Conference Synthesis

Saratoga Springs, New York, USA | November 14 - 15, 2001

Data Needs in the Changing World of Logistics and Freight Transportation

Conference Organizers:

New York State Department of Transportation (NYSDOT)
Transportation Research Board - Freight Transportation Data Committee (A1B09)

Supporting Sponsors:

Bureau of Transportation Statistics (BTS)
Federal Highway Administration (FHWA)
American Association of State Highway & Transportation Officials (AASHTO)
Northeast Association of State Transportation Officials (NASTO)

Data Needs in the Changing World of Logistics and Freight Transportation

Conference Convenors:

Joseph Boardman, Commissioner (New York State Department of Transportation - NYSDOT)
Thomas Palmerlee, (Transportation Research Board - TRB)

Conference Organizers:

Lou Adams (NYSDOT)
Richard Albertin (NYSDOT)
Nathan Erlbaum (NYSDOT)
Jay Higle (NYSDOT)
Art Hombach (NYSDOT)
Thomas Palmerlee (TRB)
John Shufon (NYSDOT)

Panel Chairs:

Paul Bingham, DRI-WEFA
Christina Casgar, Foundation for Intermodal Research and Education (FIRE)
Rick Donnelly, PB Consult
C. Michael Walton, University of Texas at Austin

Luncheon Keynote Speaker:

Michael Gallis, Michael Gallis & Associates

Speakers and Panelists:

Paul Bingham, DRI-WEFA
Joseph Boardman, NYSDOT
Christina Casgar, FIRE
Paul Ciannavei, Reebie Associates
Robert Costello, American Trucking Association
Richard Donnelly, PB Consult
Nathan Erlbaum, NYSDOT
Julius Gorys, Ontario Transport Ministry
Lance Grenzeback, Cambridge Systematics
Susan Lahsene, Port of Portland, Oregon
Bruce Lambert, Federal Highway Administration (FHWA)
Susan Lapham, Bureau of Transportation Statistics (BTS)
Catherine Lawson, SUNY Albany
George List, Rensselaer Polytechnic Institute (RPI)
Ashish Sen, Bureau of Transportation Statistics (BTS)
Frank Southworth, Oak Ridge National Labs (ORNL)
C. Michael Walton, University of Texas at Austin
Glen Weisbrod, Economic Development Research Group

Recorders:

Paul Bingham, DRI-WEFA
Ed Christopher, Federal Highway Administration, (FHWA)
Catherine Lawson, State University of New York at Albany
Ron Tweedie, Consultant

Please note: The complete list of conference participants appears in Appendix 5.

This Synthesis, as well as additional material on conference presentations, can be found in the following web site: www.dot.state.ny.us

Data Needs in the Changing World of Logistics and Freight Transportation

CONFERENCE SYNTHESIS

Compiled and edited by

Arnim H. Meyburg and John R. Mbwana

Transportation Infrastructure Research Consortium

Cornell University

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This synthesis highlights those issues and priorities that represent some degree of consensus among the conference participants. Naturally, not all viewpoints and suggestions could be incorporated. Appendices 2 and 3 contain a number of additional thoughts and suggestions expressed by participants.

The editors are solely responsible for any inadvertent misrepresentations or omissions.

Data Needs in the Changing World of Logistics and Freight Transportation

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AFS	American Freight Survey
ALMIS	American Labor Market Information System
ATA	American Trucking Association
BEA	Business Economic Area
BTS	Bureau of Transportation Statistics
CCMTA	Canadian Conference of Motor Transport Administrators
CD	Compact Disk
CFS	Commodity Flow Survey
CIA	Central Intelligence Agency
CLM	Council of Logistic Management
CUNY	City University of New York
D.C.	District of Columbia
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
DRI-WEFA	Data Resources, Incorporated and Wharton Econometric Forecasting Associates
E-Business	Electronic Business
FAF	Freight Analysis Framework
FHWA	Federal Highway Administration
FIRE	Foundation for Intermodal Research and Education
GIS	Geographic Information System
GPS	Global Positioning System
HH	Household
I-O	Input-Output
IT	Information Technology
ITS	Intelligent Transportation Systems
JIT	Just-in-Time
MPO	Metropolitan Planning Organization
NAFTA	North American Free Trade Agreement

NAICS	North American Industry Classification System
NASTO	Northeast Association of State Transportation Officials
NDC	Navigation Data Center
NY	New York
NYS	New York State
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
O-D or OD	Origin-Destination
ORNL	Oak Ridge National Laboratory
PC	Personal Computer
R&D	Research and Development
RPI	Rensselaer Polytechnic Institute
SESA	State Employment Security Agency
SIA	Spatial Interaction
SIC	Standard Industrial Classification
STB	Surface Transportation Board
SUNY	State University of New York
TEA-21	Transportation Equity Act for the 21st. Century
TIRC	Transportation Infrastructure Research Consortium
TRB	Transportation Research Board
TSFD	Trans-border Surface Freight Data
UPS	United Parcel Service
US	United States
USA	United States of America
USDOT	United States Department of Transportation
VIUS	Vehicle Inventory and Use Survey

Foreword

Complexity of the Changing World Economy

The challenges of global economic competition are making efforts to manage the intermodal freight transportation system tremendously complex. These challenges demand reliable information on regional, national and international freight distribution that is not readily available today.

The world economy is changing dramatically. Understanding how these changes impact the state, region, nation and continent is critical to an expanding economic role for the Northeast. This conference was convened to identify critical freight transportation data needs, to determine what data should be collected, and resolve how we can use that data to promote integrity in our transportation system for the future. Reliable transportation data is needed to guide future investments in our freight transportation infrastructure, and to convince our political leaders and other stakeholders across the country where key investments should be made.

State DOTs traditionally have not been attuned to the global situation. Rather, their emphasis has been understandably on maintaining the current transportation network. Now, in order to compete in an increasingly challenging business environment, it is imperative that state economic development partners focus beyond existing boundaries to better understand changing freight patterns in the global economy.

Value of Understanding Shifting Economic Trends

Reliable and timely data are essential to answering critical questions such as these:

- How should decisions regarding transportation investments be made to improve economic development?
- How are the shifting trade routes and global trends affecting the economy in the US, Northeast, and New York State?
- What proactive transportation measures should state DOTs put in place in order to be competitive and to prepare for the global changes?

New partnerships are needed between NYSDOT, industry and our neighbors to provide better customer service based on real data and accurate information. Unfortunately, an increasing amount of necessary information on regional, national and international freight distribution is not readily available. With customers demanding that their goods be shipped faster and cheaper, North American industry had responded to this challenge by improving supply patterns. As "just-in-time shipping" has become a way of life, the transportation sector now has a stronger-than-ever interest in reliable service. Accurate and timely data and information have become a critical part of the transportation infrastructure. The process of regional cooperation to understand trends and to take joint action in response to the emerging importance of freight transportation data is the key follow-up action for all involved.

Importance of Partnership-Balancing Cooperation and Competition

There have been ongoing discussions with our partners and neighbors to evaluate the future impact of the global economic systems on freight transportation. NYSDOT's leadership

has focused on what freight transportation improvements could result in a better linking of NAFTA shipments, thus making the New York State and Northeast transportation network an effective contributor to the NAFTA corridors. For this to happen, the Northeast must demonstrate that the Montreal-Boston-New York-Washington corridor (and the states in between with all of their intermodal connections) is critical to the future health of the USA and Canadian economies.

Examination of the international freight picture reveals a very competitive situation between the Northeast gateways and other US gateways. There is heavy truck traffic from Canada coming into the East, and even more truck traffic from Mexico flowing largely into the East, as well as the Midwest. When the corridors and borders program was put together in TEA-21, the Northeast was designated with only a minimal portion of the high priority corridors, though it is the East that has had to accommodate the greatest amount of truck shipping activity. This has caused a great deal of concern at NYSDOT, as it should for the Northeast region in general, because this reflects the national thinking that the prominent NAFTA corridor from Canada lies to the west through Michigan. If the Northeast states are to succeed in getting adequate consideration for their border crossings that serve the East Coast metropolitan areas, accurate strategic freight shipping data are critical to make our case and ensure that the Northeast remains competitive.

It is also important to point out that this is not just a New York or a Northeast concern; it is a national concern. For example, the East Coast and the Northeast through to the upper Midwest is a corridor for heavy Canadian truck traffic. In a densely populated Northeast we need to know where and how to prioritize our transportation projects. Today, it is essential that Northeast transportation agencies collectively determine what priorities should be emphasized, not only to support economic development, but also to ensure national security in light of the September 11, 2001 World Trade Center attacks.

Shared Commitment to Northeast Economic Development

We appreciate the contributions of the USDOT's Bureau of Transportation Statistics (BTS), the National Research Council's Transportation Research Board (TRB) and our friends from Ontario and Quebec, who all were instrumental to the success of this conference. We seek a commitment from all involved to develop an action plan that will identify the areas where these partnerships can best be used to support the growth of the Northeast economy. We particularly extend our heartfelt thanks to the TRB and the BTS for professional assistance in developing and sponsoring the program. The successful outcome of the action plan resulting from the partnerships forged here in this conference will be in large part the result of your tremendous leadership on these issues. Thank you all for participating in this effort.

Joseph Boardman
Commissioner
New York State Department of Transportation
Albany, NY

Executive Summary

A conference entitled "Data Needs in the Changing World of Logistics and Freight Transportation" was held November 14-15, 2001 in Saratoga Springs, NY. The conference was sponsored by New York State Department of Transportation, Transportation Research Board, Bureau of Transportation Statistics, Federal Highway Administration, American Association of State Highway and Transportation Officials, and Northeast Association of State Transportation Officials.

The main objective of this conference was "to provide transportation officials with a broader understanding of data issues associated with the changing focus of the global competitive markets and its implication on the existing transportation infrastructure, trade corridors, and market areas." The conference brought together an impressive collection of professionals involved in virtually all aspects of freight transportation and associated information, data needs and concerns. The timeliness of the conference was accentuated by a changing economy, with changing views of freight movements and their geographic reference framework, and, coincidentally, by the events and consequences of the tragedy of the September 11, 2001 terrorist attacks.

The conference participants focused their attention on four main themes:

- Understanding the underlying reasons for freight movements in a complex world where supply chains and trade or market areas constitute the context in which freight is generated.
- Identifying the purpose for which the data are to be used.
- Ensuring that future data collection efforts will be useful to a broad spectrum of users.
- Taking actions to develop a consistent framework for future data collection efforts.

The conference produced a remarkable consensus on a number of crucial issues related to these themes, specifically on:

- The recognition that freight flows are regional, national and global in nature, and involve freight corridors and trade and market areas.
- The need to understand the underlying causes of freight flows before deciding on what additional information is to be collected. (For example, local level vehicle movements are typically just manifestations of local, regional and global economic relationships and connections.)
- The need to develop a national data architecture that can serve as the benchmark/guideline for local, state and regional data collection, thus maintaining compatibility of data sets across geographical and topical aggregations.
- Getting shippers and other industry representatives involved in the design of future freight data collection and forming partnerships between the public and private sectors.

- An action plan for freight data collection.
- Major critical issues in freight transportation and the associated data needs.

The conferees reached a formal consensus on the five most important freight data issues. These issues stress the need to:

- Understand freight data needs.
- Collect additional local O-D data.
- Integrate modal data collection activities.
- Develop and use innovative technologies for tracking freight.
- Determine the true impact of congestion.

Among the top action items to be supported by the conference sponsors and the conferees in their various capacities, the most important is the effort towards developing a strategic business plan (framework, architecture) for freight informatics to facilitate data collection, distribution, analysis and dissemination. Many of the conference findings and recommendations will be useful inputs in the shaping of this data architecture.

