TEXAS FREIGHT 2055 ROUNDTABLE

by

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and the
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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

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INTRODUCTION

What will an effective, efficient, and safe Texas freight transportation system look like four decades into the future? The Texas A&M Transportation Institute (TTI) and the Center for Transportation Research at the University of Texas at Austin identified trends that could impact businesses' requirements for future freight transportation and conducted business interviews to gain an improved understanding of the envisioned future freight transportation system that will meet their business requirements. The study team also hosted a one day workshop to review the study findings and to discuss the role of the Texas Department of Transportation (TxDOT) in conducting proactive freight planning that will support the future growth of industry and ultimately of the Texas economy.

The Freight 2055 Roundtable was held at the North Central Texas Council of Governments in Arlington on Wednesday, July 8, 2015. Appendix A contains the Freight 2055 Roundtable invitation, Appendix B contains the Roundtable Agenda, and Appendix C contains a one page summary that highlights the objectives of the study of which the Freight 2055 Roundtable discussion was a key component.

FORUM PARTICIPANTS

The study team and TxDOT invited a diverse group of freight stakeholders that represented both the public and private sectors. Email invitations were sent to approximately 700 stakeholders. In total, 85 stakeholders participated in the Roundtable. Table 1 provides the names of the Roundtable participants and the agencies/companies that they represented.

Participants included representatives from ports, rail, highways, cities, corporations, metropolitan planning organizations, logistics service providers, engineering and planning firms, consulting firms, and academia.

Table 1. Forum Participants by Agency/Company.

Participant Name	Agency/Company
E'Lisa Smetana	Abilene Metropolitan Planning Organization
Jennifer Shepard	Alliance for I-69 Texas
Kim Sachtleben	Atkins
Barbara Koslov	Bay Area Houston Transportation Partnership
Rick W. Wilson	BNSF Railway
Aaron Hegeman	BNSF Railway
Alex Gunn	BNSF Railway
Paul Cristina	BNSF Railway
Gary Pedigo	Brotherhood of Locomotive Engineers & Trainmen
Georgina Lopez	Brownsville Metropolitan Planning Organization
Janna Rosenthal	CDM Smith
Juan Olaguibel	City of McAllen
Luis Bazan	City of Pharr International Bridge Department
Fred Brouwen	City of Pharr International Bridge Department
Hamid Baha	Dallas County
Lorraine McCord	Dallas County Community College District
Lauren Trimble	Dallas County Judge Clay Jenkins
Elena Craft	Environmental Defense Fund
Luis Crespo	E-ndeavor Program Management
Brad Walker	E-ndeavor Program Management
Srini Vasan	eShip Global
Larry J. Chilcoat	FAK Distribution
Leslie Friedrich	Friedrich Software Resources
Gary Bushell	Gary Bushell, LLP/ Alliance I-69
David Jurich	Hatch Mott MacDonald
Dennis Schulze	HDR
Lillian Champion	Hidalgo County Metropolitan Planning Organization
Linda de la Fuente	Hidalgo County Metropolitan Planning Organization

Participant Name	Agency/Company
Hans-Michael Ruthe	Houston-Galveston Area Council
Lisa Phillip	Hybas International
Gerry Schwebel	International Bank of Commerce/ Laredo I-69
Richard T. Doarn	J. B. Hunt Intermodal
Olivia Varela	Laredo Development Foundation
Phil McGuire	McGuire Transportation Co., Inc.
Brett Moore	McLane Group, LP
Rachel Connell	NASCO
Kevin Feldt	North Central Texas Council of Government
Jeff Hathcock	North Central Texas Council of Government
Michael Johnson	North Central Texas Council of Government
Dan Lamers	North Central Texas Council of Government
John P. Roby	Port of Beaumont
Jarl Pedersen	Port of Corpus Christi
Jennifer Stastny	Port of Victoria
Michael Reeves	Ports-to-Plains Alliance
Bruce Mann	PUHA
Michael Cline	Rice University
Julian Alvarez	Rio Grande Valley Partnership
Jesse Hereford	S&B Infrastructure
Sherry Pifer	SH 130 Concession Company
Robert Hooks	Southwest International Freight Services
Mohammad Najafi	University of Texas at Arlington
Shirley Nevala-Chavie	Timco Logistics
John Esparaza	Texas Trucking Association
Isaac Aguilar	Texas Department of Transportation
Christopher Caron	Texas Department of Transportation
Ron Johnston	Texas Department of Transportation
Gus Khankarli	Texas Department of Transportation
Olive MacGorman	Texas Department of Transportation
Melissa Meyer	Texas Department of Transportation
Kevin Pete	Texas Department of Transportation
Roger Schiller	Texas Department of Transportation
Erik Steavens	Texas Department of Transportation
Brenda Mainwaring	Union Pacific Railroad
Jose Grimaldo	University of North Texas
Terry Pohlen	University of North Texas
Michael Bomba	University of North Texas
Brian Hill	US Maritime Administration

Participant Name	Agency/Company
James Sewell	US Flagship Corp
Georgi Ann Jasenovec	US Department of Transportation
Sonny Crenshaw	Walmart
Kevin Dyer	Walmart
Les Harris	Walmart
Ron McGriff	Walmart
Mike Vahle	Walmart

PRESENTATIONS AND REMARKS

Participants were welcomed to the Roundtable discussion and to the Dallas/Fort Worth region by Mr. Michael Morris (Director of Transportation, North Central Texas Council of Governments (NCTCOG)). Mr. Morris began his remarks by noting the importance of a partnership between the public and private sectors in addressing freight needs. He provided a number of statistics that illustrate the importance of freight to the region and the state. Mr. Morris concluded by highlighting provisions in MAP-21 and the proposed DRIVE act.

Ms. Caroline Mays (Manager, TxDOT Freight Transportation Planning Branch) provided the TxDOT freight perspective. She highlighted key components of the Texas Freight Mobility Plan, which will be submitted for approval to the Texas Transportation Commission in the fall. Ms. Mays also thanked all the participants in advance for their participation in the Roundtable Discussion and stated that the large number of participants is a testimony of the progress that have been made in bringing both the private and public sector to the table in addressing freight needs and planning for future freight movements.

Ms. Jolanda Prozzi (Research Supervisor for TxDOT Research Project 0-6089) reviewed the study objectives and the Roundtable Discussion objectives. She reviewed the structure of the Roundtable and encouraged everyone to participate and share their insight. The information shared will be used by the study team to develop a framework for TxDOT to inform proactive freight planning for the state.

Ms. Prozzi's remarks were followed by six presentations. The first four presentations discussed major trends that could potentially impact Texas' business in the future. The last two presentations discussed the perspectives of businesses as shared with the study team during the conducted interviews.

- Jeff Warner (TTI) presented data on Texas' imports and exports and provided an overview of global trade trends.
- Dr. Michael Cline (Rice University) presented the socio-demographic trends over the next forty years.
- Megan Kenney (TTI) presented national and global environmental trends, including the impacts of extreme weather events and anticipated government, industry, and consumer responses.
- Dr. Rajat Rajbhandari (TTI) reviewed current technologies that shippers and freight carriers use (e.g., RFID and GPS), services accessible to consumers that are reshaping demand for goods and services (e.g., e-commerce), and emerging technologies that have the potential to transform the supply chain (e.g., 3D printing, automated vehicles, and truck platoons).

- Arturo Bujanda and Juan Villa (TTI) presented on the perspectives of major industries in Mexico.
- Dr. C. Michael Walton (CTR) presented on trends and their potential impact on major companies in the United States.

Appendix D provides a copy of the presentations that were presented.

Following the presentations and lunch, the Roundtable attendees participated in group discussions. Attendees were pre-assigned to one of six groups to ensure a diverse perspective on the information presented in the morning sessions and to gather input on the role of TxDOT in ensuring an effective, efficient, and safe Texas freight transportation system four decades into the future. Participants were asked to provide input and respond to the following:

- The major factors and trends:
    - What will be the impact on Texas' businesses? How will product sourcing and delivery be affected?
    - What will be the impact on transportation modes? How will businesses move freight?
- TxDOT's Role:
    - What can TxDOT do in 2015 to facilitate the freight system of 2055?
    - What freight strategies should be adopted?
    - What opportunities exist?
    - What constraints need to be overcome?

Two staff members (from TTI and the CTR study team) facilitated the group discussions and recorded the inputs/insights obtained during the afternoon discussions. Table 2 provides a summary of the key inputs/insights by discussion group. Appendix E provides a detailed record of the group discussions.

Table 2. Summary of Group Discussions.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Major factors and trends	• Changing shopping patterns, with online shopping becoming more prevalent. • Amazon may use drones in future. • Increased regulations hamper rail and trucks • Containers from large Panama Canal ships will congest rail and roads. • The Panama Canal could have a dramatic impact on bulk imports in Texas.	• Technology can eliminate some commuter travel. • Consumer demand for quick deliveries (e.g., Amazon Prime). • Delivery by non-professional drivers (like Uber). • Robots in warehouses. • 3D printing will require inputs such as plastic and metal.	• Mexico will remain a key trade partner. • Mexican reforms might change the commodity mix of NAFTA trade. • Nearshoring will continue to drive NAFTA trade growth. • Population growth will impact vehicle miles travelled (VMT), and consumption. • Immigration trends will continue. • Road construction will follow urban growth.	• Freight border crossings could become faster if technology reduces inspection times. • Empty freight trailers could have their own lane at border crossings to reduce congestion and travel time. • The border needs updated infrastructure and more lanes. • People may use cars less. • Automation will displace drivers and other workers.	• Road congestion. • Logistics concentrations and multimodal hubs in Dallas/Fort Worth, San Antonio, and Houston. • Movement of hazardous materials should be tracked. • Rail will be utilized more in the future. • Online retailers (e.g., Amazon) are buying more real estate to address the increasing demand for goods delivery.	• Electronics and x-rays can be used to decrease border crossing times. • Customs and Border Patrol needs to offer more training to truckers entering from Mexico to comply with Automated Commercial Entry protocol. • Texas' maritime industry is lagging. • 3D printing probably will not impact freight for 20 years.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
	• Labor prices have increased in China, and manufacturing jobs could move from China to Mexico.	• Driverless cars: could make people more comfortable driving longer distances (could address the truck driver shortage). • HOV-type lanes for driverless cars or truck platoons.	• There may be fewer cars on the road as people switch to other modes. • Transportation costs could increase without enough transportation funding. • Shifts towards rail, pipelines, and post-Panamax ships. • More distribution centers will be developed near urban areas as online shopping increases.	• Younger generations may have reduced pensions and Social Security. • Older generations may have to work longer before retiring.	• Last mile delivery has become more important as more people are shopping online and having goods delivered to their homes. • More central delivery and pick-up locations could substitute some home deliveries. • Educational gaps in transportation and logistics needs to be addressed. • Gas tax has not increased for a long time. A Vehicle Miles Traveled fee would make more sense.	• Autonomous trucks may be implemented in long rural corridors (e.g., San Antonio to El Paso). • Truck only lanes may be required if autonomous trucks become more prevalent. • Adverse environmental events could impact freight, ports, and roads. • Changing work hours or locations may reduce the number of passenger vehicles on the road.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
			• Last mile delivery will be a challenge for the logistics industry. • There may be more autonomous vehicles. • Mobile applications will be used to coordinate freight movement (Uber for freight).			
Dominant Trends	• Impact of increased population on freight infrastructure (e.g. rail crossings in high density areas).	• More home deliveries require more distribution centers close to urban areas; central pick-up points could facilitate personal deliveries.	• Border crossing time and infrastructure are ongoing issues. • Population will impact goods movement.	• Industry technologies. • International events and policies.	• Funding an ongoing issue, because current transportation funding does not cover maintenance costs.	• Use of technology for freight planning.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
	• Public participation in the regulatory environment. • New technology could impact freight movement. • Grocery pick-up and delivery could be emerging trend. • Younger generations dictate the supply chain.	• Mixed-use developments. • New store formats; some companies experimenting with smaller stores. • Variety of fuel options. • Air freight will decline. • More transportation funding sources needed.	• Funding issues. • Trade pattern changes. • New technologies could reduce delivery times.	• System efficiencies (operations, size and weight issues, Intelligent Transport Systems, freight tubes, other innovations).	• Congestion, sprawl, and population increase. • Freight is a system—changes in demand and mode will occur to facilitate freight movement. • Workforce development and education: need to understand the importance of transportation. Who will be the future transportation leaders?	

