costs which is noted in the dispersion in supply chains (for example, average labor hour costs in manufacturing in Detroit is $35 per hour and in China the average is $3 per hour). Although The Reshoring Institute reports a shift to low-cost labor markets in the developing world has gone from 10 to 1 jobs in the emerging-to-developed economies, to almost parity these days. In addition, a counter interpretation of the growth of Industry 4.0 (the digitalization of manufacturing system and mass customization of manufacturing products to supply specific markets) is that it may serve domestically as a centrifugal force and to the relative advantages of developing countries.

Q2: A topic of this conference is the impact of transformational technological innovations on the supply and demand for transportation services across modes. What are the key technological innovations and trends that may affect patterns of world trade, transportation and supply chains? The moderator asked the panelists to address more than what had already been presented regarding logistical implications of ecommerce and the likelihood for greater multimodal market development potential.

The panelists reiterated an inflection point in this regard and identified non-physical “soft” technology options like block chain and “hard” physical changes in automation occurring at ports such as: fully automated gantry cranes, digital bills of lading, and advanced cargo handling equipment to augment efficiencies and reduce time-related friction at ports. However, in the mid-to long-term major initiatives like the multimodal Belt and Road Initiative (BRI) led by China, which may be the largest transportation engineering effort in human history, will likely have great impacts on the patterns of global trade and transport over the next 30 years. The China project spans almost half of the world’s GDP and is being developed in collaboration with
approximately 70 countries. These developments could change the trade dynamics of emerging markets in Africa, South–Southeast Asia, and Central Asia. Panelists pointed out the potential implications for key transshipment countries, like Bangladesh and Myanmar. They noted that Bangladesh relies heavily on transshipment via Sri Lanka before latching onto the major Marine Silk Road.

One panelist noted that technology is facilitating multimodalism in unprecedented ways. He noted that is not by chance that the EU’s approach to corridors is essentially multimodal and fully integrated. There are three factors from the perspective of developing countries.

1. Rise of the sharing economy (platforms for facilitating multimodalism, facilitating big data, addressing empty truck back haul problems, and real-time data monitoring platforms);
2. Anticipatory flow analysis promoting understanding of bottlenecks; and
3. Urban and city logistics (the development of platoons, last-mile issues becoming increasingly important, automated transportation, Amazon’s “smart lockers,” adoption of drones, and block chain enhancing trust in trade).

**Q3a: Question three is broken into two parts. First, a topic of this conference is how environmental considerations have played an increasing role in transportation and supply chain management policies and practices. What initiatives and investments are greening the supply chains transport infrastructure to foster more sustainable development, enhance environmental and transportation reliability? A second question pertains to restructuring in energy markets over the last decade, particularly in oil, gas, coal and growing renewable sectors. What can you say about how these shifts in the energy sectors affected transportation services across modes and technological and infrastructure investments supporting trade flows and supply chains? The interesting example of liquid natural gas conversion to a major export from this region largely stimulated due to fracking in the Houston area was presented to stimulate the discussion and pointed to the intertwined nature of the energy–environment nexus.**

According to the panelists, the climate change problem would not be addressed by making marginal contributions. In this opinion, the adjustments made at ports and modal shifts are small or marginal changes—those that you could not expect to reduce significantly carbon emissions. One panelist stated that in order to make contributions in this domain one has to decarbonize fuel, pointing out the need to develop noncarbon or super low-carbon alternatives. The panelists suggested that greater investments in research and development and clean tech innovation are warranted. Currently cost-effective technology does not exist and is not ubiquitous enough. With a shift in political will, greater investment in research of alternative fuels, the panelists point out the export of energy through liquefied natural gas (LNG) terminals or coal shipped globally will change because it is unsustainable.

**Q3b: The World Bank is currently engaged in many lean and green initiatives. In addition, there are interesting dynamics playing out in the developing world: the rise of the middle class, rising income levels, rise of the megacities, and a shift in consumption. How are the World Bank initiatives related to these dynamics?**
According to one panelist, the World Bank realized that transport does not have a voice regarding sustainable development goals, rather it developed four goals around sustainable mobility for all (SuM4All). These goals revolve on access for all, efficiency, safety and security, and being green (noise, air pollution, climate change). Countries have to score well on all four goals. The World Bank has developed road maps to help countries meet these goals to support lean and green initiatives as a win–win situation. Panelists agreed that it does not make sense to set targets and standards for sustainability; the challenge is they will be difficult to achieve every year with increasing levels of activity in developing countries. To get the transport sector on a sustainable path, according to the panelists, will require adopting policies, developing technologies that will seem to have marginal impacts in the short term. The impacts may be very different in the long term, since these dual energy and environmental agendas are clearly interrelated.

Economic, efficiency, sustainability, and resilience are keys to developing countries, according to one panelist. Companies contributing to their resilience are also improving upon logistics efficiency and sustainability. Resilience is critical especially in the context of disasters. The area of the contingency planning is important in the larger energy–environment discussion and management.

**Q4: The mobility for all initiative is both interesting and important for not seeing another divide in the developed and developing world. There are current realities on the ground in the United States in dealing with the current tempo of technology, trade, and transportation. The maritime industry has experience with this issue. What are the maritime industry’s current initiatives to manage these realities and regional planning initiatives?**

According to a panelist, the energy–environment nexus is a dynamic and interesting area, yet it is also a daunting existential challenge of our time (energy–environment–climate change). Ninety percent of most trade is facilitated by the maritime sector but compared to other industries, energy usage in the maritime industry has been off the radar. Approximately 55,000 merchant ships, at any point in time, contribute to sulphur emissions due to the use of bunker fuel. The health effects of this type of fuel was one of the driving forces behind a class action lawsuit in the early 2000s that contested a terminal expansion project at the Port of Los Angeles. This was an important case, given that nearly 40% of U.S. imports and exports flow through the Port of Los Angeles, a port surrounded by one of the most densely populated regions of our country. There was a proposal to expand the terminal at the ports; however, the community and local businesses protested the expansion and filed a lawsuit against the port in partnership with the Natural Resources Defense Council. Therefore, there is a nexus between transportation, energy, and the environment.

Panelists state that more can be done, including partnering with industries, federal and local agencies, NGOs, national labs, etc., to protect the environment and continue to grow economies. One panelist mentioned that LNG retrofits and new builds for merchant vessels and hydrogen-powered ferries are major initiatives that are likely to gain greater interest going forward, especially since the emissions from ships is becoming a greater focal point for international regulators. The United States is second in the world, behind Norway, with respect to the size of its passenger ferry network. The panelist noted the Port of Miami is concerned about climate change, due to its low elevation, as are Navy officials at the Norfolk Naval Base. The use of zero-emission drayage trucking, smart queuing, and fully electric tugboats are other...
examples of technological changes in the maritime sector. The panelist emphasized that these technological changes, combined with modal shift from landside transport to waterway transport are key if we want to make progress in the area of reducing pollution and congestion, leading to a more sustainable development near port areas.

Q5: As mentioned already, political and policy changes have emerged across the globe to reframe national agendas on the role of trade and globalization, most prominently in the United Kingdom (UK) with Brexit and the EU, but also the United States, Asia, and developing nations (like the BRI). In light of these changes and uncertainties, how can national and regional planning and investments enhance the economic resiliency of supply chains and transportation infrastructure? What are the strategies that can be used to enhance economic and environmental resilience?

One panelist said that there are regional economic integration initiatives. The BRI is a connectivity initiative. The World Bank does feasibility studies of the effects of connectivity improvements to make transparent the process flows among industries and the impact on economic activity. It is not about corridor thinking or a process to cut costs. It is about the flow of trade and people. In the current environment, the G20 Alliance has a key role in sharing knowledge and thinking, and building political support. Increasingly we need to envision the future and think of integrated systems in terms of multimodality. The World Bank had developed some tools such as the open-street platform and other tools to examine road safety and there are other examples. The World Bank has maintained a balanced view on all four goals but particularly universal access.

Another panelist commented that trade has a political economy function. Trade occurs because countries agree to trade, leading to a global trading system. It is a set of beliefs and systems not just ports and technology. However, China has viewed the trading function through the systemic innovation of modern mercantilism, devaluing currency, overlooking intellectual property rights, and seeking to promote a one-way flow of technological transfer. China is willing to trade some commodities but not jet airplanes and other high-tech product lines. India and Brazil are embracing localization and intensive data innovation. The panelist indicated that he was not sure that the United States was clear on the extent of these strategic trade initiatives being mounted by other nations in the game of trade.

The last panelist added that there were important and interesting intellectual property rights issues within the realm of modern trade practices and also agreed at some level the other panelists. There is an important distinction between trade facilitation that speaks to supply chains versus trade policy (tariffs) measures. Which does a better job of contributing to growth? The consensus is that trade facilitation measures that focus on supply chain efficiency tend to contribute more to GDP than trade policy. In fact, credible studies have indicated that nontariff measures can increase GDP by almost four times more than tariffs measures alone. Likewise, transportation is a service—one that serves the supply chain. In general, large retailers may be less concerned with the nuts and bolts of logistics processes inside the maritime supply chain; instead, they are mainly interested in reducing any friction to the smooth flow of their products to market. At the time of the 2014–2015 West Coast port disruption mentioned earlier, ports were viewed as “black boxes” where obtaining metrics were hard to come by. Thus, they had to divert their cargo through other nodes in the supply network. So it is about reducing friction in transportation and other links in the supply chain that has the potential to lead to
economic development. Technology, of course, plays an important role in that. Last, the United States and Europe are concerned with import-reliant strategic commodities that serve their commercial and industrial bases. In the United States, for example, there are 21 materials that we are 100% import-reliant on and another 30 commodities that we are at least 50% import-reliant on. This is another strategic trade issue that confront trade and transportation policy today.

DISCUSSION

Following a facilitated discussion among the moderator and panelists, the moderator invited the audience to ask questions.

Audience Q1: Will 3D printing advance to a point that it will impact the supply chain via localization?

The future of 3D printing shows promise where high levels of precision are required for parts or tools. Short production runs and items that can be printed with a return for the investment are ideal for 3D printing. But considering the amount of material that would be needed to print items, it is unlikely many things will be printed to impact the global supply.

Audience Q2: The political economy of trade will change economic geography between countries, consider a situation where United States increases its exports to China. What do you think will happen to transport geography in such a circumstance? And what does it mean for transport investment allocation across modes?

Padilla stated that the shipments may be more bulk transport where there may be great security concerns associated with marine vessel movements. Additional concerns would be geographic challenges such as the Panama Canal expansion not capable of handling megavessels by limiting the passage of ships less than 14,000 TEUs (20-ft equivalent units). Although, it did improve the number LNG ships that have been able to go through. This is one geographic change. Competing against Australia and Qatar in the LNG trade is another factor that could impact transport geography. The United States has significant LNG potential, so we will see how that develops. Another example is the potential for a waterway canal across the Thai Isthmus. This would be an advancement for marine transport since ships would save about 1,200 km in terms of distance and about 3 days in terms of time. Approximately 6% of operational costs for ship voyages is fuel, so industry would be incentivized to avoid the Malacca Strait near Singapore in favor of Thailand.

TOP TAKEAWAYS

This session brings an important issue for consideration and assessment in transportation planning, forecasting, strategic planning, to include economic development, resilience planning, and sustainability. It will be important to draw attention to National Cooperative Highway Research Project (NCHRP) Report 750 Series: Strategic Issues Facing Transportation that the TRB published in 2013. The Foresight NCHRP Report 750 Series, Volumes 1–6
(http://www.trb.org/Main/Blurbs/171856.aspx) provide decision-makers with a critical analysis of the driving forces behind high-impact economic and social changes that may affect the U.S. freight transportation system. The foremost issue this panel focused on specifically was mega-scale infrastructure improvements in the rest of the world occurring sometimes in tandem with technological change, innovations and improvements, and their ability to influence supply chains, transportation and sourcing patterns. The discussion below is presented as set of key takeaways on major issues that were discussed as part of this plenary session.

**Issue 1: Emerging Factors Affecting Supply Chains and Transportation**

The panel described a range of centripetal forces within megaregional trends that could influence U.S. and global sourcing patterns or worldwide production and consumption points, and create or change the dispersion or spread of current sourcing patterns. They are broken down as consumption drivers, political factors, production drivers and transformation factors. Transformational factors and political factors could affect both production and consumption in turn. Politics of trade and transformational aspects are the other two set of factors that can in turn, influence consumption (altered sourcing patterns, for instance) and or production factors. These are summarized in Figure 1.

![FIGURE 1  Mega trends impacting global supply chains.](image-url)
Consumption Drivers

- Demographics and shifts thereof in demand points:
  - Increase in population and population density in the developing economies,
  - Rise in mega-cities,
  - Rise in middle class and income levels in the developing world, and
  - Shifts in the concentration of population density—the rise and role of high-density economies.
- Ecommerce:
  - Trends in urban logistics with e-commerce developments focusing on last mile as potentially the most important segment.
- Technology and automation adoption drivers as part of an overarching supply chain management process were noted to influence both consumption and production of trade but is placed in a separate category:
  - Adoption of different kinds of technology and automation along different parts of the value chains.

Factors affecting both consumption and production side of freight flows:

- Changing geography of trade flows and associated rebalancing of north–south flows;
- Reconfiguration of trading rules; and
- Large-scale (mega-scale) connectivity improvements like those occurring across Asia.

Political Factors

Some of the panelists stated that political factors around trade whether trade will grow faster than GDP. Perceptions on trade globally and around General Agreement on Tariffs and Trade and World Trade Organization could serve as both a key production and consumption driver.

Issue 2: Effect on Sourcing Patterns

While there was not a general conclusion on aspects of sourcing patterns, it was part of a broader discussion surrounding key drivers. The general agreement was that supply chains will likely change, but that the net effect cannot be noted with any measure of certainty. Some panelists felt that it would be significant for high-value products. Yet others felt that it would be important to discern the impact on strategic commodities on which the United States is globally reliant. There was a broader reference to technological and innovation dimensions through 3D printing and additive manufacturing that could create opportunities for localization economies. In such cases, there seemed to be some consensus on a threshold for generation of those externalities to influence domestic and regional supply chains and sourcing patterns. In other words, game changers can be associated with such tipping points in offsetting localization economies with regard to niche commodities and technologies, such as precision parts and instruments. The panel touched on technology type infrastructure shrinking physical space to create logistical efficiencies in several parts of the value chain. Physical transport infrastructure, on the other hand, like connectivity improvements combined with shifts in geography of trade flows and
shifts in demand centers, factor prices and trade policy can and will likely influence sourcing patterns over the mid to longer term as a way to gain competitive advantage. At the same time, there was also an opinion that rising income levels across countries could erode the labor advantage and restrict opportunities for wage arbitrage.

**Issue 3: Implications for Sustainability, Resilience, and Green Freight**

There was significant discussion surrounding the World Bank initiatives in the developing world and the U.S maritime industry on the implications of current and changing trade patterns on energy, environment, resilience, and sustainability. Irigoyen spoke of the fourfold sustainable development pathways that it focusses on and emphasizes as it builds and develops “road maps” for individual countries as to how to achieve those four goals of access for all, efficiency, sustainability, and green initiatives. Closer to home, the maritime industry is increasingly emphasizing the adoption of technology and automation to reduce frictions in trade and promoting green initiatives at major ports in United States such as at the Ports of Los Angeles and Long Beach and elsewhere. Other such initiatives include zero-emission drayage trucks, electric tugboats adopted at the Port of Long Beach, technology within vessels themselves, hydrogen-powered ferries, LNG retrofits, and partnerships with research institutions and companies to promote examination. Additionally, the Ports of Miami and Norfolk are increasingly concerned and addressing issues associated with sea level rise. These initiatives are known to reduce negative impacts on the local economy and lead the pathways for more sustainable, more cost-effective freight movement at the ports. At the other end, it was also noted that there must be greater investments in research and development and a change in political will to affect innovation of cost-effective green freight solutions that are also transformative.

**Issue 4: Transportation and Economic Resilience and Sustainable Development Planning Considerations**

Short- and longer-term strategies that the panelists presented as a way forward to promote greener freight included the consideration of modal shift opportunities. From a planning and forecasting perspective, Irigoyen made the following key observations and correlations with the NCHRP Report 750 Series:

- Scenario planning is an important practice to making decisions on future investments. In doing so, Irigoyen noted that it is important to recognize situations and scenarios that could allow some economies to leap-frog development and follow nonconventional development scenarios.
- Irigoyen refered to regional integration initiatives by noting it is important to broaden the limits of a corridor before moving to integrate systems.

Additionally, Irigoyen also noted the need to develop economic impact and feasibility studies of planned initiatives as a way of building transparency in the process.

With respect to resilience planning, participants discussed the need to develop contingency planning frameworks for disruptions caused by natural and manmade disasters in critical infrastructure systems. The frameworks should include contingency planning to support the resilience of business and economies with respect to existing supply chains and workforce.
FUTURE DIRECTIONS

The session provided insights into the future of global value chains and supply chains as well as the multitude of factors that can have both a dispersionary effect and a contractionary effect on sourcing. The net effect on the economy and economic development implications for the United States will depend on the extent to which key globally traded commodities and their value chains respond to these mega trends over the short, mid, and long terms. While it was generally agreed that mega-initiatives like those in Asia and China will likely have some influence, the net effect on trade and freight flows is a matter of uncertainty in terms of industries, domestic, national, and regional implications. Yet, the state of the practice in adapting trade flow and freight flow forecasts to uncertainty via scenario methods or other methods is still not a widely adopted practice. From a broader research perspective, the net effect of Asian mega-scale connectivity initiatives, which will come to fruition by 2049, approximately 28 years from now. This represents the approximate planning horizon for many travel modeling software and tools, and should certainly be part of a broader research agenda.

The Standing Committee on Transportation and Economic Development will likely convene a research roadmap to address the key aspects highlighted from a short- to mid-term (3- to 5-year) timeframe. Some of the questions arising from the conversations in this plenary, which could be part of the roadmap, include the following.

• Which industries are most likely to be impacted and how?
• How will regions and states be impacted?
• What are best practices in planning for such longer-term planning horizon issues and its differentiating practice from state of the art?
  • Where is technology and automation likely to make the most headway in the short, mid, and long terms?
  • What does it mean regarding over–under capacity frameworks for different infrastructure types in different locations?
    • How is resilience applied in the planning processes?
    • What are the economic development implications of such changes and how can they play a role in facilitating this dialogue? How can these pathways be part of a more sustainable growth?
  • What does a reconfiguration of supply chains mean for economic development issues (jobs, workforce, price effects, freight flow patterns)?
  • What might be the environmental implications of a reconfiguration of supply chains?

Transport costs were a significant factor in driving the dispersion of trade flows. It remains to be seen how these factors will play out relative to other sourcing decisions over the next decade or so in response to Asian investments and other reconfiguration of trade rules. At micro and regional levels, transport costs domestically will likely continue to drive efficiencies in supply chains, regardless. At a macro-scale, and for the competitiveness of the macro economy, the next effect or balance of trade, transport and other factors will still merit serious examination as to their net effects of welfare, jobs, and GDP.

Another set of research topics may focus on more discrete topics raised by the plenary and include the following.
• Analyze trade and industry data to
  – Examine the development of global supply chains serving emerging and high tech sectors, and
  – Identify reshoring of elements of key domestic manufacturing supply chains and the impact on domestic transportation services.
• Examine domestic initiatives in green domestic transport services to foster more sustainable supply chain infrastructure and management practices in freight, rail, and ports.
• Analyze how shifts in world energy markets for the oil and gas, coal, and growing renewable sectors have affected domestic transportation services as well as technological and infrastructure investments in freight, rail, and ports to support trade flows and major domestic supply chains.
• Examine strategic implications of BRI on major U.S. manufacturing supply chain logistics for transportation services at key ports and trade gateways.
TECHNICAL SESSION 1A

Economic Corridor Development and Regional Integration

Lessons from Developing Countries

JASON WANG
Appalachian Regional Commission
Moderator

BAHER EL-HIFINAWI
BINYAM REJA
SOMIK LALL
CECILIA BRICEÑO-GARMENDIA
MARTIN HUMPHREYS
BEN ELIBERGEN
World Bank Group
Speakers

SUMMARY OF PRESENTATIONS

The Belt and Road Initiative:
Enhancing the Benefits, Managing the Risks
Baheer El-Hifinawi and Binyam Reja

The presentation introduced the BRI, defined “road” and “belt,” and countries to be covered. It includes six corridors involving more than 65 countries. The BRI involves more than road or maritime corridors by including transportation services involving more-diverse aspects such as energy, trade, and financial integration. El-Hifinawi and Reja included China’s vision of six BRI objectives and possibly five major financing bodies. El-Hifinawi and Reja proposed a conceptual framework for BRI analysis comprised of reducing economic distance, minimizing divisions, and improving density. It involves three I’s (infrastructure, institutions, and interventions) toward regional integration. To maximize the BRI benefits, good planning and prioritization is required since not all corridors are equally important or needed presently. El-Hifinawi and Rja also provided examples of planning methods and models to be used for extra-large-scale project–initiatives like the BRI. Good institutional mechanisms for corridor development management are likely to be a major challenge given distributive dimensions of benefits and risks among multiple countries and partners in nature. These initiatives need a balance between being inclusive and efficient. Since BRI will create winners and losers, complementary policies should be developed to help enhance benefits and alleviate losses. Finally, a financial framework, debt capacity of involved countries, and environmental and social management are important aspects and need to be assessed during the BRI implementation.
Spatially Differentiated Effects of the Belt and Road Initiative

Somik V. Lall

Lall provided an ongoing World Bank study examining impacts of large infrastructure projects and policy, and policy changes on the distribution of economic activities within countries and a need for complementary development policies to enhance and spatial distribution and gain from BRI. The main question discussed is the exploration of the benefits from BRI investment and whether they will be spatially concentrated or geographically distributed. As the spatial concentration, or agglomeration of economic activities could have great benefits for productivity and economic expansion. For places that can benefit from the BRI investment, Lall questions whether those places will be prepared to attain the potential benefits. Lall laid out his study approaches to focus on the economic effects.

- Economic effects of the BRI transportation infrastructure and trade openness proposals for the following:
  - Assessing spatial perspectives to determine land values within proximity of the BRI and to determine level of distribution of economic and land development within clusters.
  - Evaluating the drivers of direct efficiency saving of being close together and agglomeration economies to transportation infrastructure and trade openness.
  - Constructing and calibrating “new economic geography” style models of spatial interaction to explore the possible effects of BRI on locations along the China–Europe corridor.

Lall’s analytic framework includes:

- Assessing likely impacts of policy change and infrastructure development to bring significant relocations of economic activity within and between countries by focusing on two inter-related, yet distinct, approaches:
  - Economic geography within and between many countries, all of which are divided into subnational units (cities or regions).
  - Economic geography within each country, where internal geography responds to external integration and domestic transport investments.
  - Drawing on the analytical framework of trade models to provide insights at the country level as well as the work on spatial effects looks at the impact of the BRI at the subnational level.

Lall gave the following bulleted summary of the study:

- Economic effects of the BRI transport infrastructure and trade openness proposals:
  - Concentration of economic activity around gateways and hubs and
  - Potential for significant sectoral and spatial transformations.
- Complementary policies and institutions to maximize the gains:
  - Taking advantage of potential economic changes—business environment, urban management, and transport systems.
  - Spatially spreading the benefits—should we and how?
Complementary policies and institutions to manage the risks:
  – Risks associated with reduction in transport and trade costs. Need to enhance labor mobility; allows for economic concentration and living standards convergence.
  – Risks associated with large infrastructure projects (environmental risks) and options for managing such risks.

