

5. Fraedrich, E., et al. (2020). Automated Driving and Social Sustainability: A European Case Study. *Transportation Research Part C: Emerging Technologies*, 121, 102834.
6. Giffinger, R., et al. (2020). Smart Cities – Ranking of European Medium-Sized Cities. Centre of Regional Science, Vienna University of Technology.
7. Harrison, C., & Donnelly, I. A. (2021). A Theory of Smart Cities. *Proceedings of the 55th Annual Meeting of the ISSS*, 55(1).
8. Hawkins, T. R., et al. (2021). Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles. *Journal of Industrial Ecology*, 25(5), 1193-1206.
9. International Energy Agency. (2023). *Global EV Outlook 2023: Catching up with Climate Ambitions*. OECD Publishing.
10. International Transport Forum. (2023). *ITF Transport Outlook 2023*. OECD Publishing.
11. Jittrapirom, P., et al. (2020). Mobility as a Service: A Critical Review of Definitions, Applications, and Synthesis. *Sustainable Cities and Society*, 52, 101843.
12. Kim, K., & Kim, K. (2022). Hyperloop Transportation System: Concept, Development, Challenges and Opportunities. *Transportation Geotechnics*, 34, 100745.
13. Litman, T. (2022). *Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transport Planning*. Victoria Transport Policy Institute.
14. Marchau, V., et al. (2019). Managing the Transition to Autonomous Vehicles: A Systematic Literature Review. *European Journal of Transport and Infrastructure Research*, 19(4), 288-316.
15. Metz, D. (2021). *Beyond the Car: The Future of Transport in Urban Areas*. Elsevier.
16. Shladover, S. E. (2022). Connected and Automated Vehicle Systems: Introduction and Overview. *Journal of Intelligent Transportation Systems*, 26(3), 271-285.
17. Smith, G., & Hensher, D. A. (2022). Towards a Framework for Mobility as a Service: A Conceptual Analysis. *Transport Reviews*, 42(4), 455-474.
18. Sperling, D. (2018). *Three Revolutions: Steering Automated, Shared, and Electric Vehicles to a Better Future*. Island Press.
19. World Economic Forum. (2022). *The Future of Mobility: A Macro View of Societal Trends and Their Impact on Transportation*. World Economic Forum.
20. Zhang, W., & Guhathakurta, S. (2021). Parking Spaces in the Age of Shared Autonomous Vehicles: A Case Study of Atlanta. *Journal of Planning Education and Research*, 41(3), 308-322.
21. Zhao, L., & Wang, J. (2023). Maglev Transportation Development: Global Status and Future Prospects. *Journal of Advanced Transportation*, 2023, 8846158.

**LEGISLATIVE INITIATIVES ON ROAD SAFETY IN UKRAINE:  
RELEVANCE AND PROSPECTS FOR EFFECTIVE IMPLEMENTATION**

*Andriy Tsitserskyi, student,*

*Olga Gubaryeva , PhD, Associate Professor,*

The transport sector is one of the basic sectors of the economy, with an extensive railway network, a developed road network, seaports and river terminals, airports and an extensive network of air connections, and freight customs terminals, which creates the necessary conditions for meeting the needs of transport users in the provision of transport services and business development. A number of international transport corridors pass through the territory of Ukraine: Pan-European Transport Corridors Nos. 3, 5, 7, 9; Organization for Cooperation between Railways (OCR) Corridors Nos. 3, 4, 5, 7, 8, 10; Trans-European Transport Network (TEN-T), Europe-Caucasus-Asia Corridor (TRACECA). In 2016, transport, warehousing, postal and courier activities accounted for about 6.6 percent of gross domestic product and 6.1 percent of the total employed population. However, global trends in the development of transport systems indicate the need for rapid integration of transport technologies and regional mobility projects. Transport is becoming increasingly energy-efficient and “green,” safe, and friendly to consumers and the environment. Many countries around the world plan to replace most of their internal combustion engine passenger cars with electric vehicles by 2030.

Increased speed, efficiency, and environmental friendliness of vehicles is a major trend in all modes of transport. The development of electric vehicles is driven by the need to reduce carbon emissions and the growing demand for electric vehicles. The transport strategy until 2030 has been developed to comprehensively solve existing problems in the transport sector and contains priorities for its development, particularly in the context of the introduction of a European integration course and the implementation of the Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their member states, on the other hand, ratified by Law of Ukraine No. 1678-VII of September 16, 2014 (hereinafter referred to as the Association Agreement), as well as changes in the geopolitical environment in the region.