The conferees recommended that this data architecture be structured such that:

- Underlying reasons for freight movements are considered.
- The data sets are compatible across geographical and functional aggregations.
- A time frame for data updates is included in order to keep the data current.
- It represents joint efforts (partnerships) between public and private sectors.
- It takes advantage of latest developments in information technology to track shipments and vehicle movements.

A working group has already been established by the National Academy of Sciences to develop the guidelines for this freight data business plan and architecture.

This Conference Synthesis Report is structured as follows: Section 1 provides an introduction to the conference topic and to the challenges of the conference. Section 2 represents an overview of emerging trends and data needs in freight transportation. Current availability and the future of freight transportation data are discussed in the Section 3, followed by material on analytical and forecasting capabilities and data requirements in Section 4. Sections 5 and 6 of this Synthesis provide a summary of the conference deliberations and conclusions and an action plan, respectively.

A reference list about related conferences and materials is provided at the end. The appendices describe currently available data sources, list additional issues, concerns and problems raised during the panel discussions, and provide the complete conference program, as well as the list of participants.

Access to this Synthesis and to slide presentations delivered during the conference can be gained through the NYSDOT web site: www.dot.state.ny.us

Synthesis of Conference Findings and Discussions

1. Introduction

The main objective of this conference was "to provide transportation officials with a broader understanding of data issues associated with the changing focus of the global competitive market and its implication on the existing transportation infrastructure, trade corridors, and markets." In addition to this "global" objective, the conference organizers identified the following more specific objectives:

- Provide an overview of freight transportation and emerging trends.
- Identify the availability of regional and national freight transportation data.
- Discuss new actions or strategies to obtain and enhance freight data and analysis.
- Identify the data required to address various decision support needs e.g., policy, logistics, etc.
- Examine analytical and forecasting capabilities in freight transportation.
- Develop research recommendations to set priorities for TRB, FHWA and BTS.
- Identify strategies for improving freight data collection and closing the gaps in data that are required for the development of policies, plans and programs.
- Infuse the reality that market areas overlap political boundaries.
- Promote consistency and compatibility among existing data sources.

The conference presentations and, particularly, the discussions and interactions addressed all of these objectives. In fact, they went considerably beyond them in the direction of developing consensus among participants about the most important issues in the freight data arena. (See Section 5.) In addition, a number of action items were identified that will constitute the core of several follow-up actions at the state and federal levels (See Section 6.)

The conference deliberations focused a substantial amount of attention on the need to understand the reasons for collecting new data, as well as on ways to obtain them, once the need is firmly established. The conference organizers and participants recognized the importance of understanding freight flows, of understanding the underlying economic activities (supply chains, etc.) and the relationships that generate these flows, as well as the regional, national and international context in which freight flows occur and how market areas are served.

The broader perspective of the conference also becomes evident by the fact that while the New York State Department of Transportation (NYSDOT), in conjunction with the Transportation Research Board (TRB), was the major organizer of this effort, the supporting sponsorship by the Bureau of Transportation Statistics (BTS), the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Northeast Association of State Transportation Officials (NASTO)

indicates the more national and global context and perspective in which freight transportation occurs and is increasingly seen.

The timeliness of the conference was accentuated by the consequences of the September 11, 2001 events with respect to freight flows and by the upcoming Re-Authorization of TEA-21. It opened up an opportunity for providing significant input concerning the role of freight transportation for the national economy and its infrastructure. Also, issues of safety and security will play an increased role in freight movements and their documentation.

Obviously, New York State (NYS) has a particular interest in understanding freight flows, given its central role and geographical location with respect to the population and activity centers of the eastern half of the US. While NYS has substantial intra-state freight flows, its concern is equally focused on the regional and the international context in which NYS operates. It serves as major gateways for traffic between New England and the rest of the US, as well as between the eastern Canadian provinces and the eastern US, in addition to providing international gateways for port and airport freight traffic.

The identification and understanding of market areas and their functioning requires insights into why companies locate facilities (stores, production sites, etc.) in an area, how far apart these can be, how they secure local distribution, what determinants are important, and what role the transportation infrastructure plays in these decisions. Another question that was addressed by Frank Southworth (ORNL) and George List (RPI) is whether and how these decisions can be modeled and forecast.

The conference is not the first one dedicated to the important issue of freight transportation. A review of the relevant literature (see Reference List) on earlier efforts in this area shows that many of the problems, priorities and some action recommendations match nicely with those of this conference. This demonstrates that the conference recommendations are backed by a large number of transportation officials at the local, state, regional and federal levels, by private transportation interests and by the planning and research communities. What was unique about this conference was that it focused its deliberations on the issues surrounding freight data needs and market areas.

The global perspective is absolutely necessary if there is any hope to understand the supply chains that generate most of the freight flows. Data collection at the local, e.g., Metropolitan Planning Organization (MPO) level, might provide a picture of current vehicle movements, but it does not allow an understanding of the underlying causes for such movements. Only such an understanding will provide the information that is necessary to make meaningful and effective investments in transportation infrastructure. It will help to form operational and development policies in support of local, state and regional economic activities.

Another important aspect of how we look at our understanding of freight movement and its associated data is a consequence of the events of September 11, 2001. Redundancies in infrastructure and availability of supplies or inventory have become important issues again and will probably feature prominently in the future. Also, in view of these events the pros and cons of Just-in-Time (JIT) delivery, as well as current security issues will have to be reexamined.

Summary

- Many leaders in freight transportation attended the conference.
- Conference main focus was on freight data needs.
- Conference focus was also on trade and market areas.
- Conference was dedicated to approaches that help the understanding of freight movements.
- Conference objective was to foster a better understanding of freight flows.
- Conference themes had regional, national and global perspectives.

2. Overview of Freight Transportation: Emerging Trends and Data Needs

Concern with freight movements, in particular with truck movements, is not new. In fact, the research and planning communities, as well as trucking concerns, have been trying to get the issues on to the national agenda for a long time. In the seventies, the dichotomy between the intra-urban and inter-urban perspectives created a serious obstacle in the discussion. In a sense, this somewhat myopic view relegated freight concerns to a back burner and virtually stopped effective, well-funded research activities.

The shift of economic activities to the suburbs and suburban malls, coupled with the ever-changing actions to improve logistics efficiency (a key to competition) changed transportation and travel patters needed to conform to an infrastructure built for past patterns.

A change in attitude and outlook has occurred during the last few years. The focus on global connections and issues, as well as the emphasis on the need to understand the underlying reasons and mechanisms for freight flows was a refreshing perspective of this conference. More importantly, there was a consensus among the participants on this perspective. What is observed (and counted) at the local level is merely a consequence of global and regional economic activities and resulting commodity flows.

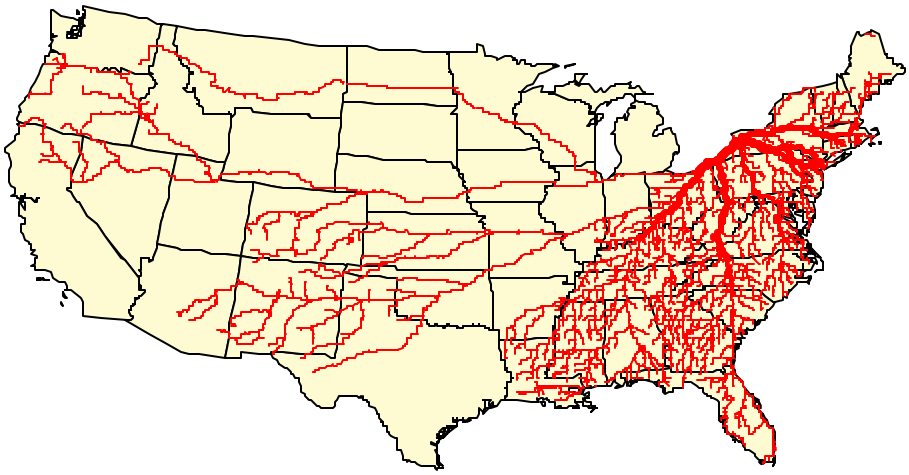
Nathan Erlbaum (NYSDOT) presented the "global" issues as viewed from the NYSDOT perspective. He showed New York's role in, and dependency on its adjoining states and provinces, i.e., New England, the Mid-West and Ontario and Quebec. This emphasis on broader trade areas in a regional, national and international context was mentioned repeatedly by a variety of conference participants. Figure 1 illustrates this orientation. It shows national trade and market areas focused on regional centers. Lance Grenzeback (Cambridge Systematics) made the point that we aggregate our data at the metropolitan or state level. However, in reality the economy operates at trade block levels. When considering global trade, these blocks can be replicated at a much larger scale. Therefore, as we think of data needs and data gaps, we need to think beyond state or metropolitan jurisdictions. This means the tasks of collecting and storing freight transportation data need to be coordinated at least along these trade blocks or market areas but appropriately at a national and global level. It is also important to ensure that there is reconciliation in the data between these trade blocks (cross-border or cross-trade area data.)

Michael Gallis (Michael Gallis and Associates) broadened this perspective even further by describing the world trade routes. This showed convincingly that global trade has existed long before "globalization" became a buzzword (concept) in recent years and that our typically much more introverted, isolationist perspective has hurt our understanding of global connections. He showed "super regions" and trade areas that transcend state and provincial borders. We have concentrated on the local, state or regional manifestations of global economic connections, while ignoring the global root causes. However, our perspective is widening rapidly, as is evident by the discussions and recommendations of this conference. The relationships between economic zones or market areas that extend beyond existing political boundaries are important to foster regional thinking.

Figure 1. National Trade Areas. (Source: *Lance Grenzeback – Cambridge Systematics*)

Commissioner Joseph Boardman (NYSDOT), who was the main proponent for this conference, is committed to this broader view of freight movement as a consequence of global supply chains. This comprehensive view includes not only New York State's role in the region, nation, and the world, but also how freight issues overlap jurisdictional provincial boundaries. Figures 2 and 3, which are part of a set of flow maps developed by FHWA, clearly show truck flows emanating from NYS locations to the rest of the nation. They stress the overlapping importance of the regional infrastructure, even when taken from the perspective of freight moving to and from NYS. More importantly, Figure 3 illustrates that a better understanding of the global context of international trade and economic relationships between market areas is essential, even when viewed simplistically from the impact of one international crossing on the adjacent regions and market areas.

Figure 2. New York State's Total Combined Truck Flows (1998)



FHWA, Office of Freight Management and Operations

Figure 3. Cross-border Truck Traffic Flows through Erie and Niagara Counties, N.Y.

BTS Director Ashish Sen spoke to the national perspective of freight movement data and pushed hard to make sure that any national data collection effort generates information that is as useful as possible at different levels of aggregation. He stressed that, above all, we must tie data collection to its use by making sure that we know what the needs are before we start collecting more data.

It is obvious that we do not have, nor can we expect to have "one-size-fits-all" data. Freight data serve many masters, i.e., policy, planning, programming, project development, investment decisions, modal operations, shipper concerns, and others. This means that the range of information detail needed, and ultimately collected, is very disparate across stakeholders, customers and clients. Nathan Erlbaum (NYSDOT) stressed this point, as illustrated in Figure 4. While there will unlikely ever be a singular data set to fit all needs, the overall objective needs to be that of developing a data architecture whose elements are compatible and can be made to work with each other. This means that researchers, planners, operators and policy makers can use the relevant information and window in and out to investigate their specific interests, the local context, as well as the regional and global aspects. In addition, data and information collection must focus on its intended use.