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Impact on Texas' businesses		• Cost of delivering goods may increase. • Freight industry needs reliable travel times between points.	• If costs increase, businesses may leave to less expensive locations. • Higher costs could be passed on to consumers. • Panama Canal will be important for imports and exports. • More Mexican manufacturing could impact trade through Texas. • Commodities could become scarce as the population increases.	• Focus on exporting liquefied natural gas (LNG) through the Panama Canal.	• Lack of funding for transportation leads to outsourcing. • Congestion can cause mode shifts. • Businesses use optimized routes to address travel delays (25% of costs are logistics). • Young people needed for good jobs in warehouses and rail. • Industry needs to be more technology savvy to attract younger workers.	• Shortage of trucking drivers and warehouse workers. • Traffic.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
					• Businesses need to help consumers understand the freight cost (may be willing to paying more if they understand the costs).	
Impact on Texas' infrastruc-ture and transport-ation system	• Increase in home deliveries could impact VMT and air quality. • Railroads need double tracks. • Better port and rail connections are needed. • Texas needs better bridges and roads. • HOV lanes should be truck only lanes.	• Rail may be better option for freight between Dallas and Houston. • Need for increased hours at ports of entry. • Companies like Amazon may have to pay to support the public good. • Companies could pay a premium to use truck only lanes.	• Funding needed to increase the number of ports of entry and facilitate trade. • Continued development and trade with Brazil, Russia, India, China, and other emerging markets will put pressure on Texas' ports of entry.		• Dredging and maintenance are ongoing issues at ports. • Tax local industries to support infrastructure improvements. • Slow permitting process slows down ability improve infrastructure.	• More funding needed to build infrastructure. • Ports need more funding for improvements. • Ship channels need to be maintained and storm surge protection is important.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
		• More distribution centers.				
TxDOT's Role	• Allocate funding for freight projects (need a dedicated, recurring funding source). • Become a facilitator in development of Texas' transportation system rather than construction and maintenance of road system.	• Facilitate freight by rail. • Facilitate relationships between ports. • Do not build things unless they are needed. • Educate public so that they know how important freight is and the importance of various modes. • Facilitate connectivity from the ports to the highways.	• Be more of a facilitator. • Plan to address changes in import/export patterns. • Plan for an intermodal system and include ports of entry. • Reduce project development times and streamline the National Environmental Policy Act (NEPA) process.	• Identify where Mexico is investing in roads to predict traffic in Texas. • Pay for infrastructure with public-private partnerships, TIGER grants, and user fees. • Address changes in import and export products, e.g., petrochemicals . • Become more involved with the public and private sectors (including, the federal government).	• Use tax incentives to encourage the behavior we want. • January transportation forum is important. • Consider ports and rail; not only highways. • Educate the public and workforce on the importance of multi-modal freight (businesses can sponsor education). • Support the movement of freight networks away from the inner city.	• Focus less on commuters and more on freight. • Make transportation consistent and reliable so that Texas continues to be competitive. • Develop a mobile application for freight traffic. • Support infrastructure improvements in local metropolitan areas.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
	• TxDOT has to become the custodian (depository) and clearinghouse for big/massive data for freight. • Become a multimodal agency. • Educate the legislature and the public on the need for freight projects. • Become more nimble, more responsive, and innovative. • Fund pilot freight studies that could be implemented at the local level. • Have more authority to regulate.	• Smart planning that includes vertical clearance on the highways, oversize/over-weight routes. • Plan for extreme weather events.		• Facilitate the ports' relationships with the Intercoastal Waterway and the Army Corps of Engineers. • Think and plan with multiple modes in mind. • Follow-up on studies of international trends. • Develop implementable plans. • Connect with personnel at other DOTs. • Address redundancy and resiliency issues in the current road network.	• Incentivize the movement of freight by barge to reduce trucks on highways (e.g., from Beaumont to Houston). • Lobby for more Harbor Maintenance Tax funding. • Facilitate economic development and workforce development. • Allow slightly heavier containers. • Facilitate a multi-modal network. • Be a bridge between the business community and the legislature.	• Work with the FAA to write rules for Unmanned Aerial Vehicles so they can be used for freight. • Utilize big data in infrastructure planning. • Focus on improving maritime transportation. • Develop a flood control plan and mitigation strategies to address extreme weather. • Consider the rural areas that freight passes through, in addition to borders.

Topic	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
				• Use weigh-in-motion and electronic pre-clearance. • Better communicate the role of freight in today's society.		• Foster a transportation system that is efficient from the dock to the customer. • Support commuter rail to reduce cars on urban roads. • Convert HOV lanes to truck only lanes.

MAJOR TAKEAWAYS

At the conclusion of the Freight 2055 Roundtable, a participant from each discussion group was asked to share major takeaways from their discussion. The following was shared:

- Group 1: There is a huge difference between those that will be alive by 2055 and those that will not be. However, connectivity and intermodal planning, mega data, and truck only lanes are considered important. Educating the general public about freight is also necessary. A North American partnership is needed to facilitate border connections.
- Group 2: People do not understand freight. They just want their stuff fast. The border is important to freight. Infrastructure planning can facilitate flexibility, and alternative routes are important to a resilient system. It is necessary to protect and expand capacity for all modes.
- Group 3: At border crossings, there needs to be greater staffing levels and crossing times need to be improved. As the population grows, more people will require more goods, and the increase in the older population cohort will affect what goods are demanded. New funding sources are needed; tolling has faced a backlash. Financing is very important, because projects are costly. There will be trade pattern changes and commodity price changes. LNG plants are being built along the coast. Online retailing is increasing the number of trucks on the road.
- Group 4: New technologies will be important to the future of freight. International projects and policies in Panama, Cuba, and Mexico will also be important. There is a need to plan for changes in fuels. System efficiencies should be improved. Hurricanes and other severe weather events are a concern. It is imperative that TxDOT support intermodal transportation.
- Group 5: Financing/pricing needs to be fair, and people need to understand it. Freight is a system and everything is connected, including Houston and Odessa. Population growth in urban areas is likely, but what will happen to rural areas? Workforce development is also important because we need more logistics professionals. Changes occur when fuel prices change, and we need the infrastructure to accommodate modal changes. TxDOT needs to be a multimodal facilitator, that can act as a translator between groups, and can provide a systems perspective.
- Group 6: Funding is an issue as the gas tax does not even cover maintenance of the existing system. There is a shortage of truck drivers. Big data can be used for operations, planning, and modeling. For maritime transportation, flood control plans and mitigation are important. Supply chains need to be efficient and consider rural areas. Commuter rail can be an issue if it impedes freight. HOV lanes should be converted to dedicated truck lanes.

Dr. Walton thanked all the participants and adjourned the Roundtable Discussion.

APPENDIX A – ROUNDTABLE INVITATION

Freight 2055: Roundtable Discussion

JULY 8, 2015

North Central Texas Council of Governments
Transportation Council Room
616 Six Flags Drive, Arlington, TX 76011

The Texas A&M Transportation Institute (TTI) and the Center for Transportation Research (CTR) invite you to a Roundtable Discussion. Our goal is to inform the development of a framework for an effective, efficient, and safe Texas freight transportation system four decades into the future.

The Roundtable Discussion will:

- Review the factors and trends that will impact future business models.
- Translate expectations for future freight transportation into viable modal frameworks.
- Form the basis for the development of the Texas Freight Framework 2055.

The Texas Freight Framework 2055 will identify and discuss the Texas Department of Transportation's role, freight strategies, opportunities (including critical investments), and constraints in developing the freight transportation system of 2055. The framework will support proactive freight planning and inform the prioritization of freight investments that will support growth of industry and ultimately the Texas economy.

RSVP: **Kristi Holstead**
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CENTER FOR TRANSPORTATION RESEARCH

APPENDIX B – ROUNDTABLE AGENDA

Freight 2055 Roundtable Discussion
Agenda

Wednesday, July 8, 2015

Arlington, Texas

9:00 – 9:30 Arrival and Registration

9:30 – 10:00 Welcome / Introductions / Study and Roundtable Objectives

Michael Morris (North Central Texas Council of Governments)
Caroline Mays (Texas Department of Transportation)
Jolanda Prozzi (Texas A&M Transportation Institute)

10:00 – 12:00 Presentations / Remarks

- Major Factors/Trends
  - Global Trade Patterns *(Jeff Warner – Texas A&M Transportation Institute)*
  - Socio-demographic Trends *(Mike Cline – Rice University)*
  - Environmental Trends *(Megan Kenney - Texas A&M Transportation Institute)*
  - Technology Trends *(Rajat Rajbhandari - Texas A&M Transportation Institute)*
- Industry Perspective *(C. Michael Walton – Center for Transportation Research and Arturo Bujanda/Juan Villa – Texas A&M Transportation Institute)*

12:00 – 1:00 Lunch*

1:00 – 4:00 Roundtable Discussion

- Discuss Factors/Trends
  - Impact on Texas's businesses/Where products are sourced and delivered?
    - Changes in the origins of freight shipments/where inputs are sourced
    - Changes in freight destinations/locations of final demand
  - Impact on transportation modes/ How businesses move freight?
    - Changes in transportation modes used
    - Changes in freight volumes/shipment size and freight value
- Texas Department of Transportation (TxDOT)
  - TxDOT's role in 2015 to facilitate the Freight System of 2055
  - What freight strategies should be adopted?
  - What opportunities (including critical investments) exist?
  - What constraints need to be overcome?

4:00 – 4:30 Feedback/Wrap-up

4:30 Adjourn

** Provided by the Texas A&M Transportation Institute*

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APPENDIX C – PROJECT SUMMARY

Texas Freight 2055

Efficient, reliable, and safe freight transportation is critical to the economic prosperity of any region. An efficient multimodal and intermodal transportation system reduces transportation and supply chain transaction costs and increases connectivity, mobility, reliability, and accessibility to local and global markets. An efficient freight transportation system, therefore, supports economic development, expansion of international trade, increased employment, growth in personal income, and growth of the gross domestic product of a region—ultimately improving the quality of life of its citizens.

The Texas Department of Transportation (TxDOT) has contracted with the Texas A&M Transportation Institute and the Center for Transportation Research at The University of Texas in Austin to develop a framework for an effective and efficient Texas freight transportation system four decades into the future. Specifically, the objectives of the research are to:

- consult with a representative sample of Fortune 500 companies with headquarters in Texas and major maquilas in Mexico to determine their vision and expectations for a Texas freight transportation system four decades into the future;
- translate these alternative views into viable modal frameworks; and
- develop the TxDOT Freight Framework 2055, which will identify and discuss TxDOT's role, freight strategies, opportunities (including critical investments), and constraints in enabling the envisioned freight transportation system in 2055.

The framework will support proactive freight planning and could inform the prioritization of freight investments that will support the growth of industry and ultimately of the Texas economy.

For More Information:

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APPENDIX D – FREIGHT 2055 ROUNDTABLE PRESENTATIONS

1

- Identify factors/trends impacting business models
- Engage/interview
  - Major Texas businesses (Fortune 500)
  - Major Mexican manufacturers
- Host Roundtable Discussion

TEXAS DEPARTMENT OF TRANSPORTATION

WHAT DO WE WANT TO ACHIEVE TODAY?

- Global trade patterns
- Socio-demographic trends
- Environmental trends
- Technology trends

- Major factors/trends:
  - What are the major trends that will impact Texas's businesses?
  - How will these trends impact how businesses move freight?
  - What will be the impact on Texas's transportation system?
  - What is the role of TxDOT? (How should the agency prepare?)

