



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

SHRP 2 C20 Project Overview

Freight Demand Modeling and Data Improvement Strategic Plan

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Project 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.



Project Purpose

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



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Strategic Objectives

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

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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.



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 and economic input-output models
 - Commodity-based models
 - Vehicle- and 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
- 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



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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 that have been incorporated into modeling

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Decision-Making Needs, *cont'd.*

- Industry-level freight data at a local, subregional 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
- Leveraged freight data from GPS-based resources and ITS applications (e.g., CVO, Weigh-in-Motion, IntelliDrive)
- Interplay of land-use policies and freight
- Understanding of freight activity relative to fuel costs, currency valuation, and economic trends

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Decision-Making Needs, *cont'd.*

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



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Sample Research Initiatives



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.

Sample Research Initiative	Research Dimension			Strategic Objective		
	Knowledge	Models	Data	Improve Freight System Efficiency	Increase Freight System Reliability	Increase Freight System Capacity
A. Determine the freight transportation knowledge and skill requirements for transportation system operators, and professional and technical staff. Develop the associated learning systems to address knowledge and skill deficits.	Red	Blue	Blue	Blue	Blue	Blue
B. Develop techniques and standard practices to utilize freight forecasting.	Red	Blue	Blue	Blue	Blue	Blue
C. Develop modeling approaches for "last-mile" freight movement.	Red	Blue	Blue	Blue	Blue	Blue
D. Develop methods that predict incident and highway capacity under basic or unusual "what-if" scenarios.	Red	Blue	Blue	Blue	Blue	Blue
E. Develop a range of freight forecasting methods that facilitate decision-making under uncertainty for a number of levels of national regional state (NRS) economic.	Red	Blue	Blue	Blue	Blue	Blue
F. Develop robust tools for freight cost/benefit analysis that permit freight to be strategic alternatives, costs, and intermodal.	Red	Blue	Blue	Blue	Blue	Blue
G. Develop cost-benefit approaches that describe how elements of the freight transportation system, service, and/or the "last-mile" are used and participation.	Red	Blue	Blue	Blue	Blue	Blue
H. Determine how economic, demographic, and other factors condition freight transportation forecasts. Document economic and demographic changes related to freight choices.	Red	Blue	Blue	Blue	Blue	Blue
I. Develop freight alternatives for application at sub-regional levels.	Red	Blue	Blue	Blue	Blue	Blue
J. Develop, test, and validate a suite of cost-benefit alternatives that include pricing, congestion, and capacity alternatives.	Red	Blue	Blue	Blue	Blue	Blue
K. Develop conditions for applying freight forecasting to the range of transportation alternatives such as pavement and bridges.	Red	Blue	Blue	Blue	Blue	Blue
L. Advance research to effectively integrate freight and passenger modes with transportation policy, planning, and engineering public works.	Red	Blue	Blue	Blue	Blue	Blue
M. Develop standard tools for freight planning and modeling through the integrated process of the study and address its broader applicability.	Red	Blue	Blue	Blue	Blue	Blue

refer to handout



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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Sample Research Initiatives, *cont'd.*

- E. Develop a range of freight forecasting methods and 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 the 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 affect the larger overall transportation system.

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Sample Research Initiatives, *cont'd.*

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

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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.



Strategic Road Map



Developing a Strategic Road Map

- Fostering interest among the freight community based on extensive outreach and engagement of public and private freight stakeholders
- Documenting freight decision-making needs—particularly those of state DOTs and MPOs
- Piloting a successful international freight modeling and data-innovation symposium—to spur breakthrough thinking and innovative ideas (www.freightplanning.com)
- Developing an initial set of sample research initiatives validated by freight stakeholders



Road Map Elements – Organization

- Global Freight Research Consortium (GFRC)
- Road map that is an agile framework for achieving the strategic objectives
- Elements include
 - GFRC,
 - freight modeling and data-innovation symposium, and
 - initiative advancement.



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Road Map Elements – GFRC

- **Purpose:** To promote a body of research through funding agencies and other stakeholders in improved freight performance and decision making.
- **Participation:** Voluntary and including those with a stake in achieving road map strategic objectives—public domestic agencies, modal and other associations, universities, and the transportation research entities of other countries.
- **Responsibilities:** Enable, fund, and promote research supported through public organizations (national and international) with assistance from private freight-oriented organizations.



Road Map Elements – Symposium

- A good foundation is to build on 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.





GFRC 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.



SHRP 2 C20 Research Results



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- Road map to move freight modeling and data innovation forward through
 - Implementing 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



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 scales, 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.



C20 Technical Expert Task Group (TETG)

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