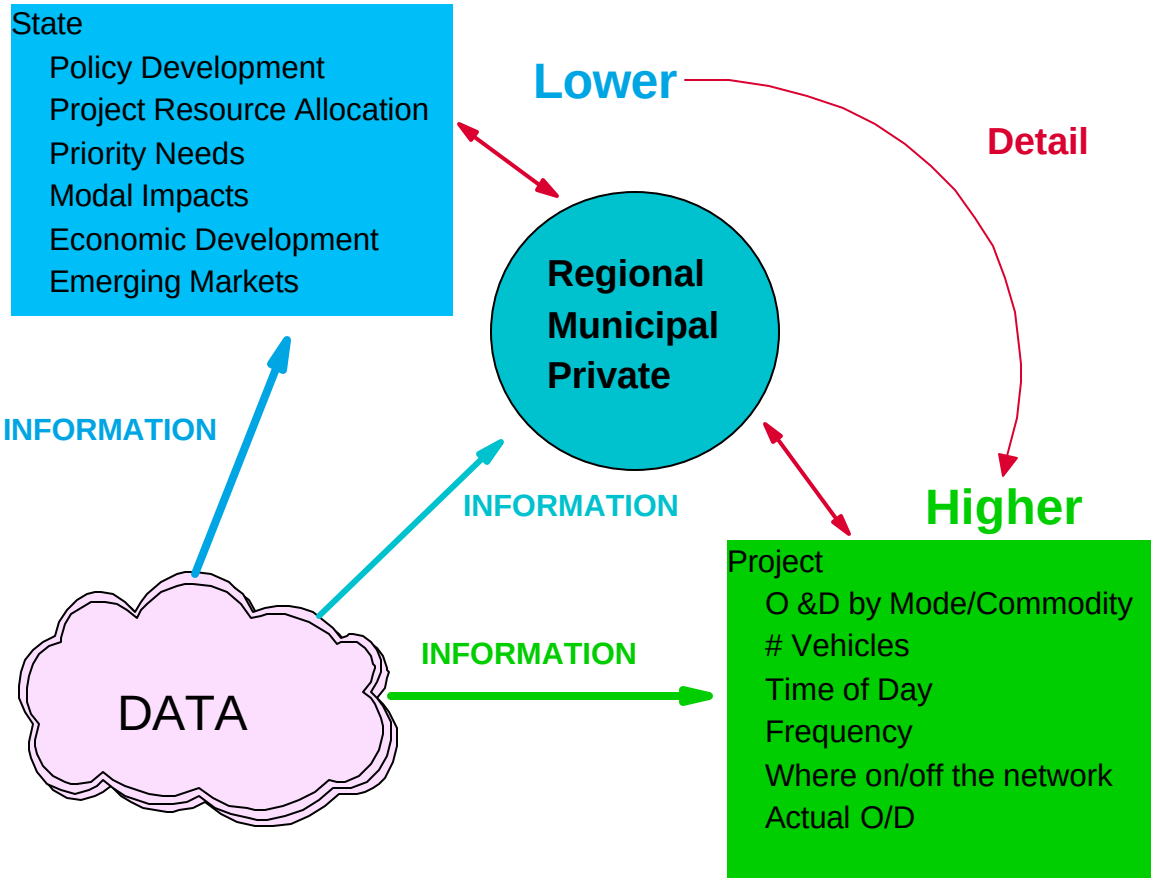


Figure 4. Illustration of Varying Data Needs Among Users. *(Source: Nathan Erlbaum – NYSDOT Planning & Strategy Group)*

Suggestions were made that challenged data users to "think outside the box" (or "without a box"), namely to re-evaluate their analyses and modeling paradigms in order to streamline data collection efforts, technologies and conventions. While these sound like worthy suggestions, some participants also warned that we still do not quite understand yet what is going on "inside the box." This concern relates specifically to the issue of having to understand supply chains, reasons for freight flows, and the underlying economic activities and their relationship to the generation of freight flows and to market areas. Only when we understand these issues, will it become more meaningful to step outside existing data and analytical tools (the box) or to forget about the box all together.

Data Users Perspective on Needs

Paul Bingham (DRI-WEFA) pointed out that as a regular user of freight data for forecasting, his firm serves two sets of customers: business and government. There are differences in the needs or perceived needs of these two groups and sometimes these two do not communicate well.

Business needs information for investment strategy, market planning and operations. Data driven decision-making in business is fundamental and therefore, there is tremendous demand for information. However, most business sector data is proprietary and not available to public policy makers. In the collection of freight data, it is important to protect competitive intelligence and other information in order to preserve the viability of those companies against their competitors, domestic or international.

Government needs information for policy-making, infrastructure planning and operations. This need is increasingly important for operations since the focus has now shifted from that of building more infrastructure to that of managing existing infrastructure and operating the system more effectively. Unfortunately, government knows little about market area analysis undertaken by businesses and so is relegated to reacting to change, rather than understanding the market dynamics to anticipate change.

Government and business need data for decisions with common elements so that they can work together to improve the common user elements of the national system. One obstacle to this is that business focus is short-run where the long-term can mean 1-3 years, not the 10 or 30 years of government. Somehow the divergent needs must be brought together.

The following are two examples of areas where large gaps exist between the freight data available to business and government:

The number of urban delivery vehicles have grown increasingly in the traffic stream, many of them being express delivery vehicles contributing considerably to congestion levels in high-density commercial activity areas. Very little data is available to government on these vehicles. Data on these flows should not be measured only in ton-miles, but in number of vehicles, vehicle stops, deliveries made per mile, value of commodities, etc.

Businesses have extensive data on air freight due to the high-value and time-sensitivity of most air cargo. With the exception of a few transshipment hub airports, most air freight has concentrated ground transport activity around urban passenger airports. This freight tends to end

up in both express delivery vehicles seen in urban areas and on long-distance carriers with origins and destinations in other regions. Reliable access to airports becomes the overriding issue to preserve the potential of time-sensitive freight deliveries. Data and information about these deliveries are generally considered proprietary and, hence, not easy to access for planning purposes. There is a need for understanding reliability versus speed of delivery, which can affect transportation decisions and infrastructure use.

Demands on the System are Increasing

Freight mobility is essential for continued U.S. economic growth and is at least as important as mobility for people. Productivity, growth, and therefore increasing standard of living, depend on it. While passenger travel (e.g. work trips) can be substituted for using technology such as telecommuting, there is no similar substitute for freight transportation.

With or without public sector help, the private sector continues its drive to improve service and reduce costs using logistics and supply chain management. Freight transportation is at the core.

The private sector will continue to try to reduce costs driven by market competition. They may try to sub-optimally do this at the firm level, or do it from a national network perspective in order to use the system most efficiently. We need better and more accurate data to do this. The private sector has an increasing wealth of such detailed data. However, for the private sector to participate in sharing data needed for long-term planning, it needs to be induced by demonstrating the long-term payoff of its participation on long-term planning.

More timely and accurate data are critical for logistics technology investments to pay off. More activity details will be measured as a result. Another aspect of transportation planning affecting both public and private sectors is the relationship between planning for freight transportation needs versus the aspirations of the traveling public. It is not clear whether planners and policy decision makers understand the relationship. Are the two needs compatible?

Technology Increases the Pace of Change

Government's long-term planning now has to provide for needed infrastructure capacity and efficient operations with shorter lead times. With shorter technology product life cycles, factories and distribution facilities handling these products have shorter lives, putting increasing demands on the infrastructure used to support them. Businesses' short-term profit making objectives take priority over helping with government planning or long-term public policy objectives, despite likely long-term payoff for business. Short times for decision making require more complete and detailed information sooner, and may encourage business to participate more.

Paul Bingham (DRI-WEFA) identified the following obstacles that need to be overcome to engage in effective data collection and sharing.

- <u>Split responsibilities for freight data</u>
  Public freight data is necessarily distributed across public agencies, making overall progress slower.

- Respondent burden
  Technology has the potential to reduce respondent burden, but we are a long way from eliminating the perceived burden.

- Legal issues of liability, privacy and data rights
  Uncertainty about the ultimate uses or impacts of providing data hinders collection and availability.

There are several issues regarding the evolution of law around data that are being addressed at international, national and state levels. We need to look at what the Europeans have done in the area of information privacy that is going to affect transportation data. There are separate legal issues that surround data use, data collection, and data rights and privacy. If these issues are neglected we are going to undermine the availability of potentially rich and much-needed data sources from the private sector. This may mean that future meetings to discuss data issues should involve legal experts and the private sector (e.g., shippers). Also, the Nation's increased sensitivity to security increases the importance of this issue.

Paul Bingham (DRI-WEFA) drew the following conclusions for freight data needs

- Higher standards of living come from business productivity gains from technology and data investments, but are not guaranteed.

- Technology changes the freight data world due to the competitive drive to increase service and lower costs.

- Business and government have different data needs, yet common data must exist for our common benefit.

- Obstacles, including respondent burden, legal, and research issues, remain significant and unresolved.

- The freight transportation community must work together to assure needed data availability.

- "You can't manage what you can't measure."

Summary

- Need to understand regional and global supply chains and market areas.
- Need for public/private cooperation and coordination in data collection.
- Need to demonstrate to private sector benefits of joint data collection.
- Include consideration of impact of parcel and express deliveries in urban areas.
- Need for research on information privacy and legal issues.
- Potential incompatibility between freight transportation planning needs and needs of the traveling public.
- Government officials need to better understand short and long-term industry needs.
- Industry needs to share appropriate data to help government plan better.
- Emphasis on determination of purpose and use of data before collection.
- Importance of innovative perspective to understand freight movements.

3. Current Availability and the Future of Freight Transportation Data

A lot was said about the shortcomings of existing freight data sets. Michael Gallis (Michael Gallis and Associates) pointed out that often freight data collection is determined by chambers of commerce, rather than by transportation professionals. To illustrate the need to plan for data needs, the Commodity Flow Survey (CFS) database was cited as an example. Some of the criticisms of CFS data include:

- Lack of geographical detail.
- Lack of industry coverage for industries that are moving very fast (CFS data is collected once in five years).
- Absence of several kinds of movements.
- Lack of vehicular flow information.
- Orientation towards shippers.
- Focus only on domestic movements.
- Difficulty of matching with other data sources.

While CFS data is useful, it cannot possibly address all data requirements. The problems seen in the CFS underscore the need to plan for and better coordinate transportation data needs. Ashish Sen (BTS) mused that the initial intention for collecting CFS data was not done from a freight transportation perspective. It was meant for various economic analyses to keep track of economic activities, rather than to keep track of actual movement of freight on transportation infrastructure. Similar deficiencies seen in CFS data also exist in other databases. Part of the answer to address these deficiencies is to view freight data at a comprehensive level.

The acknowledged data deficiencies could easily lead to decision traps. Often, existing data determine what and how we think. Analysis methods are often predetermined by the available data. The conference stressed that, as we discuss data needs in freight transportation it is important to think of decision needs and maybe even develop new paradigms for freight decision-making. These will form the basis on which we can establish raw data needs. There is a need to avoid potential decision traps, e.g., the constraints brought on by only using and thinking within currently available data sets. Freight data is needed by many entities. There is a need to coordinate efforts and have a joint strategy for data collection, storage and use.

There are efforts at different levels to keep abreast with the vast amount of freight data. One important effort is represented by the TRB freight data committee (A1B09), as discussed by its chairperson Paul Bingham (DRI-WEFA), which plays an important role as a liaison for meaningful use of freight data. The main committee objectives are:

- To identify and publicize sources of data, as well as the needs for data, on commodity movement, international trade, freight transportation, and the economics and organization of entities engaged in freight transportation.

- To advise data-collection agencies on cost-effective ways to fulfill essential data needs.
- To assist analysts and decision makers in the effective use of freight transportation data.

3.1 Currently Available Freight Data Sources

Some of the available data sources are listed below. These data sources contain varying levels of details and aggregation. A description of these data sources can be found in Appendix 1.

