Optimization of a multimodal container transport network: application to the hinterland of the port of Shangha'i

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Abstract

As a fundamental component of the international transportation, the container transport between seaports and their hinterland has been the subject of many research concerns. A typical port-hinterland system is always based on a multimodal infrastructure network that includes road, railway and waterway modes. As an example, the port of Shangha'i is the 1st container seaport in the world, and its hinterland extends along the Yangtze River which is the most important economic region of China. In this paper, we present a multimodal container transport network model and its application to the improvement of the flows within the hinterland of the Shangha'i port, especially to reach a better share of the flows by the different modes. To that purpose, a tactical multimodal multiproduct single period network flow assignment model is proposed to evaluate scenarios including the current situation and possible new policies. This MILP model considers a set covering framework including a path-based formulation of the flows through the network, with the objective of minimizing the total transport cost to satisfy the demands subject to time constraints. A solution method is developed based on the column generation procedure. By analyzing the current hinterland network of the Port of Shangha'i, scenarios for improvements may be considered such as increasing the capacity of railway container transport and building new intermodal transfer terminals connecting the railway system to the sea port. The application of our model suggests that with these policies the total transport costs and duration could be reduced.

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