Cost, Time, and Networks:
Transport Linkages in Europe and Central Asia
Cecilia M. Briceño-Garmendia

Briceño-Garmendia provides a framework examining the linkage between transportation and regional integration in Europe and Central Asia (ECA). She presented an analysis framework to assess connectivity based on transportation service indicators (time, cost, and reliability) from the perspective of users (passengers and freight), covers several modes (rail, road, and multimodal for freight), and includes three geographic levels (domestic, regional, and global). Her study also considered network effects in transport decisions, specifically the role of a country in networks and corridors with both centrality and criticality aspects. She then presented cases by different countries in ECA from corridor, regional, and global perspectives. She notes that there are plenty of international corridor initiatives for regional integration around world. However, regional integration is often a stepping stone to global integration rather than an alternative. Transportation networks are enablers of global integration.

Regional Integration and Development Corridors in East and Southern Africa
Martin Humphreys

Humphreys first presented a case for regional integration and development potential of African countries. Then, he discussed the challenges of regional integration in terms of the high costs of transportation and an impact of the continent and region lacking a variety transportation modes for competitive pricing. The region still ranks lowest in the world on the Logistics Performance Index. Humphreys then discussed 11 international corridors in east and southern Africa region with four pillars of integrated corridor development initiative. The four pillars are

  Pillar 1. Connecting firms and communities to markets;
  Pillar 2. The assessment of wider economic effects;
  Pillar 3. Building stakeholder consensus for integrated corridor development; and

The resulting strategies are as follows.

  • Strengthen the institutional framework for the sector.
  • Strengthen the management and operation of the transportation sector.
  • Improve the safety, security and resilience of the transport sector.
  • Address the priority gaps in the infrastructure—primary, secondary and tertiary levels.
Finally, Humphreys presented several exemplar project cases in the region to highlight the approaches and implementation programs toward integrated corridor or regional development.

India Railways: Dedicated Freight Corridor Program

Ben Eijbergen

Eijbergen began his presentation by discussing key facts of India’s economic development and India Railways (IR) operational, capacity, and trunk network status as follows:

- IR operates a network of 65,400 routes. Capacity utilization on IR’s most heavily used routes exceeds 100% of nominal capacity by a significant margin.
- Main railway corridors—part of Golden Quadrilateral connecting Delhi, Mumbai, Chennai, and Kolkata—account for less than one-fifth of the network but carry more than 60% of its freight task.
- Passenger trains comprise two-thirds of train kilometers.
- Insufficient physical capacity and service quality resulting in loss of market share (move to road haulage).
- Sufficient traffic demand to create additional capacity.

Eijbergen mainly discussed Eastern and Western dedicated freight corridors (DFCs). Both are under development (at least partially). His discussion focused on transformational impact of DFCs, institutional innovation, key economic and societal benefits, financial viability, poverty reduction, and development impact.

FUTURE DIRECTIONS

General findings as related to economic development in a broad range of cases and contexts were presented.

- There are many innovative ideas and unusual approaches presented in this session related to transportation infrastructure investment and economic development. This is mainly because the cases, projects, or programs presented rarely are seen in the United States. Most of the cases and scenarios presented in the session are mega-scale, multinational, or even multicontinent transportation project–program investment contexts. These present diverse impacts and unique characteristics of economic development effects quite different from the typical projects considered in the United States. Yet, there are multistate and multicounty efforts that may find some common ground.
- The World Bank has developed a wealth of knowledge and skills for analyzing the economic impact from such transportation and infrastructure investments while dealing with challenges of obtaining needed data for such analyses. As such, the scale of projects entail innovative ways of analysis using data or information that are not normally used in routine economic impact analysis (e.g., night light reflections). Satellite imagery is another such data source that sometimes is used in impact analysis. In this context however, it may indeed be a valuable dataset in many of these large-scale projects.
• More time at TRB events would be helpful for further and detailed discussion of the session’s presentation topics.

At least three of the five presentations are based on ongoing research projects from World Bank or their international consultants and partners.
Horst opened the session and introduced the presenters. Philip was unable to attend the conference; his presentation is included in the summary. Stich and Thornton presented findings pertaining to trade. Cutler and Weisbrod presented a scenario analysis of alternative futures using their scenario-building tool—TREDPLAN.

SUMMARY AND DISCUSSION OF INDIVIDUAL PRESENTATIONS

The presentations in this session addressed some of the strategic planning implications of global and domestic trade patterns for greater resiliency of key economic sectors and aging transportation infrastructure. The presentations in this session were focused on attempts to (a)
understand dynamics of trade and (b) capture trade flow patterns in response to factors like changes in tariffs.

The Impacts of Unscheduled Lock Outages
Craig Philip and Mark Burton

Philip and Burtons’ study for the National Waterways Foundation and MARAD motivates the question of funding the aging system of locks and quantifies the economic effects of unscheduled lock closures using a full supply chain cost burden method (or economic impact across the full supply chain upstream and downstream along the waterway). They use three costing tools (barge cost model, rail cost model, and motor carrier cost from American Trucking Research Institute) and other ancillary costs. Four affected locks along the Mississippi River were presented and shipper cost burden established using diversion analysis, and separation of both primary and non-primary nine commodity markets dependent on the locks. The choice of locks is illustrative of costs alone. This constitutes the first part of the bigger objective, which is to study the regional economic development (RED) impacts of an unplanned outage for an unspecified duration. It also seeks to build on an earlier 2014 study relying on the use of Regional Economic Models, Inc., to simulate closure. The high costs for agricultural and grain trade lead them to needing additional rail capacity along the Louisiana Gulf Corridor. Without the additional rail capacity would result in the rail system along the Pacific Northwest having to absorb the additional grain leading to additional costs to farmers. The shipper cost burdens are used as part of a broader simulation exercise examining RED impacts (lost output, jobs, and income). While Philip and Burton’s presentation does not further discuss the actual simulation details, it concludes by noting the direct and regional economic effects will exceed $1 million annually and that 18 states could be affected by unanticipated closures (Texas, Louisiana, and Illinois being the impacted the greatest). Burton concludes by noting that the methods adopted are consistent with the U.S. Army Core of Engineers’ Principles and Guidance and driven by economic principles.

Chassis: The Unsung Linchpin of Global Supply Chains
Bethany Stich, Peter Webb, and Ian Butler-Severson

Stich identified chassis pools as the key to intermodal trade. She provided the introduction and history of shipping containers and chassis. Chassis is defined as a wheeled undercarriage on which a freight container fits, primarily for drayage to and from ports.

There are several types of chassis, including ocean liners, ocean carriers, and marine chassis, with an average age of chassis of 19 years.

Despite their importance in trade, chassis are associated with greater local safety issues and congestion impacts at U.S. ports (relative to other countries) from carriers using leased chassis pools. However, international ports differ from U.S. ports in the following ways:

- Venice containers are grounded and not stored on chassis.
- International container chassis are supplied by customers, truckers, or off-terminal pools and brought to a marine terminal by drayage drivers. Drivers do not interchange chassis with ocean carriers or terminal operators.
- Most chassis have no antilock brakes, radial tires, or LED lights.
Stitch noted that the 2008 recession caused international ocean carriers to divest themselves of their chassis to save money. Maersk was the first ocean carrier that stopped offering chassis. Currently, there are three major chassis lessons:

- A guarantee that all chassis purchased would be used (legacy contracts) is needed. Ocean carriers still mandate the use of chassis, and truckers are required to pick up or drop off specific chassis related to contract.
- Chassis contracts are inefficient and expensive, and ports need space for chassis storage.
- Chassis cause terminal congestion, and drivers do not get paid for extra movements.

At a macro level, Stich discussed the market dynamics influencing carrier–chassis markets and the market concentration in the chassis pool markets, as well as merger and acquisition activity in the ocean carrier–chassis markets so to maintain competitive advantage and minimize transactional costs. She concluded her presentation by emphasizing the need to understand chassis utilization and fleet data to determine right-size fleet types for U.S. ports. She advocates for a national chassis pool model governed by open choice. Stich’s talk examined how chassis pools serve or do not serve the nation’s shippers. She noted that the trade-based export–import chassis market operates far less efficiently than the domestic chassis market.

North American Free Trade Agreement, Cuba, and the U.S. Gulf Coast

*Dennis Thornton, Bethany Stich, and Faisal Mallum*

Thornton opened his presentation by reflecting on historic developments and trends in international and domestic trade. He specifically addressed U.S. energy trade, the impacts of the Presidential Proclamation on Adjusting Imports of Steel into the United States (Executive Order 232, https://www.whitehouse.gov/presidential-actions/presidential-proclamation-adjusting-imports-steel-united-states/), and the impacts of the Presidential Memorandum on the Actions by the United States Related to the Section 301 Investigation (https://www.whitehouse.gov/presidential-actions/presidential-memorandum-actions-united-states-related-section-301-investigation/). Furthermore, Thornton discussed the North American Free Trade Agreement (NAFTA) and Cuban and other free trade agreements. His presentation is a compilation of articles on assessments of potential impacts and potential implications of trade flows. He presented a review of economic impacts of Executive Order 232 on the economy to include the loss of 200,000 jobs, higher prices, and a reduced capacity due to reduction in smelters from aluminum tariffs. Thornton followed up with thoughts on the potential for changes in the nature of trade flows throughout Americas and discussed a likely role for Cuba as a short sea shipping node in a potential scenario. He noted that U.S. energy markets had been capable of importing more fuels than exporting, although the United States has been planning to move in a different direction by becoming energy independent and exporting fuels. The new trade scenario includes dozens of ports throughout the Caribbean, making Cuba a primary intermediate shipment location. Thornton noted that Cuban port infrastructure could assist the United States, further U.S. economic development progress, and bolster North and South American commodity flows. He concluded by noting that economic development in the U.S. Gulf Coast is driven by international trade flows and its stemming of inland flows.
Thornton’s presentation suggests the spillover effects of tariffs into different markets. For instance, he provides an example of how during the last steel tariff (2002) the industry struggled presumably due to retaliatory effects negatively impacting flows of pig iron going up the Mississippi River. The trickle-down unintended cause of this tariff was a loss of backhaul opportunities for barge operators on the waterway and a rise in barge shipping rates. Thornton also asks the following questions:

- How are trade, energy, and transportation related?
- Why are trade patterns changing?
- What are the implications for the future of transportation?

Planning in the Face of Shifting Global Trade and Technology: Implications for Economic Resiliency and Transportation Planning

Derek Cutler and Glen Weisbrod

Cutler and Weisbrod’s presentation emphasizes the value of scenario planning as a way of dealing with uncertain futures associated with trade and technological trends. They propose a three-pronged approach for addressing planning and evaluation.

1. The first aspect allots long-term changes in economic and demographic factors where they are harder to anticipate due to fluctuations such as technological changes, economic changes, disruption, and changes in resource availability.
2. The second aspect delineates which factors can respond like changes in spatial patterns of population and economy and or changes in supply chains.
3. The changes are used in transportation planning and evaluation (like evaluating changes in demand for specific modes, corridors, or facilities).

Cutler and Weisbrod put forth a proprietary TREDPLAN model to analyze alternative futures as the core of the approach. TREDPLAN is a data analytics and visualization system for assessing economic and transportation consequences of alternative futures. It is built from alternative economic forecasts of Moody’s Analytics, I-O technical matrices for interindustry buy–sell relationships, commodity flows from Freight and WiserTrade (for ports), and trade flow responses to exogenous scenarios that shift import, source, export market, and reassign mode and flow shares on the basis of relative costs. The rest of the presentation discusses three examples or scenarios showcasing for which effects are traced out using TREDPLAN: (a) changing product demand; (b) changes in trade regulations; and (c) effects of disruption. The four aspects of TREDPLAN are discussed as a tool to support decision-making with alternate futures. The discussion below presents the scenarios as presented.

- Not all areas of Indiana growing economically.

Scenario 2. Looking at trade regulations via grain scenario assuming NAFTA agreement replaced by regulations, taxes, etc.
- Who will buy grain and where will it go?
• Mexican demand decrease is presented as an increase in China’s demand and consequently a shift from Mexico-serving to Asia-serving ports.
• Highway routes of grain transportation greatly shift:
  – Less reliance on I-35 in Texas,
  – Higher dependence on Seattle and congested California ports, and
  – Texas ports still utilized.

**Scenario 3.** Port closure—disruption—simulate catastrophic port failure due to sea level rise or hurricane (Norfolk, Virginia). Models diversion of port economic activity. Assets from closed port should be relocated to a nearby port.
• First month, captive cargo is moved by truck to the nearest port.
• Following months additional traffic diverted to other ports. Certain goods are affected more than others. Visualizations of tonnage of goods being rerouted by ship and diverted by truck to other ports were presented showing how long-distance highway freight truck traffic increases across country.

**DISCUSSION**

Following the panelist discussion with the audience policy, planning implications were noted as well as a summary of research areas and needs.

**Policy and Planning Implications**

Examining and analyzing trade-based (domestic and global) effects to the economies of host and captive regions took center stage in this session. The session begins with a recognition of regional and national economic effects of disruptions of unknown duration for the nation’s critical infrastructure systems. One presentation specifically traces out full upstream and downstream effects of lock closures in order to motivate the value of aging locks and dams. Tied to this is a critical need to consider the value of aging infrastructure (locks and dams) and the need to (a) fund the system so that it functions at optimal capacity and/or (b) provide an alternative modal choice (like rail) to serve the agricultural, coal, and other sectors that are dependent on the system and can avoid costly detours and additions to their transit times. The second point highlighted in this session is the role of a lesser-known market—the chassis markets—in contributing to unsustainable outcomes at the key export–import points and local economies at those locations. The third aspect highlighted in this session, covered in two papers, is value in analyzing the effects of tariffs and other scenarios on the local and national economies including the effects of strategic uncertainty. The latter can be very critical in transportation planning for trade dependent facilities.
FUTURE DIRECTIONS

1. This session brought from a strategic standpoint the need to examine the impacts of shifting existing trade patterns to shorter north–south chains. How would freight flows change across modal infrastructure? What would be the effects on commodity flows and supply chains?

2. How can we improve methods for analyzing the effects of trade and tariffs on freight flow patterns and impact on different states and regional economies?

3. Another research need stemming from this session points to the need to document analyze and develop useful methods for anticipating the effects of disruptions on multiple modes.
Lawrence opened the session by providing an overview of the presentations. He stated the presentations in this session were to address:

- Implications and management of cross border trade in the face of changing trade patterns;
- Responsible growth via green freight strategies and greener supply chains;
- Novel ways of preparing for domestic and international trade-based truck freight movement in congested areas; and
- Emerging approaches in analyzing influences on macro competitiveness and value chains and spatial competitiveness based on trade databases.
SUMMARY AND DISCUSSION OF INDIVIDUAL PRESENTATIONS

The Impacts of Delays at the California–Baja California Border
Alejandro Solis, Bruno Penet, and Elisa Arias

Solis presented a summary of a research project with San Diego Association of Governments (SANDAG) that discusses sustainability and economic impacts of delays in traversing land ports of entry in Southern California. He presented the main goals of the study, which was conducted to:

• Assess the economic impact at the port of entry at the Baja California border;
• Assess the impact of delays on air quality; and
• Present scenario analysis of the future of the region.

Solis discussed the different primary data collection methods used which included (1) wait time data collection for commercial vehicles, pedestrians, and automobile-based travel (for both northbound trips to United States from Mexico and southbound to Mexico) using license plate sampling; and (2) the derivation of delay times and queue length (across six ports of entry) using global positioning loggers. An additional component of the study was an intercept survey of northbound crossings for both crossing choices and emissions-related data. Crossing choices collected included information on

• Trip purpose,
• Average trip spending and average trip spending by category,
• Elasticity of travel demand with respect to delays at the border, and
• Average “alternate” trip spending in home country and its breakdown.

Emissions data collected included statistics associated with

• Vehicle model year,
• Odometer readings and units of measurement,
• Fuel type and share of fuel purchased in Mexico,
• Adherence to a smog check program, and
• A willingness to switch to nonmotorized border crossing modes (like train, transit etc.).

Solis’s review of the three data collection methods were used to analyze the economic and emissions impact of four different future scenarios associated with border-crossing capacity and consideration of the impacts to additional alternate modal options like transit and active transportation modes. The “sensitivity scenario” considers changes to wait times and travel volumes alone on the level of the impacts. Economic impacts were examined for the current year of the analysis (2016) and the future year 2025, while emissions were modeled for 2016, 2025, and 2035. Risk analysis was an integral to the economic impact estimation, although no details of the risk analysis were presented.

Economic impacts for the U.S. side of the crossing were estimated from the Economic Impact Analysis for Planning (IMPLAN) for several geographies. On the Mexican side, National Institute of Statistics and Geography (INEGI) input–output matrices were used and combined
with data from INEGI, the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), and the U.S. Bureau of Transportation Statistics. The core data collected were processed to provide five of the main inputs required for impact estimation.

1. Excess times,
2. Wait time elasticities,
3. Crossing volume,
4. Baseline expenditure in United States and in the home country (Mexico) for pedestrians and passenger vehicles, and
5. Truck value and the ratio of loaded to empty for commercial trucks.

Economic impact is reported in dollars of lost output and annual average emissions for five categories of pollutants: PM, NOx, ROG, CO, and greenhouse gas (GHG) emissions based on emission factors and Motor Vehicle Emission Simulator models. The combined emissions and economic impact results are used to evaluate and present a range of strategies at the port of entries to reduce delays in crossing both northbound and southbound. These strategies include capacity, operations, corridor improvements, and access improvements. Interestingly, intelligent transportation system-related modifications as well as Freight Advanced Traveler Information Systems and emissions-based strategies and policies are included within options.

Solis outlined the broad approach for collecting and analyzing data, but did not discuss details or assumptions associated with the calculation of impacts for prioritization of options and strategies.

**Green Freight Programs:**

*An Innovative Policy and Commerce Tool to Foster Sustainable Economic Development*

*Joshua Silverblatt and Buddy Polovick*

Silverblatt opened the presentation with an introduction to the strong linkages between logistics, freight and the economy, and the implied association with emissions from freight movements. He indicated that growth in freight volumes and the attendant emissions may be considered an opportunity by shippers, carriers, and third-party logistics providers to adopt more-sustainable and greener freight options. The complex supply chain with a multitude of segments and parties leads to a classic case of asymmetric information, which he noted is particularly problematic for monitoring or documenting emissions and for adopting greener technology. Barriers associated with technological adoption like rigidities in carrier markets and market failures in the trucking and shipper markets were presented as important factors impeding innovation and adoption in fuel-related emission reduction technologies. It is understood that supply chains compete globally and also compete on environmental performance. However, lack of data also serves as a barrier on reducing environmental externalities. The SMARTWAY freight database is represented as a signaling mechanism and repository tool and database for freight companies to allow greener and smarter decisions as well as to monitor emissions for three pollutant types. The Environmental Protection Agency (EPA) created SMARTWAY to address this problem and these are its uses:

- Tools: interactive and designed to work together;
- Include all modes of transportation;
- Embedded consistency checks;
- Allows EPA to rank carriers;
- Centralized data platform to take the program to business;
- Screening and signaling carriers and providing signals to other carriers and shippers to screen shippers based on their environmental assessment;
- Generate carrier specific environmental information to capture the efficiency improvement; and
- Characterize results into performance rankings for apple to apples comparison and allow a correction of market failures.

Once information gaps are addressed, it is possible to see improvements in emissions, which grow in importance as freight grows. These benefits include

- Reducing resource burden,
- Reducing data recoding burden,
- Creating a language that all freight carriers and shippers can use, and
- Helping their countries make the reductions.

The growth of this mechanism is seen in the growth of enrollment by freight companies, an increase worldwide of 245% over 14 years from 15 to nearly 3,700. Rosenblatt concluded by noting that SMARTWAY has led to more environmentally responsible logistic chains and has led to more-sustainable growth by reducing fuel costs, emissions, and energy use.

Understanding, Visualizing, and the Last Mile of Urban Freight for Economic Development

Vivek Sakhrani

Sakhrani presented the results of a recently completed research project, NCFRP Project 49: Understanding and Using New Data Sources to Address Urban and Metropolitan Freight Challenges (https://www.ncfrp49-newfreightdata.com/). He noted that the project summarizes the value of different kinds of commercial truck databases to understand and prepare for freight planning in congested locations. The problem statement initiating the study noted one of truck observability with data and analytics being as important in addressing a blind spot for truck flows. What is not known on a global scale is the volume of truck data.

Within the United States data resources on intercity freight movement exists but is disaggregated, creating blind spots at local levels. Technology trends such as sensors, cloud storage, and power in devices can all create windows of opportunity for data collection. There are three key questions regarding freight data:

1. What problems could be addressed by emerging truck freight data and analytics?
2. What are the applications of such new data sources?
3. What are the practical, policy and institutional challenges of using such new data sources?

Sakhrani discussed five of the top challenges in urban and metropolitan areas for addressing truck mobility. They are urban congestion, last-mile and last-50-ft access, parking
for delivery trucks, conflicting land use patterns, and issues related to anticipating projected uses using employment changes in the transport and logistics sector as an indicator.

Following this discussion, Sakhrani presented examples of applications of data including the frequent use of real estate data that is used in land and economic development studies for impact analysis to better understand local freight generator development patterns. Additional domestic and international case study examples were presented using specialized novel truck data and analytics to address specific freight mobility challenges.

Networks, Value Chains, and Competitiveness
Sharada Vadali

Vadali discussed the newly released Bureau of Economic Analysis (BEA) input–output data, which allows researchers to examine and separate the imported or foreign content of domestic supply chains and domestic commodities. This new input output data is examined to unpack the structure of the U.S. economy by examining the relative importance of traded sectors in the overall network and what that may mean for the domestic economy. Network analysis methods are used to understand and discern the links between macro productivity as a key measure of macro-economic competitiveness, centrality of key sectors of the economy as well as transportation sector linkages between those sectors. The research examines the BEA database at three time periods between 1997–2017 using the 70-sector level aggregation. A 389-sector disaggregate analysis for the year 2007 is also provided (the only year for which this level of disaggregation is available). New insights are provided by isolating “key or central” sectors by using three measures: (a) Eigen centrality measures, (b) upstream (or measure to which commodities rely on upstream sectors for inputs and resources in the production process), and (c) downstream degree (or a measure to which sectors provide resources to final demand uses). Some of the key findings noted by Vadali include the following:

- Evidence of high levels of global dependence for the manufacturing chains, a dependence that has been rising over time, with a slight reversal in 2017 over 2016 especially with electronics and computer manufacturing.
- Key and traded sectors. Manufacturing sectors are highly interlinked with each other via trade. The manufacturing sector as a whole contributes only approximately 11% of the overall value added but its sectors are among the more central sectors of the U.S. economy and also the most dependent on global trade. The most central among all manufacturing sectors is the metal manufacturing sector [North American Industry Classification System (NAICS) 331], while the sector which is the most dependent on global trade is motor vehicles. The energy sector (petroleum and coal) has the strongest connection with all the freight transport modes of transportation.
- Traded sectors and U.S. competitiveness. The centrality of individual low value added yet highly innovative and trade-dependent manufacturing sectors suggests that external shocks to such traded sectors (tariffs, production disruptions–supply shocks) may have more negative effects on U.S. economic gross domestic productivity than on less “central” sectors like services. Transport sectors like water and air transport and agriculture sectors are also highly central but less trade dependent than manufacturing. These patterns have implications for how the economy’s GDP can respond to different types of shocks (technology, innovation, demand, trade, disruption, etc.) to each of sectors. Preliminary community detection methods
show potential pathways for transmission of impacts to economy across upstream or downstream sectors.