Commodity Flow Survey (CFS)

Trans-border Surface Freight Data (TSFD)

Vehicle Inventory and Use Survey (VIUS)

Motor Carrier Financial and Operating Statistics

U.S. Army Corps of Engineers Waterway Transportation Data

State Freight Transportation Profiles

American Trucking Association (ATA) Monthly Data Compilation

Transearch Data (Reebie Associates)

National Roadside Survey (Canada)

Rail Waybill

Employer Database

American Trucking Association (ATA)

Council of Logistics Management (CLM)

It is recommended that a central source of information be established regarding all available data sources useful to freight transportation analysis. The TRB Freight Transportation Data Committee already does this to some extent. However, a more comprehensive documentation of these sources, updated regularly, will be helpful.

3.2 The Future of Freight Transportation Data

Data Needs

It was well established in the conference that currently available regional and national data are inadequate to support analysts and policy makers and that market area data are not readily available. **However, it was stressed that the freight community had better understand why the data are needed first before collecting them. It was suggested that a freight data business plan be coordinated in order to establish data needs and usage, and be able to design better data architecture and collection methods.** The process of determining what freight flow or vehicle data need to be collected has actually started already. BTS has initiated an American Freight Survey (AFS) initiative.

Susan Lapham (BTS) described AFS as a new effort that will cover all freight transportation modes, in order to provide valid, reliable, timely, and comprehensive freight data that will meet both local, as well as global policy and business needs. The design of this database would address such questions as:

- What kind of freight data will the transportation community need in the short run as well as in the long run?
- What kind of data will the private sector need in order for it to identify markets?
- Who should collect such data and how should it be collected, stored and disseminated?

BTS is currently working with the American Trucking Association (ATA), an AASHTO subcommittee on data and with TRB data committees to get input from various data users regarding the best way to coordinate the AFS effort. Conference participants were asked to contact BTS to give their input on AFS. AFS is envisioned to be ambitious and is to be collected annually. Steps currently being taken by BTS towards the design of the AFS program include:

- Continued partnering with the freight community.
- Monthly meetings at DOT to continue the dialog, starting from January 2002.
- Have BTS travel across the country to meet with the freight community in gatherings such as the Saratoga Springs conference.
- Have BTS issue a request for information published in Commerce Daily. BTS is seeking information from companies that wish to explore new ways to freight data collection.
- Have BTS work with the Bureau of Labor Statistics in using their establishment sample frame.

In addition to the AFS initiative, the National Academy of Sciences has also sponsored a working group, as a result of this conference recommendation, to focus on developing a freight data business plan. This business plan will look at all aspects of data needs, collection methods, storage, and dissemination

Data Collection

Many conference participants stressed that the future of freight data collection, storage and dissemination has to take advantage of the advances in information technology (IT). Freight data collection has to be an E-business. It has to be a highly distributed and highly coordinated effort.

It was suggested that R&D should focus on the development of new sensors and wireless communication networks to facilitate an IT-based data collection, analysis and distribution system. The future of freight data has to have a transportation informatics backbone where smart vehicles (GPS, transponders, etc.), smart facilities, IT-equipped packages/travelers, ubiquitous wireless IT network and robust, highly distributed command and control systems work together to capture relevant data, store them, process and distribute them to the freight community.

If this collection effort is well coordinated with better use of available analysis tools, there is hope of fulfilling significant freight transportation data needs.

Summary

- Establish data needs before collecting data.
- Most current freight data is collected for purposes other than freight transportation analysis.
- Develop joint strategy for data collection.
- Need for a freight data business plan.
- Lack of vehicle flow and freight O-D data.
- Utilize existing and emerging Information Technology to facilitate data collection and distribution.
- Centralize inventory of available freight and freight-related data sources.

4. Analytical / Forecasting Capabilities and Data Requirements

As a mechanism to replicate and/or simulate systems and reality, modeling allows us to assess the consequences of alternative actions or policies. It permits us to evaluate the sensitivity of a system to changing inputs, i.e., it provides the opportunity for sensitivity analysis of policy alternatives. Since experimentation in the transportation arena is expensive, particularly in case of failures, modeling is a lower cost alternative.

However, the virtue and value of models are very much dependent upon how well they replicate reality and equally important, on the availability and the quality of input data for model calibration and forecasting. The data needs for modeling purposes vary depending on the objective of the model. Examples are shipment or vehicle movements, aggregate or disaggregate data, regional, local or market area perspectives, etc.

George List (RPI) presented three case studies that demonstrated how primary data collection was used as inputs to modeling efforts at the regional level. Julius Gorys' (Ontario Ministry of Transport) presentation outlined objectives of freight transportation research and data collection principles and the danger of collecting the wrong data.

The design of any data collection effort for modeling has to match the study objectives. Since it is economically inefficient and unreasonable to assume that highly specialized data collection can be performed ad infinitum, it is important to start thinking about data collection designs that generate data that can be used at various levels of aggregation.

For example, modeling and forecasting shipment and/or vehicle flows at the MPO level is likely to be ineffective if the underlying data and information about global, regional and market trends is ignored, since the latter have a major impact on what happens at the MPO level.

The development of a data structure that meets the needs of various constituencies is an important objective for any future data collection efforts. This structure should also take into account the desirable frequency of such data collection, either for purposes of developing time-series data and/or avoiding using outdated data sets.

In order to understand and measure regional and global freight movements, it is typically necessary to track freight across geographic and political boundaries. This is particularly difficult, if not impossible, under current practices and limitations, putting severe constraints on freight modeling efforts. A national or international freight data architecture and data collection design will need to address this issue.

The need for capturing global data was stressed by Commissioner Joseph Boardman (NYSDOT). Currently, this is beyond state and regional data acquisition capabilities. Most of the existing data is collected to meet national objectives. However, the supporting infrastructure for freight flows is the responsibility of local (MPOs) and state agencies. Clearly, this disconnect needs to be overcome.

Frank Southworth (ORNL) and Nathan Erlbaum (NYSDOT) observed that in order to improve freight analysis and forecasting, we need better data on freight O-D volumes. This includes tonnage, dollar value, number and size of vehicle loads, how much freight is generated, received and transported between places and transferred between vehicles. In addition to better

freight volume data, Frank Southworth also stressed the need for better data on freight costs. This includes full transaction costs of moving freight between places, by commodity type, mode, vehicle type, region, corridor, and season. This means we need data on the costs of line haul, including handling, transfers, and inventory holding.

Freight Volume Data Needs

There are a number of ways of obtaining better freight volume data. Southworth identified three methods. These are:

- New data collection initiatives similar to initiatives such as the BTS American Freight Survey (AFS). This strategy is necessary since there are severe data gaps. However, any new data collection efforts should be guided by needs at the decision making levels.

- Another way of obtaining better volume data is data extraction. In this method the freight community gets more transportation information from existing data sources. This may involve data mining from various sources to build more comprehensive volume data.

- The last method involves data fusion and data modeling in which data sets from different sources are combined and new data is generated using statistical and simulation models. We often need to combine data on freight from different sources and from different types of data collection efforts in order to answer policy questions. This is especially true when we try to build comprehensive commodity and mode-specific freight flow matrices (for planning and forecasting purposes). A number of mathematical and statistical tools exist with which to accomplish this. Development and application of these tools are often much less expensive than additional data collection. The use of such tools should be seen as a compliment to, not a substitute for current data collection efforts.

Frank Southworth (ORNL) and George List (RPI) discussed modeling techniques such as multi-dimensional iterative proportional fitting and log-linear modeling, synthetic origin-destination matrix generation, inter-regional input-output (I-O) models, traffic-count enhanced freight O-D matrices, as some of the tools that can be used to generate or enhance freight data. The linkages between data types, data models and the resulting data products are summarized in Figure 5. The conference participants were urged to focus on better use of the available analytical tools before thinking of collecting more data.

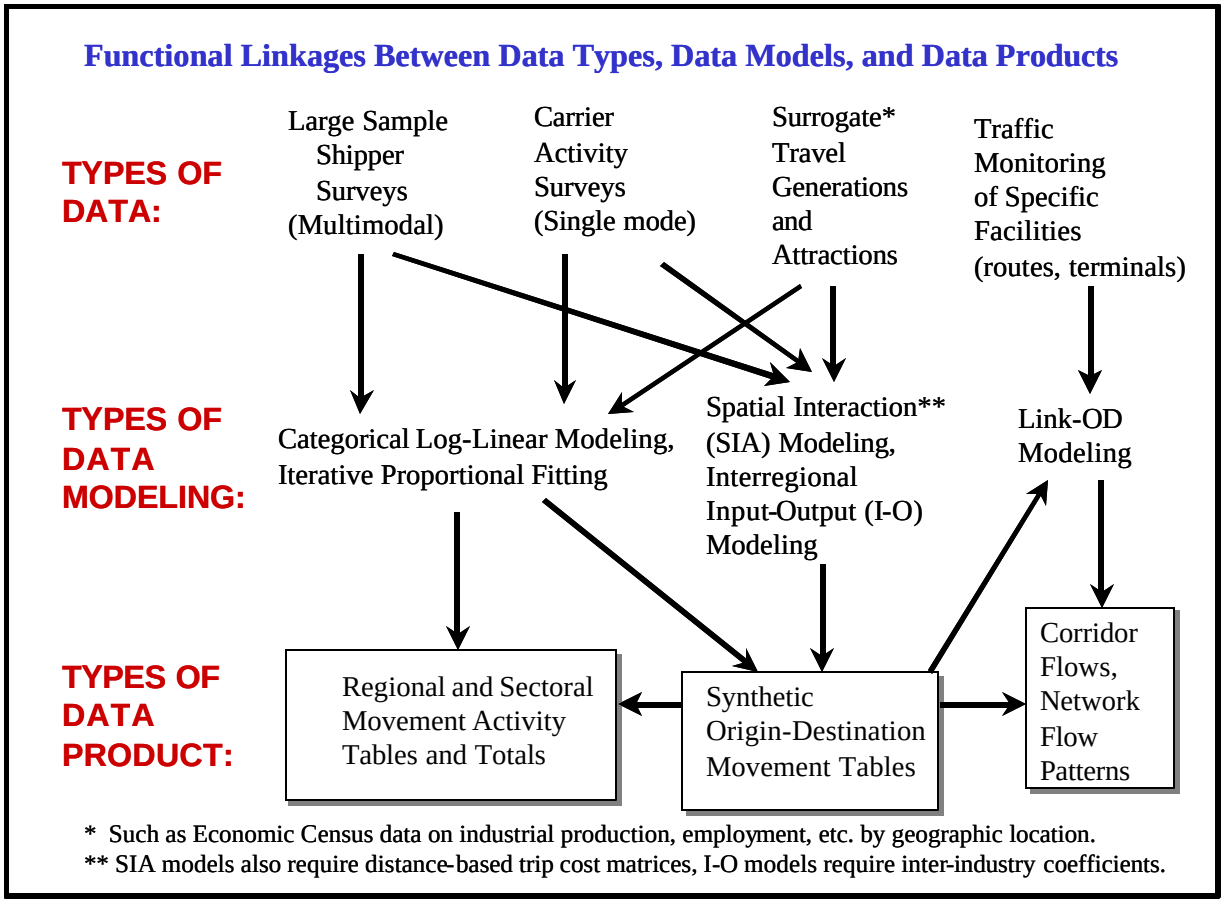


Figure 5. Linkages Between Data Types, Data Models and Data Products. *(Source: Frank Southworth - ORNL)*

Freight Cost Data

The same avenues used to obtain better freight volume data, namely data collection, extraction and modeling can also be used to obtain better freight cost data. These efforts should lead to a more complete understanding of freight transaction costs, including physical costs of line haul, transfers, inventory holding, etc. These data should also reveal informational and financial costs including Internet transactions. It should answer such questions as:

- What is the cost of passing information among users?
- What is the value of real-time information?
- What is the cost of delayed information?

