ENVIRONMENTAL ASPECTS IN AUTOMOTIVE TRANSPORT: THE IMPACT OF ELECTRIC VEHICLES ON THE ENVIRONMENT AND OTHER ECOLOGICAL INITIATIVES

Stepanenko O., student,
Gubaryeva O. S., PhD, Associate Prof.,
Kharkiv National Automobile and Highway University.

This article is devoted to analyzing the environmental impact of automotive transport and promising measures to reduce its negative effects on the environment. It explores the main ecological problems caused by traditional vehicles, including air pollution, noise, climate change, and effects on biodiversity.

Special attention is given to electric vehicles as one of the main alternatives to internal combustion engine vehicles. The article also highlights other ecological initiatives in the transport sector that aim to reduce its negative environmental impact. The role of international and national regulatory bodies in implementing sustainable transport solutions is also mentioned.

Keywords: automotive transport, electric vehicles, ecology, emissions.

Introduction. Automotive transport is an essential part of modern society, providing mobility for people and supporting economic processes. However, its impact on the environment remains one of the most pressing ecological problems today. Harmful emissions, high energy consumption, noise pollution, and climate change are just some of the negative consequences caused by the use of internal combustion engine vehicles.

One of the promising directions for minimizing this negative impact is the shift to electric vehicles. However, the ecological friendliness of electric cars remains a topic of debate, as their production, use, and recycling also involve certain environmental challenges.

Besides electric transport, other ecological initiatives in the transport sector are also important—such as improving transport infrastructure, reducing noise pollution, and implementing sustainable development programs.

The purpose of this article is to conduct a comprehensive study of the environmental impact of automotive transport, with a focus on the role of electric vehicles and modern ecological initiatives in reducing this impact.

Traditional automotive transport has a serious impact on the environment, mainly due to the use of fossil fuels, which leads to environmental changes and worsens the climate [1]. Vehicles are a major source of this pollution, releasing carbon monoxide, particulate matter, and other harmful substances into the air, which affect both human health and the environment [2][3]. Additionally, noise pollution caused by traditional vehicles not only affects wildlife but also contributes to stress and health problems for people living near busy roads [3]. It is important to understand that the damage from vehicles is not limited to emissions during use. The entire life cycle of a vehicle—from production and use to disposal—must be considered to fully understand the scale of this impact [3]. Even after a car is no longer in use, materials like plastic and toxic battery acids can continue to pollute the environment [2]. Thus, understanding the complex interaction between traditional transport, infrastructure, and ecological processes is important for developing effective policies to reduce its negative effects [3].

Electric vehicles are a promising alternative to traditional fossil fuel-powered cars, mainly due to their environmental advantages and operational efficiency. One key benefit is the absence of tailpipe emissions, which helps reduce air pollution and improve public health and the environment [4][5]. Besides ecological advantages, electric cars are also economically beneficial. Their operating costs are usually lower, since electricity and maintenance are cheaper than fuel and servicing internal combustion engines. Electric motors have fewer moving parts, which reduces the need for frequent maintenance [4].

Another benefit is the ability to charge at home, which gives users more convenience and independence. Depending on electricity tariffs, this can also lead to long-term savings [4]. As the charging infrastructure continues to grow, owning an electric car becomes more practical, encouraging more drivers to choose environmentally friendly options [4]. However, despite their potential, the

sustainability of electric cars also depends on the wider energy strategy, including the use of renewable energy sources to power this new transport system [6].

In addition to the development of electric vehicles, the transport sector is actively involved in various ecological initiatives to reduce its environmental impact. One major program is the European Green Deal, which aims to reduce greenhouse gas emissions by 90% by 2050. Achieving this goal requires major changes in how we power and manage our cars, planes, and ships [7].

An important part of sustainable transport development is supporting more ecological options such as rail and inland waterways. To improve their efficiency, increased capacity and modern control systems are needed. Shifting to multimodal transport—combining different types of transport for one route—opens new opportunities for sustainable logistics but requires systematic support and infrastructure development. The Combined Transport Directive plays a key role here by promoting freight transport using rail and water routes, including short sea shipping.

Improving the efficiency of the transport system is crucial for achieving environmental sustainability. The use of digital technologies, such as automated mobility and smart traffic management systems, helps increase efficiency and make transport greener. “Smart” mobility apps and services based on the "Mobility as a Service" concept also help optimize routes, combine transport types, and reduce pressure on infrastructure.