- Logistics sector. The logistics sector reflective of the transport and warehousing sectors is almost as central as other manufacturing sectors, but less dependent on trade. Jointly this sector accounts for 5% to 6% of the value added (half of the combined manufacturing sector) in the overall economy.

- Competitiveness at the macro level is not the same as spatial competitiveness where policy goals may define alternate measures of competitiveness, which will require more granular industry data sources for addressing industry centrality and RED implications.

- Several possible future research areas were discussed. A particularly important area of research is understanding how different supply chains can be impacted in response to positive and negative shocks and impact the national and/or regional economy, separately and in conjunction with the BEA.

**DISCUSSION**

**How difficult was it to normalize data from the United States and Mexico and what was the margin of error?**

Solis stated there were steps to disaggregate the primary data and review smog programs. For example, adjustment factors were made, such as the quality of fuel. What was found is that the existing fleet in Mexico mostly complies with U.S. standards and the fleet is routinely inspected for engine and visual inspections. There are correspondences between U.S. and Mexican emission rates, but what applies in the United States is not the same in Mexico. There was a lot of work doing these translations.

**Was there consideration in reducing the processing time independent of physical improvements?**

Solis replied by saying Customs and Border Protection (CBP) cannot consider changes to the process. However, CBP is attempting to reduce times in processing rates. When validating data, such as the processing rate, fleet managers and operators did not respond to all of our queries. The measure of delay reductions was vetted by them however.

**Is there evidence of SMARTWAY working effectively?**

Silverblatt answered by saying when a shipper is looking to hire SMARTWAY they are separated into different bins based on ranking score. This provides transparency from an environmental standpoint.

The conference attendee followed by asking what is the incentive for shippers and carriers outside of the United States to join the program.

Silverblatt stated it is a voluntary process so businesses self-select to work with the program. Because the EPA can get in the proverbial black box that companies cannot, it is a cost-free resource available to any company. Once they start to use it they can see where
improvements are being made. They are able to demonstrate this in a public manner. It is transparent communication.

**Did you look at anything related to e-commerce as far as things that are nonstandard, like nonstandard time of the day?**

Sliverblatt stated they looked at it in Toronto and London. But the data did not provide specifics to nonstandard times.

**POLICY AND PLANNING IMPLICATIONS**

This set of presentations addressed policy issues using a combination of methods. Solis evaluated border-related policies and strategies across six land ports of entry using emission impacts. These policies include smart growth, consideration of alternate fuel and vehicle technologies in trucks and vehicles crossing the borders, as well as policies to address mode shift from truck to rail and other modes at the ports. Silverblatt discussed the motivation and development of SMARTWAY as an incentive voluntary policy mechanism and tool for influencing behavioral choices in the freight markets by recruiting shippers and carriers to promote more environmentally conscious supply chains and economic growth at the global and local levels. SMARTWAY is a combination of incentive strategies including financial incentives and mechanisms and partnerships relying on markets to generate sustainable outcomes in the movement of freight. SMARTWAY demonstrates how public policies can assist firms in achieving environmental goals and can facilitate the development of a “green” profile that can be good for the firms operation and profitability. Sakhrani discussed the role of emerging technologies, data sources, and analytics to prepare for technology trends influencing urban and metro area freight movements. Vadali suggested that new methods could be used to examine impacts of policy shocks at the macro and micro levels, but suggested that the adoption of such methods at the state, regional, and local levels would require access to more disaggregated data sets as well as different data sets based on the context. In other words, in order for global supply chains to be beneficial for development and planning it is important to understand them better to enhance models that are more relevant from a supply chain perspective.

Additionally, Solis made direct references to adoption of specific methods to facilitate decision-making and planning at the borders in Southern California.

**FUTURE DIRECTIONS**

The sessions highlight varied research needs:

1. A need exists for evaluation of emerging policies and specific strategies and options addressing freight congestion in urban and metro areas from an economic standpoint (economic impacts and costs–benefits).
2. The SMARTWAY program provides a mechanism for building global sustainable growth from freight movements. What are the implications of changing supply chain
configurations on economic growth and emissions? How might one evaluate economic and emission impacts of such changes?

3. Can design and development of alternative mechanisms generate sustainable economic outcomes?

4. A need exists for developing alternate models of impact analysis at macroeconomic and regional levels. Current methods of impact analysis are based on input output and econometric methods. How can other methods complement or improve conventional impact analysis?
The Midwest High-Speed Rail Association works to educate people, businesses, and lawmakers about the potentials for faster, more-frequent, and more-reliable trains to connect midwestern economies and communities. Today, new technologies such as hyperloop and autonomous vehicles are emerging and calling attention to the need for adoption of effective and modern technologies. High-speed trains between cities will not only help the economy of the region, but also provide personal comfort and enhance personal connections.

In the United States high-speed rail (HSR) is not always viewed in terms of an integrated network but rather as isolated lines between individual cities. Yet with the rise of megaregions in the United States, there is a strong potential for the creation of a real passenger rail network that can connect across the nation. For example, it could take 90-min via high-speed train to go between Chicago and Indianapolis. Yet the impact of that single-pair connection may not be large enough to justify major investment in HSR. By considering neighboring places in Illinois and Indiana, such an investment could support a more robust feeder network that could generate a larger regional impact. By taking the perspective of regional network planning, bus services can also be seen as playing an important role in enabling better regional connectivity. Statewide coordination can further create benefits by reducing transportation cost, increasing productivity, better distributing economic growth across an entire state, and generating less air pollution. To accomplish this, we need better planning that views modern train sets and rail infrastructure as a requirement and also views private railroads as allies in our efforts to achieve these outcomes.
Mitch Warren

The Northeast Corridor Commission (NCC) provides coordination and planning support for fast and effective service along the northeast corridor rail line, by bringing together the transportation departments of eight states and the District of Columbia. The northeast corridor serves a mix of intercity passenger trains, local commuter trains, and freight trains. It features one of the busiest and most complex networks in the world and serves four of the 10 most-populated metropolitan areas in the United States.

Travel among cities in the Northeast Corridor is already very congested, whether it be via highway, air, or rail travel. For example, a combined half of all flight delays in the United States originate at one of the New York City and Philadelphia airports. On the other hand, the northeast corridor rail lines carry more intercity travelers within the NCC region than all airlines combined. With over 2,000 daily trains serving over 800,000 daily passengers, the good news is that the trains are serving a large and important base of customers. The downside is that the infrastructure is old, aging badly, and there is currently inadequate funding to sustain the growth of these services. The NCC and U.S. DOT have been working on a new cost allocation policy since 2015, which incorporates a state–federal–Amtrak cost-sharing formula and funds-application policy. More work likely will be needed to improve and modernize the rail lines over the next 5 years, and we will need to improve transparency, accountability, collaboration, and cost sharing.

Jagoda Egeland

The International Transport Forum (ITF) is part of the Organization for Economic Co-operation and Development (OECD) that includes the United States and other nations. From an OECD perspective, we see several efforts underway to integrate regions through transportation investment in Europe and in Asia.

- Trans-European Transport network. The European Commission is supporting development of trans-national corridors that encompass multimodal facilities. There are growing economic discrepancies between European countries, and a need to link nations with significant productivity and income differences. This calls for new investment plans and infrastructure, based on considerations of the economic advantages of regions and consideration of the cost and benefit consequences for affected regions.
- Enhancing connectivity in Central Asia. Efforts are underway to improve intercity connectivity within the multi-country block of Kazakhstan, Uzbek, Kyrgyzstan, Tajikistan, and Mongolia. These efforts require measurement of current connectivity and a determination of where bottlenecks occur and the kinds of multimodal solutions that can be most effective.
- China’s One Belt, One Road initiative. OECD is investigating how China’s multimodal highway and marine trade corridor investments are being developed, and how, after the construction, they are likely to create economic changes that will impact the OECD membership.

From the OECD perspective, transportation investment alone is not enough to unlock productivity improvements, so any policy exercise should first determine the drivers of growth and what holds it back. Furthermore, to tackle productivity challenges, policy-makers need to
design “investment packages” based on consideration of the spatial distribution of costs and benefits and potential effects on the integration of regions.

**DISCUSSION**

Weisbrod facilitated a discussion among the panelists with prepared questions. Following asking the question, Weisbrod allowed each panelist to respond.

**How are discussions about HSR and multimodal planning different in the United States than in Europe?**

Weisbrod clarified his question by saying, in the second half of the 20th century, the United States jumped ahead of rest of the world in terms of having an Interstate Highway System (IHS) while Europe is still working to catch up. But, on the other hand, the United States is behind European countries when it comes to high-speed passenger trains.

- **Richard Harnish:** The United States already has a very robust highway system as well as strong freight rail and trucking networks. The United States faces a challenge, though, of declining revenues and growing needs to maintain aging infrastructure.
- **Mitch Warren:** The IHS currently receives a large share of fuel tax funds while transit receives a lesser share of those funds. There is no complementary source of funding for intercity passenger rail, which makes it even harder to direct funds for investment in its infrastructure.
- **Jagoda Egeland:** In Europe, we are also struggling to deliver truly multimodal national investment plans. Each nation has its own form of transport funding and priority setting, making it hard to integrate national investments and create transportation network efficiencies across modes.

**Do you think the ownership structure of rail facilities and services presents obstacles to intermodal planning in the United States? How about air and other modes?**

- **Mitch Warren:** In some places we have public passenger trains and private freight trains sharing tracks, and we also have a mix of tracks owned by private railroads and tracks that are publicly owned. This presents challenges for cooperative planning.
- **Richard Harnish:** Yet another challenge for rail service planning is the limited level of service provided by commuter rail serves to airports. Better feeder networks are needed.
- **Jagoda Egeland:** The London airports are privately owned and that creates challenges for planners when it comes to investment in airport capacity. On the one hand, privatization is a boost for competition that has driven prices down for passengers, but on the other hand, it complicates public decision-making on where to locate new capacity and who should pay for it.
How are wider economic development benefits being recognized in transportation investment decisions, and what challenges do they present for planning?

- Jagoda Egeland: Most of European countries use a form of multicriteria analysis as well as and cost–benefit analysis to evaluate proposed investment. More countries are now incorporating consideration of wider economic benefits (WEBs), and one at the forefront is the UK. There are still significant methodological challenges regarding data availability and methodology. The basic concept of economic benefits and GDP effects do seem intuitive to decision-makers, but at the same time the analysis methods being used to calculate results are complex and that creates challenges for widespread acceptance of those results.

- Mitch Warren: There are also issues regarding the scale of impacts. For instance, if we were to lose all intercity rail services on the entire northeast corridor then cost impacts can be directly estimated. But it is more difficult to identify indirect impacts such as changes in the location of businesses or residential patterns.

GENERAL FINDINGS AS THEY RELATE TO TRANSPORTATION AND ECONOMIC DEVELOPMENT

The panelists ended the discussion with a general agreement that it will be important to improve connections across economic regions to enable North American and European growth in the years to come. However, the connections should be integrated across modes (encompassing rail, road, and air) and they should be developed with the active collaboration and involvement of private and public stakeholders spanning local, regional, state, and national perspectives.

FUTURE DIRECTIONS

The panelists thought that more research and guidance would help to improve the ability to estimate and measure the economic development benefits of multimodal investments in connecting regions, as well as our ability to communicate these factors and incorporate them into funding decisions and plans.
SUMMARY

Casual Effect of High-Speed Rail: Evidence for the Madrid–Barcelona Corridor
Daniel Graham and Jose Carbo

Summary

Transportation investments in HSR have expanded progressively since 1990. HSR matters because of its effects on the economy. This study–paper established the casual effect of HSR on Spanish regional economy. The effect on passengers is a large increase in rail ridership. A difference in difference (DiD) approach was used. It considers the specification of HSR service using variables like gross value added (GVA) per employee, employment, and number of firms. Time effects are taken into consideration. A DiD dummy variable was included to estimate the effect of HSR. A synthetic control was used. The variables of interest were GVA per employee and number of firms. The synthetic control was a weighted average of the control regions.
Results

The empirical analysis presented by Graham and Carbó found

- Positive significant effect of HSR on GVA per employee, productivity, and number of firms in the treated provinces;
- DiD captured the effect of HSR improvement—introduction and showed 1% positive effect on GVA, and a 3% increase in the number of companies and firms; and
- The difference in treatment and synthetic control started to increase after 2003.

The Northeast Corridor and the American Economy
Shana Johnson and Donnie Maley

The role of the Northeast corridor, which comprises a multitude of rail segments and agencies across multiple states. This project tackled economic research with a mixed methodology that was quantitative and qualitative. Beyond serving its riders, the corridor is a reliever to nearby highway and aviation networks. The study was needed to overcome an old narrative about the Northeast corridor, which is that it is not only important to people who ride the regional trains and that is not an economic asset. It also helped explain the freight flow and impact on the corridor and the birthing of new cities along the Northeast corridor. There was a need for qualitative and quantitative data to tell the full story. The tools and aspects of the Northeast corridor include:

- Talent location—the analysis revealed that the location of talent plays a role in regional development;
- Job access; and
- National and megaregion impacts—companies are changing the way they do business including a larger geographical coverage.

Economic Development and Express High-Occupancy Toll Lanes:
A Case Study from Israel
Rimon Rafiah

Summary

The case study considers how the high-occupancy toll (HOT) lanes influenced the travel habits of people in the influence zone. It also addresses economic behaviors encountered in the HOT lanes and related economic impact within the influence zone.

Results

- The HOT lane saves time and vehicle operating costs.
- Shuttle services using HOT lanes enable workers to commute with paying parking fees in heavily congested Tel Aviv.
- The HOT lane project changed road use behavior by addressing modal split, increased vehicle occupancy rates, increased use of park-and-ride, and casual carpooling.
HOT lanes have a conservative estimated increase of GDP by $26.5 million. Construction and technology investments can be paid back in about 19 years with tax revenue.

**Economic Impacts from Housing Production Policies, and Implication for Leveraging Public Transportation Investments**

*Mike Wilkerson*

**Summary**

One objective of the research was designing policies to incentivize smart cities and leverage transportation investments. A second objective was to understand regulatory barriers to increasing household formation. The research addresses underbuilding in some states. The analytic approach adopted was to build an econometric model to calculate housing supplies. Research growth scenarios were used to analyze effects of the following three contexts:

- Connecting land use and housing to transportation;
- Effects on housing development of single-family homes and middle- and high-density housing prototypes; and
- Effects of housing on vehicle miles traveled (VMT).

A Regional Economic Model (REMI) was used in the research to model dynamic economic effects.

**Results**

- U.S. housing starts have not kept pace with household formation. The research show that the United States fell 7.3 million housing units behind housing demand from 2000 to 2015 across 23 states.
- When comparing the differences between Smart Growth and traditional approaches we found:
  - Smart Growth generates positive fiscal revenue;
  - VMT impact is reduced by 16%;
  - Smart Growth uses 25% of the land footprint; and
  - Smart Growth delivers a variety of housing units across an income spectrum.

**DISCUSSION**

One audience member commented on Wilkerson’s presentation on the complexities of a comparison between Smart Growth strategies and transportation community planning approaches. The practical issues of investing in smart cities and vertical infrastructure can encounter social, cultural, and socioeconomic challenges. The commenter stressed the downside of travelers who use public transportation to access smart cities would have access to new areas and potentially new development, but they may not be able to afford the cost of living or may experience other social and cultural challenges.
GENERAL FINDINGS ON METHODOLOGY AND POLICY

The research presented was based on different methodologies. Some of the approaches made use of quantitative analyses, while others were more qualitative and descriptive in nature. Both are needed to advance and to tell a complete story of links between transportation assets and economic development.

FUTURE DIRECTIONS

Researchers and policy makers will need to better model and understand the linkages between public transportation and economic activity in export analysis as well as from a broader regional policy context to analyze effects of transportation (in this case, public transportation) on housing stock–supply and on travel behaviors.
SUMMARY

**Economic Analysis of Completing the Appalachian Development Highway System**
*Daniel Hodge and Glen Weisbrod*

Hodge presented on his studies of the economic impacts of completing the Appalachian Development Highway System (ADHS). The Appalachian Region, as defined in ARC’s authorizing legislation, is a 205,000-mi² region that follows the spine of the Appalachian Mountains from southern New York to northern Mississippi. It includes all of West Virginia and parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia. Hodge first provided results of backcasting which estimated transport and economic impacts of ADHS system through
2015. Then, he presented the economic impacts upon the completion of ADHS by the year 2045. Hodge found significant travel time, reliability, labor access, and business delivery gains inside the Appalachian region, and includes 20% of the car and 30% of the truck benefits from the surrounding area outside of the region. ADHS is also accountable for 168,000 jobs as of 2015. Hodge stated that there is an expectation of the ADHS system to create 47,000 jobs by 2045 and produce $4.2 billion GRP/year.

**Optimizing the Priority of ADHS Projects by Integrating Simulation and Genetic Algorithm**  
*Elham Shayanfar, Paul Schoenfeld, and Jason Wang*

Shayanfar provided a study on prioritizing the development of the remaining ADHS projects subject to limited resources while dealing with interrelations among projects. Their study considers transportation (travel time, vehicle operating, and safety costs) and economic impacts (accessibility to buyer–supplier market) of completing the remaining ADHS corridors. Shayanfar stated the goal is to determine the optimized sequence of projects in order to optimize a performance metrics (consisting of transportation and economic impacts) subject to budget flow constraints. Shayanfar noted that the team integrated an equilibrium traffic assignment model with freely available EconWorks market analysis tool and a genetic algorithm to solve the optimization problem. Their paper showed that different objectives result in different optimized plans, and the economic productivity implications of completing ADHS is much more significant than direct transportation impacts. Finally, Shayanfar stated future work as (1) considering sources of uncertainty in elements such as budget, project cost, and future demand; (2) exploring the sensitivity of results to variables such as productivity elasticity and impedance decay parameter; and (3) improving computation time to analyze much larger networks such as the entire Appalachian region.

**Rail Network Access in an Era of Declining Coal**  
*Mark Burton (presented by Daniel Hodge)*

Burton’s research problem was introduced by Hodge, who asked the following questions:

1. Where will freight rail availability be most threatened?
2. How deeply and how broadly will railroad availability be impacted?
3. What do these outcomes mean to public-sector response?

Hodge presented a detailed network model for freight rail transportation across the eastern United States by carrier and commodity. Then, he explained the inputs for forecast models on coal volumes. Hodge compared current traffic volumes with future reduced-coal traffic volumes and presented results of vulnerable and abandoned rail lines. Burton’s study could be summarized as follows:

- The transport of coal would have large reductions by tonnage in the states of West Virginia and Kentucky. Further reduction are expected within the Appalachian region.
- Some Tennessee railroad coal carriers have closed down. Closures of other railroads are expected to continue.
• Most coal shipment via rail are bound for coal-fired electric utility power plants.
• With very little demand for other localized rail shipments, there is an expectation of coal business declines and in the region.
• Global demands for coal will shape the future of the coal industry in the Appalachian region.

Transportation Infrastructure and Poverty: A Case Study of Ethiopia
Yue Ke and Konstantina “Nadia” Gkritza

Ke began the presentation by asking the question: How do transportation infrastructure investments affect poverty in developing countries? The answer to his question, he says, depends on how poverty is measured and what transportation investment means. In his study, poverty is measured as household income or wealth ownership, human capital, health, and food security. Transportation infrastructure includes different road types (asphalt, graded gravel, dirt track), and distance to each road type. Ke presented regression analysis results on how transportation infrastructure affected poverty measures in Ethiopia. For example, longer distance to a major road is noted to have a negative effect on food storages within households. The second part of his presentation showed results of two-stage least squares model on how geographic conditions affect number of households. Ke ended the presentation by stating future work as (1) additional research to understand why gravel road and level of schooling have negative relationship and (2) study on heterogeneity in road conditions within surface type categories.

DISCUSSION

While the theme of this session focus was on transportation and rural economic development, the question from the audience honed in on how the Appalachian transportation projects were funded. According to the panelists, funding for the projects come from many different places. Some funding comes from unobligated funds, although the funding is not enough to complete a project for a corridor. Funding can come through public–private partnerships (P3s) with an accelerated model to pay back the investors over many years. Tolls and congestion pricing to generate revenue is not adopted in the ADHS. Additional funding had been provided by the U.S. DOT through TIGER grants. Since funding is limited, ARC updates project cost estimates every 5 years and the prioritization study did account for those construction costs in a second model.

An audience member asked whether the region considered railroads as an alternative to address low-traffic volume issues. Hodge replied by saying there are not many flat landscapes for industries to settle to support new rail-dependent industry. Rail has been declining in the Appalachian region. Once the rail is dismantled, the footprint becomes a bike and pedestrian trail. Once the rail is gone, it does not come back.

GENERAL FINDINGS ON ECONOMIC DEVELOPMENT

• The portions of the completed ADHS has had significant economic development impacts in terms of market accessibility, job creation, and productivity so far, and is expected to continue to have similar impacts throughout completion time.
• An optimization framework for prioritizing highway projects considering both transportation and economic development impacts was introduced in the session. The model is applicable to any real size problem for planning and prioritizing purposes at local, state, and multistate regional levels.
• With a reduction in coal demand in Appalachia and development of the ADHS corridors, railroad business has declined and short-line railways have been abandoned.
• Properly measuring poverty and the form of transportation infrastructure investment are important for assessing the relationship between transportation infrastructure and poverty.

FUTURE DIRECTIONS

Research is needed for methods to prioritize large transportation infrastructure projects with economic development objectives, such as the ADHS corridors, by assessing community market accessibility benefits and the relationship between road surface type and poverty.
TECHNICAL SESSION 2C

Transportation Planning and Evaluation

Wider Economic Benefits of Aviation

JAGODA EGELAND
International Transport Forum, OECD
Moderator

JAMES WILTSHIRE
International Air Transport Association
Speaker

STEVE LANDAU
Economic Development Research Group
Speaker

JOSE MANUEL CARBÓ MARTINEZ
DANIEL J. GRAHAM
Imperial College, London
Speakers

SUMMARY

The panel organized by the ITF at the OECD aimed to explore the challenges to estimating WEBs of air transport and how these challenges could be addressed.

In his presentation, Wiltshire stressed the importance of aviation not only to passengers and freight forwarders, but also to fostering both the local and national economy. It is important for policy-makers to understand the impacts of aviation in order to make the right decisions regarding aviation policy and investment in airport infrastructure. In practice, however, quantifying all the impacts of air transport is challenging, in particular in relation to the so-called WEBs that arise as a consequence of transport’s impact on economic geography.

The first challenge is that of avoiding double counting of some of the benefits in a process in which more than one assessment methodology is used in impact assessment (cost–benefit analysis, computable general equilibrium, input–output tables). Because the transmission mechanisms through which wider economic impacts occur for international air transport are different from those for domestic or urban transport, another challenge is to develop a framework of channels or mechanisms through which wider economic impacts of air transport can occur, and to find the evidence needed to quantify these mechanisms and apply them in transport appraisals. In order to achieve that, Wiltshire concluded that transport economists need to start working together with trade economists and experts on foreign direct investment (FDI) to address the effect. He emphasized the importance of scale and geography of flows in driving wider benefits.

Landau focused on how WEBs of aviation were assessed for a sample of cities in the United States. His research was based on Airport Cooperative Research Program (ACRP)
Report 132: The Role of U.S. Airports in the National Economy (Project 03-28, http://www.trb.org/Publications/Blurbs/172595.aspx), a study to quantify the economic role of U.S. airports to the national economy. Landau discussed how aviation connections between markets affect regional economies based on the regional industry mix and the level of connectivity between regions. In addition, he examined how operations of airports trigger catalytic effects in regional economies by facilitating visitor spending, long-distance fast cargo movement, and supply chain effects from on-airport activities.