Freight cost is an integral part of logistics costs. The freight logistics supply chain is what we need in order to understand what is going on with freight costs. The changing nature of the transactional relationships between producers, warehouses, distributors, freight forwarders, retailers and final demand markets needs to be understood. We also need to understand the roles, options and cost savings offered by new freight handling technologies, by intermodalism, and by

containerization. So, as ways of improving our freight transportation models are discussed, freight cost models have to be an integral part of this effort. Specifically, government needs to demonstrate an understanding of industry needs by taking short-term actions to ease the most pressing problems.

This point was further illustrated by Glen Weisbrod (Economic Development Research Group) who explained the difficulty in justifying many transportation infrastructure investments (where freight is a major component) due to the difficulty of documenting the benefits of those projects from the freight point of view. This is caused by deficiencies in the freight data, specifically freight cost data. Glen Weisbrod concluded by saying that the freight community needs not necessarily more data, but rather more relevant data in order to understand true costs of cargo delay and to make intelligent multi-modal decisions.

Better Freight Data Through Institutional Cooperation.

The efforts to obtain better data mentioned above would only work if the various entities collecting or synthesizing freight data would coordinate their efforts. It was therefore suggested that the freight community should develop a plan of action or a freight data business plan that would identify data needs, and a data architecture that would combine all (local, state and federal) freight data sources. One of the reasons given for the need of this coordination is to reconcile trans-border (state, trade region, or market areas where data are collected) freight flow data that are currently in bad shape. This will enable the freight community to have a better understanding of freight movements.

Summary

- Value of modeling is dependent on reliable and quality data.
- Need to track freight across geographic and political boundaries.
- Need better data on freight O-D volumes for better forecasting.
- Need better freight cost data.
- Use modeling to fill some data gaps.
- Need coordination among data collection entities.

5. Summary of Conference Deliberations

At the conclusion of the conference, a multitude of critical issues surrounding freight transportation data needs had been identified and discussed. There was a call to coordinate efforts among users and generators of freight data. Michael Walton (University of Texas at Austin) prefaced the discussion on critical issues facing freight transportation data by saying that the challenge is to make the case not just for more funding, but also for the ongoing stable collection of freight data and its use. Together, he said, we must build the case for further investment and stability of freight transportation data programs, mainstreaming freight into the system.

Towards the end of the conference, two panels discussed the critical issues facing freight data collection and analysis, as well as the future of such efforts. As the result of identifying and ranking of important freight data issues by all conference participants, the following emerged as the top five issues:

i. Understand data needs.

ii. Collect additional local O-D data.

iii. Integrate modal data collection activities.

iv. Develop and use innovative technologies for tracking freight.

v. Determine true impact of congestion.

Appendices 2 and 3 contain the complete list of all critical issues raised at the conference.

(i) Understand Data Needs (Data versus Information or Knowledge)

The number 1 critical issue identified by the conference participants is that the users of data should understand why they need data. George List (RPI) pointed out that data needs have to be established not just for producing pretty pictures, but to understand why we need to see the pictures, e.g., safety and security, capital investment decision making, network management. This means there is a need to first establish the information (or knowledge) needs of various entities. Based on these information needs, a strategy can be developed to determine essential data needed, what data need to be collected and what data gaps can be filled by analysis.

Several participants also observed that different entities have different information needs depending on their respective focuses (e.g., global, regional, market area, state, local), depth (quantity and quality of information) and timeliness of information. We do not have one-size-fits all data. It is important for public and private interests (across dimensions of policy/planning/projects) to come together in order to establish these needs. Understanding these needs will also enable the users to determine required data sample sizes. Several speakers spoke of these varying perspectives on data needs, illustrated by Figure 6. This figure shows that, whereas the public sector (states and MPOs) focus has been regional and local, the private sector focus is increasingly national and global.

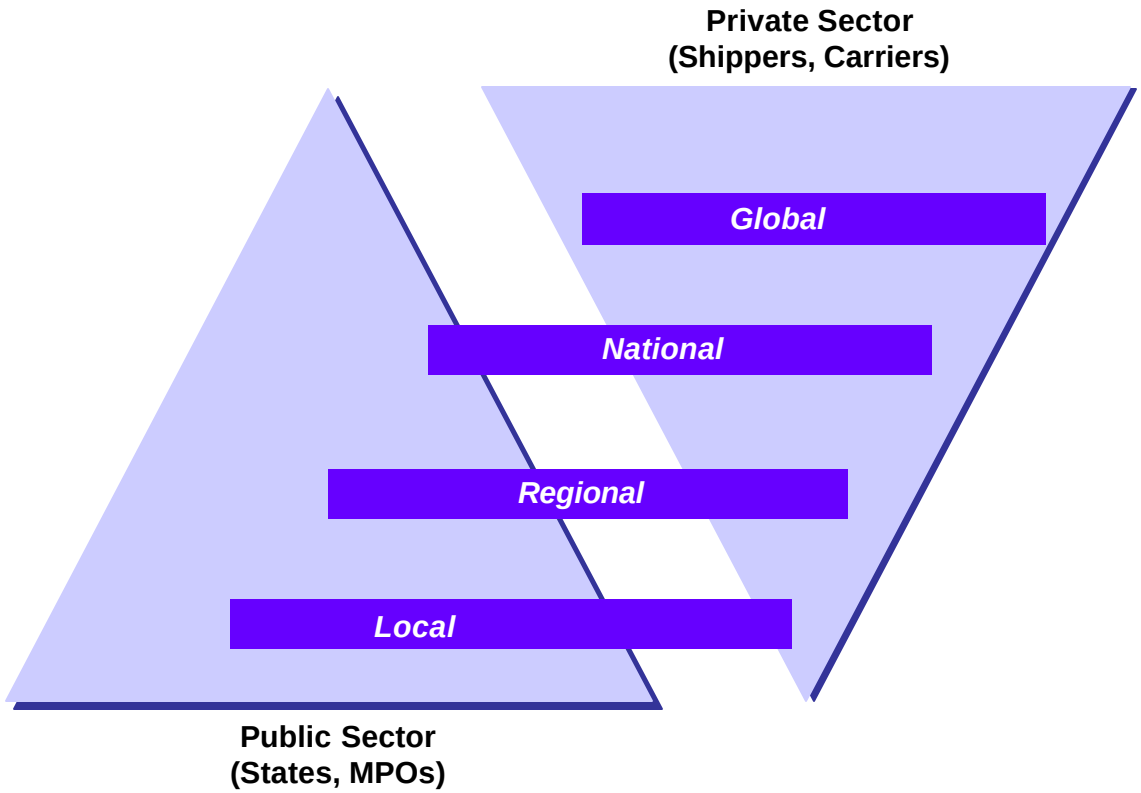


Figure 6. Public Sector versus Private Sector Freight Data Perspectives *(Source: FHWA)*

Nathan Erlbaum (NYSDOT) presented another dimension in the variation of data needs, namely the level of detail. He agued that at state or national levels where broad issues such as policy development, resource allocation, etc. need to be addressed, the level of detail required is lower than in precise modeling work that may require, for example, detailed O-D data by mode and commodity for project implementation. (see Section 2 and Figure 4)

As the conference came to an end, it was clear that the "WHY" behind the data loomed large and that there was no single answer to this question due to a multitude of data users and their varied reasons for data needs, ranging from broad policy issues to specific logistic analyses. Michael Walton (University of Texas at Austin) suggested, and was supported by many participants, that there is a need to develop a national freight data business plan or framework. This framework would identify and coordinate the vast mosaic of who is or should be collecting freight data and how to manage the effort. Tom Palmerlee (TRB) observed that the basic approach ultimately is likely to be a National Research Council committee of key freight data stakeholders, both from public and private sectors. This committee would refine the concept of the business plan, decide how to approach its development, hire a consultant to develop the plan, review the consultant product and write its own report on the findings.

(ii) Collect Additional Local O-D Data

Participants expressed the need for disaggregate freight data in order to improve analysis and forecasting methods. The freight movement process needs to look at individual shipment flows in order to understand the delivery process. The major stumbling block to obtaining this type of data is that most such data are proprietary and there is no incentive for the private sector to share them. For example, container freight is a growing segment of rail but the content within containers are often unknown, unless shippers cooperate in giving these data. Carriers (like rail services) get shipments and know it as general freight. However, to know what commodities are in the shipment, where they come from and their final destination is impossible unless the shippers cooperate. Several speakers observed that, currently, tracking cargo across modes is difficult at best and this makes travel demand forecasting difficult.

In his presentation, Lance Grenzeback (Cambridge Systematics) observed that we often need data in order to measure performance of freight transportation systems. Some of the data we need include:

- Infrastructure performance
- Vehicle performance
- Trip (door-to-door) performance.

We have reasonably good systems to measure infrastructure (bridges, pavements, rail systems, etc.) performance. We have good capability to measure vehicle performance, e.g., flows, and travel time. However, measurement of freight trip performance leaves a lot to be desired. For example, it is difficult to get information on the variability of trip time for a particular commodity in a given market segment. The individual shippers may have this information, but most of it is proprietary. Currently, we have very little understanding of the characteristics of shipments to an individual shipper or carrier. In the process of organizing our data needs, we need to start looking at the freight world through the door-to-door trip. It is this information that will enable us to plan and forecast freight transportation more efficiently. From this data we can determine what is needed to improve vehicle flows, reduce congestion, influence policy in the freight shipping world and in infrastructure for better investment decisions.

To be able to understand what level of disaggregation is needed, there is a need to develop a simplified picture of how all the freight modes are interrelated from shipper to consumer. There is a need for better freight transportation models. These models can then help determine the precise data needs.

Several conference participants observed that the shippers' point of view was missing at the conference. Their interests as users of the network must be obtained early on in the process of developing a freight data business plan. Rick Rybeck (Washington D.C. DOT) pointed out that there is a need to find a way to get the private sector stakeholders to participate by giving them some financial stake in the outcome. The private sector understands the long-term pay-off of making decisions. However, currently there are no incentives, and at times there is deterrence for them to participate. There is a wealth of freight data in private sector hands. They may perceive their involvement in making their data transparent as a means by government

authorities to tax them more. There must be an incentive for the private sector to share this data or participate in joint efforts to collect data. There is a need to involve shippers early in the dialogue. It is also important to understand their concerns and be able to address them if we are to get any cooperation from them. One positive aspect of detailed data, such as knowing the contents and O-D information, is its impact on safety and security. In addition to shippers, Dan Rosenthal (Nebraska DOT) provided a designer's perspective, asking that road builders and AASHTO be brought into the data collection framework process in order for it to succeed.

(iii) Integrate Modal Data Collection Activities

The freight data framework suggested above would also address the third critical issue identified by the participants, namely that of integrating modal data collection activities. It is apparent that air, water and rail freight transportation all require some level of truck transport. Therefore, multi-modal relationships, capacity differences and transfer costs between modes constitute useful data that are best collected in an integrated fashion. It was also stressed that there is a need to coordinate freight data collection at a global level so that data and freight information can be shared across geographic regions. It is possible that such efforts would move policy makers to be responsive to the global issues.

It was also apparent, as discussed in Section 3, that there are several existing databases, public as well as private, that have major differences in their composition. These differences create problems when analysts try to merge, compare or share data from different sources. It was therefore suggested that, as the national freight data business plan is being developed, one key element of that plan should be to define some common metrics in the data architecture that would ease the sharing of data from different sources. It was suggested that the first step could be the development of a tri-national (U.S./Canada/Mexico) database to keep track of cross-border freight.

This point was also echoed by Bruce Lambert (FHWA) who, using the recently completed FHWA multimodal Freight Analysis Framework (FAF) as an example, made several points, including that there is no one ideal freight database. He called for data standards to be established for state and local level data so that they can be compared across regions. He said there is a need to develop better incentives for participation in providing data. Among the difficulties encountered using data from different sources are the inconsistencies across coverage, timing and formats. While the FAF was developed as a national level policy tool, there are now many other demands being placed on it for lack of anything better. This is a measure of how much better data are needed. Bruce Lambert (FHWA) and David Ganovski (Maryland DOT) also stressed that the area of data needs that requires more attention is that of truck freight. They pointed out that whereas waterborne freight and rail data are good, truck freight data are poor and the data are critical to understanding intermodal relationships and network impacts. However, Michael Walton (University of Texas at Austin) pointed out that there is hope in improving data collection from the trucking industry since the industry is more interested now than it was twenty years ago.

