Future Freight Flows
NCHRP 20-83-01

AASHTO Research Advisory Committee & TRB State Representatives Annual Meeting

27 July 2011
Salt Lake City, UT

Dr. Chris Caplice
Executive Director, MIT CTL
What I’m talking about . . .

- What is NCHRP 20-83-1 – Future Freight Flows?
- Why Scenario Planning and what is it?
- What scenarios did we create?
- How did we use them?
- What have we learned so far?
NCHRP 20-83(1) Project Objectives

• Two Objectives:
  • “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].”
  • “Better enable informed discussions of national, multi-state, state, and regional freight policy and system investment priorities.”

• Three Key Deliverables:
  • Develop a set of Future Freight Flow scenarios
  • Validate scenarios and process in 6 workshops across the US
  • Develop “Scenario Planning in a Box” for any DOT to use
Different Methods for Planning

But what about very long term (10 to 30+ years) planning?

Material adapted from Dr. Mahender Singh SC2020
Longer term planning is impacted by events

Different Methods for Planning

Shift focus from prediction to preparation

Material adapted from Dr. Mahender Singh SC2020
So many potential futures, so little time . . .
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
Effects versus Events

14 April 2010
Eruption of the Eyjafjallajökull Volcano

Summer 2008
Manufacturing moratorium in Beijing
Translating *Events* into *Effects*

Freight Flow Patterns

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

Impact on flow destination
Where is the demand located? How are final destination locations distributed?

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

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

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
Future Freight Flow Scenarios

We created 4 FFF scenarios for November 2, 2037

ONE WORLD ORDER

MILLIONS OF MARKETS

Naftástique!

Global Marketplace
## Differences Between Scenarios

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
<th>High</th>
<th>Low (physical)</th>
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<tbody>
<tr>
<td><strong>Global Trade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Resource Availability</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Energy Cost Level</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Energy Cost Variability</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Level of Environmental Awareness</td>
<td>Same as Today</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Population Dispersion</td>
<td>Growth in SW</td>
<td>Growth in Biggest Cities</td>
<td>Growth in Biggest Cities</td>
<td>Rise in Mid Tiered Cities</td>
</tr>
<tr>
<td>Energy Sources</td>
<td>Majority NA</td>
<td>Mix Foreign &amp; Domestic</td>
<td>Majority Foreign</td>
<td>Majority Domestic</td>
</tr>
<tr>
<td>Level of Migration</td>
<td>High w/in Bloc, Low between</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Migration Policy</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Currency Fluctuations</td>
<td>Low w/in Bloc</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
</tbody>
</table>

*Italics: indirect effect*
Key Ideas

Fast paced, Interconnected, Chaotic, Minimal Government intervention, Commercial

Heavy handed, Regulated trade, Slower pace, Feel of 1970’s PBS broadcast, Strong government

Self-Reliance, Merging cultures, Trading Blocs, Re-domestication of manufacturing

Mfg. clusters close to consumption, Dispersed demographics, Energy renaissance
So, what do we do with the scenarios?

- **Use them in workshops**
  - Invite a diverse set of stakeholders
    - Private Sector: shippers, carriers, 3PLs
    - Public Sector: from Federal, state, & local levels
  - Have them consider a set of strategic options or alternatives
    - Set of potential investments
    - Potential freight corridors
    - Open-ended set of themes to prioritize

- **Validated in 6 workshops held across country**
  - Delaware Valley Regional Planning Commission
  - Minnesota DOT
  - Washington State DOT
  - Port of Long Beach
  - Georgia DOT
  - Washington DC
FFF Workshop Structure

Introduction & Overview (ALL)

- Global Marketplace
- Naftastique!
- Millions Of Markets
- One World Order

Segments

Feedback &/or Evaluation

Debrief (ALL)

- No Brainers
- No Gainers
- No Regrets
- Contingencies

Scenario Immersion

Evaluation Mechanism

Convergence & Reconciliation
National Workshop: Infrastructure Components

- **Gateways**
  - East Coast Water Ports
  - Gulf Coast Water Ports
  - West Coast Water Ports
  - Border Crossing: Mexico
  - Border Crossing: Canada
  - International Airports

- **Corridors**
  - Gateways to/from Population Centers
  - Gateways to/from Production Locations
  - Population Centers to/from Production Locations

- **Connectors**
  - Gateway to Corridor Connections
  - Intermodal Connections
  - Feeder Lines to Corridor
Q1. Priority of Federal Funding TODAY for 2037

- **Individual Component Voting**
  - 15 chips per person
    - 12 Invest Chips (red or white – color does not matter)
    - 3 Veto Chips (Black with Skull & Crossbones)
  - More invest points = more important in scenario
  - You must use all 12 of your invest chips
  - You must use at least 1 veto chip but no more than 3
  - You cannot have both Invest and Veto chips on same segment
  - You may place invest chips on non-listed initiatives (write in)

- **Team Segment Voting**
  - After discussion, you may change your own votes
  - Teams can have both Invest and Veto chips on same bundle
All scenarios: Q1 Voting results
Initial Learnings

• Process & Method
  • Attendee selection is key – group dynamic dictates discussion level
  • Group facilitation is the most critical skill
  • Positive/Negative voting mechanisms work
  • Immersion works with portfolio of collateral – videos especially
  • Debrief in same day is difficult – and not totally worthwhile

• Insights & Outcomes
  • System connections (intermodal) were always robust
  • Flexible use of existing facilities frequently robust
  • Global Marketplace – viewed as most like today and most probable
  • One World Order & Naftastique! as “evolutionary”
  • Millions of Markets – revolutionary and most drastic future

• Challenges
  • Can DOTs conduct these workshops by themselves?
  • How can this be incorporated into the existing planning process?
  • Is it even worth the effort?
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