One of the conclusions provided by Landau was that the term “wider economic benefits” is used differently in the United States and in Europe. In Europe, the WEBs category comprises those benefits that arise due to transport’s impact on economic geography, while in the United States, WEBs constitute all the benefits that go beyond the direct impacts of transport.

Carbó and Graham outlined the methodology and findings from a study of air connectivity in Tibet, China, which established causality between air transport and productivity (measured as GDP per employee). Carbó and Graham examined the productivity impacts of deregulating the aviation market in China in 2003, a policy that was not applied to Tibet at the time. To do so, they conducted a treatment versus control analysis, in which a synthetic control region was established using synthetic control methods. The treatment region was Tibet as the deregulation policy was exogenous to Tibet’s economic characteristics. Their study fills an important research gap, as there are very few studies available that establish the link between air connectivity and productivity.

DISCUSSION

In conclusion, the panelists agreed that it is important for researchers to work on establishing more robust methods of quantifying WEBs of air transport. Advancing these methods would help policy-makers make better investment and policy decisions. In order to make that happen, transport economists need to work together with trade economists and FDI experts to better understand how long-distance markets offered by aviation impact local, regional, and national economic growth and productivity. There would also be value in comparing and contrasting the European and U.S. approaches to such assessments. It is important to distinguish between “wider benefits” as in conventional cost–benefit analysis from the “broader or other economic benefits” of aviation.
PLENARY SESSION 3

Impact of Multimodal Transportation and Transformative Technologies on Regional Economy and Community Development

KONSTANTINA “NADIA” GKRITZA
Purdue University
Moderator

ROY NUNNALLY
Indiana Department of Transportation
Speaker

BENJAMIN WU
Maryland Department of Commerce
Speaker

LEI ZHANG
National Transportation Center at University of Maryland
Speaker

SUMMARY

Nunnally gave an overview of the regional economy and transformative technologies in Indiana. Indiana is known as the “Cross Road of America” with Interstates that connect our borders, rail system, and U.S. bike route–trails. Indiana is ranked nationally in agriculture production. Connected tractors can have a significant impact to the agriculture industry and allowing the reporting of seasonal trends and usage that can tie in with crop harvesting and air quality (e.g., produced dust from harvesting select crops). Manufacturing–logistics are other key industries. Indiana is growing in life science and service sectors as well. Indiana DOT is pursuing a statewide drone program for air and ground units. The concept of drone usage is growing in Indiana and will have a tremendous economic impact in terms of productivity and applications. Indiana DOT is shifting from fixed assets to mobile probe data and is interested in reported sensor information from vehicles. Nunnally also discussed other transformative technologies that Indiana DOT is investing in such as virtual weigh-in-motion sites, truck platooning, and truck parking information management systems that can increase drivers’ overall productivity, efficiency, and allow for increased safety (e.g., reduce crashes from driver fatigue). Indiana DOT has developed interactive mapping tools for its Next Level Roads Program. This allows for increased accessibility of information internally to Indiana DOT’s partners and to the public. Nunnally concluded his presentation with some challenges going forward. Indiana DOT has leadership and support for implementing transformational technology. This has to be consistent over long periods of time and must survive administration changes. State DOTs are advised to invest in statisticians and staff with data analytical, information technology, and informatics skills to support engineers and decision-makers.
Wu started his remarks by pointing out the strong link between the transportation sector and economic development. Transportation is the fastest growing industry in Maryland. Maryland is investing in road and rail projects, such as the $9 billion plan to relieve traffic by adding express lanes to I-270, the I-495 Beltway, and the Baltimore–Washington Parkway, through P3s. In addition, the state is spending $50 million for traffic signal upgrades and is starting construction of the Purple Line, a 16-mi light rail extending from Bethesda to New Carrollton that will provide a direct connection to Metrorail lines as well as MARC, Amtrak, and local bus services. The state is also exploring a Maglev train line between Washington, D.C., and Baltimore. Wu also highlighted the relationship between transportation and broadband access, apprenticeship programs, tech transfer and world-class education. Connectivity can spur economic development across the state, while bringing groundbreaking research and cutting-edge technology from the laboratory to the marketplace that can transform ideas into economic power. Much of that could not be possible without successful P3s.

Zhang discussed how big data, AI, and advanced computing will drive economic development and change the way research is done when providing information to decision-makers. Zhang presented some completed studies in his lab using traditional data sources and conventional statistical approaches for assessing the relationship between transportation and economic development. He highlighted the AASHTO SHRP 2 Solutions EconWorks (https://planningtools.transportation.org/13/econworks.html), a database of 132 completed transportation projects in the state of Maryland and identified their direct–indirect economic impacts. This type of data can allow decision-makers to learn what project scenarios have worked well in the past and conduct ex-post impact analysis. Turning to transformative technologies, Zhang discussed several initiatives in big data from cell phones, global positioning systems, and smartphone apps and how these are used to illustrate origin–destination travel patterns across different U.S. regions and metro areas to visualize and analyze real-time traffic in metro areas. It is now possible to build transportation model that defines behavior rules for every traveler using AI and machine-learning techniques. Zhang concluded his presentation with promising research directions for integrating big data, AI, and advanced computing into transportation and economic development research and practices.

DISCUSSION

Konstantina facilitated the session discussion with two questions. Then, the audience had an opportunity to ask the panelist questions.

Maryland and Indiana cities are still in the race for Amazon’s second headquarters (HQ2) location. What is being done by these states to attract Amazon? What do the states do to attract larger companies?

Nunnally responded by stating that Indiana incentivizes through infrastructure by providing increased accessibility. Indiana DOT receives specific requests to make an area more livable for folks that do not drive. Indiana DOT and the local governments are working with Amazon to accommodate these amenities via road diets and other strategies.
What role does Indiana DOT play in site-selection decisions for smaller business compared to larger businesses like Amazon?

Nunnally answered the question by saying Indiana DOT has a dedicated economic development representative that is engaged in direct discussions with the business owner, developer, or representative. One of the challenges is that small and large businesses often seek sites at, near, or have direct access to an Interstate. State DOTs need to do a better job at promoting services their non-Interstate corridors can provide to industries.

Wu stated that with the proposed expansion of mass transit with the Purple Line and proposed HOT lanes, Maryland is already expected to bring additional economic growth.

Zhang pointed out that big data will help determine the location of Amazon’s HQ2. He provided an example of the European banks looking at traffic patterns when deciding where to locate banks and automatic teller machines.

Each of you has spoken on big data in your discussions and the collection of individual and personal information. What is being done or what protocols are in place to thwart hacking and security concerns?

Nunnally offered a response by saying protocols are in place to minimize hacking and data leaks. Many of the data sets that we collect are purchased (for example INRIX Data for traffic probe data, InfoUSA/Dunn and Bradstreet data for business data, and freight data). Other data sets such as those from departments of motor vehicles, crash data, and other data sets have limited access or have to be aggregated to large zones to minimize privacy issues. To access this information, it is necessary to sign an agreement. Indiana DOT does not have access to other data items with personal identifying information. As more data becomes available, personal identifying information will likely not be available.

Zhang added that the National Transportation Center at the University of Maryland collects big data with personal identifiable information on businesses for the 50 states, more detailed than the proprietary business sources Indiana DOT have purchased for, but they cannot share this data. Internet of Things protocols are in place to thwart hacking or forwarding this information to others.

Elaborate on behavior mechanisms used to trigger behavioral “nudges,” say within the Incentrip App?

Zhang said his center conducted behavioral experiments with local residents to develop an application-based behavior-based model. Zhang tested different monetary and nonmonetary incentives and tried to make incentives respond in dynamic real time. The goal is not to pay people to change behavior, but to incentivize them periodically.

How much effort is given to engage shipping industry?

Wu said the Maryland DOT is situated as an ideal location for a distribution center within the eastern coast. Land, air, and sea transportation are key aspects of the state’s commerce.
KEY FINDINGS

The following key findings were covered in the presentations:

- Big data, AI, and advanced computing can be used to improve the understanding of transportation and economic development.
- New skills and ways of thinking are required to embrace transformative technologies.
- Connectivity can spur economic development. Rural areas are just as important to develop economically as urban areas.
- Leadership and support are needed for successfully implementing transformational technology.
- Security and privacy concerns need to be overcome.

FUTURE DIRECTIONS

The following ideas appear suitable for follow up research:

- Evaluate economic impacts based on observed micro-level passenger and freight travel demand changes related to individuals and businesses.
- Develop transportation and economic impact models based on big data and AI methods and potentially also building on behavior economic theories.
- Develop large-scale computational economic modeling tools and simulation of transportation and economic development interaction.
- Develop tools based on behavioral nudges: personalized signals, pricing, and incentives for maximizing the benefits of transportation investments.
TECHNICAL SESSION 3A

Site Selection

JAMES GILLESPIE
Virginia Transportation Research Council, Virginia Department of Transportation
Moderator

PETER PLUMEAU
Economic Development Research Group
Speaker

KEVIN ADDERLY
Federal Highway Administration
Speaker

CHAD MILLER
YUANYUAN ZHANG
Center for Logistics, Trade and Transportation, University of Southern Mississippi
Speakers

ROBERT CASE
Hampton Roads Transportation Planning Organization
Speaker

SUMMARY

How Transportation Project Investment Affects Private Business Site Selection
Peter Plumeau

Plumeau noted that the presentation is based on ongoing research that he is doing for FHWA with Adderly.

Local governments may not always understand everything that goes into site selection. Plumeau outlined three steps in private-sector site selection: (1) a screening-level search based on a high-level scan of a large region, with attention such factors as highway access, utilities, and taxes; (2) a more-focused study of suitable locations, including some financial (sketch) analysis, demographics, and traffic studies; and (3) a detailed analysis of specific sites. With the exception of economic development offices, most public-sector agencies have an incomplete view of the details involved.

The needs and the emphasis vary from one industry to another. For example, a microchip fabrication plant requires good Interstate highway access, good air cargo access, a high-volume supply of water, and a qualified labor pool. A distribution center (also known as an e-commerce fulfilment center) requires lots of land, highway access, and a suitable labor pool, but not the same labor pool that the “chip-fab” plant requires. An intermodal rail facility (also known as an inland port) requires reliability—a low risk of disruption to traffic, both rail and highway,
moving in and out. A headquarters requires a reasonable commute distance from residential areas and convenient access to corporate (air) travel. People in the government and the planning community may not be familiar with all of these different needs.

Just as the locating businesses care about multiple factors, communities care about several dimensions of impacts: economic vitality, but also land use impacts, transport impacts, quality of life, and public revenue. Many entities [the economic development office, the local chamber of commerce, industrial development agencies, elected officials, the DOT, the metropolitan planning organization (MPO), public utilities, and environmental and permitting agencies] can or should have a role. Plumeau’s research to date, however, suggests that the involvement of all of these agencies at early stages in site selection—and site preparation—can be rare.

The need for multiparty coordination means that reactive planning, in response to a prior demonstration of interest from a specific searching firm, can seldom be timely. If some of the responsible entities become involved later, rather than earlier, then some critical decisions may be “backfilled” into a site development plan that already has begun to take shape. Site searchers may have filled in missing pieces of the picture (temporarily) with assumptions about what is possible, or about what the impacts will be. Either of these circumstances can lead to suboptimal decisions that lead to unforeseen public costs, unforeseen labor access problems, or unforeseen transport bottlenecks. Plumeau mentioned three examples: (1) unforeseen traffic generation that required a road widening to alleviate a bottleneck; (2) unforeseen labor access problems so severe that the municipality ultimately subsidized transit service from the urban core to meet the labor demand at a new suburban location; and (3) unforeseen conflict between a brightly lit 24-h distribution facility and a neighboring residential subdivision.

Plumeau and Adderly have found that the most active and effective economic development offices have ongoing relationships with the state and local DOTs, and that the most-competitive regions prepare in advance before a searching business approaches them. Proactive planning to prepare sites that will be attractive to businesses of the type that the locality hopes (realistically) to attract is desirable. Some actions Plumeau suggest for communities to consider within economic development and land use are

1. Engage economic development partners at the state and local levels;
2. Talk to local firms about the pros and cons of doing business in the area; and
3. Invite site-selection experts to talk with policy-makers and staff.

**Using Bill of Lading Data to Identify Economic Development Opportunities**

*Chad Miller*

Miller noted, by way of introduction, that the Economic Development Program within University of Southern Mississippi’s College of Business is in the business of “educating economic developers.” It is in the context of preparing future economic development officers and future site-selection professionals that he and Zhang have studied methods to exploit bill of lading (BoL) data, that is, data on the documentation of exports and imports, in applied projects.

Miller discussed critical site selection factors, according to an annual survey of corporate executives. High on the list were availability of skilled labor, access to highways, and proximity to markets, quality of life, available buildings, energy availability, and cost. The importance of transport, via labor supply, highway access, and market proximity, were basic and average on the
annual survey results. He noted that the selection process tends to be an elimination process. Searchers identify their needs, and then they drill progressively deeper into local data to screen out locations that don’t have what they need.

Typically, the searchers end up looking at secondary data in city and community websites as they narrow the candidates, which carries two important lessons for local planners. First, know what the site selection consultants are seeking, and make sure it is on your community’s website. Second, make sure that the data for communities are accurate.

After the initial screening-level search (described by Plumeau), the site selectors will send a request for information to the jurisdiction in which they are interested. To answer some of the questions the jurisdiction will require help from the utility companies, the state DOTs, and other experts. How does transport fit into the equation? Static measures include the capacity of the highway link, whether two lanes or four, and the distance to the highway. Links with the greater Interstate network and rail service matter. If the site in question is transit accessible, the extent of the transit network and the potential expansion of the network matters.

A community ought to try to identify “target” industries. The available data tend to be easier for firms who start from known industry needs to search for communities with requisite assets, but harder for economic development offices who start from known community assets to search for industries with requisite needs. Target market analysis attempts to reverse engineer the site-selection process, to identify industries and companies that might be interested in a given community. Miller outlined six steps in this method.

1. Look for signs of “clustering” by reviewing employment in each industrial sector, to see what industries are expanding where;
2. Perform value chain analysis: are certain industries purchasing a lot locally?
3. Rank the growing industries;
4. Identify the trends in terms of volume and in terms of geography;
5. Define the target region(s); and
6. Identify the targetable industries for that region. Once this is accomplished, outreach involves overtures to industries (for example, attendance at trade shows and even calls to particular companies).

These six factors are referred to as the Modified Clemson’s Regional Economic Development Research Laboratory (REDRL) approach. REDRL developed an algorithm to rank all of the $1 million-and-up companies on their likelihood of expansion.

Miller proceeded next to describe the information he, Zhang, and their students have been able to distill from BoL. A BoL typically identifies the shipper, the foreign port where the shipment was loaded, the U.S. port where it was unloaded, the destination, the location where receipt was declared, the consignee (to whom the shipment was addressed), the arrival date, the nature of the goods, their volume, their estimated value, and a description of the container. Data services (data miners) consolidate BoL data into tabular formats that are useful for researchers who wish to

1. Classify freight volumes or values by commodity;
2. Track a company’s market activity;
3. Identify top carriers;
4. Identify top ports; or
5. Measure market impacts.

Miller and Zhang’s team, seeking to use BoL data to identify the role that transport plays in a location decision, introduced two new analysis techniques. One is to analyze the regional significance of a specific port. Another is to identify international companies that are either shipping high volumes to the region under study or receiving high volumes from it.

Miller drew on specifics from Tippah County in northern Mississippi to illustrate his methodology. Tippah is in the northern part of the “Tupelo furniture cluster,” which is not in the Memphis Standard Metropolitan Statistical Areas but is not too far from Memphis. He showed some tables of findings for Tippah County: top buyers ranked by TEUs, top sellers, and shipping costs derived using a Freight Rate Calculator.

He mentioned, also for illustration, some findings from studies done for the port of Gulfport. This research identified the port’s import and export customers in Mississippi and estimated, using REMI software, the cost savings they realized by having access to Gulfport. The studies also identified the extent of Gulfport’s paper product “hinterland” by identifying the destinations to which came through Gulfport were going.

The BoL records have data problems that call for careful screening. There are false buyers: 10% of BoLs are addressed to third-party logistics providers, that is, intermediary logistics companies who are not the researchers’ actual target. There are purchasers who remain incompletely identified because they do business under more than one name or because they do business through subsidiaries. Some companies that appear in the BoL records compiled for a given region have no local presence at all, or they have only small local offices that are not the true destination of the shipment. Sometimes the shipping cost or the exact volume of a shipment are not available. He also noted issues with the Harmonized Code and its limitations of BoL data make them most useful when aggregated to a certain geographic scale. While the application to BoL data compiled for Tippah County illustrate the methods, Miller opined that the methods would probably produce the clearest, most reliable results at a regional, multicounty level.

He concurred with Plumeau about the advantages of proactive site preparation over reactive site preparation.

Amazon HQ2 and Rail Transit
Robert Case

Gillespie introduced the presentation and discussed how as Hampton Roads was of the 238 metro areas that responded to Amazon’s request for proposals (RFP) for site selection of its second headquarters. The Hampton Roads Transportation Planning Organization (HRTPO) acquired from the business news company Quartz a list of 151 metropolitan areas known to have submitted proposals, and winnowed the list to 103 metro areas whose data were readily available and who were large enough to be serious contenders. This list included all of the localities who survived the first cut to make the list of 20 finalists.

According to Gillespie, the HRTPO modeled the first round of the selection process on a cross-sectional data set. The binary dependent variable consisted of the known results of the first cut: 1 for the 20 successful finalists, 0 for the unsuccessful localities. The five explanatory variables were based on statements in the Amazon RFP.
1. A dummy for the presence or absence of light rail transit was the variable of chief interest.
2. The number of college graduates served simultaneously as a proxy for the size of the metro area and as a proxy for the pool of technical talent, both identified as desiderata.
3. A dummy for location in the western United States or not, reflected Amazon’s wish for the second HQ to be not too close to its existing HQ.
4. The unemployment rate reflected Amazon’s preference not to be the “economic savior” of the new HQ location.
5. A dummy for location not at the center of the proposer’s Standard Metropolitan Statistical Area completed the list. HRTPO fitted a logistic regression model to the resulting cross-sectional data set.

Gillespie noted highlights from the regression results. First, all five explanatory variables had coefficients significant at the 10% level or better. Second, with the sole exception of Minneapolis–St. Paul (Minnesota), every candidate the fitted model assigned a probability of first-round success greater than 0.40 made the list of 20 finalists; among the 20 finalists Northern Virginia was assigned the lowest probability of first-round success, about 7%. Third, the coefficient on the rail transit dummy implied that the presence of light-rail transit (LRT) would reduce the probability of first-round failure by a factor of 5 for a very strong contender, or increase the probability of success by a factor of 5 for a very weak contender.

In closing, Gillespie remarked that HRTPO’s findings differed from those in a Brookings Institute article, which inferred that rail transit was not an important factor. The author conjectured that this might have to do with the fact that Brookings counted Nashville, Tennessee; Austin, Texas; and Raleigh, North Carolina—all finalists—as locations that did not have significant rail transit. HRTPO on the other hand counted Nashville and Austin as possessing LRT, based on their commuter rail systems, and counted Raleigh as possessing LRT, based on the approval of LRT in a recent referendum. Virginia Beach, one of the cities in Case’s Hampton Roads metro area, had rejected LRT in a recent referendum.

DISCUSSION
Following the conclusion of the panelist presentations, the audience asked questions of the presentations.

Question directed at Plumeau: You noted that planners may understand the complexity of the site-selection process for every different industries. How would you recommend incorporating that information, the needs of each industry, into the planning process?

Plumeau answered by saying, as an example, the freight industry, over the last 20 years, has been getting more involved in planning. In general, industry needs to be brought into the process so that the community can determine how to make itself attractive to the industry they would like to target. Although, community planning is a two-way street: (1) local planners and decision-makers can learn more about the site selection process and (2) industry people could learn more about the ways that they can influence and leverage local policy choices. Where transport is
specifically concerned, one would hope for congruence where the Comprehensive Development Plan and the Transportation Improvement Plan overlap.

Miller added that community leaders might consider ways to identify the “target” industries, and their needs, before a comprehensive plan is written.

**Question:** Do these methods have applications to the TIGER program or its successor, the new BUILD program?

Miller stated that in a similar approached used by the HRTPO to evaluate the first cut of communities submitting to the Amazon HQ2 RFP, a researcher at the University of Wisconsin in Madison attempted to use results from one of the rounds of TIGER grants to reverse engineer the application scoring process.

**Question for Miller:** What if a region’s stakeholders don’t understand what their region’s attractiveness really is? How do you reconcile them to what you see in the data?

Miller said that economic development advisors should ideally work with a regional group that meets regularly. A regional level group can mediate conflicts among stakeholders. The group could agree and document what is to be counted as benefits and costs.

Plumeau added that the community’s land use planning and zoning codes may not be appealing to the type of industry that the community wants to attract. A site-selection specialist can recommend codes that send the desired message.

**Question:** A decision-maker may consider making site selections based on access to an Interstate highway. Congress, however, has criteria as well for accepting a highway into the Interstate system. How much does Interstate access really matter?

A member of the conference planning committee who was not among the panel of speakers responded to the question first. He stated the exceptions that Congress has made are fairly narrow, and only for Congressionally designated future Interstate routes. The exceptions have led to the signing of some segments temporarily unconnected from the rest of the system, but plans to connect these segments to the system by 2037 would be helpful.

Miller also stated that some non-Interstate highways are equally good. Interstate designation is a “brand” and a design standard. If a company cares about Interstate-quality highway access, the Interstate shield means the company has one less thing about which to worry.

**FUTURE DIRECTIONS**

No specific research needs were identified from this session. It was noted that the committee was working on a broader research need addressing both planning and policy aspects of site selection as well as place making decisions.
TECHNICAL SESSION 3B

Transformative Technologies

ROBERT GINSBURG
Center on Work and Community Development
Moderator

ROBERTO AGOSTA
AC&A, Buenos Aires, Argentina
Speaker

PAMELA FISHER
Indiana Department of Transportation
Speaker

DANIELLE BRISCOE
University of Texas at Austin
Speaker

KARL SIMON
U.S. Environmental Protection Agency
Speaker

SUMMARY

Implications of Connected and Automated Vehicles on Sprawl and Transportation Systems: The Case of Buenos Aires
Roberto Agosta

Developing a Business Ecosystem Around Connected and Autonomous Vehicle Infrastructure in Indiana
Pamela Fisher

These two presentations discussed research and programs addressing policy choices to support adoption and implementation of connected and autonomous vehicles (CAVs) by residents and by businesses.

Agosta presented part of their research looking at key policy choices that can help avoid some of the negative consequences from CAVs such as sprawl and unequal infrastructure. He presented the initial results of a survey in Buenos Aires, which showed that residents would be willing to use CAVs if there was overall cost savings, minimal changes in travel time, and most importantly, if it was viewed as integrated with public transit options. Even dedicated car drivers would be willing to switch to CAVs with additional incentives.

Fisher discussed a project between Indiana DOT and Purdue University looking to understand how state infrastructure development can enable business adoption of CAVs.
technologies. The greatest impact from state planning appears to be in industries that are
component suppliers and other industries in larger supply chains for primary producers. In these
industries they are exploring ways to facilitate testing and development of CAV technologies to
speed up adoption, expanding more tailored-workforce development programs, and developing
better real-time data collection on transportation conditions. They also have identified a need for
better state understanding of industrial siting criteria.