- Roundtable Discussion:
  - Review the factors/trends
    - Missing trends
    - Game changers?
    - Impact on businesses
    - Impact on transportation
      - Changes in sourcing patterns
      - Changes in freight destinations
      - Changes in modes used
      - Changes in freight volumes/value

- Roundtable Discussion:
  - Discuss TxDOT's role
    - Expectations of state transportation planning agency
    - Role, strategies, investments, constraints?

2

TEXAS DEPARTMENT OF TRANSPORTATION

WHAT ARE THE MAJOR FACTORS/TRENDS?

Global Trade Patterns

TEXAS DEPARTMENT OF TRANSPORTATION

TRADE DATA TRENDS

Texas Trade and Major Trading Partners

Texas Exports

- Number one U.S. exporting state for 12 consecutive years (2013)
- Texas' exports increased on average 7.8% per year (1990 to 2012)
  - Manufacturing exports increased 8.1% per year
- 41,558 companies exporting from Texas locations (2013)
- Export trade supported an estimated 1.1 million jobs (2013)

Texas' Major Export Commodities (2013)

- Petroleum and coal products ($80.6 billion/22% of Texas' total merchandise exports)
- Computer and electronics ($48.2 billion)
- Chemicals ($47.9 billion)
- Machinery (except electrical) ($29.9 billion)
- Transportation equipment ($24.4 billion)

Texas Trade Forecasts

- Texas trade projected to increase 211% between 2012 and 2040
- Traditional trade partners expected to remain top U.S. and Texas partners
  - Texas trade with Mexico projected to increase to almost $388 billion by 2040 (remain Texas's major trading partner)
  - Eastern Asia trade projected to increase from $85 billion (2012) to $352 billion (2040)
- Brazil represents an important emerging market
  - For export trade with Texas, ranked 10th in 2000 and ranked 3rd in 2013

1

TEXAS DEPARTMENT OF TRANSPORTATION

TRADE FACTORS/TRENDS

Factors/Trends Impacting Texas Trade

- Free Trade Agreements (FTAs)
  - Reduce trade barriers, making it easier and cheaper for U.S. companies to export
  - 81% of Texas' exports in 2014 went to countries participating in current FTAs
  - Trans-Pacific Partnership (TPP) and Transatlantic Trade and Investment Partnership (T-TIP) being negotiated
  - Normalization of trade relations with Cuba

Factors/Trends Impacting Texas Trade

- Single Window
  - International Trade Data System implemented by December 2018
  - Use single electronic platform to complete forms needed by multiple government agencies
  - Streamline exporting process and reduce clearing times
- Supply Chain Redundancy
  - Move away from just-in-time to redundancy in trade supply chains
  - Ensure reliability in the event of extreme weather, urban congestion, labor disputes, etc.

Factors/Trends Impacting Texas Trade

- Nearsourcing
  - Assign business process to foreign, lower-wage country close in distance (Mexico) to benefit from lower freight costs
  - 84% of surveyed industry executives regard nearsourcing very/somewhat important (2013)*
- Insourcing/re-shoring
  - Relocate business process back to the U.S.
  - 37% of surveyed industry executives prefer to locate in U.S. (2013)*

* Source: AT Kearney, 2013

To Think About?

- What are the major trade trends that will impact Texas's businesses?
- How will these trade trends impact how businesses move freight?
- What will be the impact on Texas's transportation system?
- What is the role of TxDOT? (How should the agency prepare?)

2

Meeting the Texas Challenge

- Slides Available at http://hobbycenter.rice.edu/
  - Go to: "Presentations"
- See also, "Data"
  - Current (2014) Estimates for Incorporated Places and Counties
  - Selected 2010 Census Data (including 2000-2010 Change and 2000 Comparisons) for Counties and Places
- For background on *Changing Texas*, see: http://thetexaschallenge.com

Major Categories of Impacts

- **Impacts on Demand**
  - **Freight transportation is a demand driven activity**
- **Impacts to Industry**
  - **Factors that inhibit or enhance delivery of freight from one point to another**

Major Demographic Trends

- **Population Growth**
- **Urbanization/ Regional Concentration**
- **Population Aging**
- **Racial/Ethnic Diversification**

POPULATION GROWTH

Ten Largest States in the United States Ranked by Population Size in 2014

State	April 1, 2000	April 1, 2010	July 1, 2014	Change 2000-10 Numeric	Change 2000-10 %	Change 2010-14 Numeric	Change 2010-14 %
United States	281,421,906	308,745,538	318,857,056	27,323,632	9.7	10,111,518	3.3
California	33,871,648	37,253,956	38,802,500	3,382,308	10	1,548,544	4.2
Texas	20,851,820	25,145,561	26,956,958	4,293,741	20.6	1,811,397	7.2
Florida	15,982,378	18,801,310	19,893,297	2,818,932	17.6	1,091,987	5.8
New York	18,976,457	19,378,102	19,746,227	401,645	2.1	368,125	1.9
Illinois	12,419,293	12,830,632	12,880,580	411,339	3.3	49,948	0.4
Pennsylvania	12,281,054	12,702,379	12,787,209	421,325	3.4	84,830	0.7
Ohio	11,353,140	11,536,504	11,594,163	183,364	1.6	57,659	0.5
Georgia	8,186,453	9,687,653	10,097,343	1,501,200	18.3	409,690	4.2
North Carolina	8,049,313	9,535,483	9,943,964	1,486,170	18.5	408,481	4.3
Michigan	9,938,444	9,883,640	9,909,877	-54,804	-0.6	26,237	0.3

Source: US Census Bureau

Ten States in the United States with the Largest Numeric Population Increase, 2010-2014

State	April 1, 2000	April 1, 2010	July 1, 2014	Change 2000-10 Numeric	Change 2000-10 %	Change 2010-14 Numeric	Change 2010-14 %
United States	281,421,906	308,745,538	318,857,056	27,323,632	9.7	10,111,518	3.3
Texas	20,851,820	25,145,561	26,956,958	4,293,741	20.6	1,811,397	7.2
California	33,871,648	37,253,956	38,802,500	3,382,308	10.0	1,548,544	4.2
Florida	15,982,378	18,801,310	19,893,297	2,818,932	17.6	1,091,987	5.8
Georgia	8,186,453	9,687,653	10,097,343	1,501,200	18.3	409,690	4.2
North Carolina	8,049,313	9,535,483	9,943,964	1,486,170	18.5	408,481	4.3
New York	18,976,457	19,378,102	19,746,227	401,645	2.1	368,125	1.9
Arizona	5,130,632	6,392,017	6,731,484	1,261,385	24.6	339,467	5.3
Washington	5,894,121	6,724,540	7,061,530	830,419	14.1	336,990	5.0
Colorado	4,301,261	5,029,196	5,355,866	727,935	16.9	326,670	6.5
Virginia	7,078,515	8,001,024	8,326,289	922,509	13.0	325,265	4.1

Source: U.S. Census Bureau

Ten States in the United States with the Largest Percentage Population Increase, 2010-2014

State	April 1, 2000	April 1, 2010	July 1, 2014	Change 2000-10 Numeric	Change 2000-10 %	Change 2010-14 Numeric	Change 2010-14 %
United States	281,421,906	308,745,538	318,857,056	27,323,632	9.7	10,111,518	3.3
North Dakota	642,200	672,591	739,482	30,391	4.7	66,891	9.9
Texas	20,851,820	25,145,561	26,956,958	4,293,741	20.6	1,811,397	7.2
Colorado	4,301,261	5,029,196	5,355,866	727,935	16.9	326,670	6.5
Utah	2,233,169	2,763,885	2,942,902	530,716	23.8	179,017	6.5
Florida	15,982,378	18,801,310	19,893,297	2,818,932	17.6	1,091,987	5.8
Arizona	5,130,632	6,392,017	6,731,484	1,261,385	24.6	339,467	5.3
Nevada	1,998,257	2,700,551	2,839,099	702,294	35.1	138,548	5.1
Washington	5,894,121	6,724,540	7,061,530	830,419	14.1	336,990	5.0
South Dakota	754,844	814,180	853,175	59,336	7.9	38,995	4.8
South Carolina	4,012,012	4,625,364	4,832,482	613,352	15.3	207,118	4.5

Source: U.S. Census Bureau

Population in Texas, 1970-2010 and Projected to 2050

Population, Licensed Drivers, Yearly Vehicle Miles of Travel, and Road Miles Needed, 2010-2050

Year	Population	Drivers	Drivers Per 1,000 Population	Yearly Vehicle Miles of Travel: Per Driver	Yearly Vehicle Miles of Travel: Total (In Billions)	Additional Road Miles Needed*
2010	25,145,561	16,197,460	643.8	15,275	247.3	-
2020	30,293,311	18,923,968	624.8	15,072	285.2	71,219
2030	37,292,766	22,709,488	609.1	12,998	295.1	129,090
2040	45,316,711	27,409,027	604.7	12,446	341.1	201,446
2050	53,203,280	32,261,707	606.5	12,276	396.0	271,723

Source: Projections by the authors and 2010 other estimates and assumptions from U.S. Department of Transportation Federal Highway Administration, Highway Statistics Series, 2000, 2010 and 2011, and U.S. Department of Transportation Federal Highway Administration, Nationwide Travel Survey, 2009; U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, Highway Statistics Series, Highway Statistics 2011.

*Indicates all street, freeway, and highway miles.

From: Changing Texas: Implications of Addressing or Ignoring the Texas Challenge

URBANIZATION/ REGIONAL CONCENTRATION

Population Growth and Urbanization in Texas, 1850 - 2010

Change in Urban/Rural Population in Texas, 1900-2010
Urban
Rural

Population Density of Selected Counties, 2010 and Projected to 2050
2010
2050
Collin
Harris
Tarrant
Dallas
Denton
Bexar
Montgomery
Travis
Williamson
Hays

Population Change in Texas Counties April 1, 2000 – April 1, 2010

Population Change in Texas Counties April 1, 2010 - July 1, 2014

Population Change in United States Counties April 1, 2010 - July 1, 2014

INTERSTATE
27

3

POPULATION AGING

4

Percentage Change in Licensed Drivers in Texas by Age, 1990-2010
120.0
100.0
80.0
60.0
40.0
20.0
0.0
15-19
20-29
30-44
45-64
65-79
80+
Total

RACIAL/ETHNIC DIVERSIFICATION

Race/Ethnicity as a Percent of the Total Population in Texas, 2000 and 2010
2000
2010

NH White and Hispanic Populations as a Percent of the Total Population in 2000, 2010, and Projected in 2050
52.4
32.0
45.3
37.6
21.8
55.6
2000
2010
2050
NH White
Hispanic

Percent of the Population Age 25 and Older in the United States and Texas with Less Than High School Diploma/GED by Race/Ethnicity, 2010
9.3
37.0
17.9
14.5
15.2
14.4
8
40.4
13.7
14.3
9.3
19.3
United States
Texas
NH White
Hispanic
NH Black
NH Asian
NH Other
Total

Percent of the Population Age 25 and Older in the United States and Texas with Bachelor, Professional, or Graduate Degree by Race/Ethnicity, 2010
34.4
13.0
17.9
50.0
24.3
28.2
34.1
11.6
19.7
52.0
30.0
25.9
United States
Texas
NH White
Hispanic
NH Black
NH Asian
NH Other
Total

5

Median Household Income, Family Income, and Per Capita Income by Race/Ethnicity for Texas, 2010
Median HH Income
Median Family Income
Per Capita Income
NH White
NH Asian & Other
NH Black
Hispanic
Total

Mean Household Income in 2010 and Projected for 2050 Under Alternative Assumptions of Sociocconomic Closure Between Minority and NonHispanic White Households
2010
2050

Mean Consumer Expenditures in 2010 and Projected for 2050 Under Alternative Assumptions of Sociocconomic Closure Between Minority and NonHispanic White Households
2010
2050

