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URBAN DISTRIBUTION SYSTEMS IN THE CONTEXT OF SUSTAINABLE MOBILITY DEVELOPMENT

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With the development of e-commerce and the focus of consumer demand on individual orders, the share of small shipments in the total volume of cargo transportation has increased significantly. This is especially true for transportation that takes place in cities that differ in their road transport and industrial infrastructure, as well as the characteristics of the demand for transportation [1]. In this regard, the formation of optimal routes for the transportation of small cargo in cities is a very urgent task. Logistics cost is a big part of the expenses for many manufacturers and companies in managing the movement and transportation of goods. Therefore, businesses wish to find ways to reduce logistics costs, especially at the "last mile" stage.

On the other hand, companies strive to find ways to minimize the negative impact on the environment caused by transportation activities. By implementing environmentally friendly practices and technologies, businesses can contribute to a greener and more sustainable supply chain. To reduce the negative impact of transport on the climate, important steps are the transition to more sustainable energy sources, the development of public transport, and the promotion of electric and other environmentally friendly modes of transport.

For the transport of small loads in the city, the potential advantages of cargo bikes in terms of energy consumption, environmental impact and road load are proposed as an alternative to trucks. In densely populated cities, electric cargo bicycles are becoming increasingly popular as a replacement for vans and cars for delivering goods such as groceries and parcels [2, 3].

The study formalizes the task of forming delivery routes for small cargo shipments in the city under dynamic environmental conditions, characterized by uncertainty factors and the risk of unavailability of the required quantity of products at the nearest loading point. A simulation model has been developed for the process of forming cargo transportation routes within the city [4]. The study compared different technologies for serving customers of a supermarket chain (pendulum routes and distribution-assembly routes), while modeling was carried out for the conditions of use of various vehicles (an electric cargo bike and a car) [5]. As a result of simulation modeling, distribution routes were formed and operational parameters were optimized on cargo delivery routes in the city for various types of vehicles with different carrying capacities.

For the convenience of applying the simulation model, software with a user-friendly interface has been developed, allowing input of data about suppliers, customers, and information about the actual availability of cargo from suppliers, as well as the current demand for freight from customers.

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