Federal Highway Administration (FHWA)

Scenario Planning Applications for Freight Transportation

July 30, 2014
1:00 – 2:30 pm ET
Webinar Agenda

• Overview of Scenario Planning
  – What is Scenario Planning?
  – FHWA / FTA Scenario Planning Program
  – Applying Scenario Planning for Freight Transportation

• Freight Transportation Scenario Planning Overview: Understanding the Possible Impact Factors
  – Dr. Chris Caplice, Massachusetts Institute of Technology

• Understanding Hypothetical Future Scenarios to Enhance Freight Transportation Planning – DOT/MPO Perspectives
  – Barbara Ivanov, Washington State Department of Transportation
  – Ted Dahlburg, Delaware Valley Regional Planning Commission

• Q&As / Discussion
What is Scenario Planning?

• Scenario planning is a process that **identifies, explores, and assesses future alternatives** for transportation, growth, land use, economic development, and other issues.

• Scenario planning **proactively engages stakeholders and the public**.
What are Some Benefits of Scenario Planning?

- Scenario planning can support:
  - More strategic transportation and land use decision-making.
  - Active stakeholder involvement.
  - Dialogue among transportation and land use professionals, and members of the community.
  - Consensus building.
MAP-21 Language

• (4) OPTIONAL SCENARIO DEVELOPMENT. —

(A) IN GENERAL.—A metropolitan planning organization may, while fitting the needs and complexity of its community, voluntarily elect to develop multiple scenarios for consideration as part of the development of the metropolitan transportation plan, in accordance with subparagraph (B).

- Subtitle B—Performance Management
SEC. 1201. METROPOLITAN TRANSPORTATION PLANNING
MAP-21 Performance Management

• **SEC. 1201. METROPOLITAN TRANSPORTATION PLANNING**

  Subparagraph B

  Recommended Components:

  • Regional investment strategies;
  • Population and employment;
  • Maintains or improves baseline conditions for the performance measures identified in subsection (h)(2);
  • Revenue constrained scenarios; and
  • Estimated costs and potential revenues available to support each scenario.
How Does FHWA Support Scenario Planning?

• FHWA / FTA Scenario Planning Program:
  – Sponsors scenario planning workshops and webinars.
  – Provides guidance and assistance to agencies using scenario planning.
  – Collects and shares innovative practices and lessons learned through case studies and research.
  – Provides information on tools and resources.

FHWA Scenario Planning Program Website: www.fhwa.dot.gov/Planning/scenplan/index.htm
Applying Scenario Planning to Freight Transportation

- It is important to understand how freight works when conducting freight scenario planning activities.
  - Freight transportation is multimodal and often long distance.
  - Freight transportation volumes are driven by company and ultimately consumer demand.
  - Freight transportation demand has a close tie to the types of land uses in communities and other locations.
Understanding Freight Scenario Planning Factors

• Freight transportation demand, while often consistent over time, can sometimes change significantly due to a variety of factors:
  – Natural or human-induced disasters or events
  – Macro-scale economic changes
  – Demographic changes
  – Political and/or regulatory changes
  – Infrastructure availability changes
  – Technological developments

• Understanding the factors that can impact freight transportation and the implications of changes related to those factors can enhance transportation planning efforts.
Resources

• FHWA Scenario Planning Website
  www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning

• FHWA-FTA Transportation Planning Capacity Building – Scenario Planning Website
  http://www.planning.dot.gov/scenario.asp

• FHWA Office of Freight Management and Operations
  http://www.ops.fhwa.dot.gov/freight/index.cfm
For Additional Information

FHWA/FTA Scenario Planning Program Contacts:

• FHWA Headquarters
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• FHWA Resource Center
  – Brian Betlyon at (410) 962-0086 or Brian.Betlyon@dot.gov
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FHWA Freight Contacts:

• FHWA Headquarters
  – Chip Millard at (202) 366-4415 or Carl.Millard@dot.gov

• FHWA Resource Center
  – Vidya Mysore at (404) 562-3929 or Vidya.Mysore@dot.gov
Future Freight Flows:
Using Scenario Planning to Assist in Long-Term Transportation Infrastructure Planning
NCHRP 20-83(1)

Dr. Chris Caplice
Executive Director, MIT CTL
Founder, MIT FreightLab
NCHRP 20-83(1) Project Objectives

• Two Objectives
  1. “Provide decision makers [state DOTs] with a critical analysis of the driving forces behind high-impact economic changes and business sourcing patterns that may effect the US freight transportation system [in the year 2030 & beyond].”
  2. “Better enable informed discussions of national, multi-state, state, and regional freight policy and system investment priorities.