Multimodal Modeling: Building Information Modeling
Templates for Hub Design and Networks
Danielle Brisco

Revolutionizing Freight Transportation:
How Big Data, Technologies, and Strategies Are Reshaping Goods Movement
Karl Simon

The final presentations looked at the need for new methods and data analysis techniques to meet
the challenges posed by CAVs to our current operations and infrastructure.

Briscoe focused on initial research on the potential of using Building Information
Modeling (BIM) techniques (which are extensively used by engineers and architects in planning
and design of projects in the construction industry such as buildings) to develop new
transportation networks, such as multimodal hubs. While the BIM techniques are just now being
modified to apply to transportation system issues, transportation planners need to begin using
additional planning techniques for CAV and multimodal transportation hubs. Other industries
and disciplines have tools that take into account diverse populations, variable users and networks
with multiple time periods.

Simon presented initial analysis on the impact of bigger, cheaper databases and data
collection which are beginning to drive many decisions on climate change, transportation
planning, and multimodal transportation system design and needs. He argued that data generation
and analysis will likely reshape freight transportation. System logistics and impacts from GHG
emissions can be optimized as we gather more data. Simon provided an example of “Big Data”
being used to optimize shipments between major ports to minimize delays and minimize GHG
emissions. Government and industrywide planning is only slowly developing the capabilities to
productively use and integrate the data it is already collecting.

DISCUSSION

One of the main areas of discussion among the panelists and audience focused on data collection
and use of the data. A number of participants thought that data needs to be made transparent and
accessible and that funding should ideally be available need to do more with it. There was also
interest in figuring out how to both identify and then integrate new skills and approaches, such as
the architectural BIM techniques and big data analysis, into research and regulatory programs.
Those skills will be critical in understanding and identifying good data from bad data. It is
important to both solve issues of today but also want to support unexpected developments and
needs as new technologies are adopted.
A second area of discussion focused on how new technologies are affecting site design and selection. Economic development and state DOT staffs have budgets for development and building transportation infrastructure. Those staffs and budgets largely overshadow the funding and resources for planning and analysis needed to understand the opportunities and modifications of current and new infrastructure presented by new technologies, firms, and systems coming online. State DOTs are beginning to develop new partnerships with universities and industry to improve their understanding of the technology and more intelligently respond.

The last major area of discussion focused on the current impacts of data collection and CAV technologies. Currently electric, hybrid, and other technologies are reducing GHG and other emissions and putting pressure on current support infrastructure. There are no large-scale coordinated changes to adapt. Platooning (connected trucks) is moving ahead quickly and likely will be one of the most widely used CAV technologies but our testing and evaluation of safety and other impacts is lagging behind implementation. It is a challenge to explain to state constituents as well as policy-makers even when trying to develop data and systems to understand and address public safety. The final complication from platooning is that it is not a fully automated technology nor is it fully developed and the industry has not come to agreement on what it needs to support implementation. In this case, government decision-making is occurring parallel to industry development and is in danger of being premature or ineffective by the time the technology is implemented.

FUTURE DIRECTIONS

1. One research idea is on how transportation infrastructure can play a larger role in local, regional, and international site-selection economic development decisions. State agencies generate data relevant to economic and business development and they need to understand how to use and monetize it.

2. Another research idea could be how data that is independently collected by both the public sector and by the private sector can be integrated and then analyzed. The current data collection systems have too many unconnected “silos” and thus determining trends and needs is difficult because the entire spectrum of data is not transparent, easily accessible, or easily usable.
TECHNICAL SESSION 3C

Nonmotorized Vehicles and Transit

SHANA JOHNSON
Foursquare TIP
Moderator

DANIEL HODGE
Hodge Economic Consulting
Speaker

BENJAMIN FORMAN
MassINC
Speaker

ERIC HALVORSEN
RKG Associates
Speaker

CONOR SEMLER
Kittelson Associate
Speaker

JENNY LIU
Portland State University
Speaker

JAMIE PFAHL
People for Bikes
Speaker

ERIC LEE
MICHELLE LAU
Bennett Midland
Speakers

SUMMARY

National Study on the Business Impacts of Street Improvements for Bicycle and Pedestrian Mobility
Jenny Liu

Liu introduced a national study on the economic impacts of street improvements for the nonmotorized modes. She explained the variety of potential economic impacts of nonmotorized
transportation infrastructure, including property values impacts as well as economic development impacts on businesses along the improvement corridors. This particular study used Portland, Oregon, as a pilot case for exploring the data sources and methodology, and the national study includes cities across the country such as Minneapolis, Seattle, Memphis, and Indianapolis. Liu stated that in order to study the economic development impacts on businesses along corridors where nonmotorized infrastructure has been installed, researchers must find data sources that are available at fine geographic detail. The data sources explored included geographic information system spatial data, Longitudinal Employment Household Dynamics (LEHD), sales tax data, and Quarterly Census of Employment and Wages (QCEW), and the methodologies to evaluate the impacts includes trend analysis, DiD, and interrupted time series. Based on the case studies, Liu noted there were no obvious negative impacts observed after the street improvement for the nonmotorized modes. The limitations of LEHD are also discussed regarding the required scope of problem (micro level–corridor level) and the rough categories of industry sectors. She stated that to address such issues, micro-level sales tax data and QCEW may be helpful.

**Transformative Transit-Oriented Development in Massachusetts Gateway Cities**

*Daniel Hodge*

Hodge introduced the transformative transit-oriented development (TOD) in the “Gateway Cities” of Massachusetts—these are midsize urban centers that anchor regional economies. There are 26 Gateway Cities in Massachusetts: Attleboro, Barnstable, Brockton, Chelsea, Chicopee, Everett, Fall River, Fitchburg, Haverhill, Holyoke, Lawrence, Leominster, Lowell, Lynn, Malden, Methuen, New Bedford, Peabody, Pittsfield, Quincy, Revere, Salem, Springfield, Taunton, Westfield, and Worcester. According to Hodge, the potential of converting the current commuter rails to a regional rail network is discussed, which involves higher frequency, more express trains, and even electrification. In addition, the potential of residential development in the downtown of the gateway cities are also analyzed along with the transit capture rates. The main takeaways from Hodge are: (1) Salem has the highest ridership in the commuter rail; (2) MassWorks public infrastructure grants are critical to spurring private investments; and (3) sophisticated financing tools are required (private historic tax, credits, and housing incentives).

**DISCUSSION**

**Question for Liu: What about studies at city level instead of corridor level?**

Liu stated studies at the city level should be looking at a network-based problem where the accessibility of the network is considered. Liu stated that she is conducting an ongoing research project that examines how to characterize nonmotorized infrastructure at a network level using Portland as the pilot city.

**Question for Liu: The street improvements for bikes are similar to those for rapid bus. Will results be replicable from dedicated bus lane?**
Liu replied these two types of improvements are for different types of users, and thus will have different impacts. People using nonmotorized modes can more easily stop, and are more likely to stop and shop compared to rapid bus transit users.

**Questions for Liu:** (1) Have you considered a difference in the length of corridors? (2) How would a researcher handle the different spatial factors? (3) How could a researcher get sales tax data in Portland?

Liu said improvements on longer streets may have bigger impacts. But the situation will become more difficult to analyze if the corridors pass through residential areas or mixed land use exists in the corridor. Different spatial factors are important, but we are limited by the availability of data to assess. Liu clarified that Portland does not have sales tax, and thus sales tax data was not used in this case.

**Question for Hodge:** What is the logic between better and cheaper rail from Gateway Cities to Boston and the residential development in the Gateway Cities?

Hodge stated Gateway Cities have still not reached their potential. The economic development may start from residential land development, and spur later developments in retail and commercial activities.

**Question for Hodge:** (1) What is the impact on low-income groups that currently live in downtown Boston? (2) How will you ensure transit ridership will grow among owners of personal vehicles?

Hodge answered these questions by saying lower fares for low-income groups and people who live near the stations are being considered. Boston is considering TODs near stations and employment centers as ways of building a healthier urban environment to initiate a travel behavior where people are more likely to use transit and walk to retail locations and restaurants. The appeal for car owners would be a healthier lifestyle, access mobility, and not having to deal with parking.

**KEY FINDINGS**

There were four key findings resulting from this session:

- Nonmotorized infrastructure improvements do not appear to negatively impact business activities along street corridors, although available data is limited.
- Establishing best practices data collection and analysis methods to examine economic and business impacts of nonmotorized transportation infrastructure is important to enable planners and policy-makers to produce comparable analyses.
- Regional rail systems that connect Gateway Cities can provide potential solutions to housing, sprawl, and workforce issues in urban regions.
- Investments in TODs in Gateways Cities can be critical in spurring economic development in station areas and by spurring land development in other area employment centers.
Summary

Shirley presented “Approaches to Making Infrastructure Investment More Productive.” He explained that a boost in federal investment increases the size of the public capital stock, on net, with the impact dependent on two factors: (1) the response of state and local governments; and (2) how quickly that capital investment depreciates. Such federal investment will have an effect on output. In an assessment by the Congressional Budget Office (CBO), there is roughly a two-thirds chance that a $1 federal investment would result in more than a 0.05-cent increase in annual GDP. The impact depends on the specific investment so, when possible, the CBO’s analysis of proposals reflects specifically estimated effects on timing, productivity, and responses of other investors. As an example, the construction of the IHS has been associated with sizable gains in productivity, especially for industries that use the road system intensively. However, subsequent capital spending on roads has had a much smaller impact. Investments that increase international trade, facilitate agglomeration economies through growth of metropolitan areas, or repair and rehabilitate existing assets could increase the productivity of federal spending. Shirley also discussed how the allocation of federal highway spending is only loosely related to how heavily highways are used. To explain this issue, Shirley presented charts depicting spending per vehicle mile on urban versus rural as well as Interstate versus non-Interstate road networks compared to congestion and pavement quality on those networks. Approaches to increase economic benefits from infrastructure investment could be to utilize
more pricing and benefit–cost analysis and to provide more linkage between funding and performance measures.

Greene presented “Incorporating Equity Considerations in the Coordination of Transit and Economic Development.” Her presentation covered six issues:

1. Opportunity and challenge of achieving multiple and conflicting objectives;
2. Gentrification and displacement concerns resulting from successful economic development;
3. Processes for the integration of affordable housing and community facilities;
4. Impacts on project affordability and funding;
5. Funding and financing opportunities and challenges; and
6. Development of essential partnerships among all involved and affected public entities and community groups.

Greene described these issues in three project examples: Atlanta Beltline, Rosa Parks–Willowbrook Blue and Green Line Station in Los Angeles, and Link US (Union Station in Los Angeles). Integration of funding and financing opportunities includes coordination of federal discretionary grants, state grants, local funding programs such as tax allocation districts, federal transportation financing programs, qualified tax credit bonds, new market tax credits, sale of development rights, potential social infrastructure bonds, and new institutional mechanisms such as the proposed neighborhood finance and transit improvement bonds in California. The use of many of these sources is increasingly attuned to not only economic benefits but also social and cultural impacts. Greene’s recommendations are to form essential partnerships; document benefits and costs to beneficiaries; develop innovative funding and financing strategies; be a developer of communities; instead of revitalizing only buildings, revitalize relationships; and bring economic momentum in a community.

Rahn highlighted the critical importance of economic development objectives to the transportation investment decisions made in the state of Maryland and the use of P3s to enable implementation of significant projects. Three of the nine objectives that are assessed in the Maryland DOT current $14.5 billion Consolidated Transportation Program for 2018–2023 are directly related to economic development and prosperity. An interesting point provided the Maryland Transportation Authority provided $2.5 billion to this program and has the same three objectives. This focus on Maryland DOT’s management of a “system of systems” is facilitated by its multimodal composition as well as the multiple funding sources that are dedicated to the Maryland DOT Transportation Trust Fund, which include tax and fee revenues; toll, port, transit, and airport operating revenues; and federal aid. Funds are allocated to projects and programs in conjunction with state and local elected officials. The state of Maryland is gaining value from use of competitive P3 project delivery methods which maximize performance returns from each state dollar invested. Rahn cited multiple project funding examples including I-495, I-270, Purple Line, Seagirt marine terminal, and I-95 service areas. Many projects are oriented to achieve reduced congestion, which impacts travelers’ quality of life and competitive position of the state of Maryland. Other projects are oriented to job creation and enabling people to travel to those jobs.

Corrado discussed the Amtrak–New York–New Jersey Gateway Program and its economic benefits and funding partnerships. She emphasized that the Gateway Program is an urgent infrastructure program in the United States and is a critical investment so that growth is
not stifled. A standard benefit–cost analysis conducted early in the program’s development showed that the program’s benefits far exceed its costs even under the most conservative discount rate assumptions. The analysis showed that the Gateway Program compares favorably to other major infrastructure projects across the United States and internationally. The benefits included in the benefit–cost analysis were: reduced travel time, reduced travel cost, emissions reductions, increased safety and security, avoidance of lost productivity from foregone trips, reduced highway congestion, increased travel reliability (rail), reduced in-vehicle crowding (rail), and disruption avoidance (during tunnel rehabilitation). Corrado explained some other benefits were not included in the initial benefit–cost analysis, including job creation, increased state and local revenues, increased property values and personal income, induced office space development, and other WEBs. These other benefits are being incorporated in an updated analysis. Corrado emphasized that management recognizes that delay is the biggest contributor to cost increases. Planning for the Gateway Program also needed to be closely coordinated with the Hudson Yards development project.

QUESTIONS AND ANSWERS

Boast began the question-and-answer segment of the session by asking the panelists whether funding for projects such as the Amtrak–New York–New Jersey Gateway Project are going to result in the same levels of development benefits as a new construction project. Corrado stated that the Gateway Project should have positive agglomeration effects that will include extending the useful life of the rail assets. Positive agglomeration effects are positive factors for the local and regional economy. Rahn stated concern for the structural condition of the rail tunnels in Baltimore that are used by Amtrak, MARC, and CSX. The tunnels are approximately 128 years old and during the past 50 years the United States has let infrastructure age without sufficient reinvestments to maintain it at the safety, structural, and operational levels that it is needed to be at today. Rahn also pointed out that cost–benefit analyses frequently show urban transportation projects as beneficial due to a densities affect, but other federally funded transportation investments are analyzed for the impacts on the enterprise transportation system that connects everybody and provide benefits in all states. Greene pointed out that the definition of local versus national benefit needs to be analyzed by the CBO, in that the proposed federal loans for the Gateway Program are perceived as federal funding, even though the two states would be repaying them. Rahn opined that not all corridors in the nation can pay for themselves yet they are important components of the national system, so pricing to finance future funding needs is not the answer for all corridors.

The audience asked a few questions:

Further elaboration of how use of pricing can result in more productive investments?

Shirley elaborated by saying demand and willingness to pay can be a useful market measure for providing additional indications on where further investment are desired and useful.

Regarding funding of projects like the Gateway Program, did some funding measures work better than others based on broader economic development considerations?
Corrado stated an answer to this question is complicated since economic development projections are the major reason for the project. The Gateway Program will take a decade to complete. Attrition in economic development projects begin soon if a program does not start.

Rahn added the Purple Line is perfect for a tax increment financing (TIF), as there is already $2.5 billion of development occurring at the station locations. Transportation drives economic development. But any TIF revenues will go to locals rather than to the state. Seventy-seven percent (77%) of Maryland DOT revenues derive from automobile related taxes and fees but 59% of Maryland DOT expenditures are on transit. So, there is already a significant transfer to transit which will continue to grow since transit operating expenses are growing faster than revenues.

KEY FINDINGS

- National infrastructure investment benefits and productivity measures estimated by the CBO can recognize a premium for investment that has agglomeration effects, rehabilitates existing assets, and a long life cycle.
- When developing new transit assets, it is critical to
  a. Consider gentrification and displacement concerns;
  b. Integrate affordable housing and community facilities;
  c. Consider the impact on project affordability and funding; and
  d. Develop essential partnerships.
- The size and multimodal nature of the Maryland DOT comprehensive transportation trust fund enable the state to develop a wide range of projects that address economic development objectives.
- The Gateway Program estimated benefits far exceed estimated costs even under the most conservative discount rate assumptions. Gateway compares favorably to other major transport infrastructure projects across the United States and internationally, even before considering broader economic benefits.

FUTURE DIRECTIONS

- A study analyzing the types and functions of road assets allocated federal highway funds against stated transportation and aging infrastructure needs.
- A compilation study looking at more effective uses by agencies of value capture financing for the purpose of meeting multiple economic and program objectives.
- There is a need to study options for federal financial participation in transportation projects of regional and national economic development significance.
SUMMARY

The four speakers of this technical session offered domestic and international perspective regarding WEBs. Graham opened the session with his perspectives of WEB in the UK. Pickrell provided a theoretical overview of WEB. Weisbrod provided perspectives on the state of the practice of WEB in the United States while Williges presented the his perspectives on reconciling WEBS with conventional cost benefit analysis. Following the speakers’ remarks, Timothy provided the audience with an opportunity to ask them questions.

State of the Practice in the United Kingdom
Dan Graham

From a UK perspective, Graham outlined the conceptual case for WEBs, defined the basic classes of WEB, and provided examples. To start, Graham reviewed the UK definition of cost–benefit analysis and benefit–cost ratio while describing a comprehensive approach. The cost–benefit analysis in the UK is a static, systematic, microeconomic approach to estimating the strengths and weaknesses of investment projects in transportation. The process involves estimating perceived private and external costs and benefits within alternative project spending options and selecting the option with the highest return for benefits. Benefits can include project cost savings, travel-time reductions, and the public’s willingness to pay. According to Graham the cost–benefit analysis compares the transportation market under the “do something” and the
“do minimum” scenarios. The key function of the cost–benefit analysis is to identify a comprehensive set of benefits without double counting a benefit.

Graham states a WEB provide added motives not captured by a cost–benefit analysis, such as political and technical values. The WEBs utilizes agglomeration economies to identify cross sector or regional economic and socioeconomic benefits of large-scale transportation projects such as a HSR. Graham provided the example of the CrossRail project in the UK to demonstrate that agglomeration can account for increases in regional productivity and development within more than one city through transportation connectivity. Graham concluded by directly comparing the difference and values between the static cost–benefit analysis and the dynamic WEB agglomeration. He also warned that WEBs are not always understood by the public and they could be misinterpreted.

Pickrell provided a generalized explanation on how WEBs are relatively the same as a cost–benefit analysis, with the inclusion of externalities as benefits for the investment in transportation infrastructure. He pointed to three potential sources of WEB: agglomeration economies, improved matching of worker skills, and increased productivity.

Pickrell presented a different perspective from Graham on productivity increases within a conventional cost–benefit analysis. He pointed out that agglomeration of related productivity increases are not additional benefits as they are just another way of measuring the same welfare effects assessed in cost–benefit analysis. Prickrell noted that agglomeration externalities are, however, real economic benefits that are more difficult to capture fully in conventional cost–benefit analysis. Pickrell continued to provide the pros and cons of WEBs by adding

1. Most of its categories are limited and likely to be small compared to the benefits that are typically measured in cost–benefit analysis.
2. The approach is ideally suited for high-capacity infrastructure projects in large urban areas, or connecting multiple rural regions.
3. In some instances, the agglomeration externalities measured with could be analyzed individually as part of a cost–benefit analysis.
4. There is a presumed risk in the concept of relying on “markup” or “uprating” factors derived from large transportation infrastructure projects.

Weisbrod focused on his perspective of effective measures to conduct and practices for evaluating a cost–benefit analysis and other economic impact analyses. He began his presentation by asking whether access and reliability are captured in traditional cost–benefit analysis.

Weisbrod, similar to the other panelists, mentioned the differences between the analysis tools, such as value of nonmonetary benefits, and the areas of commonality, such as productivity factors. He went further with the comparisons by noting that some benefits and externalities are not captured through traditional cost–benefit analysis, including delivery to market, reliability, supply chain impacts, connectivity, etc. Weisbrod reflected on these limitations to the similarities of how environmental impact analyses came to be recognized in transportation planning as a result of the acceptance of there being cumulative economic factors of negatively and positively effecting the environment. The same cumulative effects are noted via productivity, access, and reliability. Weisbrod pointed to the cumulative effect of the completed I-81 project in Virginia. The completed projected attracted more freight operators from I-95 due to improved travel times. With the increased reliability of travel times and the availability of skilled labor within the area a
company opened a massive distribution center along I-81 for just-in-time delivery. He notes that current analysis tools do not account for these externalities. He asks if the cost–benefit analysis should be adjusted to account for these externalities in similar way as WEBs. In the absence of having such trusted capabilities, state DOTs are currently resorting to multicriteria rating and scoring systems in an attempt to identify potential missing ancillary benefits.

Williges presented his perspective around challenges when applying WEB to transportation infrastructure project analysis. To separate traditional assessed benefits from the challenges, Williges states that as a baseline cost–benefit analyses evaluate travel times, operating costs, safety, and environmental impacts. From there he described the challenges, with the first being the lack of a common WEB definition or approach. According to Williges, the classifications of assessment factors of WEBs vary by location or country, and it continues to evolve over time.

Williges stated the second challenge is the methods for assessing reliability and productivity are questionable. There is more than one way to assess reliability through buffer times or mean-variance. Having more than one way to evaluate creates confusion and mistrust in the analysis.

The third challenge raised by Williges is the potential for double counting. cost–benefit analyses account for travel time savings and the WEBs allow for accounting reliability. Therefore, the benefits count travel time savings and, as a secondary benefit, the assessment counts travel time reliability. Williges also questions the relationship of counting market access and separately because there could be some overlap.

Other challenges presented by Williges are the excessive amounts of data collection and the specialization in analytical tools requiring training or contractors to conduct analyses. The amount of data collection is beyond typical cost–benefit analyses data needs. He pointed to the types of data needed for the example of reliability, again, which looks at hourly, weather, and travel time data.

Williges stated some potential solutions to address the WEB challenges. He suggested there is a need for developing more WEB compliant tools that have generalized validated applications. Additionally, developing tools that can assess multimodal infrastructure projects would be helpful.

**DISCUSSION**

*What makes valuing reliability so hard to analyze?*

Prickrell answered by saying reliability is difficult to measure from examples of infrastructure investments that change reliability of travel time without changing the mean of expected travel time. Deciphering changes of values between the two is conceptually and empirically challenging. Weisbrod stated that adding segmentation for freight and passenger travel times is difficult since travel modeling typically is not broken up by different market segments. New data allows market segmentation to test hypotheses by various market segments that value time and reliability differently. Williges added that a number of the reliability studies use revealed travel preferences survey approaches of hypothetical choices. Travel preference data are only available for passenger reliability, not freight. Freight datasets for more complete results, he says, are emerging.
Why is it that the first moment “mean” is considered in cost benefit analysis but there is so much debate around the second moment?

There was discussion on this aspect from the audience who noted that conventional CBA compares projects by comparing mean travel times assuming that the spread remains unaffected. However, in certain circumstances the second moments become relevant. It is less clear which of these situations alter spreads, which makes it difficult to include reliability in conventional CBA. For the most part, it remains as an add-on consideration.

Why does the UK standardized approach derive multipliers from a limited group of projects?

Pickrell stated the approach provides a layer of protection from overestimation. Weisbrod stated, however, there are trade-offs standardization and individual analyses. The standardized approach cannot handle special projects with unique aspects. Its benefits are barely noticeable.

