



 **SHRP 2**
STRATEGIC HIGHWAY RESEARCH PROGRAM
Accelerating solutions for highway safety, renewal, reliability, and capacity

SHRP2 C20, C43,
and Others

SHRP 2 Freight Modeling and Data Activities



SHRP 2 Freight Product Group Need

- Goods movement is vital to prosperity.
- Transportation improvements are capital-intensive, long-term commitments.
- Transportation plans and programs must have a meaningful freight component to support sound decision-making.
- Passenger-oriented travel demand models and existing data are insufficient to reflect the complexity of freight.



Freight Product Group Purpose

To foster fresh ideas and new approaches to freight demand modeling and data collection that ultimately enhance decision-making.





SHRP 2 Freight Project Overview

- C20: Freight Demand Modeling and Data Improvement Strategic Plan (completed)
- C43: Second Freight Modeling and Data Innovation Symposium (event held Fall 2013, report in progress)
- C44: TRB Workshop on Using Supply Chain Data for Planning and Programming (completed)
- Adapting Freight Models and Traditional Freight Data Programs for Performance Measurement Workshop (TRB Division A, event held Spring 2013)
- [C15: Guide to Involving Freight Stakeholders in Capacity Project Planning, Programming, and Development (completed)]



Project C20 Overview



Developing a Strategic Road Map

- Foster interest among the freight community based on extensive outreach and engagement of public and private freight stakeholders.
- Document freight decision-making needs—particularly those of state DOTs and MPOs.
- Pilot a successful international Freight Modeling and Data Innovation Symposium—to spur breakthrough thinking and innovative ideas (www.freightplanning.com).
- Develop an initial set of Sample Research Initiatives validated by freight stakeholders.





C20 Strategic Objectives

1. Improve and expand the knowledge base for planners and decision-makers.
2. Develop and refine forecasting/modeling practices that reflect the “real world” of supply chain management.
3. Develop and refine forecasting/modeling practices based on sound economic and demographic principles.
4. Develop standard freight data to smaller geographic scales.

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C20 Strategic Objectives, *cont'd.*

5. Establish methods for maximizing the beneficial use of new freight analytical tools by state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) in their planning and programming activities.
6. Improve the availability and visibility of data among agencies and between the public and private sectors.
7. Develop new and enhanced visualization tools and techniques for freight planning and forecasting.



C20: Current State of the Practice



Current State of the Practice

- Key factors: Globalization of trade, underlying economic forces, private sector inventory and logistics, and centralized warehousing
- Freight planning, forecasting, and modeling response:
 - Economic Flow Models
 - Land Use/Economic Input-Output Models
 - Commodity-based Models
 - Vehicle/Trip-based Models
 - Estimation Routines
 - Aggregate Measures
 - Quick Response Procedures





Current Models are Lacking in Terms of:

- Multimodal dimensions of freight transport
- Key variables that “drive” freight demand
- Transportation variation by commodity type
- Obtaining proprietary data from private sources
- Time sensitivity of mode choice
- Local deliveries (i.e., “touring”) in metropolitan areas
- Complex relationship of land use and freight generation



Current Data Shortcomings

- Availability in general
- Frequency of updates
- Cost of collecting data to close gaps
- Accuracy and suitability for planning and modeling at varied geographic levels
- Potential errors aggregating or disaggregating data for geographic scaling
- Relating freight data to transportation networks in models





C20: Decision-Making Needs



Decision-Making Needs

- A recognized and valid inventory of standardized data sources with common definitions.
- A range of analytical tools and applications to address diverse decision-making needs.
- A process to routinely generate new data sources and problem-solving methods.
- Behavior-based facets of freight decision-making should be incorporated into modeling.

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Decision-Making Needs, *cont'd.*

- Industry-level freight data at a local, sub-regional level, and a better understanding of local deliveries in urban areas.
- Benefit-cost analysis tools that go beyond traditional financial measures by including direct and indirect benefits and costs (public and private).
- Development of a statistical sampling of truck shipment data similar to the Carload Waybill Sample available for railroads.

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Decision-Making Needs, *cont'd.*

- Intermodal transfer characteristics, volume, and trends.
- Leveraging freight data from GPS-based resources and ITS applications (e.g., CVO, Weigh-in-Motion, Connected Vehicles).
- Interplay of land use policies and freight.
- Understanding freight activity relative to fuel costs, currency valuation, and economic trends.

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Decision-Making Needs, *cont'd.*

- Applying freight forecasts to revenue projections.
- A multimodal, network-based freight demand model:
 - all modes of transport
 - similar level of detail for varied geographic scales





C20: Sample Research Initiatives



C20 Sample Research Initiatives

- The sample research initiatives demonstrate how the strategic objectives could be advanced.
- Each also applies to one or more of the three research dimensions—knowledge, models, and data.

The sample research initiatives outlined as part of SHRP 2 C-20 demonstrate how the strategic objectives could be advanced. Each also applies to one or more of the three research dimensions.

