

DATA AND INFORMATION TECHNOLOGY GROUP

Committee Triennial Strategic Plan (TSP)

Committee Name and Number: ABJ090 Freight Transportation Data

Committee Chair: Donald Ludlow, Vice President, CPCS Transcom

Committee Vice Chair: Alison Conway, Associate Professor, City College of New York

TSP Three-Year Period: April 2018 – April 2021

Date Prepared: January 2018

Committee Future Outlook

Current scope

Currently, the defined scope of the Freight Transportation Data Committee is:

- to identify and publicize sources of and needs for data on commodity movements, international trade, freight transportation activity, and the economics and organization of establishments engaged in freight transportation
- to advise data collection agencies on cost-effective means of fulfilling essential data needs; and
- to assist analysts and decision makers in the effective use of freight transportation data.

Factors and influences that will shape committee activities

Over the last decade, the landscape for freight transportation data has changed radically. Historically, the committee has focused primarily on the application and upkeep of large federal data products such as the Commodity Flow Survey and Freight Analysis Framework. The passage of MAP-21, followed by the FAST Act, created a variety of new Federal mandates for freight planning and freight performance measurement that now require states, MPOs, and local governments to collect, process, and utilize freight data for planning and decision-making. At the same time, new communications technologies and rapid advances in data processing, storage, and security have quickly changed the information and tools available to both industry and the public sector for freight planning, operations, and performance measurement. Emerging sources of freight data include but are not limited to:

- Satellite Images
- GPS/Bluetooth/Smartphone data
- Road sensor data
- Smart vehicle information (containers, RFID)
- Inventory and manifest data
- Traffic operations data (affecting freight routes)
- Human factors data affecting freight
- “Open” public records that may provide information relevant to freight activity

Recognizing the pace of change in this area, in 2014 TRB approved a Task Force, ABJ92T, to focus on Big Data in Freight Transportation. The activities of the task force are detailed in Appendix B. In January 2018, after the Annual Meeting, TRB elected to sunset the Task Force. Within the next year, we will be working to update the defined scope of the Freight Transportation Data Committee to absorb the functions of the Task Force. Additional functions of the Task Force that are expected to be brought under the scope of the committee include:

- to focus on emerging big freight data sources, including those produced by global navigation systems, cameras, sensors, and administrative records;
- to explore the use of data science, artificial intelligence, and data fusion methods to enable public agencies to apply big data to improve freight mobility;
- to assist agencies to address common challenges such as data collection, automation of data crosswalks, bias and error of new data sources and methods, analytical methods, and applications for agencies to improve freight mobility;
- to identify how those data might be made practical for transportation agency decision makers; and
- to coordinate interests of both freight and transportation data committees within TRB.

The committee will continue to monitor expected rapid changes in technology deployment and supply chain organization. It is expected that in the longer term, the committee will need to address data needs and data sources associated with transformative technology advancements and continuing evolution of retail models; specific areas of interest are expected to include:

- Data needed for and generated by connected and autonomous fleets and unmanned aerial systems; and
- Data to understand global and local impacts from 3-d printing and automation in the manufacturing sector;
- Last-mile and last-50-ft data to characterize disaggregate freight activities, especially those associated with e-commerce and omni-channel retail models;

Committee Plan

The Freight Data committee has a fairly specific focus, but as discussed above is currently in the process of expanding its scope; specific emerging, critical, and cross-cutting issues of interest to the committee include:

- Freight performance measurement
- New technologies for data collection
- Data mining and data fusion techniques
- Artificial intelligence applications
- Institutional arrangements for data sharing within agencies and between stakeholders

To address these interests, over the next three years the committee will focus on the following four major tasks.

Task #1: Identify necessary structural changes to incorporate the expanding scope of the committee.

