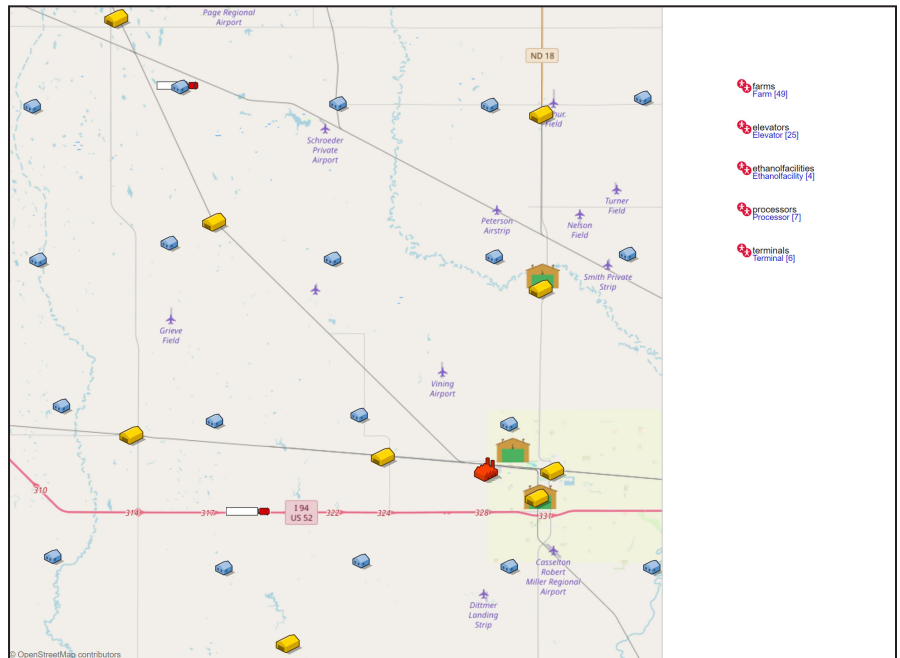


# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 18-370 (project 458) | November 2018

## Application of a Multi-Agent System with the Large-Scale Agent-Based Model for Freight Demand Modeling



### the ISSUE

North Dakota road and bridge infrastructure is critical to support energy development and the agricultural industry. Due to the nature of infrastructure investment, transportation planning requires long-term projection and large investments of public dollars. Consequently, statewide freight demand modeling is a great tool for planning enhancing effective and efficient investment.

### the RESEARCH

In this study, researchers used the agent-based simulation (ABS) for modeling agricultural transportation demand. With the simulation model, geographic information systems (GIS) was utilized to collect and analyze remote sensing of agricultural crops. The researchers reviewed agent-based modeling in freight and public transportation planning to fill the gap between traditional modeling efforts and emerging needs of adopting behavioral modeling for an agricultural transportation model. The study then investigated adoption of an agent-based model for a large-scale travel demand model. The objective of the proposed model was to provide a platform to analyze grain transportation movement at the micro-level, since most industry reports lack such micro-level freight analysis while supporting regional and statewide planning.



A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University  
North Dakota State University  
South Dakota State University

University of Colorado Denver  
University of Denver  
University of Utah

Utah State University  
University of Wyoming



### Lead Investigator(s)

EunSu Lee, Ph.D.  
elee3@njcu.edu  
New Jersey City University

### Co-Investigator(s)

Ali Rahim Taleqani  
North Dakota State University

### Project Title

Application of a Multi-Agent System with the Large-Scale Agent-Based Model for Freight Demand Modeling

### Research Assistant(s)

Yong Shin Park, GRA, Ph.D.

### Sponsors | Partners

North Dakota State University  
Upper Great Plains  
Transportation Institute  
USDOT, Research and  
Innovative Technology  
Administration

### the FINDINGS

Researchers found that the proposed model is capable of handling sophisticated decision-making processes, such as grain pricing strategies, transportation costs, holding costs, and advanced logistics choice model and the behavioral selection process.

### the IMPACT

Agent-based simulation for modeling agricultural transportation demand provides a greater level of detail for transportation planning efforts. This level of detail increases accuracy and enhances the ability to accurately project investment needs and target infrastructure investments.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=926>

For more information or additional copies, visit the Web site at [www.mountain-plains.org](http://www.mountain-plains.org), call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



This publication was produced by the Mountain-Plains Consortium at North Dakota State University. The contents of this brief reflect the views of the authors, who are responsible for facts and the accuracy of the information presented herein. This document is disseminated under the program management of the USDOT, Office of Research and Innovative Technology Administration in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.



NDSU does not discriminate in its programs and activities on the basis of age, color, gender expression/identity, genetic information, marital status, national origin, participation in lawful off-campus activity, physical or mental disability, pregnancy, public assistance status, race, religion, sex, sexual orientation, spousal relationship to current employee, or veteran status, as applicable. Direct inquiries to Vice Provost, Title IX/ADA Coordinator, Old Main 201, 701-231-7708, [ndsueoaa@ndsu.edu](mailto:ndsueoaa@ndsu.edu).