(iv) Innovative Technologies for Tracking Freight

With respect to actual data collection efforts, it was emphasized that designers of data collection efforts should take advantage of existing and emerging technologies. One such example could be to put smart tags on freight to track it by mode and its origin and destination. Freight modeling, data collection and technology must be part of a holistic approach aimed at providing a solid characterization of the freight transportation system. A question was raised as to how to make ITS technology pragmatic and agreeable to all parties in view of its potential legal or other "big brother" implications. Caution was raised to ensure that regulatory or privacy concerns are well addressed in order to take full advantage of technology in freight data collection efforts.

(v) True Impact of Congestion

Julius Gorys (Ontario Ministry of Transport) and Glen Weisbrod (Economic Development Research Group) articulated the need to understand the true cost of congestion. Susan Lahsen (Port of Portland, Oregon) also pointed out that congestion has real costs and affects business productivity. The cost may be categorized into hard cost and soft cost. Examples of hard costs include extra time for pick-up and delivery that may reduce production time, extra vehicles to meet "Just-in-Time (JIT)" demands of customers and scheduling problems caused by longer delivery times, etc. The soft costs include business credibility, expansion decisions, etc.

In order to justify more or appropriate funding for freight transportation analysis, there is a need to understand the true economic cost of congestion or delay. This knowledge would enable analysts to address questions such as, how much freight really has to go JIT and what are the land use implications?

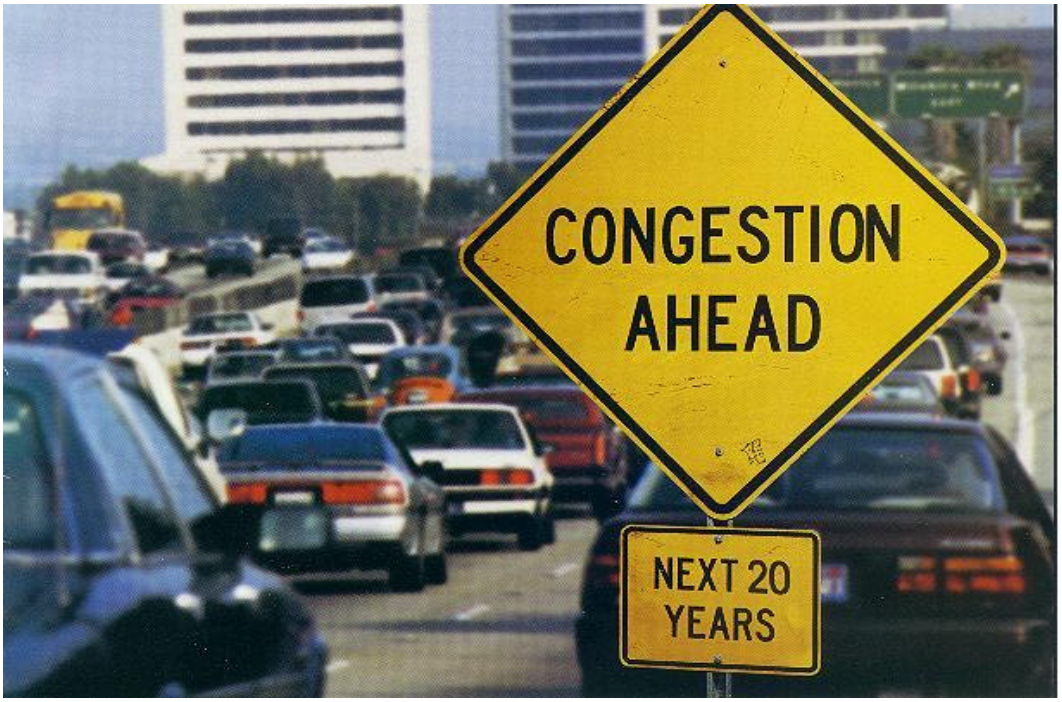


Figure 7. "The Road Ahead" *(Source: Lance R. Grenzeback – Cambridge Systematics)*

6. Conclusions and Action Plan

At the conclusion of the conference, many suggestions and action plan proposals were made towards understanding freight transportation data issues. Rick Donnelly (PB Consult) pointed out that this was a difficult challenge and that there were no easy answers to the freight data problem, otherwise we would have already found them. However, he acknowledged that the conference had some of the faces of the future that are suitable to deliberate this complex problem. The panels were challenged to first articulate what the freight data problems were, in the form of critical issues, and then they were asked to propose solutions to the problems in the form of action plans.

Several speakers observed the importance of existing freight data and data products. As Ed Christopher (FHWA) and others pointed out, the freight transportation data community knows that the existing data are a quilt or patchwork of data sets and may not be the best. However, the freight data user community has come to rely on these data sets by working with what they have. The patchwork of available data sets is a result of uncoordinated efforts by various entities doing data collection. Most freight data collection efforts did not have freight transportation analyses in mind when they were first designed. Most of them were intended for various economic analyses. If properly re-designed, the current data collection efforts could yield data that are more suited to analyze many aspects, including freight transportation issues.

However, before we can redesign current data collection efforts (e.g., AFS) or starting any new data collection efforts, it is important to establish why we need the data. A data set that is suitable to one group of users may be too detailed or deficient for another. Therefore, close coordination among freight data users and data collection entities would help to develop a holistic view of the mosaic of data needs.

Data collection, storage and distribution are expensive activities. The conferees stressed that data users should first make full use of available data, and where possible, use analytical models to fill in data gaps. Any effort to collect new freight data should be preceded by an understanding as to why the new data are needed. Data needs should be established for new as well as redesigned data collection efforts. Since there are many users of freight transportation data with varying needs, it was recommended that we need a strategic freight data business plan to guide future data collection efforts. This plan would identify all freight data users and their needs. Based on these needs, a national or international freight data architecture or framework would be developed. The purpose of this data framework would be to streamline data collection efforts and facilitate compatibility of various data sources at different levels of aggregation.

The freight data business plan should solicit cooperation from all parties, public as well as private. The inclusion of shippers was deemed crucial since they hold a wealth of information pertaining to shipments, origin-destination (O-D) information, and freight transportation costs that are important from the transportation studies point of view. This effort should encompass all modes of freight transportation.

The actual task of data collection needs to change and take advantage of existing and emerging trends in information technology. Just as it is important to develop a strategic freight data business plan, it is also crucial to think of a data informatics business plan. The business of

freight data should be an E-business. This will facilitate data collection, storage and dissemination in an efficient manner. The use of smart sensors on freight, infrastructure, and vehicles will be the future of freight data collection efforts. The sooner the freight community gets into this business, the better.

One of the main reasons for needing freight transportation data is to justify infrastructure investments. The conferees pointed out that we need to understand the true cost of congestion in order to justify investments in the transportation infrastructure. This could be the meeting point between public and private concerns. Private entities face the real cost of congestion in their daily business. Therefore, there is interest from the private sector to see government do something to solve the congestion problem. However, government entities, like state DOTs and analysts supporting these entities, need data from the private sector in order to justify investment in the infrastructure. Therefore, long-term planning activities of the public sector dovetail with the often short-term private sector interests. A good understanding of the cost of congestion requires data, most of which reside within the private sector. This common interest is likely to be the force that would bring cooperation between public and private sectors in the efforts to establish data needs and to developing coordinated data collection efforts.

Table 1 presents a summary of the most important critical issues presented at this conference and their associated action plans.

Table 1. Summary of Critical Issues and Action Plans

	Critical Issue	Action Plan	
		Macro-level / Long-term	Micro-level / Short-term
1	Understand data needs	· Develop a freight data business plan or framework or architecture. · Institutionalize freight data	· Develop an understanding of true data collection cost (public and private). · Improve modeling and analysis techniques. · Identify data gaps. · Utilize data synthesis tools to fill data gaps
2	Collect additional local O-D data	Develop strategy to track door-to-door shipments.	· Involve private sector, especially shippers. · Address shippers' fears about transparency and laws that hurt privacy.
3	Integrate modal data collection activities	· Coordinate the development of data architecture so that data can be shared at various levels of aggregation. · Integrate international freight data. · Form market area coalitions for freight and corridor studies.	· Concentrate on truck data since this is where the bulk of the problems reside. · Air freight data also need attention.
4	Innovative technologies for tracking freight	· Get into E-Business · Develop strategic business plan for freight informatics to facilitate data collection, distribution, analysis and dissemination.	· Ease accessibility of data to practitioners. · New sensors. · Address security issues
5	True impact of congestion	Develop performance measures for freight.	Environmental impacts
6	Analytical and forecasting capabilities	· Avoid over-commitment to particular modeling and analytical approaches to allow future advances in methods	· Understand existing freight data and known analytical tools to fill data gaps · Start with known methods within and outside the transportation community. · Stimulate research interests in freight transportation.

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APPENDIX 1. CURRENTLY AVAILABLE FREIGHT DATA SOURCES

Commodity Flow Survey (CFS) (http://199.79.179.77/ntda/cfs/)

The Commodity Flow Survey (CFS) obtains data on shipments by domestic establishments in manufacturing, wholesale, mining, and selected other industries. The U.S. Census Bureau in partnership with the Bureau of Transportation Statistics of the U.S. Department of Transportation conducts the CFS as part of the Economic Census. The data are collected every five years, starting from 1963.

It was observed by a number of conference participants that the CFS data are not about flow. It is an origin shipper survey. It allows summarization on only one or two dimensions. It does not have detailed O-D data for commodity by mode, which is what transportation experts want. CFS does an excellent job at determining what is sent out by states to the rest of the country, how it is going, and how far it travels. However, it does not do a good job on what is coming in, let alone focus on market area dynamics or actuality.

Transborder Surface Freight Data (TSFD) (http://199.79.179.77/ntda/tbscd/)

The Transborder Surface Freight Data set provides North American merchandise trade data by commodity type, by surface mode of transportation (rail, truck, pipeline, mail and other), and with geographic detail for U.S. exports to and imports from Canada and Mexico. These data, available since April 1993, are a subset of official U.S. international merchandise trade data. The purpose of the database, updated on a monthly basis, is to provide transportation information on North American trade flows. This type of information is being used to monitor freight flows and changes to them since the signing of the North American Free Trade Agreement (NAFTA) by the United States, Canada and Mexico in December 1993 and its entry into force on January 1, 1994. The database is also being used for trade corridor studies, transportation infrastructure planning, marketing and logistics analyses, and other purposes.

Once again it was observed that TSFD is a customs data set. It is not a transportation survey data set. U.S. Customs is collecting revenues on goods moving across the border so that they can determine tariffs. The U.S. and Canadian sides are not consistent in these efforts and the problem of transshipments may continue to exist within this resource.

Vehicle Inventory and Use Survey (VIUS) (http://199.79.179.77/ntda/tius/)

The Vehicle Inventory & Use Survey (VIUS), formerly known as the Truck Inventory and Use Survey (TIUS), provides information on trucks domiciled within a state and owned by businesses and individuals, ranging from multi-trailer combination vehicles to pickups, vans, and minivans. The US Census Bureau conducts the VIUS every 5 years. It does not provide information on where these trucks are used and, only in limited detail, on zones or range of motion.

Motor Carrier Financial and Operating Statistics (http://199.79.179.77/ntda/mcs/)

The Motor Carrier Financial Statistics Program conducts annual and quarterly data collections for motor carriers of property and passengers. The program collects industry financial, employee, operating, and other data.