The Committee is in the process of identifying efficient ways to expand beyond our traditional scope and strengths to incorporate the scope of the Big Data in Freight Transportation Task Force. Specific actions we will undertake include:

- **Broadening the membership** of the committee to include more individuals with expertise specifically in big freight data as well as more individuals who are users of this data. Ideally, this will include: members of the preceding Big Data task force, recent graduates with expertise in cutting-edge analytical techniques; state DOTs, MPOs, and local agencies in large, medium-sized and small communities in the US and abroad.
- **Establishing formal liaisons** with relevant committees in the Data, Freight, Marine, and Operations groups and sections to increase opportunities for cross-committee collaboration on workshops, sessions, research needs statements, and other activities; a few examples include the Artificial Intelligence Committee, the Household Surveys Committee, the Freight Planning and Urban Freight Committees, and the Highway Traffic Monitoring Committee. We will also identify a liaison to the Freight and Marine Young Members Council.
- **Exploring the introduction of standing subcommittees**, which have not previously existed under ABJ90;
- **Updating or replacing existing committee communications resources** (e.g. website) and introducing new forms of communication (e.g. social media) to better maintain ongoing communications with interested members, friends, and collaborators. Our existing website is outdated and must be replaced or redeveloped.

Task #2: Monitor new advances in freight data applications and research.

The Committee will continue to monitor and recommend new advances in freight data applications and research. This includes the continued implementation on best practices in disaggregation and rapidly developing methods in combining freight and non-freight data sets to shed new light on transportation markets and operations. Specific activities that we will undertake include:

- **Tracking the status and results of ongoing major research efforts**, such as NCFRP 49 - Understanding and Using New Data Sources to Address Urban and Metropolitan Freight Challenges.
- **Continuing to invite relevant speakers** to present during annual and summer meetings. We will continue to include updates from US and Canadian data programs, and will look to expand for further international involvement.
- **Developing relevant calls-for-papers** for the annual meeting and other committee sponsored workshops and conferences to ensure that we receive submissions of cutting-edge research in relevant areas.

Task #3: Provide input, direction, and feedback to federal, state, and local research programs.

- **Developing and shepherding research needs statements relevant to freight data.** Under NCFRP, the committee was very successfully in authoring and moving forward to funding several freight

data projects. Now in the absence of NCFRP, there is a need to establish new connections with state DOTs to ensure that the committee (1) understands the priorities of research funders and (2) communicates research needs in a compelling manner to move them to implementation.

- **Developing annual meeting sessions and other events to provide inputs to ongoing programs;** for example, we will continue to work with FHWA, BTS and the Census Bureau to provide user inputs on products such as the FAF, the CFS, and the Vehicle Inventory and Use Survey.
- **Communicating the products of recent research efforts** to the community of data users and serving as a liaison between major agency efforts and these data users. For example, the committee is working with the National Transportation Library to collect input on the completeness and contemporariness of the implemented freight data architecture which was developed through NCFRP 47.

Task #4: Communicate recent advances and best practices to practitioners and the international community of data users.

- **Developing Annual Meeting sessions and other events of interest to both traditional and non-traditional stakeholders.** We will develop programming that aims to expand conversations to include participants from other groups within TRB and from stakeholder groups that are not traditional TRB attendees.
- Specifically, **continuing to sponsor the Innovations in Freight Data Workshop.** As detailed in Appendix B, the Committee, along with ABJ92T, sponsored the Innovations in Freight Data Workshop in Irvine, California in May of 2017, and will sponsor the 2nd Innovations Workshop in Spring of 2019. The event successfully showcased new and emerging data sources and applications, including those related to artificial intelligence and sensor-based sources.

Appendix A: Committee History

Committee Membership *(Number of members at time of report):*

Total Members	21
Regular Member Slots	17
International Member Slots	0
State DOT Slots	0
Young Member Slots	2
Emeritus Members	2

Paper Review:

Papers reviewed during the last year	12
Papers recommended for publication	2

Annual Meeting Sessions Sponsored *(Lists of sessions for the last year provided on next page)*

Paper/conference sessions	5
Poster session	1
Workshop	3
Published meeting	1
Gathering	0
Cosponsored sessions/meetings	5*

* Includes workshops

Research Problem Statements

- Number of problem statements submitted last year 0

Other Activities Sponsored During the Last Year:

- Innovations in Freight Data Workshop (see attached summary)
- Task Force on Understanding Big Data in Freight Transportation (ABJ92T) (see attached summary)

2018 Annual Meeting Activities

Committee Meeting

Freight Transportation Data Committee

Donald Ludlow, CPCS Transcom; Alison Conway, City College of New York, presiding

Sessions

Session 842: Key Findings from the Workshop on Innovations in Freight Data

Alison Conway, City College of New York, presiding

Overview of Innovations in Freight Data Workshop (P18-20457)

Alison Conway, City College of New York

Crowdsourcing to Obtain Crude-oil-on-rail Route Information (P18-20451)

