

Review Paper

# Modernization of the Taxation System for Harmful Substances Emissions Caused by Vehicles

Danylo Bevzo<sup>1\*</sup>, Maksym Pavlovskiy<sup>2</sup>, Danylo Vankovych<sup>3</sup>, Vira Kmit<sup>4</sup> and Roksolana Paslavaska<sup>3</sup>

<sup>1</sup>Department of International Economic Relations, Business and Management, Ukrainian-American Concordia University, Kyiv, Ukraine

<sup>2</sup>Department of Motor Vehicle Maintenance and Service, National Transport University, Kyiv, Ukraine

<sup>3</sup>Department of Finance, Money Circulation and Credit, Ivan Franko National University of Lviv, Lviv, Ukraine

<sup>4</sup>Department of Finance, Money Turnover and Credit, Ivan Franko National University of Lviv, Lviv, Ukraine

\*Corresponding author: bevzod@gmail.com (ORCID ID: 0000-0001-7191-4019)

Received: 21-01-2023

Revised: 03-05-2023

Accepted: 30-05-2023

## ABSTRACT

This article aims at identifying the main tendencies in changing the taxation process of vehicle owners concerning harmful emissions produced by vehicles. Theoretical framework: According to the statistical data of international ecological companies, the EU countries have to reduce emissions from transport by 90% by 2050. Accordingly, by this period, the EU countries plan to increase the use of zero-emission vehicles significantly. Just a few decades ago, no fiscal instruments were in place to force consumers to pay attention to the environmental friendliness of cars. When conducting the research, the authors used the analytical and bibliographic method to study the scientific literature on vehicle owners' taxation regarding harmful substances emissions, as well as induction, deduction, analysis, information synthesis, systemic and structural, comparative, logical and linguistic methods, abstraction, idealization for data study and processing, and a questionnaire survey conducted by the authors of the study online to practically clarify the most critical issues related to the taxation of harmful substances emissions caused by vehicles. Today, EU countries have a variety of tax methods that influence consumer behavior when choosing a vehicle based on its environmental friendliness, as it causes a quarter of all EU emissions. More than 70 % of these are generated by cars. For this reason, it is now time to reform the vehicle taxation system, taking into account the emission level they produce. The research results identified the leading, most important theoretical aspects of the vehicle owners' taxation issue related to harmful emissions. Also, the authors studied the opinion of scientists and executives of regional bodies of the State Tax Service on the critical aspects of this issue. Road, rail, and water transport remain the top environmental pollutants today.

## HIGHLIGHTS

- This article aims at identifying the main tendencies in changing the taxation process of vehicle owners concerning harmful emissions produced by vehicles. The research results identified the leading, most important theoretical aspects of the vehicle owners' taxation issue related to harmful emissions. Also, the authors studied the opinion of scientists and executives of regional bodies of the State Tax Service on the critical aspects of this issue.

**Keywords:** Sources of pollution, emissions caused by transport, vehicle taxation system, environmental tax, taxation system

**How to cite this article:** Bevzo, D., Pavlovskiy, M., Vankovych, D., Kmit, V. and Paslavaska, R. (2023). Modernization of the Taxation System for Harmful Substances Emissions Caused by Vehicles. *Econ. Aff.*, **68**(02): 1323-1327.

**Source of Support:** None; **Conflict of Interest:** None



One of the most pressing issues in the world today is the problem of financing environmental protection measures. Unfortunately, the situation has deteriorated even further in the financial and economic crisis context, as public spending on environmental protection has been significantly reduced. Therefore, the issue of creating alternative sources of financing environmental activities from revenues from environmental taxes, among which an important role is played by tax revenues collected in connection with emissions of harmful substances from vehicles, is currently particularly relevant.

In the theoretical part of this study, the author substantiates the essence and main global trends in the taxation of harmful substances emissions caused by vehicles.

The practical part of the study includes an assessment of transport-related environmental taxes which have proven to be the most effective in the world practice, the most effective tax base for taxation of harmful substances emissions caused by vehicles in the EU countries, the most effective ways of using the funds received as a result of an increase in revenues from the taxation of harmful substances emitted by vehicles, and also the analysis of the priority of the goal of modernizing the tax of harmful substances emitted by vehicles.