FUTURE DIRECTIONS

- There is a need to identify datasets and analytical methods to better analyze cost and benefits of transportation infrastructure projects freight markets. Freight data is not publicly provided like the data for roadways and highways. Private markets face different competitive conditions but private-sector provision also contributes significantly to national economies and gross domestic product. WEB’s need to be re-examined in the context of freight.
  - More study is needed regarding the reflection of reliability as an economic benefit and refining it as an additional benefit to travel times without the appearance of double counting. Additionally, there is need to better understand truck and freight reliability values of time. It was also noted that current research being done for trucks that should provide more information.
  - The concepts of WEB need clarification and educational materials are needed. Confusion exists around the term “wider,” whether it references additional economic assessment values or geographic impact scope or both. If there a clear distinction between WEBs, conventional cost–benefit analyses, and other economic impacts assessments?
    - What level of WEB standardization is needed to eliminate biases in the assessments and instill trust on the results?
    - WEBs should have application for assessing more than one mode, particularly when examining the costs and benefits of freight movements or mode choice option of passengers.
    - Participants discussed how there is a desire to improve the state of the practice process of understanding if, how, when, and where to consider WEB’s and establish consistency in their adoption.
TECHNICAL SESSION 4B

Connections Between Local and Regional Transportation Decisions and Sustainable Development

FRED DUCCA
University of Maryland
Moderator

JOE MCANDREW
Greater Washington Partnership
Speaker

KIMBERLY M. FISHER
National Center for Smart Growth, University of Maryland
Speaker

MARK PHILLIPS
Washington Metropolitan Area Transit Authority
Speaker

SUMMARY

Transforming Mobility Outcomes in the Capital Region
Joe McAndrew

McAndrew began by discussing the history of the Greater Washington Partnership (GWP), which highlights collaboration and partnership forward across jurisdictions. The GWP was formed in 2016 with the goal of making the National Capital Region a good place to work, raise a family, and build a business. The GWP is a civic alliance with private companies and government agencies. The National Capital Region has one of the largest economies in the United States with 10.2 million people, 5.6 million in the labor force, and 50 jurisdictions. The partnership is focused on three performance values: dynamism, opportunity, and location. Using these performance indicators, the GWP is working with organizations, companies, and individuals across the region to improve the region in four areas: transportation, talent, innovations, and global identities. McAndrew focused on transportation initiatives in the remainder of the presentation. GWP’s transportation focus is on the advancement of transportation solutions that strengthen regional mobility and improve the quality of life.

In the D.C. metropolitan region there are many stakeholders and transportation needs. The GWP members developed a regional agenda called the Regional Mobility Blueprint, which addresses four priorities: connections, customer experience, equitable access, and integrating innovations. In addition, it includes a set of solutions and action items that will optimize regional mobility. One GWP priority was to stabilize Metro funding as a means of reversing the financial decline of Washington Metropolitan Transit Authority (WMATA) by partnering with elected
officials and transportation decision makers through the state legislatures in Virginia and Maryland as well as the D.C. City Council.

GWP is now focused on advocating for a regional performance-driven tolling. According to McAndrew, the current tolling facilities in the D.C. metropolitan region are fragmented. The goal is to develop a consistent and coordinated approach to result in a system with fair and equitable benefits. Andrew says that his organization has worked with a wide range of stakeholders and experts to develop six guiding principles to guide new tolling facilities and to connect existing toll facilities. Other key transportation initiatives underway are

- Integrating the mobility system in the region, which includes 13 public transit providers as well as and private providers. Without further integration there is a disincentive to use public transit.
- Buses are important, and there are opportunities for improvements especially in the bus systems between Baltimore and Richmond. There are opportunities to enhance the existing bus systems.
- The north–south connection via rail is currently disjointed. If it were integrated it would likely be more competitive and enjoyable to ride it.
- Employer mobility solutions: What can employers do to reduce congestion? Employers can influence changes in travel behaviors.
- Identifying a scope to ensure everyone has equitable access to transportation options.

**Capital Regional Projects**

*Kimberly M. Fisher*

The National Center for Smart Growth (NCSG) worked with the GWP on two projects. The first project explored scenario planning projects conducted at the NCSG in the past: Maryland Scenario Project, the Chesapeake Megaregion Project, Purple Line Build, and the PRESTO project. Briefly, scenario planning is an approach to explore potential futures as a path to moving toward preferred futures. Across the scenario planning tools, the findings include

- Effective approaches to reduce congestion—such as increases in fuel and parking pricing, and adding tolling facilities as parallel to existing routes—sometimes makes it more expensive to drive.
- Transit service improvements alone do not reduce congestion; they should be combined with other incentives such as land use change (such as TOD) or congestion-pricing methods.
- Transit travel times and reliability need to be competitive with auto travel times and reliability.
- Autonomous vehicles and telecommuting may promote greater demographic shifts and sprawl in community and economic development beyond the point of which can be sustained.
- Encourage smarter housing and employment growth around transit stations and multimodal hubs.

Fisher described the second planning project, which looked at existing cross jurisdictional planning in the National Capital Region. The project was based on interviews with transportation
planning agency officials, other transportation agency officials, and planning officials from nontransportation organizations. The following findings spanned these types of organizations:

- There are many examples of cooperation between jurisdictions.
- There are many gaps in available data and analytical tools.
- Megaregional approaches need stronger communications for knowledge transfer and the distribution of success stories.

From the interviews, Fisher identified potential steps to improve cross jurisdictional planning, including

- Small steps:
  - Highlighting successes;
  - Developing education initiatives for decision-maker and the public;
  - Building trust and personal relationship between staff and elected officials; and
  - Start with subsections of megaregion or big projects so that the benefits are very clear.
- Big steps:
  - Establishing an organization or collective to focus attention on the megaregion and
  - Creating data, mapping, and analytical tools.

**Transit-Oriented Development = Fiscal Resilience**

*Mark Phillips*

Phillips presented on the impact a metro rail system has on regional economics and community development. He started his presentation by noting that in 2011 research was funded to identify the benefits of Metro rail and what would happen in its absence. From a socioeconomic consideration, Metro rail saves travelers and commuters money when compared with owning and driving a car, particularly when they can access a Metro rail station without driving a car. He demonstrated this by comparing travel and housing costs for people living in D.C. and around the National Capital Region. Even with higher housing cost of living in D.C. riding on the Metro is cheaper for most than owning and driving a car. He went further to illustrate the impact Metro has on property values and tax revenues, on travel time savings, on emissions like volatile organic compounds, and on the reduction in parking infrastructure needs.

Phillips’s analysis presented an application of the impact of transit on the household affordability index using a housing and transportation calculator developed by the Center of Neighborhood Technology. He pointed out that the area served by WMATA is a compact area with approximately 4% of housing in the region is within a half-mile vicinity of transit a Metro rail station. Furthermore, Phillips provided 2015 statistics showing Metro can connect its users with roughly 33% of the businesses within the region.

Phillips discussed the importance of community and land use planners working with WMATA to promote economic and housing development around metro rail stations. There could be stations suitable for retail and housing developments in order to generate operating revenues and surplus. Similar to the rail system, the Metro bus system has positive impacts on housing values and tax revenues. It is an attractive resource enabling a successful Metro rail system within the D.C. area.
DISCUSSION

Much of the discussion following the presentations did not revolve around research and practices of transportation and economic development. On audience member asked Fisher whether she was considering expanding the planning studies to consider mode shift to bike share with the National Capital Region. She said she had not, but will consider it.
Deliver Us from Evil: Public versus Private Delivery of Public Infrastructure Projects Supporting Private Development

William Hwang

Hwang referred in his presentation to the development of a former industrial yard at Port Covington and Harbor Point in Baltimore, Maryland. Financing for these projects were approved in 2016.

Hwang focused on the nonexistence of formal policies as to who will deliver public infrastructure projects supporting economic development. He suggests that policies could offer flexibility in finance options as a collaboration model like a P3. The P3s allow for public benefits, such as facilitating agencies to procure long-term infrastructure services from private-sector providers. At the completion of construction the infrastructure could be owned and maintained by a public, private, or not-for-profit entity involved in the economic development project. In some cases when transportation construction is part of an economic development project, economic development authorities are the primary decision-makers in the project proposal approval process. Typically, the authority will consider standard transportation planning practices, but in some cases the authority will design and build beyond the recommended
transportation standard that runs the risk of agency resistance or the construction of infrastructure that are difficult and expensive to maintain.

He also discussed the advantages and disadvantages of private delivery of projects. Private delivery provision usually allows for faster delivery, and can involve innovation as a key objective of the development.

An Anecdotal Review of Virginia’s Local Transportation Funding Strategies
Audrey Moruza

Moruza focused on different sources of funding for transportation projects in Virginia. She began with a historical overview with the Byrd Road Act of 1932, which distinguished Virginia DOT from other state DOTs by permitting each county to give responsibility for its secondary roads to the Highway Commission to establish a unified State Secondary Road System. Doing so opened up additional funding opportunities for these roads. Today, Arlington and Henrico counties retain responsibility for their secondary roads.

Moruza provided other key financial indicators and resources for operating and maintaining 57,000 lane-miles of roads in Virginia, including seven revenue sources through taxes, fees, development funds, ARC funding, grants, and revenue sharing funding. Moruza also noted that annually Virginia DOT gives approximately $4 million for economic development within the ARC region.

Transit Joint Development
Rabinder Bains

The presentation primarily focused on Joint Development sources. Bains described joint development as the simultaneous improvement of a transit system and the surrounding real estate coordinated between the transit agency and real estate developers. TOD projects are an example of joint development. Transit agencies actively participate in joint development by contributing either property or funding, and the agencies also benefit by enjoying system improvements and by receiving a share of the development revenues. She mentioned that are typically economically efficient, equitable, sustainable, and feasible as well. As a federal government agency, the Federal Transit Administration (FTA) evaluates and approves the joint development projects for which it is providing federal funding. FTA also develops the eligibility criteria for joint development projects. Thirteen joint development projects have been approved since 2014, and are considered to be a good value capture strategy.

Transit Captures the Gold Ring: Using Value Capture for Infrastructure and Economic Development
Sasha Page

One of the benefits of value capture presented by Page is that it can provide a funding source for transit in addition to funding through grants, thus lessening the burden on public funding sources such as tax revenue. Examples were given with respect to a transit oriented development project in Denver, Colorado. Denver County provided funding to enhance walkable, transit-accessible neighborhoods to produce economic, health, and social advantages. The county financing helped in repayment of the project costs. Moreover, properties constructed in the project were sold to
form a cash reserve, which also helped with the project repayment. The project was not without economic risks, because at the time it was a volatile real estate market in Denver. Nonetheless, the project was a success financially and by ridership. Transit ridership rose by 8%.

Page presented two additional examples of transit projects utilizing value capture to support the project finance. One was the Moynihan Station in New York City, which was a multimodal facility and connected to the city subway system. The project was not completed (at the time of this conference) yet but is expected to bring the city many social and economic benefits.

**FUTURE DIRECTIONS**

There is a need for an investigation into the design of P3s aimed to foster economic development for transit or other projects in terms of risk and reward sharing.
SUMMARY

Shepherd spoke on the topic of “Supporting Economic Development with Highway Infrastructure.” She began by saying that state DOT perspectives on economic development concepts in transportation departments and economic departments are very different from the federal perspective. While the federal role is mostly one of policy, states control land use. Working with locals is required. Good highways support local economic development, and provide access to labor and goods markets.

The FHWA’s Community Connections initiative helps to address some of the physical barriers to economic development. Shepherd cited an example from the city of Baltimore, Maryland. She mentioned the problem of unemployed and untrained populations in the city and the mismatch with the location of economic development centers. It is difficult for Baltimore residents without cars to get to training and employment centers. For example, one might have to take up to three buses, or a combination of RailLink and buses to get to the I-270 economic development corridor from Baltimore.

Shepherd also discussed the uncertainty in estimates of how many jobs were generated by transportation investment.
One of the biggest challenges is funding. To answer the common question of why to continue paying more money for highway system maintenance. Shepard used the analogy of maintaining an old house. Better highways facilitate more economic development. FHWA is also putting much effort into connecting with local governments and people. Shepherd mentioned some details about the U.S. DOT’s BUILD program, such as its deadline and the increased rural set-aside (30% of program total) and total funding for rural projects ($450 million).

Lynott’s presentation topic, “Economic Development Integration,” focused on the Economic Development Administration’s (EDA’s) role in promoting economic development and the resources that EDA and agencies can provide. He began by stating that the EDA is the only federal government agency focused exclusively on economic development, and it plays a critical role in facilitating regional economic development efforts in communities across the nation. Over 60% of their funding goes to rural areas. He described the EDA as being “agnostic” in terms of the types of projects they fund.

Lynott heads up the Office of Economic Development Integration (EDI) at the EDA. EDI seeks to help potential recipients understand what federal resources are available for economic development, whom to contact to obtain funding, etc. They also assist recipients with understanding and following varied and sometimes complex rules for obtaining the funding. EDI works to collaborate creatively with partners. They examine how a project application can be “scaled up,” work to develop collaborative cross-agency relationships, and have developed a small—but growing—toolbox of economic development strategies.

Lynott also talked about EDA’s Regional Economic Development Summits (REDS), which help areas with developing a strategic plan for economic development, introducing them to federal partners, and helping them to understand what resources are available to them and how to access them.

Lynott provided the following resource links to the conference participants for further reference and use:

- What is EDI?: https://www.eda.gov/edi/overview/.
- Aligning EDA Resources with Regional Transportation Plans and Projects (EDA–FHWA).
- Integration Tools and Resources: https://www.eda.gov/edi/resources/.

Davenport spoke about the U.S. Department of Agriculture’s Rural Development Innovation Center (RDIC). She stated that RDIC focuses on quality of life and prosperity in rural areas. Their programs support utilities, housing, small business, large manufacturing, and energy efficiency. They have also devoted significant funding to broadband, hospitals and clinics, and transportation systems and networks.

Davenport leads the Partnerships Team in the RDIC, which fosters partnership networks around the country. They have 47 field offices, and introduce programs to communities to help them meet their economic development needs. Their efforts include streamlining application processes, data analytics, and assistance with program administration.
They also focus on best practices. They want to identify and share best practices with rural communities. Following an executive order, they were part of a 22-agency task force to identify rural community needs. They have identified five indicators:

1. E-commerce and broadband,
2. Quality of life,
3. Assistance to rural communities to attract people,
4. Workforce development, and
5. Technical innovation (especially precision agriculture).

Hamilton spoke on “Leveraging Federal Programs with Transportation Investment in the Appalachian Region.” He introduced the ARC, what it is, and its focus. Following that, he mentioned that the Appalachian region covers 13 states, 420 counties, 25 million people, and 73 local development districts. They work closely with the federal government and local governments. The ARC represents a region of great opportunity that strives to achieve socioeconomic parity with the nation. The ARC mission is to innovate, partner, and invest to build community capacity and strengthen economic growth in the Appalachia.

ARC has five main strategic investment strategies. They are as follows:

1. Create economic opportunities,
2. Develop a ready workforce,
3. Build critical infrastructure,
4. Cultivate natural and cultural assets, and
5. Foster leadership and community capacity.

Hamilton emphasized the impact of opioid abuse. He said that it is affecting not only health in the region, but hindering its economic development potential, as well. He said they are working toward economic parity. The ARC has developed county-level economic status designations to facilitate the understanding of economic parity, and Hamilton displayed a map depicting this.

The ADHS is designed to generate economic development in previously isolated areas, connect Appalachia to the IHS, and provide access to regional national and global markets. Not only is the ADHS important to Appalachia, but it provides significant economic benefits to the nation as a whole. It also facilitates Appalachia being able to compete on the basis of being within a day’s drive of many significant economic markets.

DISCUSSION

A conference participant from the Virginia DOT raised a point that a number of grant programs require skill in forecasting and benefit–cost analysis, which require economic data to support them. He wondered about the effect of this requirement on first-time applicants. Shepherd acknowledged that this can be an issue for some applicants, and thought that we can do more to streamline and facilitate such applications.

Ann Hartell of the TRB staff asked about evaluations of programs. Are there any best practices or ways to “beef-up” evaluations? Lynott said that EDA is in the process of evaluating
how they do evaluations. Their implementation of Government Performance and Results Act of 1993 requirements has focused on job creation as a performance metric.

Shepherd added that that FHWA evaluates results through follow-ups, case studies, and evaluations conducted through our research programs.

TOP TAKEAWAYS FOR RESEARCH

The discussion outlined the following key thematic areas for consideration of further research:

- How to better integrate and coordinate the Comprehensive Economic Development Strategies with transportation planning documents at the local level.
- Ideas for better integration of various funding sources for economic development purposes.
- Documenting best practice examples of streamlining grant applications, particularly those involving multiple jurisdictional agencies.

Transport infrastructure cannot act alone. Connectivity via broadband is critical to the economic health of regions like the ARC and rural areas. What are the best ways to connect rural areas to broadband technologies to maximize the benefits of infrastructure investments?
SUMMARY

There is a growing trend to develop sophisticated platforms to provide access to available federal government sociodemographic data. A similar trend is observed with large commercial databases as well like Economic Modeling Specialists International (EMSI), Jobs EQ. These databases also allow quick extraction of public data allowing manipulation and visualization of massive amounts of data. The Census database has been used extensively for transportation planning purposes but the most recent developments within the Census Bureau have leveraged transportation networks to provide a richer evaluation of Census data to further support transportation research.

Database Demonstrations

This workshop led by the Census Bureau walked participants through practical examples of the use of the Census economic data for site location/selection, economic development decisions and transportation planning. The databases examined included the LEHD, the new Job-to-Job Flows Explorer (J2J), Quarterly Workforce Indicator Explorer, and OnTheMap (OTM). These interactive applications showed participants how to create tables, maps and charts to compare, aggregate, and analyze flows by worker and firm characteristics understanding how they might utilize each of the platforms for their transportation research, and leverage the visualizations within the platforms for user-specified criteria.

The LEHD program is a partnership between the U.S. Census Bureau and U.S. states to provide high-quality local labor market information and to improve the Census Bureau’s economic and demographic data programs. This is a free service, which allows everyone to better utilize publicly collected socioeconomic data. The LEHD provides job-focused data collected through the QCEW, unemployment insurance, and the office of personal management. It includes information on employers and employees and covers over 97% of private employment as well as most state, local, and federal jobs. The range of years for data is available from 1990–2017, but the start year varies by state and data product. There are limits to the accuracy of the data and some data is suppressed for confidentiality. Industry data includes NAICS classification of economic activity, firm age, and size by location. Worker data includes age, race, ethnicity, earnings, sex, and education level. Perhaps most useful for transportation
research is commuting data and LEHD. This includes employment location, residential location, and connections between the two. J2Js value is significant for researchers seeking to study labor mobility. OTM provides a useful resource to investigate employment patterns and small area employment characteristics (the small area can be manually selected or set by the researcher and is guided by Census geographies).

An example of how the LEHD platform can be used for transportation studies was the East Gateway Land Use Vision Study (https://docs.wixstatic.com/ugd/116f69_afe4b1527f8048cf845cd63020a2725f.pdf) prepared for the Hagerstown–Eastern Panhandle MPO by Michael Baker Corp. The purpose of the research was to assist the Hagerstown–Eastern Panhandle MPO and the Jefferson County Planning Department in assessing future transportation needs in support of the East Gateway Land Use Vision Plan for the US-340 corridor. The OTM data was used to supplement ongoing and future surveys on commuter travel characteristics.

CONCLUSIONS AND FUTURE DIRECTIONS

The workshop highlighted that many transportation researchers are not fully aware of the advances being made by the free Census data platform. The visualization and mapping capabilities are allowing organizations without extensive funding to better utilize public public data to make the connections between transport and local economies.

Researchers and planners can work with Census Bureau more to develop examples and step-by-step guides that can be utilized in the classroom to better prepare for utilizing data analytics for transportation research. Subsequent workshops and sessions at TRB events could be developed to allow further examination of one or more databases and their value in furthering the use of economic information for planning, for evaluation of impacts, and for evaluating economic resilience.
SUMMARY

Kissel opened the workshop by introducing NADO, and the role and importance of economic resilience in the Comprehensive Economic Development Strategies (CEDS) and the wealth creation framework. She also emphasized the need to connect economic resilience to transportation planning. The wealth creation framework is a bottom up and a community driven framework. It is a nontraditional planning approach recognizing and even creating rural assets as well as empowering community members to support and grow such assets. As a bottom-up framework, it is based on an operationalization of the Porter value chain concept at the rural and local levels by recognizing, identifying and forging the connections that contribute value to a local community product, whatever that may be. According to the WealthWorks (WealthWorks.org) the goal of value chain analysis is “to improve the livelihoods of people and communities by creating wealth through market interactions that are owned, controlled, and reinvested locally.” Wealth assets pertaining to individual, natural, financial, social, intellectual, built, political, and cultural aspects were the thrust of the wealth creation framework.

Radial graphs used to identify and evaluate any local region based on the eight wealth assets in a community workshop environment (also known as a community exercise) were distributed to the audience to identify how and where transportation fit in any given context. These exercises were aimed specifically at addressing how transportation could lend support to any of the eight wealth assets and how identified benefits and actions fit into the regional long-range economic development or transportation plans.

This was followed up by a presentation by Anderson, who spoke of work to create community and economic resilience in the four-country region in Asheville, North Carolina. As the lead economic development agency for the region that is part of the ARC, Anderson spoke of how resilience, economic development, and transportation planning as well as how essential climate adaptation priorities are approached as part of the CEDS. Within the broader “wealth creation” framework and with respect to regional resilience, she emphasized that a data- and stakeholder-driven process is used to evaluate risk of the economic assets as well as transportation assets. Identifying and evaluating risk and risk exposure are critical parts of the
integration framework which are then used to engage stakeholders and develop a governance framework and a regional resilience action plan listing short, mid-, and long-term tasks.

**INTERACTIVE VALUE CHAIN BUILDING EXERCISES**

Following the presentations from Kissel and Anderson, the workshop included a mini-exercise for the attendees to experience how communities can use the value chain of an asset to determine critical roles and functions and methods to develop resilience and grow its economic opportunities.

Kissel started the exercise by splitting participants up into groups. Each group was asked to explore and contribute to the development of a value chain in specific industry or commodity context. The goal in each case was to identify the different partners (transactional, demand, and support role) and how they played into the broader value chain. Some of the industry value chains exercised within the ARC region were

- Bioenergy value chain,
- Hotel–tourism value chain,
- Agriculture–potato farm value chain, and
- Rails-to-trails value chain.

The end goal in each case was not only to build the value chain but also to ask the following key questions.

- What are the risks and unexpected elements, if any?
- What is the role of transportation in the value chain?
- How would the team make the value chain more resilient to natural and economic hazards?
- Are there gaps in the value chain or in the resilience plan? Are there gaps in economic development or transportation opportunities?

The workshop concluded at the end of the value chain exercise. Attendees went home having learned a new approach to collaborate with transportation stakeholders and users.
Gkritza made a few closing remarks and recognized all those who made this event a reality. She expressed her great appreciation to the conference sponsors and the planning committee. She also thanked all the plenary speakers, technical session, and workshop contributors, who delivered an impressive set of presentations and posters. She also thanked the moderators for their excellent work and the University of Maryland students for taking notes during the sessions. Finally, she thanked the TRB staff (Bill Anderson and Gary Jenkins) who worked incredibly hard to organize this meeting.

Then, Gkritza took a few minutes to reflect on the past three ITED conferences. She offered a summary of highlighted points and research needs raised in the five plenary sessions and 12 technical sessions, such as the following:

- Wider economic impacts and WEBs;
- Defining and measuring connectivity;
- Sustainable supply chain infrastructure;
- New major global supply chains serving emerging sectors;
- Implications of Belt and Road on U.S. economy;
- Implications of emerging technologies; and
- Institutional constraints.