Sample Research Initiative	Research Dimension			Strategic Objectives									
	Knowledge	Models	Data	1. Increase the number of freight trucks on the highway	2. Increase the efficiency of freight trucks on the highway	3. Increase the safety of freight trucks on the highway	4. Increase the reliability of freight trucks on the highway	5. Increase the capacity of freight trucks on the highway	6. Increase the sustainability of freight trucks on the highway	7. Increase the security of freight trucks on the highway	8. Increase the resilience of freight trucks on the highway		
1. Develop the freight and origin knowledge and skill requirements for transportation decision-makers, and professional and technical personnel through the associated training systems to address knowledge and skill deficits.	Yes												
2. Develop techniques and modeling practices to address freight flow data.		Yes											
3. Develop modeling approaches for "behavior-based" freight movement.			Yes										
4. Develop methods that predict user toll and highway capacity under a range of "what-if" scenarios.				Yes									
5. Develop a range of freight forecasting methods to address decision-making needs for the operation of all levels of national, regional, state, and local markets.					Yes								
6. Develop robust tools for freight cost/benefit analysis that are based on user-to-user, origin-to-destination, and commodity.						Yes							
7. Develop modeling approaches that describe the components of the freight transportation system, system performance, and support the higher-level user participation.							Yes						
8. Develop data systems, strategies, and other technical solutions that support freight policy and performance measurement and development changes related to freight flows.								Yes					
9. Develop freight alternatives for application at various levels.									Yes				
10. Develop, test, and evaluate data products of user freight data systems that support modeling, forecasting, and decision-making.										Yes			
11. Develop procedures for applying freight forecasting to the design of new facilities in transportation systems and regions.											Yes		
12. Advance research to identify strategies to improve freight system performance through addressing, addressing, and comparing, traffic, modes.												Yes	
13. Develop modeling tools for freight planning and modeling through a user-oriented approach to the study and address a range of decision-making needs.													Yes

refer to handout



C20: Sample Research Initiatives

- A. Determine the freight and logistics knowledge and skill requirements for transportation decision-makers, and professional and technical personnel. Develop the associated learning systems to address knowledge and skill deficits.
- B. Establish techniques and standard practices to validate freight forecasts.
- C. Establish modeling approaches for “behavior-based” freight movement.
- D. Develop methods that predict mode shift and highway capacity implications of various “what-if” scenarios.

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C20: Sample Research Initiatives, *cont'd.*

- E. Develop a range of freight forecasting methods/tools that address decision-making needs and that can be applied at all levels.
- F. Develop robust tools for freight cost-benefit analysis that go beyond financial to the full range of benefits, costs, and externalities.
- G. Establish analytical approaches that describe how elements of the freight transportation system operate, perform, and impact the larger overall transportation system.

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C20: Sample Research Initiatives, *cont'd.*

- H. Determine how economic, demographic, and other factors/conditions drive freight patterns and characteristics. Document economic and demographic changes related to freight choices.
- I. Develop freight data resources for application at sub-regional levels.
- J. Establish, pool, and standardize a portfolio of core freight data sources/sets that support planning, programming, and project prioritization.

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C20: Sample Research Initiatives, *cont'd.*

- K. Develop procedures for applying freight forecasting to the design of transportation infrastructure such as pavement and bridges.
- L. Advance research to effectively integrate logistics practices (private sector) with transportation policy, planning, and programming (public sector).
- M. Develop visualization tools for freight planning and modeling through a two-pronged approach of discovery and addressing known decision-making needs.



C20: Strategic Road Map



C20 Road Map Elements

- Consortium of agencies to lead initiatives and coordinate
- Road map should be an agile framework for achieving the strategic objectives.
- Regular Innovation Symposia (C43 was the last SHRP 2-sponsored one)





Consortium Role in Initiatives Advancement

- Define issues ripe for research innovation
- Provide recognition and incentives to spur breakthroughs
- Conduct regular innovation forums
- Promote technology transfer from other disciplines
- Promote an international focus
- Recognize the application of completed research



Road Map Elements – Symposium

- A good foundation is to build upon the successful Freight Modeling and Data Innovation Symposium (Sept 2010).
- Small size to facilitate discussion: ~50 in attendance and ~15 presentations to address the challenge of developing the next generation of freight demand models and data.
- Jury panel of freight experts to judge presentations.
- A monetary award to competition winner.
- An ongoing dialogue to incorporate innovations into modeling and data practices.
- 2013 Symposium held October 2013.





SHRP2 C-20 Research Product



- Road Map to move freight modeling and data innovation forward through:
 - Implementation of sample research initiatives that support seven key strategic objectives.
 - Expanding the dialogue on freight analysis and data innovation through an ongoing international forum of key stakeholders.
- Published



Longer-Term Vision

- By the end of this decade, a vision for improved freight modeling and data will be characterized as follows:
 - Robust freight forecasting tools have been developed and are the standard for public sector freight transportation planning.
 - These tools and data are dynamic in terms of linking with other key variables such as development and land use, and are dynamic in terms of application to local scale, corridors, or regions.
 - The challenges associated with the data necessary to support new planning tools have been addressed through bringing together the varied resources of public and private sectors.
 - The knowledge and skills of DOT and MPO staff have been methodically enhanced to complement the development of better tools and data.
 - Decision-makers recognize that transportation investments are being informed by an understanding of the implications, benefits, and trade-offs relative to freight.



C-20 Technical Expert Task Group (TETG)

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