Based on the research results, conclusions were drawn on the issues raised. The survey showed that the most effective environmental taxes in the world are energy taxes and energy consumption taxes for transportation purposes. At the same time, taxes on transport and the actual amount of pollution from vehicles are the most effective in taxing vehicle emissions in the EU. The research has shown that the most significant effect in terms of reducing emissions from vehicles can be achieved by directing the funds received from the taxation of harmful substances emitted by vehicles primarily to the development and creation of air pollution control systems and devices, construction, and equipment of authorities for monitoring and regulating the toxicity of vehicle exhaust gases, as well as the development, arrangement of equipment for cleaning engine exhaust gases and equipping vehicles with the necessary devices. At the same time, the most critical transformation goals in the taxation of harmful substances emitted by road transport are the supervision and regulation of the

process for reducing the detrimental impact on the environment and preventing pollution by vehicle reconstruction.

## LITERATURE REVIEW

Analyzing the problems of the existing taxation system and the actual causes of the high level of environmental pollution, scientists emphasize the significant share of outdated and worn-out transport and manufacturing infrastructure (Liu *et al.* 2023), (Giannakis *et al.* 2019).

According to expert and scientific studies, in most countries, various norms of environmental transport tax collection can be applied, considering these vehicles as sources of pollution. The most popular of these forms include a fee for each vehicle registration (which should be based on a progressive tax rate based on the CO<sub>2</sub> emissions level in grams per kilometer), a vehicle sales fee that should be calculated based on the cost and CO<sub>2</sub> emissions and an emissions-based vehicle use tax. At the same time, an essential means of reducing emissions is a lower tax-free emission standard in grams per kilometer, which exempts the most environmentally friendly vehicles from paying the tax (Solaymani, 2021), (Xiong, Yuan & Zhang, 2023).

There are differences in environmental taxation in European countries due to uneven socio-economic development and environmental and social awareness. Currently, about 500 types of ecological taxes are used abroad. They are divided into three groups according to their purpose. The first group includes taxes that perform a fiscal function, increase revenues, and are aimed at covering the costs of environmental regulation and replenishing the budget. The second group includes paying back taxes to clean up the environment (fees for water withdrawal, waste disposal, etc.). The last group comprises incentive taxes levied to change environmental polluters' behavior, i.e., to "educate" socially responsible behavior (Adams, Boateng & Acheampong, 2020), (Li & Solaymani, 2021).

According to the current legislation, most countries' excise duty rates are set in euros per 1,000 liters of energy. In particular, this taxation principle is applied to liquefied gas, jet fuel, gas oil, and fuel oil, and fees for used liquid gas. Accordingly, the principle of setting tax rates per gigajoule may arise to harmonize national legislation. However,

it is worth noting that excise tax rates on energy products are usually not differentiated by using such products, which is an obstacle to determining the optimal level of tax rates (Andrés & Padilla, 2018), (Elahi *et al.* 2019).

### AIMS

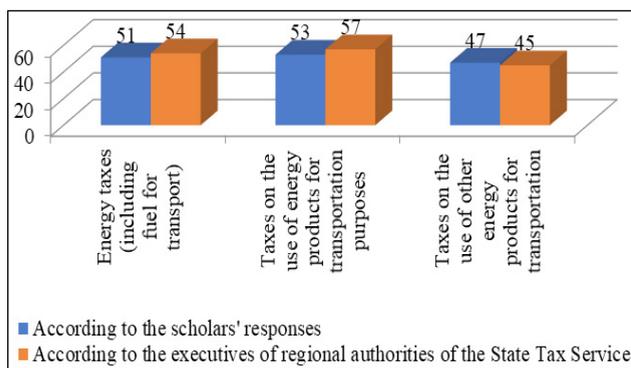
This research aims at determining the position of scientists and executives of regional authorities of the State Tax Service regarding the specifics of improving the taxation of harmful substances emitted by vehicles.

### MATERIALS AND METHODS

A practical study of current tendencies in changing the taxation system of harmful substances emitted by vehicles was conducted by interviewing 254 scientists and 329 executives of regional authorities of the State Tax Service of Cherkasy, Lviv, Ivano-Frankivsk, and Kyiv regions of Ukraine. The study was conducted using the Survio service.