Waterborne Transportation Data (http://www.wrsc.usace.army.mil/ndc/)

The U.S. Army Corps of Engineers is responsible for the operation and maintenance of the Nation's waterway system to insure efficient and safe passage of commercial and recreational vessels. The Corps of Engineers, through the Institute for Water Resources, Navigation Data Center (NDC), establishes and maintains a variety of water transportation information systems. These include databases and statistics pertaining to waterborne commodity and vessel movements, domestic commercial vessel characteristics, port and waterway facilities, lock facilities, lock operations, and navigation dredging projects. All public data are available through the NDC website shown above.

State Freight Transportation Profiles (http://www.bts.gov/ntda/sftp/)

The State Freight Transportation Profiles present information on freight transportation for each of the 50 states. The purpose of these reports is to present the major Federal databases related to state freight movements. Along with tables generated for each state, the reports give a description of the database information on access, format and contact points. The database descriptions are based on entries in the Bureau of Transportation Statistics' Directory of Transportation Data Sources. These profiles are based on other data sources, like the CFS.

TRANSEARCH Data (Reebie Associates http://www.reebie.com/)

TRANSEARCH is an integrated, multimodal freight flow database constructed from a variety of public and proprietary data sources. The data set provides a market-to-market picture of freight traffic movements in the United States, and between the U.S., Canada and Mexico. The current base year is 2000. Over 100 individual data sources are used, including an ongoing motor carrier data exchange program that provides real world data on over 75 million truck shipments.

Records display tonnage moved by market pair, by commodity and seven modes of transportation. Market definition can be at the county, Business Economic Area (BEA), metropolitan area, state or province level. TRANSEARCH also includes information on secondary traffic, freight re-handled by truck from warehouse and distribution centers. Modal coverage includes for-hire truckload, for-hire less-than-truckload, private truck, rail carload, rail/truck intermodal, air and water.

Rail Waybill

The United States government has contracted with ALK *(http://www.alk.com/tech/consult/waybill.html)* to enhance its rail waybill sample since 1979, first for the Interstate Commerce Commission and now for the Surface Transportation Board (STB). The STB Waybill Sample is an annual sample of freight movements terminating on railroads in the United States. The sample size is approximately 2.5-3.0% of all rail traffic, and in recent years has exceeded 550,000 records per year. Some of the more important data elements include: origin, destination, intermediate railroads and junctions, commodity, type of car, number of cars, tons, and revenue.

The master waybill file contains confidential information on specific station, railroad, and revenue, and is not in the public domain. A potential user of the master waybill file must first obtain permission from the Surface Transportation Board for a particular use. There is also a Public Use file *(http://www.ntis.gov/fcpc/cpn8441.htm)* that contains general, geographically oriented information and contains no information on specific railroads. In the public-use file, movements are reported at the BEA-to-BEA level (or multi-county Bureau of Economic Analysis Areas) and the 5-digit Standard Transportation Commodity Code level. For a particular commodity, the origin or destination BEA is not included unless there are at least three freight stations in the BEA and there are at least two more freight stations than railroads in the BEA.

National Roadside Survey - Canada (http://strategis.ic.gc.ca/SSG/ti01101e.html)

The 1991 Canadian Conference of Motor Transport Administrators (CCMTA) National Roadside Survey of commercial vehicles was undertaken to provide information to assist in identifying the impact of changes occurring within the Canadian trucking industry. The survey consisted of approximately 20,000 driver interviews conducted during a one-week period in June of 1991 with the survey aimed at inter-provincial movements. Information collected included carrier type, vehicle configuration, trailer configuration, capacity utilization, and driver category. The survey was complemented by a survey of Canada-U.S. trucking movements undertaken as part of the Transborder Trucking Competitiveness studies. The usefulness of the survey results lead to another roadside survey being conducted in 1995.

The 1995 CCMTA Roadside Survey contains a number of important changes compared to the 1991 survey. The 1995 survey had a broader focus, by including all truck types. Compared to the 1991 survey, the 1995 survey has more survey points, more interviews (36,000 in total) and additional information on vehicle characteristics such as axle spacing and weights, trailer length as well as vehicle technology. Additional driver information such as years of experience was also collected. However, the 1995 survey did not cover trans-border movements to the same level of detail as the 1991 studies. As a result, care must be taken in comparing results of the Transborder movements from the 1991 Transborder Survey and the 1995 CCMTA Roadside Survey.

The most recent National Roadside Study was conducted in 1999. This survey focused on the collection and analysis of detailed operating, driver, vehicle, and trip data from truck operators at several hundred locations across Canada, including several on the Canadian-U.S. border.

Employer Database (http://www.doleta.gov/almis/edbnew1.asp)

Another indirect source of freight movements is information about employers: who they are, where they are, what activities they do, how much freight they generate or attract? This information is being collected by State Employment Security Agencies (SESAs). Some of this information is not available to the general public due to confidentiality restrictions. However, the America's Labor Market Information System (ALMIS) Employer Database is an acquired database containing information about over ten million employers throughout the country that can be accessed by the general public. There are several levels of access to the data: primary recipient, intermediate user, and client. The primary recipient, usually the SESA, will be able to either download the entire database to a PC (along with a proprietary search engine, if they so choose), or search the database using the CD directly. The intermediate user, a local One-Stop or other service deliverer, will be able to search the entire database and retrieve up to 2,500 records at one time. The client, e.g., a job seeker, will be able to search the entire database and retrieve up to 100 records.

American Trucking Association (ATA) http://www.trucking.org/infocenter/index.html

Bob Costello informed the conference that the American Trucking Association (ATA) also collects monthly data from its members. The data include freight volume (loads and shipments), revenue collected, mileage driven, and equipment trends

However, ATA relies on additional information from databases such as Vehicle Inventory and Use Survey (VIUS) data, or Commodity Flow Survey (CFS) data to benchmark their own data in order to provide a more enriched database to the freight community. ATA also does special studies, such as driver compensation, technology study (how much motor carriers are spending on technology and what type of technology), etc. Future ATA freight data should include more stratified Trans-border truck and freight data.

Council of Logistics Management (http://www.clm1.org/default.htm)

The Council of Logistics Management (CLM) is a professional, voluntary association of logistics and supply chain managers. CLM members and their customers are real time managers of transparent, proprietary business data on freight shipments who can provide significant, insightful freight data from the private sector without violating privacy concerns.

Jeana Nordstrum, president of the New York City roundtable of the council of logistics management (CLM), underlined the importance of obtaining data from freight shippers because the shippers know what are in the trucks and containers the public agencies and their consultants are counting. She noted that CLM members are either shippers, or work directly with shippers on a daily basis, and may be able to provide data on the commodities shipped and on the timeliness of freight shipments

APPENDIX 2. CRITICAL ISSUES FACING FREIGHT DATA COLLECTION AND ANALYSIS

The following is a summary of what the conferees expressed as being the critical issues facing freight data collection and analysis.

1. Understand Data Needs.
    - An understanding as to why new data are needed must precede any new data collection effort.
    - Re-examine our modeling and analyses paradigms for optimal use of data.
    - The use of the existing patchwork of data sets could lead to decision traps where decision support systems are built based on existing data instead of data collection efforts being designed based on the needs of appropriate decision support systems.
    - There is a need for a consistent national database across and within market areas, states, and regions.
    - We need to define a framework for a national database.
    - We need a strategic business plan to define the future of freight data collection efforts.

2. More Local Origin-Destination (O-D) Data.
    - We need a better understanding of freight flow patterns for meaningful forecasting models.
    - Need to understand how different freight modes of transportation are interrelated (from shipper to consumer) in order to develop better models.
    - Analysis of the freight movement process needs to look at shipments and the delivery process. This type of data is often proprietary. We need cooperation from shippers.
    - Issue of privacy needs to be addressed. Individual shippers may not cooperate if they perceive their involvement as a means to exact the information that can be used by government to tax them more. (Big Brother)
    - We also need to reduce the inconsistency that exists within global and domestic freight movement data. We could learn from the European community that has made progress in this direction.
    - Carriers provide Reebie Associates with annual summarization of the flows by zip code.

3. Integrate Modal Data Collection Activities.
    - Involve the private sector more in future congregations on freight data. We need to convince them that there is a financial stake in the outcome of freight data collection and freight analyses.
    - Efforts should be geared to share freight information across and within geography.
    - Get AASHTO to understand the policy and design impacts of freight data and bring them on board in the data collection efforts.
    - Develop a tri-national database (US/Canada/Mexico).

4. Innovative Technologies for Tracking Freight.
    - Future freight data collection efforts should take advantage of existing and emerging transportation informatics.
    - Data collection, storage, dissemination business should be an E-business (electronic business). Examples: use smart-tags on the freight items to track them by mode and O-D; use real-time loop based integrated vehicle data collection and monitoring technologies.
    - Be careful with electronic data collection in terms of the use of private or confidential information.

5. We Need To Know More About Freight Transportation Costs and the True Impact of Congestion.
    - We need to understand the true cost of congestion in freight transportation modeling.
    - We need cost of freight delay, classified by commodity and flow.
    - What is the cost of "Just-in-Time (JIT)" delivery? For air and overnight parcel delivery, we have the least information in this growing sector.
    - We need to establish multi-modal relationships, capacity difference and transfer costs between modes. Air, water, and rail all require some level of truck transport.

6. There is a disconnect Between Industry and Their Need for Logistics and Transportation.
    - Most of logistics and transportation services are outsourced. Therefore, most of the freight transportation industry may not have a better understanding of the problem.

7. Major Data Deficiency is in Truck Freight Transportation.
    - Water freight data is good, rail freight data is workable, however, truck freight data is complex and most deficient.
    - We need data reconciliation at state and/or market area crossing points.

- We need to integrate truck freight data with data for other modes of transportation.
- We need to define what a truck is, i.e., national truck size and weight policy.

8. Is Data for Mini-Trains Important?
    - Do we need to analyze mini-trains hauling half to million-ton movements? In which areas / markets can they be effective? How do we establish the need for this service? What data do we need to collect?

9. Website for Interaction.
    - Need a website where shippers can look at network and give feedback where they see problems.

APPENDIX 3. THE FUTURE FOR FREIGHT DATA COLLECTION AND ANALYSIS, INCLUDING ACTION ITEMS

The following is a summary of what the conferees expressed as being issues in the future of freight data collection and analysis.

1. Freight Data Collection Versus Modeling.
    - Need to Establish a Source for the Stability of Freight Data Collection Funding.
    - Level of detail needed varies among various data users. Private (business) and public entities as well as global versus local interests have differing needs.
        - *Establish user needs, then decide on the levels of detail and cost of data.*
        - *View data as an asset for decision-making.*
        - *We need a coordinated effort to develop a framework or a strategic business plan for future data collection efforts.*
        - *Need to institutionalize freight data.*
        - *How to design the AFS data collection initiative for better data. How to reduce respondents burden?*
        - *Establish who can collect data best, who can manage it best.*
    - Freight logistics models need to operate at 2 levels. The logistics (e.g., a transshipment) models at one level must be tied to the physical infrastructure network with associated transportation costs, at a second level. Future data collection should be designed to complement this type of analysis.
    - Future freight data collection efforts must serve both the infrastructure needs as well as carriers and logistics needs.
    - Can we draw similarities between freight data and passenger-travel data collection and modeling? Should we use the household (HH) travel survey approach on the freight transportation? For example, surveying small samples of firms, shipments, etc., but more detailed.
        - *A HH is a HH but freight varies by industry and commodity type. Be careful when attempting to draw such similarities. A HH supply chain is different from a freight supply chain.*
        - *Should we undertake establishment surveys?*
    - Freight modeling will benefit from more detailed (O-D) data.
        - *Carriers see shipments as general freight but not the contents.*

    - *Container shipment is growing segment of rail but the content within the container may be unknown. We need to ask the shippers.*
    - *If we know how shipments are moving we can recommend best or optimal changes in freight movements.*
    - *Reconcile freight data across borders and/or market area boundaries.*
- Form market-area coalitions to coordinate freight studies.
- Shippers cannot always provide information on the mode used. For example, a shipment going via UPS could use a combination of truck, air or train. Future data collection efforts should target freight trip-chaining information.
- Modeling, data collection and technology must be part of a holistic approach aimed at providing a solid characterization of the freight transportation system
- Research modeling and analyses paradigms outside transportation to improve freight transportation modeling and analysis.
- Is the use of the Intelligent Transportation System (ITS) set of tools pragmatic and agreeable to all parties?
    - *Are their legal or other "big brother" issues?*
    - *Are there regulatory or privacy concerns that restrict full use of technology in data and information gathering?*

2. Freight analysis should have a market area view rather than a state view. Freight movements are not confined within state borders but rather within larger market areas often incorporating several states. Data collection should have this market view. The data also must reconcile freight movement across and within market area borders.

