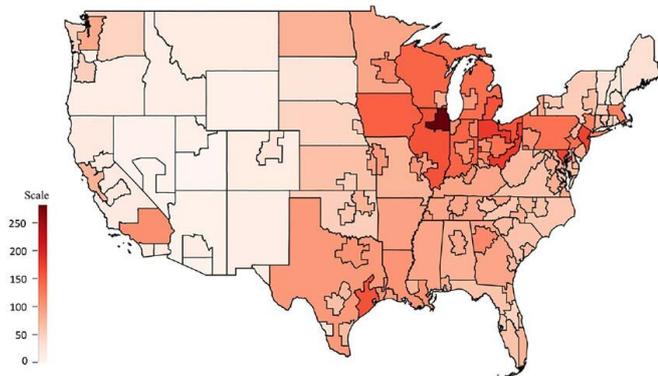


# New metric quantifies productivity of freight mobility systems

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U.S. map showing zonal F-MEP scores aggregated over truck, rail, water, and air modes. Map is color coded in a red gradient scale with darker red indicating higher scores for freight in given FAF zones. Credit: National Renewable Energy Laboratory

Trends such as the rise in e-commerce, increased vehicle electrification, connected mobility, automation, and new forms of delivery are poised to bring a paradigm shift in freight movement. In addition to modeling and forecasting emerging freight trends, it is critical to have a metric to quantify their impacts on freight mobility. The new Freight Mobility Energy Productivity (F-MEP) metric does just that.

"Conventional freight performance metrics such as truck-miles, ton-miles, and value-miles fall short of accurately capturing the impact of emerging technologies on the performance of freight systems," said Kyungsoo Jeong, NREL systems engineer and lead author of a recent *Transportation Research Record* article on the F-MEP metric. "We need appropriate metrics to quantify the changes in system efficiency and productivity in light of new technologies and trends."

Addressing that need, NREL researchers

developed the F-MEP metric to quantify the productivity of current and future freight systems from the shipper's perspective. Building on accessibility theory, the F-MEP metric provides a mathematical framework for quantifying freight productivity—connecting freight demand to freight supply, while accounting for inputs such as time, energy, logistics cost, and ease of shipping goods via various modes.

## Quantifying Freight Transport Across the United States

Researchers implemented the F-MEP metric using data from the U.S. Department of Transportation's Freight Analysis Framework (FAF) along with other sources to quantify the productivity of inter-city freight mobility in the United States.

"Preliminary results from the F-MEP implementation show intuitive trends, both at the aggregate level as well as at the disaggregate level of mode- and commodity-specific F-MEP calculation," said Venu Garikapati, NREL transportation data analytics project leader. "A correlation analysis between sector-specific employment and F-MEP scores shows that the F-MEP can be a viable indicator to evaluate the productivity of freight systems."

## F-MEP as a Scenario Analysis Tool

NREL conducted a scenario analysis to assess the capability of the new metric in tracking system-level freight [productivity](#) improvements resulting from vehicle electrification. The F-MEP metric successfully captured and illustrated freight system performance improvements from vehicle electrification with geographic specificity, demonstrating that it can be used as a scenario evaluation tool to assess the impacts of various emerging transportation trends.

**What's Next?**

NREL researchers will integrate the new metric into freight forecasting models to capture a variety of secondary effects of emerging trends on freight travel. Additionally, researchers will compute the metric at finer geographical resolutions, account for multimodal characteristics for inter-city freight, and develop an intra-city F-MEP metric to accommodate the distinct characteristics of urban freight movement.

**More information:** Kyungsoo Jeong et al. Comprehensive Approach to Measure the Mobility Energy Productivity of Freight Transport, *Transportation Research Record: Journal of the Transportation Research Board* (2020). DOI: [10.1177/0361198120920879](https://doi.org/10.1177/0361198120920879)

Provided by National Renewable Energy Laboratory

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