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ECOLOGICAL AND ECONOMIC ASSESSMENT AND ECOLOGICAL EDUCATION IN DRIVING SCHOOLS

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Abstract

Nowadays ecological education is an important cultural aspect, which cannot be disregarded in development of the state educational strategy. Need to introduce the fundamentals of ecological education into the training program for drivers of different categories in driving schools is an urgent problem of the Russian society. The study analyzes the training programs for drivers of different categories, revealing that examination of issues related to the negative impact of cars on the environment and ways of its minimization are not included into the programs of either theoretical or practical driving school courses. Ecologization development prospects for training in driving schools are related to alignment of new approaches and techniques being developed and applied in the Russian educational system. The article presents an ecological and economic assessment of damage that can be prevented in case environmental issues are included into the educational programs of driving schools. Evaluation proved the practical benefit of training drivers of a new generation, who are environmentally conscious and ecologically responsible.

Keywords: Motor transport, harmful emissions of vehicles, driving school, environmental and economic damage.

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1. Introduction

You cannot imagine modern life without cars. Appearing in the late 19th century, motor transport turned to be an economic necessity of civilization and an undoubted material benefit for humans. At the same time, development of the automotive industry and constant increase in the number of cars around the world became one of the main factors of environmental pollution, which caused many serious environmental problems in the human environment.

The main sources of pollution in operation of vehicles are internal combustion engines, which emit exhaust gases and fuel evaporations into the atmosphere. About 280 components of products of complete and incomplete combustion of petroleum fuels, as well as inorganic compounds of certain substances present in the fuel were found in the exhaust gases. Vehicles emit the largest amount of pollutants into the air at high speeds, low speed, at intersections, traffic-light stops, in the parking lots and parking areas (Golokhvast, Chernyshev, & Ugay, 2016; Kuzmenkova, 2019).

Not only exhaust gas components but also fuel, oils and lubricants have negative impact on the environment, which vapors spread in the air, especially with rising temperature. Surface runoff, including rain and snow melt water, water from car wash, etc., containing liquid petroleum products, residues of detergents, disinfectants, anti-icing and deicing agent, molding mixtures, solutions, products of artificial coatings destruction and tire wear are also very dangerous and destructive for human environment (Amato, Pandolfi, & Moreno, 2011).

In addition to environmental pollution, road transport creates a high level of noise and vibration, and is a source of electromagnetic radiation. These factors, at high quantitative indicators, have adverse effect on human health (Potapov, Tsyplakova, & Yankevich, 2016)

2. Problem Statement

According to the performed analysis, there are more than 150 cities in the Russian Federation where motor transport emissions account for more than 50% of gross emissions. In Moscow and St. Petersburg, Kamchatka, Novosibirsk, Omsk, Orenburg regions and Taimyr Autonomous region, more than 75% of urban population reside in high and very high pollution areas. Damage of motor transport exhaust gases amounts to 1024,78 billion rubles, about 1 trillion rubles per year (Potapov et al., 2006).

Thus, settlement of problem of reducing the impact of vehicles on the natural environment is one of the strategic objectives of the state policy of the Russian Federation. The transport strategy of the Russian Federation until 2030 provides for strengthening the environmental focus and reduction of negative impact of the transport system on the environment.

As of the date there isn't any integral mechanism to ensure ecological safety of motor transport in our country yet. Administrative, organizational and legal mechanisms are being actively developed and applied. It appears that ideological mechanism is of importance for solution of this strategic task, the most important tools of which are environmental education and upbringing, as well as additional environmental education for people whose activities are related to operation of motor transport.

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3. Research Questions

Chapter XIII "Fundamentals of Shaping Up an Ecological Culture" of the Federal law "Concerning the Protection of the Environment " provides for set up of the universal and integrated environmental educational system in our country in order to shape up an ecological culture and train the specialists in the field of environmental protection, including general education, secondary vocational education, higher education and additional professional education of specialists, as well as dissemination of environmental knowledge, including that through the media, museums, libraries, cultural, environmental, sports and tourism institutions . It is also provided that heads of companies and specialists responsible for decision-making in performance of economic and other activities that have or may have a negative impact on the environment, must be trained in the field of environmental protection and environmental safety.

Section 5 "Ways and means of implementation of the state policy in the field of ecology" of the Environmental doctrine of the Russian Federation, which includes priority areas of the state environmental policy in the economic, industrial, social, financial, legal and other spheres, says that the primary objective in these areas is improvement of the environmental culture of the population, the educational level and the professional skills and knowledge in the field of ecology.

"State policy bases of ecological development of the Russian federation till 2030" (approved by the President of the Russian Federation on 30.04.2012), section 3 " Main purposes of environmental policy of the Russian Federation for the period till 2030" provide for set up of ecological culture, development of ecological education and upbringing.