• Two Key Lessons
  1. Macro-economic and technology forces are impossible to predict and can have tremendous impact on supply chains
  2. Preparing for potential effects is more effective than Predicting future events
But what about very long term (10+ years) planning?
Longer term planning is impacted by events

Our major limitation for planning

We all tend to be “Provincials in Time”

1. We look to the future through today’s lenses.
2. We forget how we got to today – it seems pre-ordained
3. We think today will go on for forever – change happens slowly
Classic Cases of Short Sightedness

Great Horse Manure Crisis of 1894

• More than 150,000 horses in NYC producing over 2,000 tons of manure per day
• Estimates of manure reaching 3rd floors by 1930 & nine feet in London by 1950
• 1st International Urban Planning Conference held in NYC in 1894

Interestingly, over 4000 cars were sold in the US in 1900. By 1916 more cars than horses were registered in NYC
Different Methods for Planning

Shift focus from prediction to preparation

But what about very long-term (10+ years) planning?
So many potential futures, so little time . . .
Preferred vs. Probable vs. Plausible

Possible Futures

Preferred Future - VISION
Probable Future - PREDICTION

Now

Because we can’t explore ALL possible futures, we must create a handful of plausible, alternative futures that together contain the most relevant uncertainty dimensions.
Scenario Planning

• **Criteria for a good set of scenarios**
  • Decision Making – capture right decision
  • Plausibility – within realistic limits
  • Alternatives – no favorites or preferred (Unofficial/Official)
  • Consistency – internal logic is aligned
  • Differentiation – structurally different
  • Memorability – easy to recall after event (name helps)
  • Challenge – push against established wisdom

• **Accuracy of event forecasting is not important**
  • The skill we are developing is preparation not predicting
  • The focus is on effects not on individual events
Translating Events into Effects:
Freight Flow Patterns

How can an event impact freight flows?

1. **Impact on sourcing patterns**
   - Where are raw products and WIP sourced from?
   - Are materials sourced in or out of the region?

2. **Impact on flow destination**
   - Where is the demand located? How are final destination locations distributed?

3. **Impact on routing**
   - How is freight moved within the region? Are there intermediate shipment points or mode switches?

4. **Impact on flow volume**
   - How will the total volume of freight shipped in and through the region change?

5. **Impact on value density**
   - How will the product characteristics change? How does the value density change?
The Real Value of Scenario Planning

• Forecasting Challenges
  • Without step changes, forecasting would be easy!
  • Step changes are driven by events, and . . .
  • Events are next to impossible to predict, but . . .
  • Planners do a pretty good job preparing, so . . .

Scenario planning allows us to shift from:

Predicting future Events

To

Preparing for potential Effects
So, what did we do?

We created four scenarios for November 2, 2037

Scenarios built from industry analysis, expert interviews, extensive surveying, etc.
Ran Six One-Day Workshops
Workshop Toolkit

A complete toolkit for using scenario planning.

Includes guidelines and all needed materials for designing, planning, and running scenario planning engagements.

http://www.trb.org/Main/Blurbs/168694.aspx
Workshop Structure

Introduction & Overview (ALL)

Global Marketplace

Naftastique!

Millions Of Markets

One World Order

Investments

Feedback &/or Evaluation

Debrief (ALL)

Scenario Immersion

Evaluation Mechanism

Convergence & Reconciliation

• No Brainers
• No Gainers
• No Regrets
• Contingencies
Tools for Immersion
Learnings

• Process & Method
  • Attendee selection is key – sets group dynamic for discussion
  • Group facilitation is the most critical skill
  • Positive/Negative voting mechanisms work
  • Immersion works with portfolio of collateral – videos especially

• Insights & Outcomes
  • System connections (intermodal) were always robust
  • Flexible use of existing facilities frequently robust

• Challenges to Overcome
  • How can we enable DOTs to conduct these workshops by themselves?
  • How can scenario planning be incorporated into existing processes?
Using Scenario Planning to Prepare for the Future: 
The Washington State Freight Plan

Barbara Ivanov
Washington State Department of Transportation
Freight Systems Division Director

FHWA Office of Planning and FHWA Office of Freight Management and Operations
“Scenario Planning Applications for Freight Transportation“ Webinar
July 30, 2014
What are the Goals of the Washington State Freight Mobility Plan?