Discussions that took place at this conference will continue as part of sponsored webinars, events at future TRB Annual Meetings, and evolving research needs statements.
APPENDIX A

Poster Session Presentations

The abstracts of posters presented are included and in some cases, the posters themselves are shown.

Critical Analysis of Railway Exploitation Models: Discussion on the Argentine Case
Bruno Agosta, Frédéric Blas, Juan Pablo Martínez, Maximiliano Roca, and José Gómez-Ibáñez

Freight railway services are critical to the economic development of countries like Argentina that depend heavily on exports of agricultural products or minerals. The world markets for these products are highly competitive so that modest changes in the cost of transportation to ports can greatly affect export volumes and earnings.

In the last decades, there have been two fundamental reforms in the way freight railroad services are provided. The first one, of which Argentina was one of the key pioneers, is to transfer the management or the ownership of the railroads from the public to the private sector. By the 1980s, all Latin American countries faced decaying railroad infrastructure, dropping cargo traffic, old operating rules, low availability of locomotives and wagons, low productivity of personnel, and lack of financing. In 1989, Argentina led the way by dividing the freight railroad system into six networks and awarding, through competitive bidding, 30-year concessions for five of them (the sixth network attracted no bids and remained in public hands). Similar reforms were applied to the other large railroads in Latin America and some of the minors, with good results in most cases.

The second major reform, which Argentina is now contemplating, is to require owners of railroad infrastructure to allow independent train operating companies to run over their tracks. This policy, sometimes called open access, represents a fairly radical change in that the railroad has traditionally functioned as an integrated organization in which the same company provides the infrastructure and manages its use. This model, with increasing regulation and state control, was successful for over 100 years, all around the world.

Policy-makers in different countries are divided on the merits of open access. The European Union, UK, and Australia all adopted this policy in the 1990s in the hopes that separating the management of infrastructure from operation would improve railroad performance by stimulating intramodal competition among train operating companies. The United States, Canada, Japan, and most developing countries have chosen to keep their railroads’ trains and tracks integrated in one company for fear that train and tracks would be harder to coordinate if they were in separate companies.

The issue of open access has come to a head in Argentina for several reasons. First, the freight concessions—originally granted between 1991 and 1994 depending on the network—are due to expire in 4 to 6 years. The concessions could be extended for another 10 years, but in 2008 and 2015 the Congress passed laws encouraging regulators to switch the railway toward the “open access” model.

In addition, although Argentina is an exporter of grains and several other commodities for which rail is well suited, the railroad share in cargo transport has been declining and is currently
of only 15% of the exported grains, oilseeds, and derivatives and 4% of the total cargo tons. The analyses suggest that this last percentage could at least double in the medium term, and still grow up to 10%.

This paper examines the Argentine government’s decision whether to require open access in the next round of concession contracts. The choice is seen as a trade-off between the higher costs of coordination introduced by the multiplication of railway actors, and the benefits that would result from more intramodal competition.

The advantages and disadvantages of the possible schemes for Argentina will be analyzed, presenting the main local factors that determine the answer to the question posed. Among those (a) magnitude and structure of the demand related to the rail networks; (b) investment needs in infrastructure; (c) coexistence of public and private operators; and (d) political and social conditions such as the position of the unions in the face of reform and the vision of the railway that predominates in society.

**Accessibility to Diversity of Jobs and Resilience to Economic Shocks in Indiana**

*Davis Chacon-Hurtado*

The complex interaction between transportation infrastructure, socioeconomic factors, and regional development policies creates spatial interactions that shape the economic geography of cities and rural areas. Some of these interactions manifest into commuting-to-work patterns reflecting the level of connectivity and magnitude of employment opportunities in a region; both of which are embedded in the notion of accessibility to jobs or commuting. Industrial diversity is considered an important economic characteristic when resilience to economic shocks is considered. While these two concepts are interrelated, the role of diversity of jobs in the context of economic resilience is traditionally measured without considering the level of accessibility to these jobs. In light of this gap, this research focuses on a joint measure of transportation accessibility and diversity of jobs and evaluates its association with the economic performance of regions during the Great Recession. The diversity measure is calculated using a “standard” and a modified measurement of the Herfindahl–Hirschman Index (HHI) and the regional performance is measured based on a shift–share analysis. The data is taken from public and proprietary sources such as Census Transportation Planning Package data and the EMSI industry data. The results of the exploratory spatial data analysis show that the regional performance during the recession for a given county is spatially associated with the industrial diversity of its neighboring counties. Similarly, the proposed measure of accessibility-based HHI was found to be strongly associated with the regional performance of Indiana counties during the recession. The expected benefits of this work include gaining a better understanding of how transportation accessibility contributes to the economic resilience of regions.

**Implications of the Equity–Efficiency Trade-Off in Virginia’s SmartScale Prioritization Process**

*James Gillespie*

The Virginia General Assembly passed in 2014 legislation (House Bill 2) that changed the way the Commonwealth’s transportation agencies allocate a portion of their funds. The program that allocates these funds has been given the name “SmartScale.” The program includes an eligibility
determination, an application process, a screening process, a scoring process, and a prioritization of the projects for which applications were submitted and scored.

The 2014 legislation specified that the new allocation program consider

1. Congestion mitigation,
2. Economic development,
3. Accessibility,
4. Safety, and
5. Environmental quality.

These criteria entail unavoidable trade-offs. Within the criterion of economic development, the Transportation Secretariat chose to consider both economic efficiency (e.g., the benefit–cost ratio) and distributional equity, which involve additional trade-offs. The staff of Virginia DOT, Virginia Department of Rail and Public Transportation, and the Transportation Secretariat who developed SmartScale faced some challenges in representing these multiple criteria effectively, while simultaneously avoiding adverse incentives for applicants to develop projects that do not meet the goals implicit in the newly amended code but that do earn high scores.

Data

The new program has entered its third year of operation. The first round of applications were solicited in 2016 for funding in 2017. The second round were solicited in 2017 for funding in 2018. The window for creation of applications in the third round ran from March 1, 2018, to June 1, 2018, and the deadline for submitting all required materials was August 1, 2018.

Staff are working, consequently, with a database that consists of a list of 2 years of SmartScale applications with their scores, plus a list of previous years’ projects that, as best they could determine, were funded under the processes that SmartScale replaced. (The previous years’ lists do not include unfunded candidate projects.)

Method

The available documentation on the original development, and the continuing refinement, of the SmartScale program provides a basis for theorizing about how we might expect the introduction of the new prioritization process to affect the development impact of the projects that win funding. We focus the theoretical remarks especially on the geographical distribution of funding, the socioeconomic distribution of impacts, and the return on investment in unweighted dollar terms. In general the range of possible effects of the new program depends on variables, such as the sophistication of the personnel who fill out the applications, that can be quantified, or perhaps even signed, only empirically.

The available data provide a limited basis for distinguishing among the possible outcomes that one can identify theoretically. We describe a couple of nonparametric approaches that might, in principle, reject some of the possibilities.
Findings and Conclusions

Although the data are suggestive, especially when taken together with some of the more anecdotal documentation, they do not yield analytical results that eliminate many of the theoretically conceivable outcomes. We conclude first that more years of observations are desirable. We conclude second that a methodological approach that involves constructing counter-factual prioritizations for the years since SmartScale was set up may provide a more useful basis for comparison than an approach that depends on a list of projects from the years before SmartScale.

U.S. Transportation and Logistics Cluster Competitiveness: An Occupation Cluster Perspective
Indraneel Kumar, Andrey Zhalnin, and Lionel Beaulieu

Kumar, Zhalnin, and Beaulieu’s poster is shown in Figure 2.
Right-Sizing Transportation System for an Evolving Economy

Naomi Stein and Glen Weisbrod

Stein and Weisbrod’s poster is shown in Figure 3.

FIGURE 3 Right-Sizing Transportation for an Evolving Economy.
Economic Impacts of Regional and Local Transportation Investment on a Small City’s Downtown
Brenda Zhou

Zhou’s poster is shown in Figure 4.

FIGURE 4 Economic Impacts of Regional and Local Transportation Investments on a Small City Downtown.

SUMMARY ASSESSMENT

Top Trends and Factors Influencing Transportation and Economic Development

The conference covered a variety of current and emerging themes related to the intersection of transportation and economic development. This section of the report provides an overview of those themes. These thematic topics will inform the TRB’s Transportation and Economic Development Committee strategic plan and mission going forward. The research directions discussed earlier will serve as specific ideas for the committee to act on.
Trade, Globalization, and Supply Chains

The opening plenary threw light on a variety of mega trends influencing transportation globally. The pace and growth of specific factors will be very different in different countries, yet the fact remains, that transportation infrastructure is being subjected to new demands everywhere. This also implies that in turn, transportation will influence national, regional, and local economic developments differently due to the interplay of multiple factors. Thornton’s presentation conveys some of these implications in terms of potential modal shifts, differential pressures on coastal, global, and local seaports and the implications for Gulf Coast economies with respect to energy flows. The global supply chains plenary session and related technical sessions emphasized different facets of these trends and provided some perspectives on what they may mean for current planning efforts (transportation and strategically) and the influence on macro-national–level competitiveness. An important feature of the discussions was the focus on:

- a. Preparing for addressing uncertainty in planning at any level;
- b. Preparing for addressing economic resilience in a strategic sense; and
- c. Addressing sustainability in freight movements.

Scenario planning was noted in the sessions, however, scenario planning is only one of the several methods for addressing uncertainty associated with macro-flows, demographics, or other phenomena. Examples of scenario planning discussed at the conference are shown in Figure 5, whereas macro-level economic resilience and sustainability of freight movement chains are shown in Figure 6 and Figure 7. The presentations in this section also suggest a need to develop improved methods and tools to address the complex effects of trade and transportation among other factors, and the assumptions for analyzing those linkages.

![Figure 5](image-url)  
**FIGURE 5** Example of scenario planning: (a) scenarios studied and (b) port disruption and closure.
FIGURE 6 Considering macro-resilience and competitiveness.

FIGURE 7 Considering sustainability in freight movements.
Megaregion Multimodal Connectivity

The second plenary session discussed many of the challenges and issues associated with the planning and provision of multimodal connectivity across megaregions. Planning for passenger rail systems and air connectivity continues in a piecemeal approach instead of an integrated multimodal system, yet the experiences of super megaregion efforts globally and in Europe and the emergence of the megaregions in the United States, there is an opportunity to plan for such facilities in a more integrated way. Key issues raised in the sessions include treatment of factors like access and addressing the contributions of the introduction of such multimodal systems. Johnson’s presentation speaks to the role of access in building regional connectivity for a network: job access for commuters and manufacturing plant access to ports as an important driver for HSR connectivity in the Northeast Corridor. On the other hand, presentations by Carbó addressed the productivity implications of HSR systems (ex post).

OECD’s air transport session discussed the role of other economic impacts as WEBs of aviation as playing an important policy role in developing air connectivity in the OECD regions. For instance, Wiltshire outlines the transmission mechanisms for economic impacts in the aviation sector (Figure 8).

Economic Integration and the Rural–Urban Interface

The rural–urban connectivity aspects was touched upon in many sessions throughout the conference as an issue that is relevant globally. On the domestic front, we heard from several authors and organizations on the rural Appalachia federal initiatives and from Kan’s discussion on INFRA grants with set asides for rural connectivity as well the federal plenary session. The

![Image of transmission mechanisms](image-url)

FIGURE 8 Transmission channels of economic impacts on aviation (International Air Transport Association).
key issues the sessions covered include, but are not limited to

- The different types of economic impacts and the role they play in bridging the divide (Figure 9, Figure 10);
- International experience and planning models and methods for the consideration of transboundary integration (Figure 11, Figure 12);
- Domestic experience and methods used in bridging rural connectivity;
- Economic geography (Figure 10);
- Funding rural projects; and
- Economic resilience in rural transportation networks and rural areas (Figure 13).

In all of the presentations, the focus was on emerging methods and leveraging spatial aspects of the projects and locations as vital considerations of planning frameworks in conjunction with other methods and tools.

![Economic Impact: Appalachia and States](image)

**FIGURE 9** Appalachian highway development system impacts (Hodge et al.).
FIGURE 10 World Bank case studies and economic impacts.

FIGURE 11 Market access and transportation cost factors in prioritizing ADHS project (Shayanfar et al.).
With whom to integrate is an economic and strategic decision
From first neighbors to transport networks

- An approach to connectivity that exploits the opportunities presented by the entire network, rather than just by neighboring countries, can increase the benefit from the movement of goods and people.

- A comparison of the costs faced by countries when only connecting with neighbors compared to when connecting with Eurasia reveals country-specific challenges or opportunities.

Note: The regions are sorted with respect to their costs to reach all ECA countries. Average total road costs for each of the ECA regions for two cases: (i) costs to connect to the neighbor countries and (ii) costs to connect to all ECA countries. Road costs are estimated using the average speed on the road and the fuel costs in each country. Average costs are estimated in Euros. $\text{Cost}_c = \sum_{i \in \text{set of countries of interest}} \frac{\text{dist}^c_{i,c} \times \text{cost}_i}{\text{time}_i}$

FIGURE 12 Connectivity planning (World Bank Group).

Support for Economic Sectors

- Does the transportation network (and proposed future projects) support economic sectors identified in the local and regional plans that exist?

- Can transportation do more to support sectors that have a potential for root ownership and control within the region?

- Can transportation do more to promote economic resilience, including planning for mobility in the event of an extreme natural disaster, or changes resulting from an economic dislocation?

FIGURE 13 Rural economic resilience and planning (Anderson).
Transformative Technologies, Site Selection, and Location Decisions

The plenary sessions and technical sessions delved into various dimensions of transformative technologies including:

- Different types of technologies under development.
- Intersections of multimodal connectivity considerations and the knowledge economy.
- The potential for leveraging improved data: big data sources from large-scale tolling and other initiatives (e.g., University of Maryland initiatives shown in Figure 14), as well as EPA’s presentation on how big data itself serves as the pull factor affecting growth in freight movement and driving economic development.
- Site selection and business locations decisions of technology firms, development of high-tech (Amazon) and autonomous vehicle supply chains, and workforce effects (see Figure 15 as an example of Indiana DOT’s approach) as well as development of target markets of import goods to specific regions (as in Zhang and Miller’s use of BoL data).

Key issues are directed at addressing the implications of transformative technologies to local and regional economies and positioning to take advantage of improved computational methods for further insights into impacts and to assist in the site selection or location decisions.
Congestion and Economic Development

From global scales down to urban challenges (last-mile logistics, ecommerce, etc.), truck congestion and the need to leverage newer and richer big data sources (freight and development related) to address logistics issues for sustainable urban outcomes were at the heart of Sakharani’s presentation. On the other hand, Kumar’s talk focused on the human dimension of such logistics centers by considering them from an occupational perspective (this is common to urban and suburban clusters). To the extent that factors like e-commerce and last-mile pressures are driven by logistic centers like warehouses and distribution facilities, they will be relevant for further understanding urban freight congestion, and sustainable economic development in host regions.

Megaregion–Mega-Country Projects

A common theme cutting across many sessions was the role of economic impacts in the context of rural–urban mega projects multicountry or smaller megaregional and economic integration planning efforts and studies. This thread ran through most presentations of the World Bank Group and also projects closer to home like those that are part of the Appalachian Highway Development System. At the corridor level for transit, initiatives like those of the Northeast Corridor and Midwest HSR Association also provided an interesting view. Finally, at the regional level, we heard from Fisher and McAndrew of the Center for Smart Growth on their efforts in megaregion planning where a range of different future scenarios, projects, and visioning for the future of mobility were part of the planning framework. In nearly all these
presentations, different forms of economic impacts, equitable access, and positive environmental impacts were provided to justify megaregional projects.

Assessment of Wider Economic Benefits

The role of economic impacts beyond those conventionally included in benefit–cost analysis was another crosscutting theme. Two sessions directly addressed the issue of pertinent wider or additional benefits within the construct of conventional economic analysis. For instance, the OECD session aimed at wider benefits in the aviation sector in the OECD countries. A second session, aimed at laying out the state of the practice of WEBs applications in United States. It particularly focused on project considerations for using this assessment approach, the data and data sources in comparison to traditional CBAs, and the knowledge gaps when applying WEBs across modes. From a broader policy and planning perspective, there is a need to understand and study such impacts in understudied areas such as freight (rail freight, air freight, marine freight), and develop consistency in definitions and usage across the world even for the measures that are currently used.

Funding and Financing Projects

Several presentations and part of the fourth plenary brought up the discussion of the use of value capture and other P3s as a way forward to create funding opportunities for projects. For example, Hwang’s presentation focused on some guidelines for public versus private delivery of projects and raised interesting questions on ownership. Moruza’s presentation provided an in-depth review of Virginia’s local funding options while Bains and Page delved into the potential of value capture strategies for economic development. On the other hand, Rahn’s discussion of use of P3s to advance transportation investments and economic development objectives in Maryland via projects like the Seagirt Marine Terminal and Purple Line transit project.

Causality and Improved Methods of Isolating Linkages

The relationship between the national, regional, and local economy and transportation is complex because they form a dynamic system made up of a variety of factors. These factors are interdependent and interact with each other when the system is operating. Teasing out the true contributions of an intervention relies on well-designed causal methods. Several sessions and papers in the conference contribute to the conversation on the development of quasi-experimental methods, difference-in-difference statistic estimations, and other approaches for addressing causality of modal systems (Figure 16). Discerning the real contributions of interventions has and always will continue to inform the process of developing credible estimates of an ex-post impact.
FIGURE 16 Causal methods: DiD–impact analysis.
APPENDIX B

Final Program
WELCOME LETTER

Welcome to Washington, D.C. and the 6th International Transportation and Economic Development (ITED) Conference! ITED will bring together transportation experts, community and transportation planners, economists, students, and every-one working on transportation factors for economic development from around the globe. ITED is more than transportation policy, facilities, or technology, per se. Rather, it is about their factors at the intersection with local, regional, state, mega-regional, national, and international economic development.

As the world of transportation is changing dramatically, this conference will continue the tradition of presenting innovative research, best practices, and exploring new challenges for providing transportation which moves the economy forward and enhance economic development. The theme for 2018 ITED is Relationships between Multimodal Transportation & Economic Development: Policy, Infrastructure, & Technology. Our goal is to foster highly constructive dialogue between researchers and practitioners and improve the collective understanding of transportation in relationship to economic development. To that end, the program reflects a diversity of sessions and workshops geared towards both the community of practice and research. These topics range from globalization forces, transformative technologies, funding and financing future transportation needs, multimodal transportation, needs of rural communities and finally, data and methods needed to facilitate better decision making.

To our financial sponsors and to those who will be presenting at the conference, a big THANK YOU!

We look forward to see you in Washington D.C in June at the International Transportation & Economic Development Conference.

Special Thanks to 2018 ITED Conference Planning Committee

Dr. Kenanitis “Nadia” Gheniza, Co-chair, Portland University
Dr. Sharada Vedala, Co-chair, Economic Insights and Research
Dr. Greg Black, CDFI Fund, US Department of the Treasury
Dr. Robert Ginsburg, Center for Work and Community Development
Mr. William Leung, Regional Economic Nucleus, Inc.
Dr. Jenny Liu, Portland State University
Mr. Chad Miller, University of Iowa
Mr. Stefan Natke, Federal Highway Administration, U.S. DOT
Dr. Peter Ogorowich, HDR Inc.
Mr. Rimon Rafaib, Economic
Dr. Paul Schonfeld, University of Maryland
Mr. Jason Wang, Appalachian Regional Commission
Mr. Glen Weidner, Economic Development Research Group
Dr. Lei Zhang, University of Maryland
What is the Transportation Research Board?

The Transportation Research Board is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to increase the benefits that transportation contributes to society by providing leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board’s varied committees, task forces, and panels annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

www.TRB.org
Pre-conference Events - Committee Meetings and Workshop

**Committee Meetings** - Tuesday, June 5, 2018

<table>
<thead>
<tr>
<th>Subcommittee</th>
<th>Time</th>
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<tr>
<td>ABE20: Standing Committee on Transportation Economics</td>
<td>1:00pm-3:00pm</td>
<td>Lecture Room</td>
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<tr>
<td>ABE10: Standing Committee on Revenue and Finance</td>
<td>2:00pm-4:00pm</td>
<td>NAS Board Room</td>
</tr>
<tr>
<td>ADD10: Standing Committee on Transportation and Economic Development</td>
<td>2:00pm-4:00pm</td>
<td>NAS 120</td>
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**Workshop** - Tuesday, June 5, 2018

**Workshop:** U.S. Census Bureau—Data for Local Decision-making  
Moderator: Dr. Chad Miller, University of Southern Mississippi

Speakers: Mr. Matthew Graham, U.S. Census Bureau  
Mr. Jody Hoon-Starr, U.S. Census Bureau

**Description:** The Longitudinal Employer-Household Dynamics Program provides Census data tools to assist in harnessing large-scale data in order to understand and make better decisions. Making sense of vast amounts of data opens doors to handling challenges and changes. This session walks participants through practical examples of emergency management planning, transportation planning, site location, and economic development using the Local Employment Dynamics (LED) data tools to achieve objectives, including the new Job-to-Job Flows Explorer, QWI (Quarterly Workforce Indicator) Explorer, OnTheMap, and OnTheMap for Emergency Management/Resilience Building. These interactive applications allow participants to create tables, maps and charts to compare, aggregate and analyze flows by worker and firm characteristics.

**PLEASE NOTE:** Attendees are required to bring their own laptops. The 2-hour workshop will include case studies, demonstrations, and interactive exercises. **Space limited.**

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2018 TRANSPORTATION RESILIENCE INNOVATIONS SUMMIT AND EXCHANGE

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OCTOBER 8-10, 2018 | DENVER • COLORADO
Conference Sessions

Wednesday, June 6, 2018  
8:30am-10:15am  
Location: Fred Kavli Auditorium

**Opening Plenary Session:** Transportation and Supply Chains of the Global Economy  
Moderator: Dr. Greg Bischak, Community Development Financial Institutions (CDFI) Fund, U.S. Department of the Treasury

Speakers:  
- Mr. Tony Padilla, Maritime Administration, U.S. Department of Transportation  
- Mr. Jose Luis Irrgoyen, World Bank Group  
- Dr. Robert Atkinson, Information Technology and Innovation Foundation

**Description:** Since the worldwide financial crisis, world trade has recovered with merchandise exports growing by 22 percent over ten years, reaching $16 trillion in 2016, and commercial services growing by 64 percent to $4.8 trillion. However, during the last few years beginning in 2014, the value of world trade declined through 2016. This trend reflected falling commodity prices, particularly in oil and mining exports, coupled with the appreciation of the U.S. dollar, which exerted downward pressure on the value of world exports, even while trade volume grew slightly. Against this backdrop, political and policy changes have emerged across the globe to reframe national agendas on the role of trade and globalization, most prominently in the United Kingdom with Brexit. These political considerations also registered in the European Union, the United States and elsewhere. In Asia, several transportation initiatives are being planned to reconfigure regional trade and global supply chains. Within this context, the opening plenary and technical sessions will tackle many of these topics and others.

Wednesday, June 6, 2018  
10:30am-12:00pm

**Technical Sessions:** Informing the Domestic Context—Strategic and Planning Issues in Global Trade and Lessons from Developing Countries

**Session 1A: Economic Corridor Development and Regional Integration—Lessons from Developing Countries**  
Location: Lecture Room

**Description:** This technical session organized by the World Bank will discuss the role of cross border economic development corridors and their role in influencing regional economic integration. The focus will be large scale corridor investments such as those occurring in China and other developing countries.