3. Importance of timely data.
    - Establish the need for timely data.
    - How sensitive is freight business to change in timely data?
    - Is there a trade-off between data depth and data timeliness?
        - Can good data depth substitute for data timeliness via modeling to fill in data gaps?

4. We need to keep "background noise" data on the system. For example, collection and delivery of mail, garbage, and household delivery are also freight movements on the system every day. There are also non-freight movements using the same infrastructure as freight.
5. Encourage young researchers into the fields of freight transportation and logistics.

APPENDIX 4. CONFERENCE PROGRAM

Data Needs in the Changing World of Logistics and Freight Transportation

Saratoga Springs, New York USA
Wednesday and Thursday, November 14 - 15, 2001

Wednesday, November 14, 2001

8:00 am - 9:00 am ..... Registration and Continental Breakfast

9:00 am - 9:15 am ..... Welcome and Introductory Remarks

9:15 am - 10:00 am **The Emerging Importance of Freight Data**

Joseph Boardman	Commissioner, NYSDOT
Ashish Sen	Director, Bureau of Transportation Statistics, USDOT
Paul Bingham	Principal, DRI-WEFA, Inc, and Chair, TRB Committee on Freight Transportation Data (A1B09)

10:00 am - 11:00 am **The National Perspective**

This session will summarize the growing importance of freight movement to the national economy, trends in freight flows and critical issues for the future. The usefulness of current data sources for effective analysis will be addressed.

Christina Casgar	Executive Director, Foundation for Intermodal Research and Education
Paul Ciannavei	Principal, Reebie Associates
Lance Grenzeback	Senior Vice President, Cambridge Systematic Inc

11:00 am - 11:30 am Break

11:30 am - 12:30 pm **A New York State Perspective**

New York State DOT has a major initiative to improve its global competitiveness by enhancing freight mobility within the state and within the world economy. This initiative will serve as the framework for discussion of the effectiveness and deficiencies of current freight data sources.

Nathan Erlbaum	NYSDOT, Planning and Strategy Group

12:30 pm - 2:00 pm Lunch

Luncheon Remarks on:

The Changing World of Freight Transportation

Michael Gallis	Michael Gallis & Associates

2:00 pm - 3:30 pm	Panel: **Critical Issues Facing Freight Data Collection and Analysis**

The panelists will identify critical issues that must be addressed to provide adequate data and analytical tools to support the freight flows required by the evolving global economy.

C. Michael Walton	Ernest H. Cockrell Centennial Chair, Department of Civil Engineering, University of Texas at Austin
George List	Professor and Chair, Department of Civil and Environmental Engineering, Rensselaer Polytechnic Institute
Julius Gorys	Senior Planner, Ontario Ministry of Transportation
Glen Weisbrod	President, Economic Development Research Group
Susan Lahsene	Transportation Planning Manager, Port of Portland
Bruce Lambert	Transportation Economist, FHWA

3:30 pm - 4:00 pm	Break
4:00 pm - 5:00 pm	Panel: (continued) **Critical Issues Facing Freight Data Collection and Analysis**
5:00 pm - 6:00 pm	Reception

Thursday, November 15, 2001

7:00 am - 8:00 am	Continental Breakfast
8:00 am - 10:30 am	Panel: **The Future for Freight Transportation Data Collection and Analysis**

Panelists will suggest organizational actions and collective strategies to improve the usefulness of freight data and tools.

Rick Donnelly	Principal Consultant and Vice President, PB Consult Subsidiary of Parsons Brinkerhoff
Susan Lapham	Associate Director, Bureau of Transportation Statistics
Paul Ciannavei	Principal, Reebie Associates
Robert Costello	Chief Economist & Director, Economic and Statistics Department, American Trucking Associations, Inc
Frank Southworth	Leader, Transportation Planning and Systems Analysis Program, Oak Ridge Laboratory

10:30 am - 11:00 am	Break
11:00 am - 12:30 pm	**Recommendations for Action and Further Research**

Facilitated discussion with the objective of determining freight data gaps, actions necessary to close these gaps, and a research agenda.

Moderator:

C. Michael Walton	Ernest H. Cockrell Centennial Chair, Department of Civil Engineering, University of Texas at Austin

12:30 pm	**Adjourn**

APPENDIX 5. LIST OF CONFERENCE PARTICIPANTS

	Last Name	First Name	Affiliation
1	Adams	Louis H.	New York State Department of Transportation - Main Office
2	Albertin	Richard	New York State Department of Transportation - Main Office
3	Alves	William	Rhode Island Department of Transportation
4	Badger	Robert	Clough Harbor Associates, LLP
5	Bingham	Paul	DRI-WEFA
6	Boardman	Joseph	New York State Department of Transportation - Main Office
7	Bradford	Mark	USDOT - Bureau of Transportation Statistics
8	Bushery	John M.	USDOT - Bureau of Transportation Statistics
9	Casgar	Christina S.	Foundation of Intermodal Research and Education
10	Chin	Shih-Miao	Oak Ridge National Laboratory
11	Christopher	Ed J.	USDOT - Federal Highway Administration
12	Ciannavei	Paul R.	Reebie Associates
13	Cioffi	Gerard J.	New York State Department of Transportation - Main Office
14	Cohen	Michael P.	USDOT - Bureau of Transportation Statistics
15	Coleman	Tedi D.	New York State Department of Transportation - Main Office
16	Costello	Robert P.	American Trucking Association, Inc.
17	Curtis	Robert S.	New York State Department of Transportation - Main Office
18	Delaney	John B.	New York State Department of Transportation - Main Office
19	Donnelly	Rick	PB Consult, Inc.
20	Duych	Ronald J.	USDOT - Bureau of Transportation Statistics
21	Erlbaum	Nathan	New York State Department of Transportation - Main Office
22	Fellinger	Eric B.	Vermont Agency of Transportation
23	Fiocco	MJ	USDOT - Office of Intermodalism
24	Fowler	John L.	U.S. Census Bureau
25	Franke	Jay R.	Northwestern University Transportation Center
26	Frankenfeld	Aaron	Adirondack / Glens Falls Transportation Council - MPO
27	Gallis	Michael	Michael Gallis & Associates

LIST OF CONFERENCE PARTICIPANT (CONT.)

	Last Name	First Name	Affiliation
28	Ganovski	David	Maryland State Department of Transportation - Rail Services
29	Gilchrist	Timothy	New York State Department of Transportation - Main Office
30	Gorys	Julius	Ontario Ministry of Transport
31	Grenzeback	Lance R.	Cambridge Systematics, Inc.
32	Guinan	Jack	New York State Department of Transportation - Main Office
33	Hancock	Kathleen	University of Massachusetts at Amherst
34	Hewitt	Bridgett A.	SE Michigan Council of Governments
35	Hewitt	John W.	TransTech Systems, Inc.
36	Higle	Jay	New York State Department of Transportation - Main Office
37	Holguin-Veras	Jose	City College of New York
38	Hombach	Art	New York State Department of Transportation - Main Office
39	Hu	Patricia	Oak Ridge National Laboratory
40	Hunt	David T.	Wilbur Smith Associates
41	Kearney	Tom	Federal Highway Administration - NY Division
42	Kirch	Brian M.	New York State Department of Transportation - Main Office
43	Konieczny	Laura	Rensselaer Polytechnic Institute
44	Kontos	James R.	Nebraska Department of Roads
45	Lahsene	Susie	Port of Portland, Oregon
46	Lambert	Bruce	USDOT - Federal Highway Administration
47	Lapham	Susan	USDOT - Bureau of Transportation Statistics
48	Lawson	Catherine T.	SUNY at Albany
49	Linde	William	USDOT - Federal Highway Administration - Policy Studies
50	List	George	Rensselaer Polytechnic Institute
51	Mahoney	Martha	GEOStats
52	Mbwana	John R.	Transportation Infrastructure Research Consortium-Cornell University
53	McQueen	Tom E.	Georgia State Department of Transportation
54	Mendoza	Gerardo	New York State Department of Transportation - Main Office
55	Meyburg	Arnim H.	Transportation Infrastructure Research Consortium-Cornell University

LIST OF CONFERENCE PARTICIPANT (CONT.)

	Last Name	First Name	Affiliation
56	Miller	Kenneth	Massachusetts Highway Department
57	Mitchell	Bill E.	Roadway Express
58	Mohr	William A.	New York State Department of Transportation - Main Office
59	Moore	Kimberly P.	U.S. Census Bureau
60	Nordstrom	Jeana	Council of Logistic Management - New York City Roundtable
61	Nowicki	Eugene J.	New York State Department of Transportation - Region 5
62	Palley	Joel	FRA, Washington
63	Palmerlee	Thomas M.	Transportation Research Board, National Academy of Sciences
64	Preisler	Matthew R.	Wilbur Smith Associates
65	Purvis	Jason A.	Capital District Transportation Committee - Albany MPO
66	Ralbovsky	Frank S.	NYSERDA
67	Rosenthal	Dan J.	Nebraska Department of Roads
68	Ross	Nancy	New York State Department of Transportation - Main Office
69	Rybeck	Rick	Washington DC, Division of Transportation
70	Schneider	Norman R.	New York State Department of Transportation - Main Office
71	Sen	Ashish K.	USDOT - Bureau of Transportation Statistics
72	Shufon	John	New York State Department of Transportation - Main Office
73	Simonsen	Janine	New York State Department of Transportation - Main Office
74	Slavick	Stephen R.	New York State Department of Transportation - Main Office
75	Smith, Jr.	Robert L.	University of Wisconsin-Madison
76	Sopczyk	Scott	Adirondack / Glens Falls Transportation Council - MPO
77	Southworth	Frank	Oak Ridge National Laboratory
78	Spring	Doug	New York State Department of Transportation - Main Office
79	Sterbentz	John J.	Binghamton Metro Transit - MPO
80	Tario	Joseph D.	NYSERDA
81	Teglassi	Victor S.	New York State Department of Transportation - Region 11
82	Timmons	Richard F.	Norfolk Southern Corporation

LIST OF CONFERENCE PARTICIPANT (CONT.)

	Last Name	First Name	Affiliation
83	Tweedie	Ronald W.	Consultant
84	Valengavich	John P.	Connecticut State Department of Transportation
85	Waidley, Jr.	Gregory E.	Federal Highway Administration - NY Division
86	Walton	C. Michael	University of Texas at Austin
87	Weiner	Ross	City University of New York
88	Weisbrod	Glen	Economic Development Research Group
89	Weiskopf	Lynn	New York State Department of Transportation - Main Office
90	Williams	Virginia	New York State Department of Transportation - Main Office
91	Wright	Duane	New York State Department of Transportation - Main Office
92	Zabelsky	Thomas E.	U.S. Census Bureau
93	Zmud	Johanna	NuStats Partners, LP.