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Kateryna Hanzha[1], Nataliia Zhukova[2]
[1] student of group T-315 NU “Zaporizhzhia Polytechnic”
[2] PhD (Philology), Associate Professor NU “Zaporizhzhia Polytechnic”

GREEN REVOLUTION IN LOGISTICS AND THE ROLE OF ARTIFICIAL INTELLIGENCE

K.V. Hanzha, N.M. Zhukova

The rapid development of transport technologies over recent decades has drawn attention to the environmental impacts of transport. A ‘green revolution’ is underway in the logistics sector, driven by the introduction of new technologies and management solutions that can reduce the environmental impact of transport. Decarbonising the transport chain is one of the key elements in improving the efficiency of the global supply chain.

Key directions of ‘green’ changes in modern logistics are examined with a focus on the effective organisation of transport operations, reducing energy consumption in warehouses, lowering CO_2 emissions, and minimising the use of materials and energy during logistics operations. The impact of new information technologies, particularly artificial intelligence, on the transformation of modern logistics is analysed. The digitalisation of logistics processes using machine learning algorithms enables the rational organisation of material resources and a reduction in losses during the organisation of production and logistics processes.

Most environmental innovations in logistics are based on digital solutions for managing logistics processes. For example, an ‘intelligent toll system’ is designed to reduce traffic congestion whilst encouraging the use of electric vehicles [1]. In addition, new forms are emerging:

1. route optimisation systems using artificial intelligence to reduce fuel consumption and emissions [2];
2. preventive maintenance of vehicle fleets using neural networks to reduce breakdowns [3];
3. ‘smart’ warehouses with automated management of energy consumption and equipment operating times, as well as the use of robotics [4];
4. the use of artificial intelligence technologies to optimise packaging and cargo space in order to reduce the amount of materials used and shorten transport cycles [5];
5. monitoring of carbon emissions, enabling continuous analysis of the environmental performance of our supply chain [6].

In addition to developments that enable more effective use of artificial intelligence (AI), other technologies can support its application. The ‘green’ transport mentioned above, including the electrification of transport and hydrogen-powered lorries, ‘green’ warehouses, and closed-loop logistics (reverse and circular logistics), are slowly but surely gaining momentum in the sector.

The ‘green’ revolution in logistics is being driven by environmental measures and IT solutions. However, artificial intelligence is also increasingly being used to optimise transport flows, reduce emissions and resource consumption, and to plan and monitor environmental indicators, such as CO_2 emissions, during various logistics processes. The application of artificial intelligence in logistics ensures high efficiency and sustainable processes whilst simultaneously increasing efficiency and competitiveness.

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