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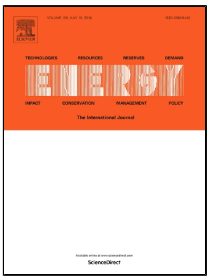

Dynamic Management of Loading Bays for Energy Efficient Urban Freight Deliveries

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Dynamic Management of Loading Bays for Energy Efficient Urban Freight Deliveries

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Abstract

A model for dynamic assignment of loading bays for urban last-mile deliveries has been developed. It aims to solve the problem of defining the most optimal number and location of loading bays and their management for energy efficient urban freight deliveries. Optimisation is based on fuzzy k-means clustering of receivers to dynamically select the best possible loading bay in combination with a routing algorithm. The model is tested on the actual data of deliveries in the historical city centre of Lucca, Italy. The results of simulations have demonstrated a significant savings of time and distance travelled by freight vehicles, as well as of CO2 and fuel, in comparison to the existing situation.

Keywords: Transport, City logistics, Last mile delivery, Fuzzy clustering, Location Routing Problem, CO2 emissions.

Article Type: Research paper

1. Introduction and motivation

The transport sector is the fastest growing consumer of energy and producer of greenhouse gases in the world [1]. In the EU, transport sector nowadays consumes already 21% of primary energy and produce 24% of total CO_2 emissions. Among transport modes, road transport is the largest emitter. It consumes 83% share of transport energy and produces 93% of CO_2 emissions in the EU [2]. The EU has set a target to reduce greenhouse gas (mainly CO_2) emissions for 20% until 2020, for 40% until 2030 and for 80–95% until 2050 in comparison to 1990 [3,4]. More research and developments are therefore needed to tackle the energy problem and to reduce the emissions in the EU [5].

Passenger cars, heavy-duty vehicles and light-duty trucks are the main sources of emissions for the whole transport sector [6]. Transport negative effects are most evident

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