The Decree of the President of the Russian Federation of April 19, 2017 No. 176 "On the strategy of ecological safety of the Russian federation for the period up to 2025", section 3 "Challenges and threats of ecological safety" identifies the low level of ecological education and ecological culture of the population, and section 5 "Purposes, objectives, priority directions and mechanisms of implementation of the state policy in the field of ecological safety ensuring" states the need to develop the system of ecological education and instruction, personal professional development in the field of ecological safety ensuring.

In this regard, the basic principles of ecological knowledge are included in the special environmental education programs for preschool children, school programs, programs of primary vocational, secondary vocational and higher professional education of all profiles. However, for some reason, the issues of environmental education are completely missing in the training programs for drivers of different categories in driving schools, although their activities will be directly related to the negative impact on the environment and public health.

4. Purpose of the Study

Purpose of this study is to analyze the environmental aspect of education in driving schools, to ground its importance and practical utility based on ecological and economic assessment of the prevented damage, and to consider the prospects of ecologization of this segment in the educational system

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5. Research Methods

Methods of this study are: method of comparative analyses, generalization method, method of eco-economic assessment.

6. Findings

Number of cars is increasing every year, together with the number of those wishing to purchase vehicles for personal use. A huge number of adult citizens of the Russian Federation are trained in driving schools, where they get theoretical knowledge about the road regulations, Motor Vehicle Construction and Layout and master the practical skills of driving.

According to the analysis of training programs for drivers of different categories, the study of issues related to the negative impact of cars on the environment and ways to minimize it are not included in the programs of either theoretical or practical courses. Nowadays, the issue of re-examination of drivers when replacing driver's licenses is actively discussed, but there is not a word said about the need to include environmental issues in training programs.

Usually, people with fairly average knowledge of the environmental situation and no idea about the environmental danger of motor transport and ways to reduce it come to driving schools. Adult population of modern Russia was not covered by educational environmental programs, which became compulsory only in recent years. Therefore, driving schools face a complicated and responsible challenge to involve this category of the population in the educational process on environmental disciplines.

As of today, only a few driving schools included issues of legal protection of the environment into their training programs, but this knowledge has nothing to do with necessity to ensure environmental safety of cars, and give just a general overview of environmental protection and environmental safety. Consequently, all activities of modern driving schools aim at training of potential environmental pollutants.

An integrated approach to set up and solution of short-term and long-term targets is necessary in order to change the current situation in this educational segment. It is important that training in driving schools became part of the overall educational strategy of the Russian society, which is aimed at openness, accessibility and quality improvement (Necheukhina, Matveeva, Babkin, & Makarova, 2017). Driving schools should take full advantage of new approaches and methods that have become the main trend of changes in the education system. Use of new communication opportunities (online courses), advanced technologies of smart education will increase the level of job-oriented approach in driving schools, allowing their quick adaptation to the digital economy reality (Glukhov & Vasetskaya, 2017; Krasnov, Kalmykova, Abushova, & Krasnov, 2018; Trostinskaia, Safonova, & Pokrovskaia, 2017; Sokolova, Pylkin, Stroganova, & Antonian, 2018).

Philosophical aspect is the fundamental one to solve the problem of ecologization of education in driving schools. Restructuring of people's consciousness is the main challenge the environmental education faces. It is impossible to change the situation basically until each person is aware of personal responsibility for preservation of environment and feels the need to be included in the environment - oriented process (Sinko, 2014). To solve this problem, it is important that environmental issues become a

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component of morality in the modern society. Moral education should establish environmental behavior patterns, using efficient strategies of moral example and encouragement to create an ethical perspective of the subject (Engelen, Thomas, Archer, & van de Ven, 2018).

There is a view that tightening of legislation in the field of environmental safety can be an effective mechanism to increase the responsibility of citizens for compliance with the established norms and rules. Fear of punishment is actually a powerful motivator of behavior. Nevertheless, sustainable social behavior of individuals is the result of long-term education and upbringing, formation of values-based orientations nationwide (Ivanov, 2015; Kashepov, 2012; Naryshkina, 2007).

According to the performed analysis, one driving school can train 150-2000 drivers a year (an average of 200-300). These are 150-2000 new traffic participants, and about the same number of cars, and since these new drivers are unfamiliar with the issues of environmental safety of motor transport, this increases negative environmental impact by 150-2000 times.

In this regard, it seemed appropriate to perform an ecological and economic assessment of ecologization of training in driving schools using the methodology of ecological and economic damage in this work, i.e. to perform a monetary assessment of negative changes resulting from operation of motor transport, which can be prevented due to introduction of environmental knowledge in the training program for drivers of various categories in the driving school.

Prevented economic damage as a result of any environmental measures is calculated by the volume of reduction of the reduced mass of pollution contained in exhaust gases, taking into account the number of units and type of vehicles specified in the regulation or registered during the inspection, using the formula:

$$У_{ТР} = У_{УДr} \cdot \sum_{K=1}^{K} \sum_{i=1}^{N} \Delta M_{iKKT} \cdot К_{Эi} \cdot К_{Эr}, [1]$$

where: $У_{тр}$ – economic damage due to air pollution emissions from mobile sources in the r- region during the reporting period, thousand rubles:

$У_{удr}$ – index of specific damage to atmosphere caused by emission of a unit of reduced mass of pollutants at the end of the reporting period for the r - economic region of the Russian federation, rub/conditional tons, a factor of 10 to the prices of 1999 is applied.