Aggregate Consumer Expenditures (in $Billions) in 2010 and Projected for 2050 Under Alternative Assumptions of Sociocconomic Closure Between Minority and NonHispanic White Households
2010
2050

Components of Population Change for Texas, April 1, 2010 – July 1, 2014
Total Change: 1,811,307
Net Domestic Migration 31%
Natural Increase 50%
Net International Migration 19%

Net Migration in Texas Counties April 1, 2010 - July 1, 2014

6

Twenty MSAs with the Largest Numeric Change, 2010 - 2014

	Population			Change 2010-2014		Change 2010-2014	
	2010	2013	2014	Number	%	Number	%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Twenty MSAs with the Largest Percentage Change, 2010 - 2014

	Population			Change 2010-2014		Change 2010-2014	
	2010	2013	2014	Number	%	Number	%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Twenty Places with the Largest Numeric Change, 2010 - 2014

	Population			Change 2010-2014		Change 2010-2014	
	2010	2013	2014	Number	%	Number	%
New York, NY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Houston, TX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Los Angeles, CA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Austin, TX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
San Antonio, TX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phoenix, AZ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dallas, TX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Charlotte, NC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
San Diego, CA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fort Worth, TX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
San Jose, CA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Denver, CO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Seattle, WA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Washington, DC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Columbus, Ohio	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
San Francisco, CA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nashville-Davidson, TN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oklahoma City, OK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New Orleans, LA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Education Pays

Source: U.S. Department of Labor, Bureau of Labor Statistics, June 2014 Final quarter 2013

Educational Attainment for the Texas Population Age 25 and Older by Race/Ethnicity, 2010

Race Ethnicity	Population Age 25 and Older	Less than high school	High school diploma	Some college or associates degree	Bachelor or more
Non-Hispanic White	8,099,053	8.0	25.3	32.6	34.1
Black	1,788,223	13.9	30.3	36.2	19.6
Hispanic*	5,083,779	40.4	25.8	22.2	11.6
Asian	639,987	14.4	15.2	18.6	51.8
Total Population	15,772,122	19.3	25.6	29.2	25.9

[illegible]

Population, Population Change, and Proportion of the Total Population by Race/Ethnicity for Texas, 2000 and 2010

	Population		Population Change			Percent of Total Population	
Race/Ethnicity*	2000	2010	Number	Percent	Percent of Total Change	2000	2010
NH White	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hispanic (All Races)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NH Black	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NH Asian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NH Other	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Prepared by the Hobby Center for the Study of Texas at Rice University http://HobbyCenter.Rice.edu

Population, Population Change, and Proportion of the Population
Under 18 Years by Race/Ethnicity for Texas, 2000 and 2010

Numeric Change in Population (in Thousands)
by Race/Ethnicity for Texas, 2000-2010
2,791
404
523
394
122
NH White
Hispanic (All Race)
NH Black
NH Asian
NH Other

Proportion of Total Population Change in Texas
by Race/Ethnicity, 2000-2010
100
80
60
40
20
0
-20
10.0
65.0
12.2
9.2
2.9
NH White
Hispanic
NH Black
NH Asian
NH Other

Numeric Change in Texas Child (<18) Population
(in Thousands) by Race/Ethnicity, 2000-2010
221
70
92
63
-101
NH White
Hispanic (All Race)
NH Black
NH Asian
NH Other

Proportion of Change in Texas Child (<18) Population
by Race/Ethnicity, 2000-2010
100
80
60
40
20
0
-20
-10.0
95.1
7.9
9.4
6.4
NH White
Hispanic
NH Black
NH Asian
NH Other

Population, Population Change, and Proportion of the
Total Population by Race/Ethnicity for State of Texas, 2010-2013

8

Counties Classified by Population Change in the
Anglo (non-Hispanic White) Population, 2000-2010

Counties Classified by Population Change
in the Hispanic Population, 2000-2010

Counties Classified by Population Change in the
non-Hispanic Black Population, 2000-2010

Counties Classified by Population Change in the
non-Hispanic Asian Population, 2000-2010

Counties Classified by Population Change in the Non-Hispanic White Population, 2000-2010

Counties Classified by Population Change in the Hispanic Population, 2000-2010

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Counties Classified by Population Change in the Non-Hispanic Black Population, 2000-2010
Legend

Counties Classified by Population Change in the Non-Hispanic Asian Population, 2000-2010
Legend

NonHispanic White Population as a Percent of the Total Population in Selected Metropolitan Statistical Areas in Texas in 2000 and 2010
2000
2010
60.7
54.7
59.3
50.5
48.1
39.6
48.7
34.1
Austin-Round Rock
Dallas-Ft. Worth-Arlington
Houston-The Woodlands-Sugar Land
San Antonio-New Braunfels

NonHispanic White Child (<18) Population as a Percent of the Total Childhood Population in Selected Metropolitan Statistical Areas in Texas in 2000 and 2010
2000
2010
51.0
41.9
50.2
39.1
39.0
29.0
31.2
25.7
Austin-Round Rock
Dallas-Ft. Worth-Arlington
Houston-The Woodlands-Sugar Land
San Antonio-New Braunfels

Hispanic Population as a Percent of the Total Population in Selected Metropolitan Statistical Areas in Texas in 2000 and 2010
2000
2010
30.2
34.4
31.5
37.4
39.0
45.4
56.4
64.0
Austin-Round Rock
Dallas-Ft. Worth-Arlington
Houston-The Woodlands-Sugar Land
San Antonio-New Braunfels

Hispanic Child (<18) Population as a Percent of the Total Child Population in Selected Metropolitan Statistical Areas in Texas in 2000 and 2010
2000
2010
34.6
42.8
30.1
37.1
35.9
45.0
59.0
64.5
Austin-Round Rock
Dallas-Ft. Worth-Arlington
Houston-The Woodlands-Sugar Land
San Antonio-New Braunfels

10

Population in Texas by Race/Ethnicity in 2010 and Projections of the Population in Texas by Race/Ethnicity from 2020 to 2050 Under Alternative Assumptions of Age and Race/Ethnicity-Specific Rates of Net Migration

Percent of the Population by Race/Ethnicity in 2010 and Projected Through 2050 Under Alternative Assumptions of Age and Race/Ethnicity-Specific Rates of Net Migration for the State of Texas

Percent Change for Selected Time Periods Under Alternative Scenarios of Age and Race/Ethnicity-Specific Net Migration for the State of Texas

Percent of Net Change in Population from 2010 to 2050 Due to Each Race/Ethnicity Group Under Alternative Scenarios of Age and Race/Ethnicity-Specific Net Migration for State of Texas

Total Public School Students by Race/Ethnicity in the 10 Largest School Districts in Texas, 2000-2001 and 2014-2015

A NOTE ON HISPANIC GROWTH

11

Hispanic Population in Texas by Origin and Citizenship Status
Hispanic Population: 9.9 Million
Not a U.S. Citizen, 22.2
Native Born, 70.1
Naturalized Citizen, 7.6

Hispanic Population Aged 18 and Older in Texas by Origin and Citizenship Status
Hispanic Population Aged 18+: 6.5 Million
Not a U.S. citizen, 30.9
Native Born, 57.6
Naturalized Citizen, 11.5

Hispanic Population Under Age 18 in Texas by Origin and Citizenship Status
Not a U.S. Citizen, 5.5
Naturalized Citizen, 0.5
Hispanic Population < Age 18: 3.4 Million
Native Born, 94.0

Mexican-American Population Growth in the United States, 1980-2010
Births
New Immigrants
0
1
2
3
4
5
6
7
8
1980-1990
1990-2000
2000-2010

Foreign Born as a Percent of the Total Population, 2006-2010
Legend

Country of Birth of the Unauthorized Immigrant Population in the United States: January 2000 and 2011
2000
2011

Estimates of the Unauthorized Immigrant Population
In the United States, 2000-2012

Estimates of the Unauthorized Immigrant Population
In Texas, 2000-2012

Children Ever Born by Race/Ethnicity
Among Women Ages 40 to 44, 2008
All Hispanics
2.3
Mexican-Americans
2.5
Non-Mexican Hispanics
1.9
White
1.8
Black
2.0
Asian/Pacific Islander
1.8
0
0.5
1
1.5
2
2.5
3

Texas Age Distribution by
Race/Ethnicity and Sex

Households Most
Likely to Have
School-Aged
Children

NH White and Hispanic Births in 2010 Compared to
Alternative Scenarios Assuming Hispanic Births or Hispanic
Age Characteristics for Both Groups
Hispanic
NH White
Thousands
250
200
150
100
50
-
195
135
195
191
195
220
Births, 2010
Hispanic Birth Rates
Hispanic Ages

13

Difference Between Reported Births in 2010 and Alternative Scenarios Assuming Hispanic Births or Hispanic Age Characteristics for All Race/Ethnic Groups
Hispanic Birth Rates
Hispanic Ages
1.75
1.50
1.25
1.00
1.24
1.60
1.29
1.31
1.24
1.29
1.19
1.31
NH White
NH Black
NH Asian
Total

AGE STRUCTURE AND
DEMOGRAPHIC DIVERSITY

Percent of Texas Population by Age Group and Ethnicity, 2000

Percent of Texas Population
by Age Group and Ethnicity, 2010
Anglo
Hispanic

Percent of Texas Population
by Age Group and Ethnicity, 2050
NH White
Hispanic

THE CHALLENGE

14

Educational Attainment for the Texas Population Age 25 and Older by Race/Ethnicity, 2010

Race Ethnicity	Population Age 25 and Older	Less than high school	High school diploma	Some college or associates degree	Bachelor or more
Non-Hispanic White	8,099,053	8.0	25.3	22.6	34.1
Black	1,188,233	13.9	30.3	36.2	19.6
Hispanic*	5,083,779	40.4	25.8	22.2	11.6
Asian	629,987	14.4	15.2	18.6	51.8
Total Population	15,772,132	19.3	25.6	29.2	25.9

Mean Household Income by Race/Ethnicity, Educational Attainment, and Occupation in Texas in 2010

Occupation	Less Than High School	High School (GED)	Associate's Degree	Bachelor's Degree
NH White				
Managerial & Professional	$ 72,498	$ 84,804	$ 120,702	$ 148,818
Technical, Sales, & Admin.	62,030	84,170	112,043	130,471
Production/Prod, Craft, & Repairers	68,770	83,247	94,878	110,087
Operatives and Laborers	63,818	81,211	77,861	80,720
Total	65,833	84,078	114,803	144,714
NH Black				
Managerial & Professional	$ 47,683	$ 62,184	$ 84,788	$ 88,873
Technical, Sales, & Admin.	33,000	43,833	78,418	80,882
Production/Prod, Craft, & Repairers	42,787	63,152	62,858	68,858
Operatives and Laborers	37,811	48,284	66,181	62,777
Total	31,072	42,668	70,833	84,600
Hispanic				
Managerial & Professional	$ 62,172	$ 84,862	$ 88,858	$ 118,600
Technical, Sales, & Admin.	45,131	60,127	81,058	81,188
Production/Prod, Craft, & Repairers	43,302	61,427	62,468	62,318
Operatives and Laborers	41,273	47,688	64,202	67,868
Total	33,221	47,780	81,848	108,473
NH Asian & Other				
Managerial & Professional	$ 84,172	$ 72,018	$ 103,727	$ 130,802
Technical, Sales, & Admin.	62,784	60,710	88,038	108,480
Production/Prod, Craft, & Repairers	84,884	63,681	70,778	82,041
Operatives and Laborers	47,838	43,818	60,868	68,871
Total	60,818	64,658	83,471	123,038

Percent of Population 25 Years of Age and Older in Texas Who Are High School Graduates and Higher or College Graduates and Higher by Race/Ethnicity, 1990-2010

Educational Attainment Level	NH White*	NH Black	Hispanic	NH Asian & Other	Total
1990					
High School and Higher	81.8	68.2	44.8	78.1	72.1
College and Higher	28.2	12.8	7.3	41.2	20.3
2000					
High School and Higher	87.2	78.8	65.3	85.7	78.7
College and Higher	30.0	18.3	8.8	47.8	23.3
2010					
High School and Higher	92.0	86.4	68.8	87.1	80.7
College and Higher	34.1	19.7	11.6	48.0	26.0

Advice to new legislators:

Spend every nickel you can on education. Every nickel you don't spend now will cost dollars in the future for welfare and prisons. Then go home. Please don't pass any more laws.