Moderator: Mr. Jason Wang, Appalachian Regional Commission

Speakers:  
- The Economic Benefit and Risk of the Belt and Road Initiative  
  Dr. Bahar El-Hifnawi and Dr. Binyam Reja, World Bank Group

  Who Wins, Who Loses? Framework to Understand Spatially Differentiated Effects of the Belt and Road Initiative  
  Dr. Somik Lall, World Bank Group

  Infrastructure Linkages: Cost, Time, and Networks: Case Study from Europe and Central Asia  
  Dr. Cecilia Briceño-Garmendia, World Bank Group

  Regional Integration and Economic Development in Africa  
  Dr. Martin Humphreys, World Bank Group

  India Dedicated Freight Railway Corridor: Economic Appraisal and Special Development Effects  
  Mr. Ben Eljebber, World Bank Group

**Session 1B: Global and Domestic Chains—Strategic Planning Issues**  
Location: NAS 125

**Description:** This session will address the planning implications of global and domestic trade patterns for greater resiliency of key economic sectors and aging transportation infrastructure.

Moderator: Dr. Toni Horst, AECOM

Speakers:  
- The Impacts of Unscheduled Lock Outages  
  Dr. Craig Phillips, Vanderbilt University and Dr. Mark Burton, University of Tennessee

  Changing The Unsung Linkpin of Global Supply Chains  
  Prof. Bethany Stich, Peter Web, and Ian Butler-Severson, University of New Orleans

  Planning in the Face of Shifting Global Trade and Technology: Implications for Economic Resiliency and Transportation Planning  
  Mr. Derek Cutler and Glen Weishbrod, Economic Development Research Group

  Changing Trade Patterns: NAFTA, Cuba and the U.S. Gulf Coast  
  Mr. Dennis Thornton, Bethany Stich and Faisal Malik, University of New Orleans Transportation Institute
Wednesday, June 6, 2018
10:30 am-12:00 pm
Technical Sessions: Strategic and Planning Issues continued

Session 1C: Global and Domestic Chains—Sustainability and Growth Considerations
Location: NAS 120

Description: This session will address different aspects associated with globalization and global supply chains. The papers in this session address the implications and management of cross border trade in the face of changing trade patterns, responsible growth via green freight strategies, economic implications of the last mile of freight, and emerging approaches in planning for competitiveness.

Moderator: Mr. Michael Lawrence, Jack Faucett Associates

Speakers:
- The Impacts of Delays at the California — Baja California Border
  Dr. Alejandro Solis and Bruno Perret, HDR, Inc., and Elisa Arias, San Diego Association of Governments (SANDAG)
- Green Freight Programs: An Innovative Policy and Commerce Tool to Foster Sustainable Economic Development
  Mr. Joshua Silverblatt and Mr. Buddy Polovick, SmartWays Transportation Partnership, U.S. Environmental Protection Agency
- Understanding, Visualizing, and Enhancing the Last Mile of Urban Freight for Economic Development
  Dr. Vivek Saini, CPSC Transcom Inc., and Massachusetts Institute of Technology (MIT)
- Networks, Value Chains, and Competitiveness
  Dr. Sharada Vadali, Economic Insights and Research

Wednesday, June 6, 2018
12:00 pm-1:15 pm
Location: Great Hall

Lunch Keynote Speaker: The Honorable Derek Kan, Under Secretary of Transportation for Policy, Office of the Secretary of Transportation, U.S. Department of Transportation

Introduction: Dr. Darrel Timely, Office of the Secretary of Transportation, U.S. Department of Transportation

Mr. Derek Kan is the Under Secretary of Transportation for Policy. In this role, he serves as a principal advisor to the Secretary and provides leadership in the development of policies for the Department, generating proposals and providing advice regarding legislative and regulatory initiatives across all modes of transportation. The Under Secretary coordinates the Department’s budget development and policy development functions. Mr. Kan also directs transportation policy development and works to ensure that the Nation’s transportation resources function as an integrated national system. By statute, the Under Secretary is third in the Department’s order of succession.

Prior to his appointment at the Department of Transportation, Mr. Kan served as the General Manager for Lyft in Southern California. He has also served on the Board of Directors of Amtrak since 2015, for which he was unanimously confirmed by the United States Senate. Previously, he was Director of Strategy at a startup in Silicon Valley and worked as a management consultant at Bain & Company.

Earlier in his career, he was a policy advisor to Senate Republican Leader Mitch McConnell and chief economist for the Senate Republican Policy Committee. Before coming to Capitol Hill, Mr. Kan served as a Presidential Management Fellow at the White House Office of Management and Budget. Mr. Kan received a B.S. from the University of Southern California, an M.Sc. from the London School of Economics, and an M.B.A. from the Stanford Graduate School of Business, where he was an Arjay Miller Scholar. He and his wife have three children.

Wednesday, June 6, 2018
1:30 pm-3:15 pm
Location: Fred Kavli Auditorium

Plenary Session: Connections Across Economic Regions — Sustainable Transportation Planning for Mobility and Economic Development
Moderator: Dr. Glenn Weisbrod, Economic Development Research (EDR) Group
Speakers:
- Mr. Richard Harris, Midwest High-speed Rail Association
- Mr. Mitch Warren, Northeast Corridor
- Ms. japoa Iqbal, International Transport Forum, Organisation for Economic Co-operation and Development (OECD)

Description: The economies of individual states are becoming interdependent in ways that increase the importance of freight and passenger movements across states, and supporting the growth of what are effectively “economic mega regions” within North America and Europe. This process reflects changes in technology, economic specialization, and agglomerations of business activities. It increases the demand for, and benefits of, fast and efficient vehicle flows between economic centers that span broader distances than are covered by traditional statewide plans. Consequently, we need to adopt new approaches for assessing the potential role and importance of high-speed rail service as well as inter-regional freight and passenger highway travel across regions.

The plenary speakers will address emerging changes in the economic landscape of regions and mobility needs for interstate travel. The subsequent sessions will address implications for how we view: (a) high-speed and intercity passenger rail in the U.S. and Europe; (b) rural highway networks that complement major interstate routes; and (c) wider economic benefits of transportation policies and projects affecting major travel corridors.
Appendix B

Wednesday, June 6, 2018

Technical Sessions: Multimodal Investments—Transportation Planning and Policy Considerations

Session 2A: Commuter and High-Speed Rail

**Description:** This session will examine economic implications of modal investments, i.e., high speed and commuter rail, as well as dedicated highway lanes. This discussion will include examples from the United States, Europe and other regions.

**Moderator:** Dr. Peter Ogonowski, HDR Inc.

**Speakers:**
- Dr. Daniel Graham, Department of Civil Engineering, Imperial College, London
- Economic Impacts from Housing Production Policies and Implications for Leveraging Public Transportation Investments
- Dr. Michael Willkerson, ECONorthwest, Mr. Michael Kingsella and Mr. Clyde Holland, Holland Government Affairs, LLC
- Northeast Corridor
- Ms. Shana Johnson, FourSquare Integrated Transportation Planning
- Economic Development and Express (HOT) Lanes – A Case Study from Israel
- Mr. Rimon Rafaely, Economist, Mr. Vladimir Simon, Israel Ministry of Transport and Road and Safety, and Mr. Shuki Cohen, MATAF—Transportation Planning Center LTD

**Location:** Lecture Room

Session 2B: Rural Transportation and Regional Development

**Description:** This session will present studies and analyses directed at largely rural economic development with transportation investment in a multi-level regional approach. A series of three technical presentations will highlight the Appalachian Development Highway System (ADHS) and its impact to the Appalachian regional economic development as well as the impact from the coal industry decline to its transportation network. ADHS along with the Appalachian Regional Commission (ARC) is a 13-state regional economic development program over five decades with a unique partnership of federal, state and local government. The fourth paper will present a case study of the impact of transportation infrastructure improvements on regional development and poverty in Ethiopia.

**Moderator:** Mr. Ryan Brunfield, Appalachian Regional Commission

**Speakers:**
- Economic Analysis of Completing the Appalachian Development Highway System (ADHS)
  - Mr. Daniel Hodge, Hodge Economic Consulting, and Mr. John Westbrooke, Economic Development Research (EDR) Group
- Optimizing the Priority of ADHS Projects by Integrating Simulation and Genetic Algorithm
  - Ms. Elham Shayanfar and Dr. Paul Schonberg, Department of Civil and Environmental Engineering, University of Maryland, and Mr. Jason Wang, Appalachian Regional Commission
- Rail Network Access in an Era of Declining Coal
  - Dr. Mark Burton, University of Tennessee
- Transportation Infrastructure and Property, A Case Study of Ethiopia
  - Mr. Yue Ke and Dr. Konstantina Nada, Gintza, Purdue University

**Location:** NAS 125

Session 2C: Transportation Planning and Evaluation—Wider Economic Benefits of Aviation

**Description:** The knowledge of wider economic benefits is vital for proper economic evaluation of all modes. This session led by the Organisation of the Economic Co-operation and Development provides insight into wider economic benefits of aviation. It will include a discussion of wider benefits of both passenger and air cargo freight travel.

**Moderator:** Ms. Jagoda Egeland, International Transport Forum, Organisation for Economic Co-operation and Development (OECOD)

**Speakers:**
- Wider Economic Benefits of Aviation: An Industry Perspective
  - Dr. James Williams, International Air Transport Association
- Wider Benefits of Aviation—the U.S. Experience
  - Mr. Steve Landau, Economic Development Research (EDR) Group
- Causal Relationships between Air Transport and Productivity—Evidence from China
  - Mr. Jose Manuel Carbo Martinez and Dr. Daniel J. Graham, Imperial College, London

**Location:** NAS 120

**Networking Reception, Exhibits and Poster Session**

**Location:** East Court and Great Hall

*Presenters*:
- Mr. Bruno Agosta, Mr. Frédéric Bis, Mr. Juan Pablo Martinez, Mr. Maximiliano Roca, AECSA and José Gómez-Vallejo, Harvard University
- Mr. Davis Chacon-Hurtado, Purdue University
- Mr. James Gillespie, Virginia Transportation Research Council, Virginia Department of Transportation
- Dr. Indraneel Kumar, Dr. Andrey Zhakhin, and Dr. Lionel Beaulieu, Purdue University
- Mr. Ian Lockwood and Ms. Jennifer Tocke, Tocke Design Group for the Pedestrian and Bicycle Information Center
- Ms. Naomi Stein and Mr. Glen Welbrod, Economic Development Research Group
- Dr. Brenda Zhou, Central Connecticut State University

*Poster Titles*:
- Critical Analysis of Railway Exploitation Models—Discussion on the Argentine Case
- Accessibility to Diversity of Jobs and Resilience to Economic Shocks in Indiana
- Economic Development Implications of the Equity Efficiency Tradeoff in Virginia’s Small-Scale Prioritization Process
- U.S. Transportation and Logistics Cluster Competitiveness: An Occupation Cluster Perspective
- The Emerging Language of Highway Removals and Mitigation in Cities
- Right-Sizing the Transportation System for an Evolving Economy
- Economic Impacts of Regional and Local Transportation Investment on a Small City’s Downtown
Thursday, June 7, 2018
8:30am-10:15am
Location: Fred Kavli Auditorium

Plenary Session: The Impact of Multimodal Transportation and Transformative Technologies on Regional Economy and Community Development
Moderator: Dr. Konstantina "Nadia" Skritza, Purdue University
Speaker: Mr. Benjamin Wu, Maryland Department of Commerce
Dr. Lei Zhang, National Transportation Center, University of Maryland
Mr. Roy Xumally, Indiana Department of Transportation

Description: Transportation as we know it is transforming with the adoption of advanced technologies for information, data and automation. Technology is altering both vehicles and transportation systems. Communities are exploring ways to integrate these innovations with their systems to create better travel options and a multimodal system.

This session will shed light on the relationship between regional economies and community development with multimodal transportation systems that could include traditional and emerging shared mobility options.

Thursday, June 7, 2018
10:30am-12:00pm
Technical Sessions: Transformative Technologies and Multimodal Impacts
Session 3A: Site Selection
Location: Lecture Room

Description: This session will discuss findings and insights on how transportation investments affect and drive the site selection decisions of private businesses (including the largest Internet retailer in the world, Amazon) and private land developers, and provide a valuable summary of available data and its application for data-driven economic development.

Moderator: Mr. James Gillespie, Virginia Transportation Research Council, Virginia Department of Transportation

Speakers: How Transportation Project Investment Affects Private Business Site Selection
Mr. Peter Plumeau, Economic Development Research Group, and Mr. Kevin Adderley, Federal Highway Administration, U.S. Department of Transportation
Using Big Data to Identify Economic Development Opportunities
Dr. Chad Miller and Dr. Yuanjuan Zhang, Center for Logistics, Trade and Transportation, University of Southern Mississippi
Amazon—Site Selection
Dr. Robert Case, Hampton Roads Transportation Planning Organization

Session 3B: Transformative Technologies
Location: NAS 125

Description: This session will discuss how investment in transformative technologies, e.g., connected and autonomous vehicles, can be linked to benefits to business supply chains, as well as demonstrate how these technologies can reshape mobility patterns using a case study of Latin-American cities.

Moderator: Dr. Robert Ginsburg, Center on Work and Community Development

Speakers: Developing a Business Ecosystem around Connected and Autonomous Vehicle Infrastructure in Indiana
Ms. Pamela Fisher, Indiana Department of Transportation; Dr. Ananth Iyer and Mr. Steve Dunlop, Purdue University
Implications of Connected and Automated Vehicles on Shared and Public Transportation Systems in Latin-American Cities
Mr. Roberto Agosta, Mr. Frederic Blas, Mr. Felipe Gonzalez, and Ms. Florencia Rodriguez Touron, ACASA; Dr. Thomas Massin, Instituto Superior de Urbanismo (BU)
Multi-modal Modeling: Building Information Modeling Templates for Hub-design and Networks
Dr. Danielle Briscoe, School of Architecture, University of Texas at Austin
Rebalancing Freight Transportation: How Big Data, Technologies and Strategies are Reshaping Goods Movement
Mr. Karl Simon, Transportation and Climate Division, U.S. Environmental Protection Agency

Session 3C: Non-Motorized and Transit
Location: NAS 120

Description: This session will discuss how transformative transit-oriented development, investment in a streetcar system, and strategies, such as street improvements that promote bicycle and pedestrian mobility and road diets, enhance livability and economic development.

Moderator: Ms. Shana Johnson, FourSquare Integrated Transportation Planning

Speakers: Road Diets: A Strategy for Achieving Safety, Multimodal, and Economic Goals
Ms. Rebecca Crowe, Federal Highway Administration, U.S. Department of Transportation
Transformative Transit-Oriented Development (TOD) in Massachusetts Gateway Cities
Mr. Daniel Hodge, Hodge Economic Consulting; Mr. Benjamin Forman, MassINC; Mr. Eric Halvorsen, RKG Associates; and Mr. Connor Semler, Kittelson Associates
National Study on the Business Impacts of Street Improvements for Bicycle and Pedestrian Mobility
Dr. Jenny Liu, Portland State University; Ms. Jamie Palmi, People for Bikes; Mr. Eric Lee and Ms. Michelle Lau, Bennett Midland
Appendix B

Thursday, June 7, 2018
1:30pm-3:15pm

Session 4A: Wider Economic Development Factors and their Use in Benefit-Cost Analysis
Location: Lecture Room

Description: Transportation investments can lead to a variety of wider economic impacts. However, there is not agreement on whether or how those effects should be considered in benefit-cost analysis for transportation decision-making. Additional effects on economic productivity, wages, and business logistics are often claimed as Wider Economic Benefits (WEBs), and procedures for estimating their value are included in the transportation appraisal guidelines of some countries, but they are not frequently included in benefit-cost analysis in North America. This session will feature a panel discussion of researchers who will illuminate and debate these issues.

Moderator: Dr. Darren Timothy, Office of the Secretary of Transportation, U.S. Department of Transportation

Speakers:
- Dr. Don Pickrell, Voelz National Transportation Systems Center, U.S. Department of Transportation
- Mr. Glen Weisbrod, Economic Development Research Group
- Mr. Chris Williges, HDR Inc.
- Dr. Dan Graham, Imperial College, London

Session 4B: Connections between Local and Regional Transportation Decisions and Sustainable Development
Location: NAS 125

Description: Beginning with the Commercial Club of Chicago's Burnham Plan, there is a long legacy of non-government and business interests influencing regional growth planning and outcomes. This session focuses on the few efforts to do so in the Washington, DC metropolitan region. Panel members will place these efforts in the context of other regional planning efforts by planning agencies and think tanks, and highlight the latest work of the Greater Washington Partnership (GWP), focused on improving mobility and accessibility in an effort to retain and recruit businesses in the region.

Moderator: Dr. Frederick W. Duca, Center for Smart Growth Research and Education, University of Maryland

Panel:
- Mr. Joe McAndrew, Greater Washington Partnership
- Ms. Kimberly M. Fisher, National Center for Smart Growth Research & Education
- Mr. Mark Phillips, Washington Metropolitan Area Transit Authority

Session 4C: Interaction of Financing and Planning at Local, Regional, and National Levels
Location: NAS 120

Moderator: Mr. Rinon Rafiah, Economist

Panel:
- Deliver Us from Evil: Public or Private Delivery of Public Infrastructure Projects Supporting Private Development
  - Mr. William Hwang, WSP USA, Inc.
- An Annotated Review of Virginia’s Local Transportation Funding Strategies
  - Ms. Audrey Moruza, Virginia Transportation Research Council, Virginia Department of Transportation
- Transit Joint Development
  - Ms. Rabinder Bains, Federal Transit Administration, U.S. Department of Transportation
- Transit Captures the Gold Ring: Using Value Capture for Infrastructure and Economic Development
  - Mr. Sasha Page, KPMG Rebel

Thursday, June 7, 2018
3:30pm-5:00pm

Plenary Session: Transportation Revenue and Finance Integration with Economic Development
Location: Fred Kavli Auditorium

Moderator: Dr. Tom Boast, THB Advisory, LLC

Speakers:
- Ms. Marie Corrado, Gateway Program, Amtrak
- Ms. Sharon Greene, Infrastrategies, LLC
- Mr. Peter Rahn, Maryland Department of Transportation
- Dr. Chad Shirley, Congressional Budget Office

Description: As national, regional and local agencies struggle with funding for transportation projects in fiscally constrained environments, revenue-generation and funding sources for transportation become important in furthering economic development and economic vitality goals. This session will explore how different revenue and finance initiatives and arrangements that balance private funding, user fees, and public financing from multiple levels of government can be used for improving transportation infrastructure in the U.S. and elsewhere in the world can affect economic development efforts in varying environments.
116  TR Circular E-C259: International Transportation and Economic Development Conference 2018

Thursday, June 7, 2018  5:45pm-8:00pm
Location: Fred Kavli Auditorium

Technical Presentation and Tour: Phase I of Washington, D.C.'s Waterfront Development—The Wharf
Tour Location: Wharf District (transportation will be provided)
Presenters:
Mr. Alex Hutchinson, Office of the Deputy Mayor for Planning and Economic Development, Government of the District of Columbia
Ms. Yasmin Douris, F.H. Hoffman

Description: New York City has the South Street Seaport. Los Angeles has the Santa Monica Pier. San Francisco has Fisherman’s Wharf. Now we can add Washington, D.C.'s. The Wharf to the list. The Wharf is a $2.5 billion 3.2 million square-foot redevelopment of the Southwest Waterfront, once a bustling commercial district that has languished since at least the 1960s. Phase I of the project, which broke ground in 2014, filled 1.6 million square feet with office space, retail, entertainment spaces, restaurants, hotels, and apartment building. The development creates a hip, walkable neighborhood just 20 minutes walking-distance from the monuments and museums along the National Mall. The Wharf is accessible via driving, though there are several better and new transportation options. It is near two metro rail stations, WMATA bus service, ride-share services, and there are the new water taxi and bike-share connections. Construction for Phase II began this year and is scheduled for completion around 2022. Participate in the technical tour to learn about this successful economic development project and transportation role in making it vibrant.

Friday, June 8, 2018  8:00am-9:30am
Location: Fred Kavli Auditorium

Federal Plenary: Federal Initiatives and Programs to Support Rural Economic Development
Moderator: Mr. Stefan Natzke, National Systems and Economic Development, Federal Highway Administration, U.S. Department of Transportation

Description: There are multiple Federal government agencies whose programs support economic development in U.S. rural communities through investments in infrastructure, education, housing, direct support to business development, job creation and employee retention. Some of these program supports go directly to communities, while others flow through state and regional entities. However, all efforts require collaboration to combine complementary programs, funding and other assistance to support rural economic development. In recent years, there have been several initiatives to provide technical and other assistance to small towns and rural areas to help them develop their local and regional economies, strengthen communities, and integrate better with the global economy. Programs, such as the multi-state Appalachian Development Highway System, were designed with an economic development purpose in mind for a less developed rural region. In other cases, communities and agencies need to work creatively and collaboratively to strategically align multiple plans, resources and requirements around common priorities for local economic growth and prosperity. This session will provide information on U.S. Federal government economic development programs and provide attendees the opportunity to discuss economic development needs and offer ideas to further support rural economic development.

Participating Agencies:

Supporting Economic Development with Highway Infrastructure
Dr. Gloria Shepherd, Associate Administrator, Office of Planning, Environment and Realty, Federal Highway Administration, U.S. Department of Transportation

Economic Development Integration
Mr. Douglas Lynott, Director, U.S. Economic Development Administration, U.S. Department of Commerce

Rural Development Innovation Center
Ms. Jamie Davenport, Team Lead, Partnerships, U.S. Department of Agriculture

Leveraging Federal Programs with Transportation Investment in the Appalachian Region
Mr. Scott Hamilton, Executive Director, Appalachian Regional Commission

Friday, June 8, 2018  9:45am-11:45am
Location: Lecture Room

Workshop: Supporting Economic Resilience through Transportation Planning and Investment
Speaker: Ms. Erica Anderson, Land of Sky Regional Council

Ms. Carrie Kicee, National Association of Development Organizations (NADO)

Description: The wealth creation framework takes a systems approach to identifying a region’s stock of assets that can be used to develop demand-driven sector strategies to improve economic resilience. This framework is intentionally inclusive and focuses on local ownership and control of assets, in order to root economies in place. Investing in and maintaining transportation, as a significant regional asset, is an important way to support asset-based economic resilience efforts.

TRB STAFF

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TRB SPECIALTY CONFERENCES IN 2019

TRANSPORTATION RESEARCH BOARD

SAVE THE DATE

Sixth International Conference on Funding and Financing Surface Transportation: Charting a Course for the Future

This conference will assemble experts from government, industry, and academia to exchange the latest research and information on innovative and emerging surface transportation funding and financing strategies. The conference is being organized by TRB’s Standing Committee on Revenue and Finance (ABE10).

Denver, Colorado
June 2019

For more information, contact William B. Anderson at WBAnderson@NAS.edu

WIT 2019
WOMEN’S ISSUES IN TRANSPORTATION
6th INTERNATIONAL CONFERENCE
Beckman Center of NASEM – Irvine, CA
SEPTEMBER 10-13, 2019
SAVE THE DATE
The National Academy of Sciences was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, non-governmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The National Academy of Engineering was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. John L. Anderson is president.

The National Academy of Medicine (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the National Academies of Sciences, Engineering, and Medicine to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at www.national-academies.org.

The Transportation Research Board is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to provide leadership in transportation improvements and innovation through trusted, timely, impartial, and evidence-based information exchange, research, and advice regarding all modes of transportation. The Board’s varied activities annually engage about 8,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

Learn more about the Transportation Research Board at www.TRB.org.