Shih-Miao Chin, Oak Ridge National Laboratory

Approaches to Monitor Truck Loading Activity in New York City (P18-20455)

Nicola Mammes, New York City Department of Transportation

Classifying California Truck Activity Using Loop Sensors (P18-20456)

Yeow Chern Tok, University of California, Irvine

Session 866: Key Questions Driving Freight Data Development and Applications

Donald Ludlow, CPCS Transcom, presiding

Data Dependent Freight Planning Issues in Florida (P18-20180)

Ricky Fitzgerald, Florida Department of Transportation

CalTrans Freight Data Needs (P18-20181)

Chris Schmidt, California Department of Transportation (CALTRANS)

Small MPO Freight Data Needs: North Front Range Experience (P18-20454)

Becky Karasko, North Front Range Metropolitan Planning Organization (NFRMPO)

Data Framework for Megaregion Freight Models (18-01860)

Krishnan Viswanathan, Cambridge Systematics, Inc.

Monisha Khurana, The Goodman Corporation

Vladimir Livshits, Maricopa Association of Governments

Sreevatsa Nippani, Maricopa Association of Governments

Pedro Camargo, Veitch Lister Consulting

Session 827: Using Automatic Identification Systems to Better Understand Our Transportation System

Edward Strocko, OST-R/Bureau of Transportation Statistics, presiding

Sponsored by Marine Group (AW000); Standing Committee on Freight Transportation Data (ABJ90); Standing Committee on Freight Transportation Planning and Logistics (AT015)

Automatic Identification System Overview (P18-20380)

Brian Tetreault, U.S. Army Corps of Engineers (USACE)

National Census of Ferry Operations Ferry Route Visualization (P18-20386)

Kenneth Steve, Office of the Secretary of Transportation (OST)

Andrew Barrows, U.S. Department of Transportation/Bureau of Transportation Statistics

BTS Port Performance Program Dwell Time Analysis (P18-20383)

Matthew Chambers, OST-R/Bureau of Transportation Statistics

AIS Tools for Transportation (P18-20384)

Kenneth Mitchell, U.S. Army Corps of Engineers (USACE)

The Use of AIS Data with Traditional Transportation Data Sets (P18-20385)

Douglas McDonald, Maritime Administration (MARAD)

Session 799: The Future of Measuring Trucks and Their Use in the United States

Donald Ludlow, CPCS Transcom, presiding

Sponsored by Task Force on Understanding Big Data in Freight Transportation (ABJ92T); Standing Committee on Freight Transportation Data (ABJ90)

Status of Federal VIUS (P18-20426)

Joy Sharp, Office of the Assistant Secretary for Research and Technology

Update on Canadian Vehicle Use Survey (P18-20427)

Robert Leore, Transport Canada

California Vehicle Inventory and Use Survey (P18-20449)

Chris Schmidt, California Department of Transportation (CALTRANS)

Freight Data User Forum

National Transportation Library Freight Data Dictionary: Freight Data User Forum

Donald Ludlow, CPCS Transcom, presiding

National Transportation Library Freight Data Dictionary (P18-20179)

Ted Westervelt, OST-R/Bureau of Transportation Statistics

Workshops

Workshop 110: SHRP 2 Workshop on Behavior-Based Freight Models, Part 1: Model Development (Part 2, Session 187)

Vidya Mysore, Federal Highway Administration (FHWA), presiding

The second Strategic Highway Research Program (SHRP 2) Freight Demand Modeling and Data Improvement Strategic Implementation Plan (C20) provides a framework for continuous improvement and innovative breakthroughs in freight transportation forecasting models and tools. This workshop, for behavior-based freight model developers, users, and innovators, focuses on SHRP 2 C20 behavior-based freight models and their applications.