The strategy defines the main directions for improving the quality of transport services, provides for bringing the level of their provision and infrastructure

development closer to European standards, increasing the level of safety and reducing the negative impact on the environment, responds to the need to improve the management system, carry out administrative reform and decentralize the powers of central executive bodies, introduce anti-corruption policies and corporate governance in the public sector of the economy.

One of the most important tasks is to ensure the innovative development of the transport industry especially in the area of road transportation, namely:

- the use of high-tech rolling stock on railways, motorways, and waterways (ensuring the development of new types of transport – electric vehicles, high-speed trains, etc.);

- creation of a modernised high-tech transport infrastructure, including the development of a network of innovative logistics systems for passenger service and cargo handling, and the formation of intelligent transport systems;

- creation of a reliably functioning, customer-oriented national multimodal transport network that provides a convenient interface for user interaction with the transport system and information transparency;

- organization of effective information support for the “trade – transport” business process, in particular the introduction of a unified system for managing information flows during cargo transportation and a “friendly” interface for interaction between the customer and the direct transportation services supplier;

- implementation of a strategy (program) for the development of digital transport corridors and electronic logistics through the introduction of paperless trade, mutual recognition of electronic shipping documents, and the provision of cross-border transport services;

- introduction of innovative solutions and best international practices for customs and other control procedures during transportation;

- introduction of intelligent transport systems and systems for managing traffic on land and water transport (ERTMS, ITS, SST and LRIT, RIS; SMART tachographs);

- use of the European satellite navigation system (Galileo) and GNSS navigation technology;

- creation of new jobs in transport enterprises;
- use of innovative technologies in the transport and road complex, revitalization of business activity and construction, increase in the standard of living of the population, budget revenues, etc., which will be achieved through the implementation of transport infrastructure projects;
- reconstruction of the main road network, which complies with TEN-T standards and connects regional centers with each other and Kyiv to increase regional mobility;
- increasing the share of public roads of national importance with hard surfaces that meet regulatory requirements from 30 percent (in 2015) to 70 percent (in 2030);
- construction of ring roads around Kyiv and other large cities;
- ensuring the formation of professional potential and the creation of an effective system of professional training and scientific and technical support for innovative development in the transport industry, in particular through the introduction of a preventive model for training specialists (the latest educational program for staff training);
- ensuring the preservation and development of professional human resources;
- implementation of joint programs of educational institutions, government agencies, and business structures for the development of the transport industry;
- recognition of national diplomas by global transport companies.

The level of transport safety, energy consumption, and environmental impact in Ukraine do not meet modern requirements. Over the past decades, there has been a rapid increase in the number of vehicles and traffic intensity worldwide, leading to an increase in the number of traffic accidents and their negative consequences.

Between 2011 and 2016, 26,700 people died in road accidents in Ukraine, 43.7 percent of whom were pedestrians and cyclists. According to World Bank estimates, annual losses as a result of road accidents in Ukraine amount to approximately US\$4–5 billion US dollars. In 2016, almost 3,400 people were killed and 33,600 were injured on Ukrainian roads.

Transport is usually one of the main issues causing the environmental pollution. 90-95 percent of pollutant emissions into the air in cities and crowded areas come from

motor vehicles. The EU's transport policy has set the goal of halving the use of traditional fuel-powered cars in cities by 2030 and phasing them out completely by 2050.

General problems requiring resolution:

1. high mortality and injury rates as a result of road traffic accidents;
2. a significant proportion of vehicles operated by Ukrainian carriers are outdated, inefficient, and have a significant negative impact on the environment;
3. imperfections in the legal mechanism and regulatory policies, regulation and state supervision (control) in the field of transport safety;
4. imperfections in the transport safety management system and the absence of a single coordinating body for road safety management, which is the reason for the lack of a comprehensive system of state management of road safety;
5. insufficiently clear distribution of functions and powers, as well as low level of coordination of actions and institutional capacity of state authorities and local self-government bodies in planning and conducting activities in the field of road safety;
6. imperfections in the systems for monitoring road traffic accidents, their statistics, and risk management;
7. ineffective approach to solving the problem of high accident rates and the severity of their consequences, and creating a scientific basis for activities in the field of road safety;
8. lack of specific measurable goals to improve road safety and a corresponding coordinated action plan in this area;
9. unsatisfactory technical condition of a significant number of vehicles and lack of a system for monitoring the safety of vehicles during their operation;
10. low level of introduction and practical application of the latest technologies and technical means of traffic management, automated means of traffic control and regulation;
11. insufficient funding for measures aimed at preventing and reducing the accident rate and the number of road accidents with serious consequences;

