Freight Data and Analysis in the New Millennium

presentation for

Data Needs in the Changing World of Logistics and Freight Transportation

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Goals for the Conference

• Primary
  – Research recommendations for TRB, FHWA, and BTS
  – Priorities and strategies for improved data collection
  – Better use of available analysis tools

• Secondary
  – Overview of freight transportation and its regional impact
  – Availability of regional and national data
  – Data requirements to support policy makers
  – Existing and future analytical and forecasting capabilities
  – New actions and strategies to obtain data and enhance analysis
Lessons Learned #1 – NYC Freight Arteries

- Goal: Freight-related investments
- Steps
  - Estimate flows
  - Identify investments
- Network
  - 43,000 links (86,000 arcs), 26,000 nodes
  - 3 link classes (allowed, restricted, prohibited)
  - 3 link attributes: travel time, length, generalized cost
- Zones
  - 410 truck zones (160,000 OD pairs)
  - Based on 3600 “auto” zones
- Flow projections
  - Total daily flows
  - One truck type
The network is huge
Data are very sparse

- 4500 OD flow observations
  - Surveys
  - Prior studies
- 820 originating or terminating observations
  - Estimates based on employment
- 350 arc volume observations
  - Observations
  - Estimates based on link data (e.g., AADT’s)
- 120 screenline observations
  - Observations from traffic counts

5790 observations for predicting 160,000 flows!!

Implication: lots of OD matrices are possible!!
But you can match the observed data
And project reasonable flows
And assess capacity needs
But more data would really be valuable

- Link volumes (24 hour, truck class, truck type, loaded/unloaded, commodity)
- Trips (origin, destination, frequency, commodity)
- Network status (capacity, operational configuration, maintenance status)
Lessons Learned #2 – Peace Bridge

- ITS investments
- Benefit projections
- Simulation
We could collect the data

- **Arrival rates**
  - Empty/monthly/in-transit (33%)
  - C4 (39%)
  - Other (28%)

- **Primary inspection**

- **Primary failure rates**
  - Empty/monthly/in-transit (~0%)
  - C4 (~0%)
  - Other (~89%)

- **Secondary inspection**
And we did get results

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Sys-90</th>
<th>Sys-Avg</th>
<th>Pri-90</th>
<th>Pri-Avg</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>2217.0</td>
<td>810.1</td>
<td>511.7</td>
<td>278.5</td>
<td>98</td>
</tr>
<tr>
<td>Low</td>
<td>613.0</td>
<td>388.9</td>
<td>418.0</td>
<td>218.5</td>
<td>30</td>
</tr>
<tr>
<td>High</td>
<td>392.3</td>
<td>353.8</td>
<td>280.7</td>
<td>160.9</td>
<td>31</td>
</tr>
</tbody>
</table>
That showed substantial benefits.
But data collection was tedious

- Inputs needed
  - Volumes
  - Service times
  - Inspection/toll booth operating plan

- Sources
  - Standing in the inspection booths
  - Watching videotapes
  - Processing databases from the deployment test
Lessons Learned #3 – Air Cargo

- Assess market penetration in air cargo
- For Nanjing-Lukou International Airport
We could build an international network
And a local network

[Diagram showing network connections between cities like Lukou, Nanjing-Shanghai Economic Region, Wuxi, Suzhou, Shanghai, and Pudong, with arrows indicating directions and shipments.]
And predict market penetration
But data assembly was a huge effort

- No single source of data was available
- The data for flows was very difficult to analyze
- Very little, if any information existed about flights and flight patterns
- And there was almost no information about carrier operating plans

Asiana Airlines will inaugurate SEL/NKG DIRECT 74F ON 16MAY twice a week. Now, you can transport your cargo safer and faster between SEOUL and NANJING related with present SEL/SHA flight.

1. SEL→NKG FLIGHT SCHEDULE FLIGHTER NBR ETD ETA DAY A/C TYPE OZ389 08:30 09:40 3 B74F OZ389 09:35 10:45 7 B74F
2. NKG→SEL FLIGHT SCHEDULE FLIGHTER NBR ETD ETA DAY A/C TYPE OZ390 11:40 14:40 3 B74F OZ390 12:45 15:45 7 B74F
Where’s the hope?

- Transportation informatics
- Smart vehicles (GPS, transponders, etc.)
- Smart facilities
- IT-equipped packages and travelers
- Ubiquitous, wireless IT network
- Robust, highly distributed command and control systems
- On-line and off-line tied-in planning and control systems
What can we conclude?

- Research recommendations for TRB, FHWA, and BTS
  - Better understand why the data are needed
  - Develop new sensors, wireless communication networks
  - Radically different, IT based data collection techniques
- Priorities and strategies for improved data collection
  - Partner with the MPO’s, Customs, etc.
  - Highly distributed, highly coordinated effort
  - Get into the E-Business
- Better use of available analysis tools
  - Capacity investment decision making
  - Network security assurance
  - Design guidelines
What can we conclude?

- Availability of regional and national data
  - Presently poor, more is needed, capitalize on ITS
- Data requirements to support policy makers
  - Flows, volumes, capacities, operational restrictions
- Existing and future analytical and forecasting capabilities
  - Capacity investments, real-time flow management, network robustness
- New actions and strategies to obtain data and enhance analysis
  - Sensors, instrumentation, wireless communications, E-Business