### RESULTS AND DISCUSSION

According to the survey participants, today, due to the need to transform the tax system, certain environmental taxes proved to be the most effective in the world practice (Fig. 1).

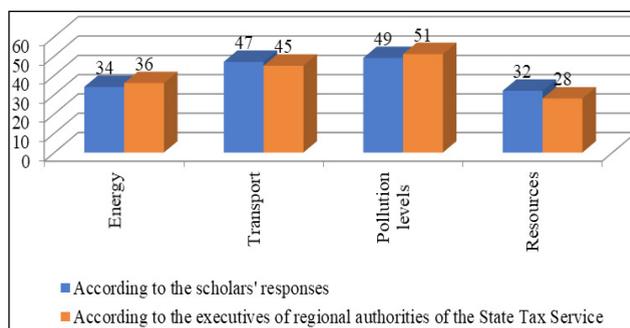


Source: Compiled by the authors.

Fig. 1: Environmental taxes related to transportation, which have proven to be the most effective in world practice, %

As seen in Fig. 1, energy taxes and taxes on using energy products for transportation will demonstrate the world's most outstanding efficiency.

The survey allowed us to determine the respondents' position on the most effective tax base when taxing emissions of harmful substances caused by vehicles in EU countries (Fig. 2).

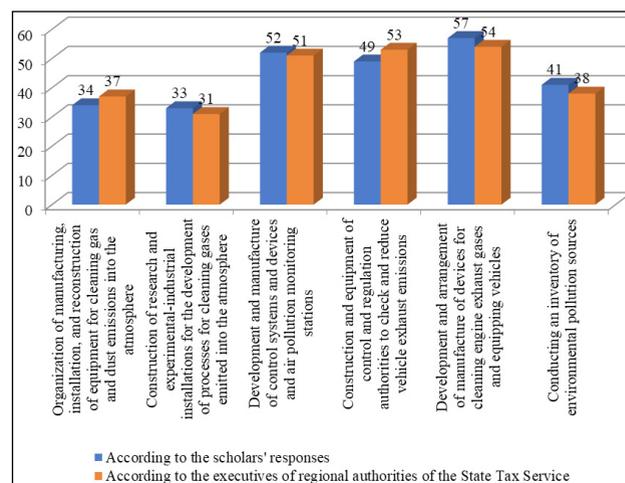


Source: Compiled by the authors.

Fig. 2: The most efficient EU tax base when taxing emissions of harmful substances caused by vehicles, %

As shown in Fig. 2, taxes on transport and actual pollution volumes are the most effective in taxing vehicle emissions in the EU.

An important result of the survey is the identification of the most optimal, according to the survey participants, ways to use the funds received due to increased environmental tax revenues after upgrading the tax collection system (Fig. 3).

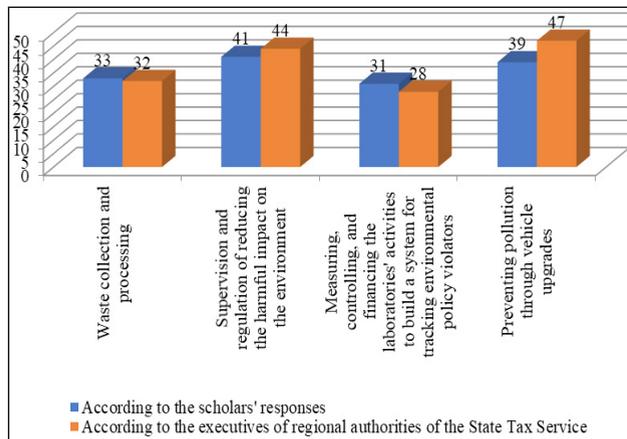


Source: Compiled by the authors.

Fig. 3: The most effective ways to use the funds received by increasing revenues from the taxation of harmful substances emitted by vehicles after upgrading the tax collection system, %.