12. ineffective system for reporting road accidents and providing emergency assistance to victims of road accidents (unsatisfactory state of pre-medical care in the first hour after a road accident);

13. low level of driver training and lack of effective control over the activities of driving schools; low level of public awareness of road safety, personal responsibility, and compliance with traffic rules; low level of control in the field of transport safety, in particular with regard to environmental protection, avoidance of responsibility for violations of Ukrainian legislation on environmental protection, and low public awareness of environmental protection measures;

14. lack of incentives for the use of alternative energy sources.

List of tasks to be performed to solve the problems is as follows:

1. improvement of the state transport safety management system in accordance with international standards and strengthening the institutional capacity of executive authorities that directly or indirectly regulate the transport services market and state supervision (control) measures for transport safety;

2. bringing regulatory and legal acts in the field of safety into line with EU regulations and directives regarding the requirements for the safe operation of infrastructure and rolling stock;

3. introducing SMART tachographs on trucks and buses; protection against acts of unauthorized interference in transport activities, namely:

- improving the level of technical equipment, organizational and personnel support for transport security facilities in order to prevent and respond to acts of illegal interference;

- introducing the latest security technologies, including scanners, detectors of new explosives, smart chips, and cyber security systems;

- introducing aviation security information technologies, including an aviation security information system;

4. improving transport security, namely:

- introducing a globally recognized classification of road traffic accidents;

- improving the system for collecting information on transport accidents, analyzing it, and developing management decisions based on the results obtained; – introducing an effective mechanism for transport safety management, state supervision, and control in transport;

- ensuring the effective distribution of functions between state bodies regarding the investigation of transport incidents, licensing, certification, and state control over transport safety;

- ensuring the implementation of EU legislation requirements in the field of dangerous goods transport, including taking into account the principles of multimodality;

5. improving road safety, namely:

- implementing a road safety improvement program;

- establishing an interdepartmental road safety management body;

- developing effective procedures for allocating funds from the State Road Fund and other sources for measures aimed at improving road safety;

- integrating road safety modules into the education system;

- reforming the system for monitoring the technical condition of vehicles and introducing a mechanism for checking the technical condition of vehicles while they are in operation on the road;

- identification of infrastructure factors in areas with a high concentration of road accidents, assessment of the safety of existing road infrastructure and introduction of engineering measures to improve safety indicators, road design taking into account speed limits;

- ensuring control over the implementation of road safety systems, including educational campaigns and fines for traffic violations, and strengthening control over compliance with traffic rules;

- widespread use of innovative technologies to ensure road safety;

- improving pedestrian infrastructure, parking areas, speed limits for vehicles, and developing infrastructure for bicycle traffic;

- improving the system for training drivers and other road users to provide the first aid to victims;
- introduction of a system for training and certifying the professional competence of drivers and transport managers in accordance with EU legislation;
- creation of a Register of Road Transport Operators, which includes a database of violations of legal requirements;
- conducting social campaigns to inform the public about road risks and the need to comply with traffic rules – road safety months, TV commercials, outdoor advertising, etc.;

6. reducing greenhouse gas emissions into the atmosphere from mobile sources to 60 percent of 1990 levels, in particular by increasing the share of public transport and electric transport, electric buses, and bicycles; reducing total emissions of pollutants from mobile sources into the atmosphere, conditionally converted to carbon monoxide, taking into account the relative aggressiveness of the main pollutants, to 70 percent (from 2015 levels); increasing the share of electric transport and electric vehicles, in particular bringing the share of electric transport in domestic traffic to 75 percent by 2030; increasing the use of alternative fuels and electricity to 50 percent by 2030; adopting a plan of measures to reduce the impact of transport on the environment, which involves the introduction of energy-saving technologies, the use of alternative motor fuels, the restoration and expansion of opportunities for the use of electric transport, and the reduction of the negative impact of transport on water bodies; improving the environmental performance of air transport; reducing specific fuel consumption per 10 tonne-kilometers by 30 percent by 2030.