--Former Lt. Governor William P. Hobby, Jr.

Mike Cline
Associate Director,
Hobby Center for the Study of Texas

Changing Texas: Implications of Addressing or Ignoring the Texas Challenge
http://thetexaschallenge.com/

For copies of the presentation and additional data for your area go to:
http://hobbycenter.rice.edu

Phone: 713-348-5396
E-mail: mcc6@rice.edu

TEXAS DEPARTMENT OF TRANSPORTATION

WHAT ARE THE MAJOR FACTORS/TRENDS?

Environmental Trends

TEXAS DEPARTMENT OF TRANSPORTATION

EXTREME WEATHER TRENDS

Extreme Weather Trends

Concerns for the next 50 to 100 years:

- Sea Level Rise (virtually certain, 99% probability)
- Rise in Arctic temperatures (virtually certain, 99%)
- More very hot days with concomitant heat waves and fewer cold days (very likely, 90%)
- Changes in precipitation levels and frequency (very likely, 90%)
- Increase in the intensity of strong hurricanes (likely, 67% probability)

Extreme Weather

Extreme Weather Impact on Infrastructure

Extreme Weather Trends

- Extreme weather events present challenges for freight transportation infrastructure
  - High sea levels destroy or displace ports, coastal highways, and railways
  - Temperature and precipitation extremes cause premature deterioration of infrastructure

1

TEXAS DEPARTMENT OF TRANSPORTATION
REGULATORY RESPONSE

Total US Greenhouse Gas Emissions by Economic Sector in 2013
Agriculture
9%
Commercial & Residential
12%
Electricity
31%
Industry
21%
Transportation
27%

Regulatory Responses
Fuel Economy Standards
Carbon Taxes
EPA's SmartWay Transport Partnership
SmartWay
Transport Partner
Getting There With Cleaner Air

Regulatory Responses
CLIMATE
SUMMIT 2014
CATALYZING ACTION
#CLIMATE2014

TEXAS DEPARTMENT OF TRANSPORTATION
BYOB
CONSUMER RESPONSE

Consumer Response
WHY BUY LOCAL?

2

Consumer Response

- Changing consumer demand
  - Increase in awareness, campaigns for buying local
  - Demand for sustainably produced products
  - Concern about carbon footprint
    - Carbon labelling

Consumer Response

Consumer Response

TEXAS DEPARTMENT OF TRANSPORTATION

INDUSTRY RESPONSE

Industry Response

- Green supply chains
  - Alternative fuels
  - Fuel efficient trucks
  - Sustainable Shipping Initiative

Industry Response

- Improving fuel efficiency
  - Fuel cell trucks
  - Improved vehicle utilization

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Industry Response

- Improve efficiency/redundancy of supply chains:
  - –Optimization of transportation routes
  - –Consolidation of multiple orders
  - –Reverse logistics
  - –Modal diversity

Industry Response

Summary

- Extreme weather will impact infrastructure in the future
- Freight community is responding to climate change trends
  - –Regulatory response
  - –Consumer response
  - –Industry response

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WHAT ARE THE MAJOR FACTORS/TRENDS?

Technology Trends

Technologies Reviewed

- Current technologies that shippers and freight carriers use (RFID, GPS.)
- Technologies accessible to consumers that are reshaping demand for goods and services (Smart phones)
- Emerging technologies that have the potential to transform the supply chain (3D printing, automated trucks, platoons.)

Radio Frequency Identification

- Contactless/wireless method of identifying objects.
- Short range, few feet.
- Benefits to supply chain:
  - Location and increased visibility.
  - Inventory levels.
  - Sharing shipping information.

RFID Market Trends

- No signs of slowing down even after a decade of use:
  - Price per unit continues to come down.
  - Global market to reach $30 billion (2024.)
  - 4 billion tags sold (2014) compared to 3 billion (2011.)

Global Positioning System

- Satellite based navigation systems.
- Benefits to supply chain:
  - Provides visibility by tracking goods.
  - Estimate arrival times, optimize routes, and manage resources.
- GPS (US), GLONASS (Russia), Galileo (EU.)
- GPS monopoly will end in few years.

GPS Market Trends

- No signs of slowing down even after three decades of use.
- Satellite navigation chips are becoming smaller and cheaper.
- Smartphones and wearables with GPS.
- Hybrid - integrated with RFID to provide identification and location information.

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Impact on Supply Chain

- Increased visibility.
- Customer engagement.
- Real-time information to higher level managers.
- Reduced asset loss, insurance costs.

Mobile Devices and Smart Phones

- Appeal of these devices lies largely in their flexibility.
- Provide constant connection to logistics operations.
- Smart phones are part of logistics work force.
- More and more consumers are ordering goods, making payments, and tracking orders using smart phones.

Smart Phone and Mobile Device Market Trends

Big or Massive Data

More Space for Growth

3D Printing

- Create objects by adding materials (not subtracting.)
- Customization of objects.

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3D Printing Market Trends

Shifting from hobbyists and prototyping to parts manufacturing (Boeing, GE)

Source: Wohlers Report, 2012

Impact on Supply Chain

- More efficient in providing made-to-order products to customers.
- Could lead to reduced inventory levels:
  - Instead of buying iPhone case, download the design and "print" it in your garage – no need to ship them from China.
- More products will be made closer to their final destination.

Automated Trucks

- Increased safety, less driver fatigue (HOS rules)
- Public acceptance is a concern.
- Many institutional issues- legislation, liability, reliability.

Public Acceptance Trends

Truck Platoons

- Drive in close proximity and collaboratively to reduce drag.
- Could be integrated with automated trucks.
- Public acceptance will be a concern.
- Legislative issues, coordination, insurance.

Impact on Supply Chain

- Automated trucks:
  - Reduced driver fatigue.
  - Increased safety.
  - Ability to haul longer distances.
- Truck platoons:
  - Tests have shown 5-10% less fuel usage.
  - Appropriate for long haul on interstates.

3

Gartner Hype Cycle of Innovation
Peak of Inflated Expectations
Big Data
3D Printing
Smart Phones
GPS, RFID
AV, AT, Platoons
Plateau of Productivity
Visibility
Slope of Enlightenment
Trough of Disillusionment
Technology Trigger
Time

Food for Thought
• Pls. think about what would your business do when these emerging technologies become available and affordable?
– Would you buy automated trucks for your fleet?
– How would you convince your managers?
– How would it change your business process?
– What would you tell your clients?
• Public sector's role in accelerating the growth of these technologies?
• Millennials want these technologies to be part of their daily lives and they will make them happen.

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THE 2055 FREIGHT TRANSPORTATION SYSTEM

MEXICAN INDUSTRY PERSPECTIVES

Arturo Egaña
Juan Villa
Texas A&M Transportation Institute

The 2055 Freight Transportation System—Interviews

- In-person and phone interviews with Fortune 500 and maquiladora executives in Mexico:
  - Food and beverages
  - Automotive
  - Steel and mining
  - Construction materials
  - Transportation
  - Manufacturing

Food and Beverages

- The internet has the potential to increase visibility throughout the supply chain
- There is a lack of communication/coordination between supply chains and the transportation system/infrastructure

Food and Beverages

- The transportation system needs to be connected to shippers and receivers to anticipate travel demand

- Transportation sector needs to use green fuels and renewable energy

Automotive

- The manufacturing base in Mexico exports finished products to the U.S.
- Storage and cross-docking operations are conducted at the U.S. side of the border
- Customs agencies/procedures add unnecessary delays, increasing supply chain costs
- Bullwhip effects are caused by adding safety buffers for production inventory levels at each stage of the supply chain

Higher costs for consumers

Automotive

- Ideal vision is to implement direct pull orders, in real time, from the point of sale, at each segment of the supply chain
  - (e.g. production plants, suppliers, and transportation)

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Automotive

- **Suppliers** need inventories closer to the **manufacturing base**

- Production plants benefit from more frequent and smaller raw materials shipments

Steel and Mining

- Rail volumes have increased substantially and expected to continue growing—250% increase in the last 10 years
- Steel and metallic products will not be replaced as a construction material in the next 50 years
- **Repairing the deteriorated infrastructure will be one of main demand drivers in next decades**

Steel and Mining

- Rail industry challenges in this industry sector
  - Long travel-times (e.g. from Texas to California, a high demand route, travel time is around 7-14 days)
  - Do not serve enough origin-destinations
- Trucking industry facing challenges
  - Driver shortage
  - Weight and size restrictions in some states (e.g. California)

Construction Materials

- Construction industry will continue growing
- Major changes in business and operational models will come from product and technology evolution
- Standard modular systems (similar to auto industry) allow for increased speed of building construction and remodeling

- Construction is evolving to a sophisticated supply chain with special transportation needs

Construction Materials

- Driverless, autonomous trucks and trains are being used at several large construction and mining sites.

Transportation

- **Re-shoring** of various large manufacturing companies into Mexico is expected to increase demand for cross-border freight transportation
- **Sustainability**—key advantage for rail; also higher level of safety, and by diverting freight to rail, highway maintenance costs and congestion are reduced
- **However**, current rail business model could not be sustainable with increased demand
- **Public Private Partnerships** would be required to develop additional infrastructure needed to serve future demand
- Some Class I railroads could need **federal funding** to help finance additional infrastructure needs

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Transportation

- Several small Texas ports have rail service which are currently under utilized. Shippers are looking at them as potential alternatives.
- Infrastructure providers should plan for improved landside access to "smaller" ports

Manufacturing

- Border crossing infrastructure and advanced technologies need to be implemted at both sides of the border to improve border crossing processes.
- Pointless to have innovative public and private border project delopment if there is no coordination among U.S. and Mexican counterparts

Manufacturing

- Several trusted-traveler security programs were implemted after 9/11, which has led to imprived border crossing operations.
- Mexico's New Certification Scheme Certified Companies (NEEC) can become as efficient as C-TPAT
- Inadequate border crossing infrastructure remains an issue
- Existing POE infrastructure is not adequate for SB inspections.

Manufacturing

- New manufacturing centers are starting operations in central Mexico (e.g., Guanajuato, Queretaro, San Luis Potosi)
- Will impact Mexico's transportation system and U.S.-Mexico border (e.g., rail exports of automobiles and air exports of aerospace parts)

Aerospace Industry Location

Manufacturing

- **Robotic process automation** is dramatically changing the way of doing business at each stage of supply chain
- **Educational attainment** and **advanced skills** become more critical for robotics and automation technologies (e.g. Queretaro)
- Adoption of **3D printing technologies** expected to revolutionize business models and plant operations

To Think About?

- How will the identified trends impact Texas's transportation system?
- What is the role of TxDOT? (How should the agency prepare?)

3

TEXAS DEPARTMENT OF TRANSPORTATION

THE 2055 FREIGHT TRANSPORTATION SYSTEM

FREIGHT INDUSTRY PERSPECTIVES

[illegible]
C. Michael Walton
The University of Texas at Austin

Freight Industry Perspectives: Fortune 500 Companies

- Identified and contacted over 50 corporations
  - Fortune 500 companies headquartered both in and out of Texas
  - Corporations with significant Texas presence

Survey Questions & Response Themes

- How are the factors below included in current business models? How do they impact current business models?
  - Demographic factors
  - Global trade patterns
  - Environmental regulations
  - Technology

Survey Questions & Response Themes

- A range of factors were included depending on the type of company
  - Aging population cohorts were of concern
- Current business model usage included
  - Investments in technologies
  - Locations of business related facilities
  - Outsourcing decisions

Survey Questions & Response Themes

- How do the factors from previous question impact changes in:
  - Freight origins and destinations?
  - Routing patterns & modes used
  - Volume of freight
  - Value changes (e.g., costs, characteristics)

Survey Questions & Response Themes

- National and international freight origins and destinations
- Efforts made to limit distances that freight travels
- Within Texas
  - Trucking is primary mode
  - Desire for additional rail options
- Volumes
  - Impacted seasonally
  - Limitations between states and internationally
- Commodities cost increased (e.g., "$75/carton to $145/carton over the past 15 years")

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Q: What are the Future Needs of the Freight Transportation System Looking 40 Years Out?