According to the survey participants, the most significant effect in terms of reducing emissions from the use of transport can be achieved by directing the funds received from the taxes on harmful substances emitted by vehicles primarily to such areas as the development and manufacture of systems and devices for monitoring air pollution, building and equipping control and adjustment authorities to check and reduce the toxicity of

vehicle exhaust gases, as well as the development, arrangement of production of devices for monitoring and controlling the toxicity of vehicle exhaust gases. This study allowed us to identify the priority of the goal of modernizing the taxation of harmful substances emitted by vehicles (Fig. 4).



Source: Compiled by the authors.

Fig. 4: Prioritizing the purpose of upgrading the taxation of harmful substances emissions caused by vehicles, %

The survey participants believe that the most important goals of the transformation in the taxation of harmful substances emitted by vehicles are to supervise and control the process of reducing detrimental environmental impact and preventing pollution through the modernization of vehicles.

## DISCUSSION

To improve control over the use of non-renewable natural resources and enhance the country's environmental safety, it is necessary to consider all possible risks when introducing resource and ecological taxation, considering the economy's specifics and the environmental and innovative nature of such taxes. Today, further tax system reform is needed to green the economy, including additional taxation of environmentally hazardous products, tax incentives to promote the introduction of resource-saving and environmentally friendly technologies, and tax sanctions for companies that have not been reducing pollution for a long time (Liv et al. 2019), (Rotaris, Tonelli & Caponi, 2022). Transport and energy taxes are European countries' most common means of reducing emissions. For example, energy taxes comprise 72% of EU

environmental taxes, and transportation taxes are 23%.

Transport taxes are also a tool for reducing air pollution emissions, although they are less effective than energy taxes. At the same time, taxes on gasoline, diesel, and other transportation fuels must be included in the energy tax, not in transportation taxes. Transportation taxes typically include mileage taxes, annual vehicle owner taxes, and taxes related to the import or sale of vehicles. Transportation taxes encourage fleet renewal, replacing vehicles with more energy-efficient ones, and consuming alternative energy sources. Pollution taxes are taxes on vehicle emissions of pollutants into the air, discharges of pollutants into water sources, noise pollution, and fees for activities related to solid waste management (Peng et al. 2019), (Zhu & Gao, 2019), (Zhang, Zhang & Zhou, 2023).

Recently, specific changes have occurred in various countries around the world regarding tax calculation and payment by vehicle owners. Therefore, the idea of increasing the tax burden on luxury vehicles is in line with the latest tendencies in the global tax system (Mahapatra & Irfan, 2021), (He et al. 2019).

Under the current tax legislation, the tax rate depends on several indicators, such as mileage, engine type, and emission standards. This system encourages purchasing and manufacturing more environmentally friendly cars (Pinto et al. 2019), (Scheelhaase, Gelhausen & Maertens, 2021).

Achieving the goals of improving environmental safety and friendliness requires not only the introduction of ecological taxes but also the organization of their effective collection and continuous improvement of the distribution system of funds received from the proceeds. Success in this area is possible only through further research into the essence of environmental transport taxes, the variety of their types, and the potential consequences of their implementation (Puertas & Marti, 2021), (Andrés, Alcántara & Padilla, 2021).

## CONCLUSION

Thus, the analysis of the scientific literature on the research topic has shown that today one of the most important global issues is the state of the environment and natural resource depletion. In recent years, there has been a negative trend

in air pollution by waste generated by vehicles, and the system of environmental taxes is one of the tools to deal with this situation. Therefore, the taxation mechanism for harmful substances emissions caused by vehicles needs to be effectively optimized to improve the environmental situation. At the same time, it should be remembered that the environmental tax is not only one of the sources of state budget income but also a means of improving the population's living conditions and a tool for greening the industry.