At the same time, it is important to consider the external environmental and social costs of transport—called externalities—which are usually not reflected in transport service prices. To address this, the European Commission plans to expand the emissions trading system to maritime transport and gradually reduce free allowances for airlines under the EU Emissions Trading System. This will align with global initiatives like the International Civil Aviation Organization’s CORSIA program and the International Maritime Organization’s actions. The EU also aims to apply the "polluter pays" principle through effective road pricing and the gradual removal of fossil fuel subsidies [8].

Pollution is especially critical in cities. To solve the problems of air pollution, greenhouse gas emissions, traffic congestion, and noise, a comprehensive approach is needed. This includes improving public transport and encouraging active travel like walking and cycling. The EU also pays attention to reducing pollution in ports, as well as emissions from airplanes and airport operations.

This comprehensive approach reflects a growing awareness of the importance of sustainable practices in the transport sector. These practices aim not only to increase efficiency but also to prioritize the health of both people and the planet.

Conclusion. Automotive transport is one of the main contributors to environmental damage, causing air pollution, noise, increased greenhouse gas emissions, and threats to biodiversity. Switching to electric vehicles, introducing digital technologies, developing public transport, and promoting multimodal solutions are essential parts of a sustainable transport strategy. Despite the strong potential of electric vehicles, their ecological benefits depend on the sources of energy used to charge them and on how well recycling challenges are addressed. A comprehensive approach that includes infrastructure changes, regulatory policies, and the promotion of sustainable mobility can significantly reduce the environmental impact of transport. International organizations and EU initiatives play an important role in this process, aiming to achieve climate neutrality. Such cooperation is the key to an environmentally safe and technologically advanced future for the transport sector.

References

1. Environmental impact of trucks and sustainability practices. URL: https://tachyonhub.com/environmental-impact-of-trucks-and-sustainability-practices/ (last accessed 06.04.2025)
2. The environmental impacts of cars, explained. URL: https://www.nationalgeographic.com/environment/article/environmental-impact (last accessed 06.04.2025)
3. Transportation and the Environment. URL: https://transportgeography.org/contents/chapter4/transportation-and-environment/ (last accessed 06.04.2025)
4. Why are electric cars a good alternative to conventional combustion vehicles? URL: https://www.eea.europa.eu/en/about/contact-us/faqs/why-are-electric-cars-a-good-alternative-to-conventional-combustion-vehicles (last accessed 06.04.2025)

5. Electric Vehicle Benefits and Considerations. URL: https://afdc.energy.gov/fuels/electricity-benefits (last accessed 06.04.2025)
6. Can electric vehicles be an alternative for traditional fossil-fuel cars with the help of renewable energy sources towards energy sustainability achievement? URL: https://energyinformatics.springeropen.com/articles/10.1186/s42162-022-00234-3 (last accessed 06.04.2025)
7. Transport and mobility. URL: https://www.eea.europa.eu/en/topics/in-depth/transport-and-mobility (last accessed 06.04.2025)
8. Sustainable transport. URL: https://transport.ec.europa.eu/transport-themes/sustainable-transport_en (last accessed 06.04.2025)

AI AND IoT IN LOGISTICS OPTIMIZATION: REVOLUTIONIZING SUPPLY CHAIN MANAGEMENT

Chekalov I. student,

T. Gerasymchuk, Ph.D, Associate professor,

Kharkiv National Automobile and Highway University

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) is fundamentally transforming the logistics industry, creating smarter, more efficient, and resilient supply chains. This technological synergy is moving logistics beyond traditional manual processes into an era of data-driven optimization, predictive analytics, and autonomous decision-making that's revolutionizing how goods are stored, transported, and delivered worldwide.

The Connected Supply Chain: IoT as the Nervous System IoT serves as the foundational layer for modern logistics optimization by providing real-time visibility across the entire supply chain. Smart sensors installed on containers, vehicles, and in warehouses continuously monitor crucial parameters including location, temperature, humidity, vibration, and inventory levels. This constant stream of data enables unprecedented control and monitoring capabilities. For instance, pharmaceutical companies can now ensure temperature-sensitive vaccines maintain perfect conditions throughout their journey, while food distributors can automatically detect and remove compromised items before they reach consumers. The implementation of smart warehouse systems with IoT-connected robots and automated inventory management