The Washington State Freight Mobility Plan will develop and prioritize freight transportation system improvement strategies that support and enhance trade and sustainable economic growth, safety, the environment, and goods delivery needs in the state.

Through the State Freight Plan, the Washington State Department of Transportation (WSDOT) will:

• Meet federal MAP-21 guidance for State Freight Plans.

• Make a strong case for funding Washington state’s freight priority projects in future federal and state transportation budget bills and programs.

• Guide capital and operating investments in the state’s freight systems.
The 2014 Washington State Freight Plan Has:

1. Identified the Washington State Multimodal Freight Economic Corridors.

2. Integrated freight elements of other state transportation plans into one multi-modal freight plan.

3. Set measurable freight performance goals for the State Truck and Waterway Freight Economic Corridors.

4. Developed and tested methods to analyze the economic impacts of truck freight improvements on highways.

5. Systematically analyzed current performance gaps and needs on highways in State Truck Freight Economic Corridors.

6. **Tested Freight Analysis Framework (FAF) forecasts against the results of near-term trends analysis, and used scenario planning to prepare for the long-term.**

7. Developed a new process to include Tribal, Metropolitan Planning Organization (MPO), Regional Transportation Planning Organization (RTPO), port and state freight strategies to improve performance on the Washington State Economic Freight Corridors in the Plan.
Why Are Freight Trade Forecasts Always Wrong?

- Trade forecasts take historical economic trends and project them forward based on a set growth rate. But we are planning transportation projects that won’t be built for 10 years or more, and are then used for another 50 years.

- Think about global economic conditions 60 years ago. In 1954 did anyone imagine how trade lanes would connect the global economy in 2014? Or which industries would drive the U.S. economy?

- In the next 60 years it is likely that U.S. and global industries and economic centers will reorganize, collapse, grow in unknown areas and radically change.

- When we predict we often focus on our preferred future, what we want to have happen, instead of other possibilities.

How can we know where to invest today to meet industries’ future needs?
How Did WSDOT Use Scenario Planning for the Freight Plan?

- We used scenario planning to prepare for long-term (30-year) freight demand, not to predict it.

- We immersed over 60 attendees at a statewide Future of Freight workshop in four different long-range scenarios:
  - **One World Order** - A highly-regulated green world
  - **Naftastique!** - A North American trading bloc
  - **Technology Savior** – A world of plenty
  - **Global Marketplace** – Global free trade, much like today

- It doesn’t matter if the scenarios don’t happen as imagined. Remember we’re not predicting, we’re learning to prepare for multiple possible futures.

- We did not focus on particular events, but on the effects of many possible events.
What Happened at the WSDOT Freight Scenario Planning Workshop?

- Attendees considered how their scenario would impact demand on the state’s multimodal freight corridors, and selected key corridors that would matter most in their future world.

- There are only five supply chain outcomes any event can impact:
  1. Sourcing patterns
  2. Freight flow destination
  3. Routing – choice of trade lanes
  4. Freight flow volume
  5. Value density (the value of goods per ton shipped)

- Participants also discussed potential investment ‘bundles’ to meet demand:
  - Land use solutions
  - Policy and regulatory initiatives
  - Infrastructure
  - Operational improvements
How Did WSDOT Combine the Power of Scenario Planning with a Trends Analysis in the Freight Plan?

- **Long-term Scenario Planning for Freight Systems:**
  
  - As an example, the FHWA Freight Analysis Framework (FAF) forecast predicts that rapid truck growth along the north-south Interstate-5 corridor will continue to be the dominant trend in Washington State. Viewed in 2014, this appears to be the only possible outcome.

  - However, the scenario workshop caused highway-centric participants to grasp how demand on the east-west transcontinental freight rail, intermodal and waterway systems will be in the forefront no matter what actually occurs in the next 20 years; whether:
    - Governmental regimes enforce much stricter environmental policies,
    - U.S. trade is not focused on China, but within the NAFTA trading block, or
    - Advances in technology disburse goods production and produced material abundance.
How Did WSDOT Analyze Near-term Industry Trends?

- WSDOT interviewed over 150 shippers, goods receivers and carriers across the state to understand near-term (six-year) industry trends.

- Interviewing people with deep expertise in manufacturing, agribusiness, construction, and retail-wholesale trade gives us a much better understanding of demand trends.

- Information from those interviews provide the ‘sensors in the ground’ we need to see if the world is actually moving towards an imagined long-term scenario, and lean into preparing for it.
WSDOT Used Near-term Industry Trends To Test Straight Growth Projections

We also used the trends analysis to test assumptions in the Freight Plan’s 20-year Forecasts, and to identify a range of forecasted demand.