## REFERENCES

- Abiodun S. 2023. Philips. Institutional enforcement of environmental fiscal stance and energy stock markets performance: Evaluating for returns and risk among connected markets. *Energy*, **263**, Part E. 126057. <https://www.sciencedirect.com/science/article/pii/S0360544222029437>.
- Adams, S., Boateng, E. and Acheampong, A.O. 2020. Transport Energy Consumption and Environmental Quality: Does Urbanization Matter? *Sci. Total Environ.*, **744**: 140617.
- Andrés, L. and Padilla, E. 2018. Driving Factors of GHG Emissions in the EU Transport Activity. *Transport Policy*, **61**: 60–74.
- Andrés, L., Alcántara, V. and Padilla, E. 2021. Transportation, storage and GHG emissions: A new perspective of input-output subsystem analysis, Transportation Research Part D: Transport and Environment, 90, January 2021, 102646. <https://www.sciencedirect.com/science/article/abs/pii/S1361920920308312>. <https://doi.org/10.1016/j.trd.2020.102646>.
- Elahi, E., Weijun, C., Jha, S.K. and Zhang, H. 2019. Estimation of Realistic Renewable and Non-renewable Energy Use Targets for Livestock Production Systems Utilising an Artificial Neural Network Method: A Step towards Livestock Sustainability. *Energy*, **183**: 191–204.
- Giannakis, E., Serghides, D., Dimitriou, S. and Zittis, G. 2020. Land Transport CO<sub>2</sub> Emissions and Climate Change: Evidence from Cyprus. *Int. J. Sustainable. Energy*, **39**(7): 634–647.
- He, X., Adebayo, T.S., Kirikkaleli, D. and Umar, M. 2021. Consumption-based carbon emissions in Mexico: An analysis using the dual adjustment approach. *Sustainable Production and Consumption*, **27**: 947–957.
- Li, Y. and Solaymani, S. 2021. Energy Consumption, Technology Innovation and Economic Growth Nexuses in Malaysian. *Energy*, **232**: 121040.
- Liu, Y., Li, H., Wang, H., Wang, Y. and Han, S. 2023. Integrated Life Cycle Analysis of Cost and CO<sub>2</sub> Emissions from Vehicles and Construction Work Activities in Highway Pavement Service Life. *Atmosphere*, **14**: 194.
- Liv, Q., Liu, H., Yang, D. and Liu, H. 2019. Effects of Urbanization on Freight Transport Carbon Emissions in China: Common Characteristics and Regional Disparity. *J. Cleaner Prod.*, **211**: 481–489.
- Mahapatra, B. and Irfan, M. 2021. Asymmetric impacts of energy efficiency on carbon emissions: a comparative analysis between developed and developing economies, *Energy*, **227**: 120485.
- Peng, B., Yan, W., Elahi, E. and Wan, A. 2021. Does the green Credit Policy Affect the Scale of Corporate Debt Financing? Evidence from Listed Companies in Heavy Pollution Industries in China. *Environ. Sci. and Poll. Res.*, **1**.
- Pinto, J.T.D.M., Mistage, O., Bilotta, P. and Helmers, E. 2018. Road-rail Intermodal Freight Transport as a Strategy for Climate Change Mitigation. *Environ. Dev.*, **25**: 100–110.
- Puertas, R. and Marti, L. 2021. Eco-innovation and determinants of GHG emissions in OECD countries. *J. Cleaner Prod.*, **319**(1): 128739.
- Rotaris, L., Tonelli, S. and Capoani, L. 2022. Combined transport: Cheaper and greener. A successful Italian case study. *Res. in Transportation Business & Manage.*, **43**: 100792.
- Scheelhaase, J., Gelhausen, M. and Maertens, S. 2021. How Would Ambitious CO<sub>2</sub> Prices Affect Air Transport? *Transportation Res. Procedia*, **52**: 428–436.
- Solaymani, S. 2021. CO<sub>2</sub> Emissions and The Transport Sector in Malaysia. *Frontiers in Environmental Science*, **9**.
- Xiong, S., Yuan, Y. and Zhang, C. 2023. Achievement of carbon peak goals in China's road transport-possibilities and pathways. *J. Cleaner Prod.*, **388**: 135894.
- Zhang, Z., Zhang, H. and Zhou, L. 2023. Zero-carbon measure prioritization for sustainable freight transport using interval 2 tuple linguistic decision approaches. *Appl. Soft Computing*, **132**: 109864.
- Zhu, C. and Gao, D. 2019. A Research on the Factors Influencing Carbon Emission of Transportation Industry in “the Belt and Road Initiative” Countries Based on Panel Data. *Energies*, **12**: 2405.