***Organizational support and monitoring of the Strategy's implementation***

Monitoring of the Strategy's implementation is carried out within the powers of the Cabinet of Ministers of Ukraine, the Ministry of Infrastructure, other executive bodies, with the participation of public organizations and associations of entrepreneurs, and international organizations. To implement the Strategy, three-year action plans are developed, which include the identification of key tasks and measures, the responsible authority, the deadline for implementation, the main stages, the assessment of resources

and costs, and the mechanism for monitoring, evaluation, and review. The Ministry of Infrastructure will also establish a monitoring committee, which will include representatives of interested executive authorities, public organizations, business representatives, the media, etc. The monitoring committee will assess the implementation of the Strategy and the effectiveness of the transport sector on an ongoing basis. If problems are identified or priorities need to be changed, the committee will initiate a study of the problem, review or adjustment of the Strategy. As part of the monitoring process, an annual report on the implementation of the action plan for the Strategy will be prepared and published. Effective implementation of the action plan for the Strategy will be ensured through the use of appropriate tools for monitoring key performance indicators and strengthening the institutional capacity of the Ministry of Infrastructure and other central executive bodies whose activities are directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Infrastructure. The Strategy will be financed from the state and local budgets, international technical assistance funds, other international donors, and other sources not prohibited by law.

### References

1. Діп І.Ю. Процес імплементації acquis ЄС у національне законодавство України. Електронне наукове видання «Аналітично-порівняльне правознавство». С. 676–682. <https://doi.org/10.24144/2788-6018.2024.01.119.9>.
2. Супровідна записка до проекту Закону України “Про внесення змін до Закону України “Про дорожній рух” щодо основних засад державної політики із забезпечення безпеки дорожнього-го руху. <https://w1.c1.rada.gov.ua/pls/zweb2/webproc34?id=&pf3511=50985&pf35401=311402>.
3. Імплементація законодавства ЄС і виклики воєнного стану: Микола Потоцький про правову роботу ІР офісу. URL: <https://nipo.gov.ua/implementatsiia-zakonodavstva-ies-i-vykyky-voiennoho-stanu-mykola-pototskyj-pro-pravovu-robotu-ir-ofisu>.
4. Про імплементацію Угоди про асоціацію між Україною, з однієї сторони, та Євро-пейським Союзом, Європейським Співто-вариством з атомної енергії і їхніми дер-жавами-членами, з іншої сторони: Розпо-рядження Кабінету Міністрів України від 17 вересня 2014 р. No 847. URL: <https://zakon.rada.gov.ua/laws/show/847-2014>

РОЗДІЛ VII.

**ANALYSIS OF THE CRITERIA FOR THE FEASIBILITY OF INSTALLING  
TRAFFIC LIGHT REGULATION AT SINGLE-LEVEL  
INTERSECTIONS**

*Yev. V. Shevchuk, postgraduate student,*

*Kharkiv National Automobile And Highway University*

*Scientific Adviser: I. S. Nahlyuk, Doctor of Science (DSc)*

*Language Adviser: O.S. Gubaryeva, PhD*

The need to introduce traffic light regulation at a specific intersection is determined using certain criteria based on the intensity of intersecting traffic flows and the occurrence of road traffic accidents (RTAs) at that intersection.

The intensity of intersecting traffic flows is regulated by relevant regulatory documents. In addition, traffic light control may be implemented in cases of high pedestrian traffic to places of attraction (cinemas, stadiums, large commercial and industrial facilities, etc.) or when schoolchildren cross the road in the vicinity of schools.

The negative consequences of motorization have recently affected most industrially developed countries. This has given rise to a number of serious economic, social, and environmental problems. These problems are particularly characteristic of large cities. One way to comprehensively solve these problems is to improve the efficiency of the transport system as a whole through the use of the latest technologies and the further intellectualization of automated traffic management systems and methods. The main method of such management today is traffic light control at intersections in the street and road network of cities.

In leading countries around the world (the US, Canada, Germany, Japan), the main parameter for introducing traffic light control is considered to be the intensity of traffic flows intersecting at the same level (Fig. 1) [1].