Truck Forecast in Washington State:
FAF projection overlaid with results of WSDOT’s Trends Analysis
What Lessons Did We Learn?

- Although a large scenario planning workshop brings in multiple points of view, several smaller events with higher-level industry supply chain experts may provide better information. The value of scenario planning is completely reliant on the level of attendees’ expertise.

- To deliver value to State Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) we need to develop business processes along the critical decision path that make use of this new knowledge.

- Under the Moving Ahead for Progress in the 21st Century (MAP-21) Act, FHWA guidance for State Freight Plans calls for a 20-year forecast of freight demand and recommends that it be based on FHWA’s forecast. FHWA could consider more sophisticated planning tools in future guidance.

- DOTs and MPOs need research into how and when to integrate information from freight forecasts, trends analysis, and scenario planning to help us understand where to invest today.
We’re very interested in your feedback.

Questions?

For more information, please contact:
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Washington State Freight Mobility Plan website:
http://www.wsdot.wa.gov/Freight/freightmobilityplan
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Ted Dahlburg
Delaware Valley Regional Planning Commission
Delaware Valley Regional Planning Commission

- Serves as the officially designated MPO for the Philadelphia-Camden-Trenton region
- Serves the 6th largest U.S. metropolitan area with 5.4 million residents
- Works collaboratively with 3 state DOTs and several adjacent MPOs highly active in freight planning
Workshop Purpose*

- Promote understanding of global freight forces and trends
- Foster public-private cooperation and partnerships
- Reinforce the linkage of land use and transportation
- Lay the groundwork to fund freight projects and projects that help freight move
- Derive results to guide future MPO freight planning activities

*As established by DVRPC for the November 4, 2010 workshop
Attendance Highlights
Investment Bundles
Synthesized Voting Themes

• Invest in a multi-modal transportation system.
• Emphasize north-south Interstate highways over east-west Interstate highways.
• Emphasize interstate highway and rail facilities over local/regional highway and rail facilities.
• Fortify connectors to both intermodal facilities and industrial centers.
DVRPC Freight Mapping Tool
Ports/Waterways

River (Delaware + Schuykill)
Capacity: Channel Depth, Width, Air Draft
Activity: Ship Count

Anchorages
Capacity: Length
Activity: Annual Ships

Port Terminals
Capacity: Berths- count, length, depth;
Cranes, Warehouse, Acres
Activity: Ship Arrivals
Data Interface
North-South Interstate Highways
Performance Measures

Planning time index on I-95 between I-676/US-30/Exit 22 and PA-63/Woodhaven Rd/Exit 35
Averaged by 1 hour for 2013 (every weekday) and for 2012 (every weekday)

Southbound

The total travel time that should be planned when an adequate buffer time is included (95% Travel Time / Free-flow Travel Time).

0 | 1.2 | 1.5 | 2 | 2.5 | 3
Connectors: Intermodal Facilities

**PA**
- Keystone Industrial Port Complex
- Morrisville Intermodal Yard
- Tioga Marine Terminal
- South Philadelphia Freight Complex
- CSX TransfLO Facility
- Philadelphia Intl. Airport
- Penn Terminals
- CSX Twin Oaks

**NJ**
- Petty’s Island
- Beckett Street Terminal
- Broadway Terminal and Gloucester Marine Terminal
Connectors: Freight Centers

FIGURE 5: DELAWARE VALLEY FREIGHT CENTERS

Freight Center
- Intermediate Freight Center: 250 - 999 Acres
- Major Freight Center: 1,000 - 1,499 Acres
- Mega Freight Center: 1,500 Acres
Freight Rail Research
Commodity Profile

Crude in the Delaware Valley

- 95% imported crude
  1. Nigeria
  2. Saudi Arabia
  3. North Sea

2005 peak of refining in the region

2006 to 2014 increasing fuel economy, fewer vehicle miles traveled, cheaper domestic crude

2014 diversified sourcing

- 48% Bakken crude
  1. Bakken
  2. Africa
  3. North Sea
Freight Scenario Planning
Benefits and Lessons

• Promotes education of unique freight system needs
• Instills greater awareness of global forces and broader perspectives
• Fosters new planning partners
• Can be used to integrate freight into “the bigger picture”
Thank You!

Questions?

For more Information, please contact:
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DVRPC’s Freight Planning website:
**http://www.dvrpc.org/Freight/**