

Tool to Assess Effectiveness of
Intermodal Facility Location and Carrier Collaboration

Technology Transfer Activities

by

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August 2021



Center for Connected Multimodal Mobility (C²M²)



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TECHNOLOGY TRANSFER ACTIVITIES

1 Outputs

The project outputs include two journal publications, one webinar presentation, one conference lectern session, two conference poster presentations, and codes that implement the strategic intermodal terminal location model and the operational vehicle scheduling with horizontal collaboration model.

1.1 Output #1

The results from the operational model were published in the journal "Transportation Letters".

Journal Publication 1: Padmanabhan, B., Huynh, N., Ferrell, W. and Badyal, V., 2021. Potential benefits of carrier collaboration in vehicle routing problem with pickup and delivery. *Transportation Letters*, pp.1-16.

The results from the strategic model were published in the journal "Transportation Research Record".

Journal Publication 2: Badyal, V., Ferrell Jr, W.G., Huynh, N. and Padmanabhan, B., 2020. Multi-Period Optimization Model for Siting Capacitated Intermodal Facilities. *Transportation Research Record*, 2674(7), pp.135-147.

1.1 Output #2

The results from the project were presented in the webinar at the C²M² Distinguished Speaker Webinar, 2nd Apr.

Webinar Session: "Freight Logistics and Intermodal Network Design", C²M² Distinguished Speaker Webinar.

The results from the strategic model were presented in a lectern session at the 99th Annual Transportation Research Board Meeting, 12-16 Jan. 2020 held at Washington D.C.

Lectern session: "A Multi-Period Optimization Model for Siting Capacitated Intermodal Facilities", 99th Annual Transportation Research Board Meeting, Washington D.C.

The results from the operational model were presented in a poster presentation at the 99th Annual Transportation Research Board Meeting, 12-16 Jan. 2020 held at Washington D.C.

Poster presentation 1: "Potential benefits of carrier collaboration in vehicle routing problem with pickup and delivery ", 99th Annual Transportation Research Board Meeting, Washington D.C.

The results from the strategic model were presented in a poster presentation at 3rd Annual C²M² Fall Conference, 18th Oct. 2019 held at Clemson.

Poster presentation 2: "Design and Analysis of Freight Networks with Capacitated Intermodal Facilities and Horizontal Carrier Collaboration", 3rd Annual C²M² Fall Conference.

1.1 Output #3

Julia and AMPL codes were developed to enable the solving of the optimization models; that is, codes are needed to specify the mathematical models in a specific format that can be understood and processed by the commercial solvers. The codes will be submitted as a project deliverable and will be available on the center's website.

2 Outcomes

The primary outcome of this research is a tool to assess the effectiveness of intermodal facility location and carrier collaboration. An integrated framework is developed using both the strategic and operational models. The first stage (strategic model) deals with the efficient transfer of freight between different modes at intermodal terminals (IMT) and the second stage (operational model) deals with collaboration among less than truckload (LTL) carriers to improve the efficiency of truck transportation.

2.1 Outcome #1

The development of an integrated framework can lead to improved efficiency of future freight transportation in South Carolina in the face of increasing demand and changes in the nature of the freight.

2.2 Outcome #2

Two mathematical models can also be used as standalone tools to optimize intermodal transportation and less than truckload transportation separately.

3 Impacts

The developed models can be used by South Carolina transportation agencies to plan for freight expansion and determine the impact of various freight scenarios.

3.1 Impact #1

The developed models will allow demands and supplies to be dynamically aggregated and disaggregated using horizontal collaboration in a way that minimizes costs, gives insight into the capacities required for the network over a long planning horizon, and informs decisions on infrastructure.

3.2 Impact #2

This integrated model could provide South Carolina with a cutting-edge tool for making investments that support increased freight flow that is destined for the State, create business opportunities in this space that fosters economic development, and minimize the negative externalities.

3.3 Impact #3

The developed models can be used by logistics providers such as UPS, FedEx, Amazon, and USPS to optimize the freight distribution process and reduce their carbon footprint.