- Business growth could lead to increased freight movement
- Desire for dedicated truck lanes/roadways
- Interest in long haul connected & autonomous trucks
- Interest in truck platooning

Q: What are the Future Needs of the Freight Transportation System Looking 40 Years Out?

- Interest in truck size & weight changes
- More efficient & safer vehicles
- Alternative fuel options for vehicles
- Impact of 3D printing?
- Limited impact from drone technologies

Next Steps & Lessons Learned

- Many corporations outsource freight transportation
  - Identify these corporations for future involvement
- Challenge was to identify correct corporate contact
- Assisted in expanded outreach (i.e., University of North Texas)

2

APPENDIX E – GROUP DISCUSSIONS

Group 1

Facilitators: Jolanda Prozzi, Megan Kenney

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Jose Grimaldo- University of North Texas
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Melissa Meyer- TxDOT
Rachel Connell- NASCO
Robert T. Sakowitz- E-ndeavor Program Management

Major factors and trends

- Shopping patterns: Online shopping (e.g., Amazon) requires delivery from UPS and FedEx. The point of sale for brick and mortar is changing with smaller deliveries from online sales.
    - Drones- Amazon might be using them in the future.
- Budgets and financing of TxDOT projects:
    - TxDOT has too much infrastructure and prioritizing projects is a challenge.
    - A comprehensive plan is needed.
    - Environmental permitting is becoming very difficult and regulatory requirements are becoming very burdensome. It is becoming very difficult to build infrastructure.
    - Support the user pays principle to fund infrastructure. Users need to continue to pay for infrastructure usage.
    - TxDOT has only recently begun looking at freight, commuter traffic, the Panama Canal, and other marine ports. Port Division only recently became a division of TxDOT.
    - Texas will be constrained because of large Panama Canal ships coming into the ports and congested access (rail and trucks) to the ports.

- Trends:
    - Walmart moved to the Port of Houston because of issues at the ports of Los Angeles /Long Beach.
    - Manufacturing reshoring is occurring in the US and not in China. Labor prices have increased in China, and in the next 40 years, those manufacturing jobs could move to Mexico from China (near shoring to Mexico). There is already congestion in Laredo.
    - Freight demand is driven by consumer goods, but not enough thought goes into bulk goods. Petroleum products are still a major export commodity and require access to highways and rail.
    - Panama Canal could have a dramatic impact on bulk exports in Texas. The Panama Canal could bring ships to the Port of Houston, but shipping lines are apprehensive. About 20 percent of unloaded goods at the Port of Houston stay in Houston, and these goods do not go beyond 200 miles from Houston. How will TxDOT facilitate the movement of these goods?
    - The Port of Saigon is looking for a home when the Panama Canal opens and is visiting a number of US sites. They visited the Port of Houston because the Panama Canal changes the efficiency and cost effectiveness for Vietnam and Thailand.

Dominant Trends

- Increasing conflict between freight and communities. For example, land use planning that allows community developments along rail corridors impacts rail operations. Rail crossings are built in high density urban areas. Conflicts are increasing as the state continues to grow.
- See increased public participation (especially in the regulatory environment) as people are becoming more sophisticated.
- Technology: Technology may allow people to travel less and thus alleviate commuter traffic. TxDOT needs to understand the interaction between commuters and freight.
    - Potentially more deliveries with smaller trucks in urban areas.
    - 3D printers could impact retail freight but will not have a big impact on most goods. All technology will be a game changer.
- Walmart plans ahead 5 to10 years and invests in “own” ports. Walmart anticipates an increased trend in grocery pick-up and online orders (i.e., multi-channel shopping).
- Engage millennials. Millennials are accepting and adopting new technologies faster (online ordering), but it is taking longer to develop and implement the needed transportation infrastructure to satisfy demand.
- Millennials moreover dictate how the supply chain moves and influence every component of the supply chain. The challenge is thus to keep up as technology changes.

What do the game changers mean for Texas' infrastructure and transportation system?

- More home deliveries could impact vehicle miles traveled and air quality in urban areas.
- Rural areas become concerned because urban areas are getting all the resources.
- Railroads need double tracks. Public agencies cannot fund the double tracking of railroads, but can help with the regulatory process. Regulations do not allow modes to be nimble and respond to increased demand quickly.
- Public agencies need to help with intermodal connectivity (specifically, connectors to ports and connectivity between major freight generators and the rest of the network).
- Intermodal connectors: cities are developing around major freight generators and corridors. Cities and counties have to pay for local roads but need a freight plan. There are 256 counties in Texas, and there no one is looking out for the greater good.
- It is difficult to build freight infrastructure, which has to be done in increasingly tight spaces. In Dallas/Fort Worth, many governments are competing for a piece of the pie.
- Coordinate better with Mexico. Mexican government is investing on the Mexican side of the border; need to understand the impacts on Texas' infrastructure.
- Texas' infrastructure bears most of the cost of NAFTA trade. We need better bridges, and have potholes.
- Truck only lanes on major corridors? Why not designate HOV lanes as truck only lanes?
- Night time travel and deliveries: McLane trucks do not travel during the day and drive only a night. Walmart delivers from 10:00 PM to 6:00 AM when the roads are not congested. Noise ordinances at night can be an issue.

What should be the role of TxDOT?

- TxDOT has to allocate funding for freight projects, with a dedicated, recurring funding source. Oregon has a Connect Oregon Program. It allocates $45 million per year to freight to serve as a catalyst for freight investments. It is in essence a state level TIGER program. The funding is obtained from lottery-backed bonds. The program identifies needs, establishes a planning framework, and aims to overcome the silo-based planning approach so common in freight planning.
- TxDOT has to become more of a facilitator of the development of Texas' transportation system.
    - Develop more infrastructure through Public Private Partnerships, with projects built by private sector. TxDOT has an office that handles comprehensive development agreements, but the Legislature has to vote on every one.
    - TxDOT should help the private industry with the Federal government, specifically where it comes to environmental regulations and permitting (e.g., NEPA compliance for rail projects). The delegation of some aspects of the environmental process to TxDOT is a good first step.
    - Bring multi-modal stakeholders together and facilitate discussions among different stakeholders. Local agencies should be provided a lump sum amount to

fund freight projects locally. TxDOT should focus on inter-regional connectivity, redundancy in the system, and last mile connectivity. Should focus on needs that might have been missed by individual modes or local agencies. For example, need to fund port access. Involve other states in the coordination also.
    - Use the strength of the market to set the price and user fees. Allow the market to dictate projects, priorities, and what is financed.
- TxDOT has to become the custodian (depository) and clearinghouse for big/massive data for freight (including maritime). Rail is more concerned about sharing data. The data could be used by the private sector and shared with the legislature, but more importantly it can be used to develop a dynamic predictive modeling system for Texas that will result in more robust freight planning. For example, what is TxDOT doing for congestion and bottlenecks? TxDOT should use big data to predict what the future will be.
- TxDOT has to become a multimodal agency.
    - Include rail at the table upfront in the discussion of proposed projects. More collaboration with the rail industry, however, requires a mutually trusting environment (i.e., no hidden agendas and a transparent agency).
    - Recognize that ports are part of the multi-modal solution. TxDOT needs to consider the role of the ports in diverting some trucks off the roads. Look at ports as multimodal facilities and not a separate mode and not just water. Help with port connectivity and adopt more of the European model. TxDOT should help Texas ports compete with other regions.
- TxDOT should educate the legislature and the public on the need for freight projects. US DOT reports that every person consumes 42 tons of freight per year.
    - Need information and education campaigns on important freight issues (e.g., freight impacts imposed by bridge clearance heights).
- TxDOT has to become more nimble. TxDOT moves slow and their technology is outdated. TxDOT needs to become more responsive and innovative.
    - Fund pilot freight studies that could be implemented at the local level.
    - The My35 concept (users receive a text when an accident happened on their mobile devices) should be expanded.
- TxDOT should have more authority to regulate:
    - Truck usage of SH 130.
    - Truck-only lanes.

Group 2

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Kim Sachtleben- Atkins
Michael Johnson- NCTCOG
Brenda Mainwaring- Union Pacific Railroad
Ron McGriff- Walmart
Roger Schiller- TxDOT

Major factors and trends

- Border crossings:
  - There is difficulty in getting both sides of the border (US and Mexico) to have the same hours of operation. This impacts cargo. If the hours of operation at ports of entry could be increased it would help facilitate trade.
  - Pharr has about two more hours of operations than other crossings, but there is still a need for an increase.
  - There is an effort being made in Tamaulipas to increase highway access on the Mexican side.
  - Rail crossings remain an issue.
  - Customs and Border Protection cannot get the hours that they need to handle freight.
  - It feels like Customs and Border Protection staffs "just under" what is needed.
  - If people want increased hours they have to pay for staffing.
- Population change:
  - A doubling of the population will require some multiplier of roadways for people (without even considering increased freight).
- Technology:
  - The game changer for travel capacity (daily travel) will have to be technology.
  - We cannot just keep doing what we are doing.
  - 3D printing will change the goods that are being transported (inputs for 3D printers such as plastics or metals).
- Funding:
  - Without changes in funding things are not going to change.
- Rail:
  - Having the railroads at the table is a recent phenomenon.

    - In terms of public policy, there is no priority on making rail an option for the future.
    - The public does not have a lot of control over rail, so they forget about it or they do not know how to consider it.
    - Policies at DOTs focus too much on highways and roads.
    - There is still an idea today that rail is "dying." It is not.
    - It is also politically difficult to spend public money on a private rail company.
    - There is often a need to expand roads, and they encroach on the right of way for rail.
- Demand for goods:
    - Amazon Prime is going to be a game changer for the future.
    - There is an increased demand for goods delivered FAST.
    - There is a big disconnect between demand and the desire for goods without thinking about freight and how goods get places.
    - Hopefully, wanting to receive merchandise so quickly helps bridge the knowledge and interest gap between the public and how goods move.
    - Are drones an actual option?
        - It is difficult to imagine drones in the near future because of legal and technological issues.
    - Uber-type delivery as well (non-professional drivers) is a game changer.
- Warehouses:
    - A lot of the innovation seems to happen in warehouses and private spaces. Amazon has robots "working" in their warehouses.
- Personal car usage:
    - What about changes in the way that people commute to work? Telecommuting, etc. It seems like there has not been a lot of talk on this.
    - Could telecommuting spread traffic out?
    - It seems like Millennials almost expect the right to telecommute, which could change things.
- Driverless cars and platooning:
    - Driverless cars could have an impact.
        - Being able to ride in a driverless car would make people mind travelling longer distance less.
        - It will probably be at least 50 years before this is an actual issue.
        - Driverless cars may be a solution for the current truck driver shortage.
        - What does the transition of having no driverless cars to all driverless cars look like?
        - You could have an HOV-type lane but only for driverless vehicles.
    - Platooning could also be an option.