Sponsored by Standing Committee on Transportation Demand Forecasting (ADB40); Standing Committee on Freight Transportation Data (ABJ90); Standing Committee on Transportation Network Modeling (ADB30); Standing Committee on Urban Freight Transportation (AT025)

Introductions and Welcome (P18-21700)

Vidya Mysore, Federal Highway Administration (FHWA)

Jeffrey Purdy, Federal Highway Administration (FHWA)

Overview of Approaches (P18-21701)

Vladimir Livshits, Maricopa Association of Governments

Brian Ryder, Baltimore Metropolitan Council

Colin Smith, RSG

Model Framework and Design (P18-21702)

Vidya Mysore, Federal Highway Administration (FHWA)

Colin Smith, RSG

Advancements (P18-21703)

Vladimir Livshits, Maricopa Association of Governments

Birat Pandey, Federal Highway Administration (FHWA)
Erica Wygonik, RSG

Wrap Up and Questions (P18-21704)

Vidya Mysore, Federal Highway Administration (FHWA)
Jeffrey Purdy, Federal Highway Administration (FHWA)

Workshop 155: Freight Planning and Data Forum: Tailoring Highway Traffic Monitoring Data to Serve the Needs of Freight Planners

Sarah Hernandez, University of Arkansas, Fayetteville, presiding

This workshop focuses on new applications of existing and new types of highway traffic monitoring data to better meet freight planning data needs. Traditional traffic data is valuable for cost allocation, maintenance, and operations but often falls short for freight planning because it lacks origin-destination, economic, and commodity information. Example topics include: new traffic data types, fusion of traffic data with other sources, and sensor placement/selection to support planning.

Sponsored by Standing Committee on Freight Transportation Data (ABJ90); Standing Committee on Highway Traffic Monitoring (ABJ35)

Workshop Introduction (P18-21451)

Sarah Hernandez, University of Arkansas, Fayetteville

Topic 1 (Freight Planning): Drawing the Line Between Freight Operations and Planning Data (P18-21452)

Chris Schmidt, California Department of Transportation (CALTRANS)

Topic 2 (Traffic Monitoring): Review of Common Highway Traffic Monitoring Data Sources (P18-21453)

Kent Taylor, North Carolina Department of Transportation

Topic 3 (Research): Tailoring Highway Traffic Monitoring Data to Serve the Needs of Freight Planners (P18-21454)

Dan Seedah, Transmetric America Inc.
Thomas Hill, Florida Department of Transportation
Jonathan Regehr, University of Manitoba
Sarah Hernandez, University of Arkansas, Fayetteville

Agenda

1) Introduction

- a) Key topics:
 - i) Freight planning requirements
 - ii) Freight performance measures
 - iii) Highlight synergies in highway traffic monitoring needs/requirements and freight planning needs
 - iv) Introduce remaining speakers and describe how workshop will run
- b) Presenter: Sarah Hernandez, University of Arkansas, and Kent Taylor, NCDOT
- c) Set-up: Podium presentation
- d) Time: 10 minutes

2) Topic 1 (Freight Planning): Drawing the line between freight operations and planning data

- a) Key Topics
 - (1) Discuss the difference between operations and planning data
 - (2) Operations → truck movements by weight or axle class at point locations
 - (3) Planning → Origin-destination data with ties to economic/business/industry information
- ii) Methods (types of studies)
- iii) Data needs
 - (1) Origin-destination volumes
 - (2) Industry classification
 - (3) Commodity information
 - (4) Weight (empty/non-empty)
- iv) New developments
- b) Presenter(s): Chris Schmidt, chris.schmidt@dot.ca.gov, Division Chief, Transportation Planning, Caltrans (*confirmed*)
- c) Set-up: Podium presentation
- d) Time: 15-20 min

3) Topic 2 (Traffic Monitoring): Review of common highway traffic monitoring data sources

- a) Key Topics
 - i) Traffic monitoring programs
 - ii) Data types
 - (1) Volume data: tube counts (AADT)
 - (2) Classification counts: WIM, tube counters (AADTT), video detection, etc.
 - (3) Vehicle tracking: Bluetooth, license plate tracking, etc.
 - iii) Technologies

- iv) New Developments
- v) Experiences with freight planners
- b) Presenter(s): Kent Taylor, NCDOT (confirmed)
- c) Set-up: Podium Presentation
- d) Time: 15-20 min

4) BREAK (15 Minutes)

5) Topic 3 (Research): Tailoring Highway Traffic Monitoring Data to Serve the needs of Freight Planners

- a) Key Topics
 - i) Using existing resources better, e.g. sensor placement decisions
 - ii) Fusion of existing/new data sources
 - iii) New data that suit planning and traffic monitoring
- b) Presenter(s): Invited research presentations (see list below)
- c) Set-up: Podium presentation, speed round style (10 minute presentations)
- d) Time: 40-60 Min

6) BREAK (15 Minutes)