        - There are multiples issues with platooning: 2 lane highways, how do they enter and exit, do they need truck-only lanes?
- Changes in freight volumes or values:
    - Increasing hours of operations at border crossings would hopefully lead to fewer emissions, lower costs, and less time waiting in the future.
    - There is a big change in origin and destination: the destination is now people's homes. This means that they need more distribution centers closer to people's homes.
    - Congestion could lead to decreased spending at more remote areas (e.g., if a store is located further than 20 minutes away). This could change urban or rural development patterns.
- Land use:
    - Not only in freight, but in general development, more developments include mixed use (e.g., apartments, transport, retail, and restaurants).
    - Freight should follow a similar model: where there are larger distribution centers located closer to urban areas with smaller distribution centers throughout urban areas.
    - The biggest challenge right now is home delivery and "last mile" delivery.
    - An idea is delivery boxes in a store or some other central location where people can collect items.
    - Also, mega distribution centers where companies can store much more than in a typical store.
- Predictability:
    - Predictability is important in shipping. There may be a tradeoff to a slower mode (ports versus land crossings). Will this option be attractive for Mexican manufacturers?
- Ports:
    - Possibility of ports working together under a state port authority or equivalent, so that ports can specialize instead of competing? Deemed highly unlikely.
    - Florida is an example of a state with a more collaborative relationship with ports, but it is also a very different state. Everyone is close to a coast and feels the impact of ports. In Texas, people in West Texas do not think ports matter.
    - The Gulf Intercoastal Waterway is also important, but it is constantly underfunded and the infrastructure is always insufficient (dredging, locks, etc.).
- Costs:
    - Costs to modernize to meet customer expectations are high.
- Rural needs:
    - In rural areas agriculture needs are important.
    - Fracking is also having a major impact on rural communities.

    - Walmart locates in any size community (Frankston, Texas has 1,400 people and has a Walmart).
- Walmart:
    - Piloting different size stores.
    - Customizing fleet as well (typical truck, sprinter van); using less than a truckload to deliver smaller amounts and doing multiple stops with large trucks.
    - Experimenting with compressed natural gas as a fuel.
- Fuel:
    - Fuel will be more diversified in the future.
    - Large companies are looking into different fuels currently.
    - Currently third party fuel and service alternative fuel vehicles.
    - Should TxDOT build these off-site fueling facilities? What is their role in alternative fuel infrastructure?
    - Many companies have asked NCTCOG to provide infrastructure (sites or fueling stations) with the promise that they will switch to alternative fuels.
    - Switching to alternative fuels will improve air quality. The volume of freight is not going to change.
    - Rail is looking into using LNG, but there are issues with having to carry the fuel on board. It comes down to economic issues.
    - Rail is the most fuel efficient mode.
    - Hydrogen locomotives and electric trains are never going to happen.
    - Safety issues or at least safety perceptions with using LNG. As is, transporting crude is being called a "bomb train." Imagine if rail used LNG.
- Air cargo:
    - Air cargo is decreasing as all other cargo is increasing.
    - With air cargo, last mile issues remain, and it is a very expensive mode to move freight.
    - Air cargo is often seen as a last resort for companies (e.g., in the case of port shutdowns on the West Coast).

Dominant trends

- More home deliveries will require more distribution centers closer to urban areas; central pick-up points could facilitate the personal deliveries.
- Mixed-use developments.
- New store formats; some companies are experimenting with smaller stores.
- A diversity of fuel options.
- Movement of freight by air will decline.
- More transportation funding sources are needed.

Impact on Texas businesses

- Companies will continue to deliver goods, but increased costs may be passed on to customers.
- Businesses will find a way to get goods where they need to be.

What do the game changers mean for Texas' infrastructure and transportation system?

- The I-45 corridor is a good example of looking at what needs to be done for the corridor in the future.
- Freight is a system.
- Houston and Dallas are examples of big producer and consumer markets.
- Rail needs to think about its role in the future: who will fill the role if trucks cannot move between Dallas and Houston?
- There is a rail line between Dallas and Houston, but there is not enough demand to use the line more than three times a week because customers want their goods the next day in Dallas or Houston. If companies could hold their goods, they could increase demand for that rail line.
- TxDOT needs to take the risk between transition periods (e.g., increasing the transport between Houston and Dallas).
- Inefficiencies, such as the rail line between Dallas and Houston, and the lack of 24 hour operations at ports of entry are a big issue.
- There is a big gap in knowledge and communication between stakeholders.
- The current system has some inefficiencies and could be used better. Let's not build stuff when we do not have to.
- DOTs often do not know how to deal with modes other than highways.
- Funding for multimodal projects is an issue.
- Texas needs investments where they are needed, not just for certain modes.
- What is the trend in terms of distribution centers?
    - The trend is toward more distribution centers. Larger ones, satellite centers, going to stores, and in the future going directly to your doorstep.
    - The company's long term goal is for customers to buy it the way they want it. In store pick-up, delivery, picking up at a depot, etc.
- Have to consider design issues. For example, will trucks coming into and out of a distribution center have to cross an at-grade rail crossing?
- In terms of toll roads, HOV lanes, etc., what is the role of the government and the private sector in terms of meeting transportation needs?
    - The most recent legislature was very anti-toll.
- Funding is a major issue.
    - If no one wants to raise the gas tax or find funding elsewhere, what will we do?
    - If we do not have enough money to maintain roads, how can we build things to accommodate future demand?

    - We need to find a way to pool public and private funds.
    - We are not going to be able to meet future demand with things as is.
    - All infrastructure is insufficient now.
    - We need simple, consistent, and transparent funding.
- Sustainability is important too.

What should be the role of TxDOT?

- An important role is education.
    - Need more emphasis on how important freight is.
    - Why is investing in modes other than highways important? How does that affect you getting to work or going to the movies? Make it more personal.
- Need better connectivity from the port to the highway.
    - First mile and last mile logistics.
- Need smart planning.
    - Vertical clearances on highways
    - Oversize/overweight: have at least one north-south, east-west route through the state.
- TxDOT has a plan to build an underground highway system in Houston.
- Need to factor in environmental factors, especially since weather conditions are changing.
    - A company elevated their rail tracks in the Midwest as much as 6 feet for 40 miles because of flooding.
    - Conservative political environment is definitely an issue in terms of environmental factors.
- What about safety?
    - Accidents of any kind slow freight down.
- The issue is not so much how long it takes to get from point A to point B but that travel time is consistent. That is where incidents play in.
- Developing alternate routes is important in case there is an accident. This is not always the case or possible.
- What is a *reasonable* expectation?
    - Is it TxDOT's responsibility to help Amazon deliver merchandise in 2 hours? I don't think so.
    - Maybe it is Amazon's responsibility to pay into the public good.
    - It will be interesting to see how public private partnerships play into this in the future.
    - Maybe there could even be a truck only lane that Amazon or whoever has to pay to use?

Group 3

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Richard Doran- J.B. Hunt
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Major factors and trends

- Border crossing times, staffing, and infrastructure at the border:
    - Sometimes you have the infrastructure, but you do not have the staff. There are only four rail crossings and the last one took 100 years to build. Mexico will remain a key trading partner.
    - Other ports of entry will be used as long as traffic flow is facilitated.
    - Continued growth in intermodal and rail cross-border traffic is expected.
    - Mexican reforms might impact the commodity mix of NAFTA trade.
    - Nearshoring trends will continue to be a key driver of NAFTA trade growth.
- Population changes will impact the movement of goods. As the population characteristics change, their consumption patterns will change.
    - Population growth:
        - Impact on vehicles miles traveled (VMT).
        - Impact on freight consumption patterns.
        - Immigration trends will persist (cannot stop the economic movement of people).
        - Road construction will follow urban growth (e.g. Midland, the Valley, etc.).
    - Cultural shift away from the car:
        - Increase in public transport, bikes, carpooling, etc.
        - Fewer cars on the road.
        - Land use patterns change.

        - Better quality of life.
    - Income:
        - Automation will keep displacing drivers, labor, and labors' income.
        - Millennials will face huge pension and Social Security risks/shortages.
        - Baby Boomers might see decreased pensions or will have to work longer before retiring.
- Funding mechanisms. There has been a backlash against tolling; nobody wants to pay. Two main scenarios were discussed:
    - No Funding:
        - Increase in congestion.
        - Increase in freight transportation costs pushing companies to seek alternative (out of state) locations with cheaper costs.
        - Reduced competitiveness.
        - Increased pollution.
        - Increased consumer costs.
        - Combination of public and private funding sources required.
    - Funding:
        - Better infrastructure.
        - Out-of-the-box solutions are more feasible.
        - More ports of entry, facilitating trade.
        - Improvements throughout urban areas; increasing accessibility.
    - The bureaucratic legislative burden has become excessive (e.g., overweight corridors, distance between axles, etc).
    - However, the administration of transportation by the private and public-private sectors has limitations.
- Trade pattern changes. The Panama Canal will be important not only for goods imported, but also for exports. Mexico's increasing role in manufacturing will impact the levels of trade moved on Texas roads. The supply of commodities will not keep pace with population growth, so scarcities are expected. This will impact:
    - Modes: Increased shift towards rail, pipeline, and post-Panamax ships to take advantage of their economies of scale.
    - Volumes and value: As recently experienced by the oil industry, volumes are a function of demand (i.e. price and the profitability of each commodity). High volatility in commodity prices might have an impact on the volumes demanded and the associated transportation requirements of each commodity.
- Technology will have an impact. It is not clear what the impacts will be, but everything points to faster deliveries.
    - Warehouses: More distribution centers will be developed in proximity to urban areas, particularly those with high demand through online orders.

    - Last mile: As a consequence, last mile delivery will become a key challenge for the logistics industry and third party logistic providers and also for TxDOT.
    - Driverless vehicles will become more common.
    - Uber for Freight: At some point in the future, the submission of trip requests for transportation of freight through mobile apps will become a prominent business model.
- Project development. At some point in the future, reducing project development times and streamlining the NEPA process will be required.
- TxDOT's role in the future. It will be more of a facilitator and some cost recovery mechanisms will have to be adopted. Planning to address changes in import/export patterns and transportation from an intermodal perspective for the overall transportation system, including the POEs.

Dominant trends

- Border crossing time and infrastructure is an ongoing issue.
- The population will impact the movement of goods.
- Funding issues.
- Trade pattern changes.
- New technologies could speed up delivery times.

Impact on Texas businesses

- If costs increase, businesses may leave for less expensive locations.
- Higher costs could be passed on to consumers.
- The Panama Canal will be important for imports and exports.
- More manufacturing in Mexico could impact the trade coming through Texas.
- Commodities could become scarce as the population increases rapidly.

What do the game changers mean for Texas' infrastructure and transportation system?

- More funding could increase the number of ports of entry and facilitate trade.
- Continued development and trade with Brazil, Russia, India, China, and other emerging markets will add pressure to Texas' land and ports of entry.

What should be the role of TxDOT?

- Be more of a facilitator.
- Plan to address changes in import/export patterns.
- Plan for an intermodal system and include Ports of Entry.
- Reduce project development times and streamline the NEPA process.

Group 4

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Major factors and trends

- Panama Canal
  - The focus has been on importing containers.
  - West Coast port dissatisfaction led to routing changes to Texas ports, with land shipments back to California and other states. Canada has become a port destination too.
    - Texas' consumable imports tend to stay within the state, while California exports to other US locations, which may change due to the West Coast port issues.
- Newer Mexican roadways have impacts on US roadways.
- International location policies have an impact on the State's needs.
  - Cuba is a factor in routing patterns.
- Funding
  - The funding structure may need to change.
  - We need proper and strategic allocations.
- Freight border crossings have issues
  - Crossings need to be faster with faster inspection process.
    - Technology is helping with this issue via thermal technologies and weigh-in-motion.
    - Provide empty freight trailers their own lane to re-enter to avoid the bottlenecks and not add to the congestion.
  - Funding concerns:
    - Infrastructure is old.

        - More lanes are needed.
        - Empower the border areas to address concerns and to spend money on the areas needed.
        - Eagle Ford Shale's spread into Mexico will make issues more pronounced.
- Focus on intermodal facilities
    - Global sourcing has led to oversize/overweight concerns.
    - Larger items are coming to ports.

Dominant trends

- Industry technologies.
- International events and policies.
- System efficiencies – includes operations, size & weight issues, Intelligent Transport Systems (ITS), freight tubes, and other developments.

Impact on Texas' businesses

- Could focus on exporting LNG through the Panama Canal.

What should be the role of TxDOT?

- Examine which roads Mexico invests in to better predict where Texas may see an increase in traffic.
- Take advantage of public-private partnerships, TIGER grants, and user fees to help pay for infrastructure.
    - Was done at the Port of Corpus Christi to fund rail yard expansion.
- Plan to address import/export changes associated with product trends (e.g., petrochemical industry).
- Increased involvement with corporations and stakeholders. Assist Texas ports with Intercoastal Waterways, and be a liaison with respect to the Army Corps of Engineers to get things done more efficiently.
- Must be multimodal in thinking.
- More follow-up with respect to international trends and border states (i.e., Oklahoma, Louisiana). Not just create reports that end up on shelves.
    - Implementable plans.
    - Better connections to personnel at other DOTs.
- Currently, funding levels are a function of congestion metrics, which does not incorporate connectivity of major corridor—an important feature for the network.
- Address redundancy and resiliency issues with the current roadway network.
    - Prioritize freight (as well as population) when allocating funding to address redundancies.
- Enhanced weigh-in-motion (WIM) deployment and usage, as well as electronic pre-clearance.
- Greater community outreach and education is needed.

- Use career fairs to inform people at all levels of employment within the transportation field.
- More effectively communicate the role of freight in today's society.

Group 5

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Linda de la Fuente- Hildago County MPO
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Major factors and trends

- Congestion: at what point will traffic lead to movement away from the area?
- Logistics concentrations (rail, road, air):
    - International inland port in Dallas/Fort Worth.
    - Hubs are forming in San Antonio and Houston.
    - Dense population areas solve problems.
    - Business is concentrating. Multimodal hubs are being developed.
- Technology: will be important to how we move freight.
- Infrastructure:
    - Will there be more rail? UP plans to build the largest North American rail hub. Rail had not seen the velocity increase that they expected from past improvements. The new bridge in Brownsville will help.
    - What is the state of the infrastructure in Texas?
- Transportation as a system:
    - Transportation needs to be considered across the entire supply chain.
    - Transportation is an integrated system (rail to truck, etc.).
    - Domestic intermodal has been growing in the US.
    - What is business moving to? How are they reacting to what they are seeing?
- Hazardous material transportation. Chemicals are imported and exported. Those chemicals should be tracked because it is important for public safety and environmental health.
- Rail: underutilized rail is being used more at certain ports.
- Demographics:

    - As people age, how does that change what they buy?
    - Younger people are buying more things online and expect things to arrive quickly, which might not always be sustainable.
    - Amazon has been buying more real estate to accommodate demand for small packages.
    - I buy 90% of my clothes (for myself and my family) through Amazon.
    - Amazon could use drones, which might not be feasible.
- Last mile delivery is an issue. Last Christmas there were UPS delays due to snowstorms. Home delivery is time-consuming, and access points other than homes are not available.
    - Last mile delivery increases the number of trucks on the road.
    - Last mile delivery is difficult in congested cities.
- Higher education is an issue. If people do not have good enough jobs, then they cannot spend more money on goods.
    - When Amazon came to DFW, the local community college had to show that it had the courses to support the workers needed.
    - There is a new supply chain management program at the University of Kansas.
- Jobs: a talent pool is missing. What about the jobs millionaires would not take?
- Consumer behavior and education: most consumers are concerned about whether something is on the shelf and how much it costs.
- Financing: the gas tax has not increased in 30 years? We need a financing model that supports the infrastructure requirements.
    - The funding source could change. When millionaires buy eclectic cars they are not supporting the gas tax.
    - A vehicle miles traveled fee would be better than a gas tax. People who drive more should pay more. This is not a politically popular option, but it would be more sustainable. Mass transit needs funding. We are trying to implement commuter rail. Most bridges in Texas are not in good condition. We need better long-term funding.

Dominant trends

- Financing is driving the problem now. The current funding does not cover maintenance.
- Congestion, sprawl, and population increase.
- Infrastructure capacity for all modes (which supports economic growth).
- Freight as a system: freight moves like water, and will look for underutilized capacity. Demand change and mode change are likely.
- Workforce development/education: we need people who understand what happens when you do not fund transport. Who will be the future transportation leaders?

Impact on Texas' businesses

- Funding:

    - Without enough funding, outsourcing occurs. Things get diverted. Facilities need on-ramps and off-ramps.
    - Private sector investment is also needed.
    - Railroads need tax incentives- tax incentives should encourage behavior we want (whether rail or CNG vehicles).
- Congestion/sprawl:
    - Can the workforce get to their employment center?
    - Exurbia- no one lives there, but it is a good place for a facility.
    - Government regulations may be a factor in why a company decides to locate in a community. Getting in and out of the airport and the ability to get direct flights are also concerns.
    - Where you are determines what vehicle you will use (certain trucks or facilities would not fit in certain areas) and also affects your schedule (more trucks move at night through the Dallas area).
    - US ports are not 24/7. Railways are 24/7. Freight should take advantage of underutilized times.
    - Retail deliveries can occur during off-peak hours. It is productive to make deliveries to a secure location, rather than having someone receive a delivery.
    - Congestion is driving carriers to shift modes. What does this mean for rural areas?
- Freight as a system:
    - Businesses like to have a tech-based system to provide different modal choices.
    - 25 percent of costs go toward logistics.
    - To drive across town, businesses need to have optimized routes.
    - Larger corporations are very focused on optimizing their logistics, smaller companies need to outsource that. Third party logistic providers and combining loads are useful.
    - The Port of Houston affects everyone.
- People/education:
    - Businesses send their workers to college to learn about the freight system.
    - People need to be excited about freight to want to be involved.
    - Warehouse work does not require much education, but pays pretty well.
    - Many people in rail are close to retirement. It is one of the highest paying blue collar jobs, good for people who only have a high school education, but it is tough work. How can you get young people to stay (work weekends, nights, and holidays)?
    - The younger workforce is more tech savvy, and industry needs to appeal to them.
    - Education materials need to be on laptops, not just in books.
    - There is a driver shortage in trucking.
    - People do not think about investments in ports or bridges in Mexico; they are just focused on what they need.

    - I do not think people understand the cost of delivering freight to them. People need to understand the cost of freight infrastructure.
    - Walmart had a commercial that explained that lower prices came from the efficient movement of goods

What do the game changers mean for Texas' infrastructure and transportation system?

- Costs will go up.
- Rail cannot self-finance itself.
- Increasing costs will have to be transferred to consumers.
- Maybe people will be willing to pay more if they understand the costs?
- Ports are locally financed. Dredging and maintenance are issues. A slow permitting process slows down the ability to make improvements. How can local industries be taxed to support infrastructure?

What should be the role of TxDOT?

- Assist with border crossing issues in Laredo.
- The transportation forum in January is useful.
- TxDOT should look at other modes besides highways (include water transport, ports).
- TxDOT is not just for buildings highways; more money could go to ports. It is the Department of Transportation, not the highway department.
- Educate the public and the workforce. Companies can sponsor education.
- The Texas Rail and Reinvestment Fund has not been capitalized. Freight and rail networks need to move away from the inner city.
- Support water transport, such as the Gulf Intercoastal Waterway. We can get trucks off the highway by incentivizing the movement of containers by barge, and they can be used for short distances (e.g., Beaumont to Houston).
    - Ports are losing depth. How do we dredge the existing channel? Heavier ships cannot get in. The US government has a harbor maintenance tax, but a lot of the money ends up in the general fund.
- TxDOT is an engine for economic development. It can be connected to workforce development.
- What does a cold storage facility at the airport mean for highway infrastructure?
- Container weight: other states allow slightly heavier containers. TxDOT should be more flexible because bridges can handle it. Longshoremen were opposed, and small towns were opposed because they did not want big trucks on their roads.
- TxDOT needs to facilitate a multimodal network. Connections between rail and roads are important.
- TxDOT can be a bridge between business and the legislature. TxDOT can join with the business community to get stuff that both want from the legislature.
- Freight does vote!

Group 6

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Phil McGuire- McGuire Transportation Co., Inc.

Robert Hooks- Southwest International Freight Services

Ron Johnston- TxDOT

Sonny Crenshaw- Walmart

Major factors and trends

- International trade and agreements:
    - Ports and funding: Lack of federal funding and state funding for improvement of ports is an issue.
    - Electronic facilities and x-rays should be implemented to reduce wait times at border crossings.
    - There is not enough compliance with automated commercial entry (ACE) protocol, especially from truckers entering from Mexico. Customs and Border Protection needs to offer more training and hands-on workshops.
    - US trucking, air, and rail are good, but maritime is at its lowest. Big shipping countries (Norway) get money from shipping companies. Maritime freight needs to be rejuvenated and shipping companies need to register in Texas.
    - Federal funding and state funding for ports is an issue. To attract alternative (private) funding you need to show return on investment. We are doing it in personal transportation with toll roads, why not ports?
- Technology
    - We need to get commuters off the road rather than increasing road capacity.

    - International travel time for containers will not change no matter what technology we are using.
    - Even if 3D printing becomes affordable, it may not shift traffic or freight off the road in the next 20 years.
    - If big data is not processed on-time for real-time decisions it does not help freight movement.
    - Automated trucks
        - If automated trucks show up in the near future, truck only lanes may be a better solution.
        - Automated trucks may improve efficiency on the TxDOT roads, especially long rural corridors (i.e., San Antonio to El Paso).
        - Insurance companies will not be interested in automated trucks until it becomes profitable and the norm.
        - Driverless trucks do not look like a possibility in urban areas.
- Maintenance of the shipping channel and storm surge protection are important.
- Marine transportation is highly underfunded federally and from the state.
- Non-peak-time traffic is going to increase, which could be a big issue.
- There is no state level funding for alternative transportation.

Dominant trends

- Use of technology for freight planning.

Impact on Texas' businesses

- Worker shortage:
    - The average truck driver is 47, and the average warehouse worker is 42.
- Traffic concerns:
    - Could incentivize alternative work weeks or alternative hours.

What do the game changers mean for Texas' infrastructure and transportation system?

- For Texas to be competitive, we need to make sure the state transportation system is efficient. Port efficiency does not stop at the dock but at the customer base.
- Freight planning should also consider rural areas where freight passes through in addition to borders.
- Getting more commuters off the roads will strengthen freight capacity.
- Ship channels need to be maintained and storm surge protection is also important.

What should be the role of TxDOT?

- Funding: TxDOT needs to obtain funding for building infrastructure. Funding is going to be a major issue when questions like the gas tax and tolls are not addressed.
- Planning:
    - TxDOT's planning and improvement program has a heavy focus on private commuters, there should be more of a focus on freight.

    - There needs to be more of a focus on freight in MPO and TxDOT planning.
    - How will the State Freight Plan be implemented at the local level?
- TxDOT needs to focus on maritime transportation. Substantial capital is needed to improve ports.
- TxDOT should make sure that our transportation system is consistent and reliable. Reliability is the key. For example, recently a large amount of freight shifted to the port of Houston from California because we were more reliable.
- Technology:
    - TxDOT should develop a dedicated app for freight traffic which could include weather, incidents, and crashes. The current signage does not provide sufficient and reliable information.
    - TxDOT should help the FAA write regulations for drones. Corridors can benefit from this technology.
- TxDOT has to fund and work with local metropolitan areas in improving infrastructure.
- TxDOT should not discount the role of technology in freight planning as it may be a game changer.
- Big data:
    - TxDOT should use its big data, but the information provided should be reliable.
    - TxDOT needs to analyze big data and take into account social media, etc. to make use of it in infrastructure planning.
- Environmental concerns:
    - TxDOT should develop a flood control plan. Regulatory measures should be taken so that developers using green space follow TxDOT's plan for drainage of flood water.
    - The impact of adverse environmental events on freight, ports, and roads needs to be studied.
- Commuter traffic:
    - There is a need for commuter rail for most city and inter-city travel. Start pursuing commuter rail as a state, which may take some traffic off the road.
- TxDOT can convert underutilized HOV lanes into dedicated truck lanes.