7) Workgroups

- a) Key Topics
 - i) Facilitated Group Discussion
 - (1) What are the unmet data needs?
 - (2) What existing/new data can be developed?
 - (3) What statistics/products would support the process?
 - ii) Consensus Development
 - (1) Are there common themes from the workgroups?
 - (2) What ideas give the biggest bang?
 - (3) What are the short term vs long term goals and needs
 - (4) What's the priority?
- b) Presenter(s):
 - i) Audience participation using group discussion at tables followed up with interactive slide show development or real-time voting;
 - ii) Tables have a mix traffic monitors and freight planner;
 - iii) Identify facilitators
- c) Set-up: Question posters/handouts, flip charts and markers
- d) Time: 30 min for group discussion, 20 minutes for consensus

Speakers for Topic 3- Research

1. Dan Seedah, Tansmetric, dan.seedah@transmetric.com, “Strategies to identify and address differences in HPMS vehicle class estimates and commodity flows” - *confirmed*
 2. Thomas Hill, FDOT, Thomas.Hill@dot.state.fl.us, “Statewide Bluetooth Data Collection” - *confirmed*
 3. Jonathan Regehr/Sarah Hernandez, Univ. of Manitoba/ Univ. of Arkansas, jonathan.regehr@umanitoba.edu, “Estimating payload factors from WIM data” (submitted as paper 18-02737 to ABJ35) - *confirmed*
 4. Glareh Amirjamshidi, glareh@gmail.com, University of Toronto(?), “Data Fusion of Vehicle GPS and Roadside Intercept Survey” (submitted as paper 18-00872 to ABJ90)
 5. Jaeyoung Jung, Ford and Andre Tok, University of California, Irvine, “Determining Optimal Sensor Locations Under Uncertainty for Advanced Truck Surveillance on California Freeways”, (submitted as paper 18-01595 to ABJ35) - *confirmed*
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Workshop 188: Research Success: How to Create a Freight Research Community That Learns from Failure

Barbara Ivanov, University of Washington, presiding

Within research communities there tends to be a cultural bias to declare many research efforts a complete success without evidence to that effect. The fact is that many research efforts initially fail. How can we change our culture to more openly discuss failure and improve practice-wide learning? Participants in this workshop will develop foundational principles that committees may use to know if applied transportation research projects are successful.

Sponsored by Standing Committee on Intermodal Freight Terminal Design and Operations (AT050); Standing Committee on Freight Transportation Data (ABJ90); Freight Systems Group (AT000); Standing Committee on International Trade and Transportation (AT020); Standing Committee on Urban Freight Transportation (AT025); Standing Committee on Agricultural Transportation (AT030)

The Principles of Evidence-Based Policymaking (P18-20772)

Nick Hart, Bipartisan Policy Center

Collaboration to Increase Port Efficiency: The Supply Chain Optimization Group (P18-21153)

Genevieve Giuliano, University of Southern California

CIVITAS in the EU (P18-20773)

Hans Quak, Toegepast Natuurwetenschappelijk Onderzoek (TNO)

Barriers to Urban Freight Policy Implementation - The Case of UCC in Oslo (P18-21801)

Astrid Bjorgen

Paris Chronopost Project (P18-21359)

Laetitia Dabanc, IFSTTAR

Bureau of Transportation Statistics (BTS) Port Performance Task Force (P18-21151)

Thomas Wakeman, Stevens Institute of Technology

USDOT Freight Advanced Traveler Information Systems (FRATIS) (P18-21152)

Edward McCormack, University of Washington

Appendix B: Summary of ABJ92T Activities

Task Force History and Mission

The task force convened in mid-2014 with a focus on understanding how to apply “big data” sources to improve freight system challenges faced by the public and private sectors.

Mission Statement

This three-year task force explores the current state of knowledge regarding the use of big data to understand and manage the movement of goods throughout the supply chains. It addresses how both private and public sector managers can use big data to improve the performance of the freight system. The task force serves to coordinate interests of both freight and transportation data committees within TRB. Topics addressed include: data collection and transmission technology, data storage and stewardship, data analysis and dissemination, uses of analysis results, institutional issues of data ownership, privacy, and sharing, suggestions for improving the application of big data by public agencies.

Task Force Activities

Initially, the task force conducted fact-finding to understand how big data is being applied in transportation and allied industries. To that end, the task force held a series of meetings during 2014-2016 with leaders in big data and data science from transportation, logistics, manufacturing, and defense industries. The task force also commissioned a white paper to summarize “big data” freight data sources. This body of work suggested the need to catalyze big data applications in the freight transportation community. With support from TRB and FHWA, the task force planned and implemented the Innovations in Freight Data Workshop in Irvine, California in May of 2017. The workshop became the centerpiece of the TRB Summer Freight Meetings. The E-Circular from the workshop provides the Task Force with a renewed and more focused sense of future mission.

Task Force Dissolution

On January 29, 2018, TRB decided to dissolve the Task Force. Had it continued, the Task Force had developed a revised mission statement following the TRB Annual Meeting in early January 2018:

The task force will explore the use of data science, artificial intelligence, and data fusion methods to enable public agencies to apply big data to improve freight mobility. The task force will serve to coordinate interests of both freight and transportation data committees within TRB. The task force will focus on emerging big data source of freight data, including those produced by global navigation systems, cameras, sensors, administrative records, and other sources to identify and how those data might be made practical for transportation agency decision makers. Topics addressed include data collection, automation of data crosswalks, bias and error of new data sources and methods, analytical methods, and applications for agencies to improve freight

mobility. The task force will provide ongoing research leadership ahead of the next Innovations in Freight Data Workshop in April 2019 and will serve as the planning committee for the workshop.

Next Steps

The Freight Data Committee will need to update the TSP to develop a plan to absorb ABJ92T activities and mission.

Appendix C: Innovations in Freight Data Workshop

The Freight Transportation Data Committee has made a strong and lasting contribution to the TRB community through its sponsorship of innovative and timely workshops that bring the TRB community together around cross-cutting freight data issues. Our May 2017 *Innovations in Freight Data Workshop* provided two days of compelling and carefully curated presentations and interactive sessions focused on applications of emerging freight data sources. The TRB Freight Group summer meetings were scheduled around the workshop, which attracted over 130 multidisciplinary participants.

Innovation: The workshop examined a range of new freight data collection and application approaches, including:

- Computer vision for truck recognition;
- Data fusion approaches to collect truck count and performance data by combining various sources (e.g. GPS, MAC ID, RFID, inductive loop detectors, etc.)
- Non-traditional methods (e.g. satellite light imagery, crowdsourced rail fan data) to estimate freight flows and trip generation;
- New rail-to-truck (and passenger vehicle) location sensing frameworks to improving real-time routing and safety.

Among many interesting sessions, the workshop included:

- A “GPS Truck Data Speed Round”;
- TRB’s first ever “Truck Laboratory” where participants “toured” an instrumented truck and held an interactive discussion with truck technology experts; and
- An interactive “poster” session where presenters demonstrated applications on large flat screens in real-time.

Results and Accomplishments: The workshop provided a significant update to the understanding of emerging data and identified key research priorities.

A post-workshop survey gave the workshop consistently high marks. 94 percent of attendees suggested that TRB should repeat the event every two years in the future. Comments included:

- “One of the best conferences/workshops I’ve ever attended. Very informative without being too overwhelming. I especially enjoyed the debrief at the end where we were all able to come together to discuss what we heard and what the next steps should be.”
- “I had to leave after the first morning. Probably the most useful morning I’ve ever had at a conference. Really outstanding and applicable stuff. Thanks for all your work!”

TRB and key sponsor FHWA have already started planning for the next workshop in 2019.

The workshop also succeeded by engaging other committees and disciplines, including operations, data science, artificial intelligence, and others, as well as by focusing tightly on “applications”, not theories. This enabled ABJ090 to advance its research agenda, including shaping calls for papers and NCHRP problem statements.

Transferability: The workshop succeeded by focusing narrowly on innovative applications, by engaging a planning committee of experts from diverse areas, and by assembling a very interesting, balanced, and interactive program. We believe the format and planning process is readily transferable.

Legacy: In addition to the “Innovations” workshop, ABJ090 has also led a string of other successful workshops over the past 10 years to help advance the state of the practice in freight data. These include:

- Two ***Commodity Flow Survey Workshops*** (2010 and 2015) ;
- The ***Measuring the Transportation System from a Supply Chain Perspective Workshop*** (2012);
- ***Toward Better Freight Transportation Data: A Research Road Map Workshop*** (2010); and
- Two ***North American Freight Flows Workshops*** (2007 and 2008).