К – number of units of mobile transport, having decrease in content of pollutants in the exhaust gases as a result of environmental activities

Кэr –ecological situation coefficient and ecological significance coefficient of the atmospheric air state of the territories being parts of the economic regions of Russia.

Кэi – coefficient of relative ecological and economic hazard of the i-th pollutant or group of substances.

i – index of pollutant or group of pollutants.

N – number of considered groups of pollutants.

ΔMiктр – actual mass of emission of the i-th pollutant from the k- mobile transport unit during the reporting period, tons.

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Being part of this work the driving school in Kolpino with the number of graduates of 200 people per year was taken as an example and the prevented eco-economic damage of cars belonging to those 200 graduates was calculated respectively. Figure №1 shows characteristics of the prevented damage amount from 200 cars when driving on a highway at a speed of 60 km/h, which is the speed at which the minimum amount of harmful substances is emitted, at stops at intersections, from parking lots and parking areas.

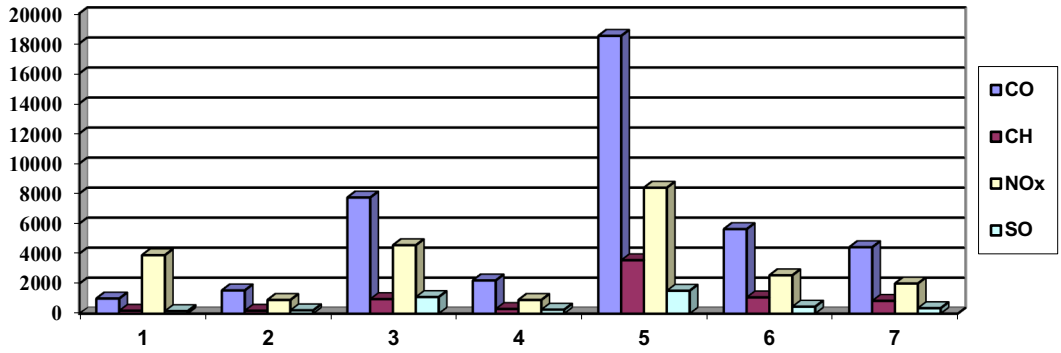

Figure 01. Relative value of prevented damage, thousand rubles: 1 - from running exhaust emissions on highway; 2 - from emissions at crossroads; 3 - from total emissions at five intersections; 4 – from the emissions on departure from the car park (warm season); 5 – from the emissions on departure from the car park (cold season); 6 – from the emissions on departure from the car park (cold season) using pre-start heating; 7 - emissions on departure from the car park (cold season) using heating during inter-shift parking.

This figure 1 shows the damage that can be prevented through ecologization of the driver training program of one driving school. As to the analysis, there are seven of them just in the small territory of Kolpino, and more than 350 in St. Petersburg.

7. Conclusion

Thus, the ecological and economic assessment of the prevented damage considered above makes it possible to estimate ecological and economic consequences of pollution of ambient air from mobile sources, but in order to engage the driving schools, motor transport companies and car owners in introduction of ecological knowledge in driver training programs, some state economic levers and incentives are necessary.

The performed analysis confirmed the relevance of the chosen direction and the need for additional assessment and ecologization of the training program for drivers of different categories in driving schools, as the quantitative composition of exhaust gases, and their toxicity, consequntly, depend on maintenance of car engines in good repair, "age", compliance with the intended use of cars, quality of used fuel and grease, their consumption, use of rational methods and driving techniques, methods and ways of storage of rolling stock and a number of other factors depending on drivers. All this knowledge need to be taught in a modern driving school to prepare a new generation of drivers, environmentally

conscious and environmentally responsible, which will reduce significantly the environmental risk of the operated motor transport.

References

Amato, F., Pandolfi, M., & Moreno, T. (2011). Sources and variability of inhalable road dust particles in three European cities. *Atmospheric Environment. 45*(37), *6777-6787.*

Glukhov, V. V., & Vasetskaya, N. O. (2017). Improving the teaching quality with a smart-education system. In S. Shaposhnikov (Ed.), *Proceedings of the 2017 IEEE VI Forum Strategic Partnership of Universities and Enterprises of Hi-Tech Branches (Science. Education. Innovations) (SPUE)* (pp. 17–21). St. Petersburg; Russian Federation: IEEE.

Golokhvast, K. S., Chernyshev, V. V., & Ugay, S. M. (2016). Car exhausts and human ecology (Literature review). *Human ecology, 1,* 9-14.

Engelen, B., Thomas, A., Archer, A., & van de Ven, N. (2018). Exemplars and nudges: Combining two strategies for moral education. *Journal of Moral Education*, *47*(3), 346-355. Retrieved from https://www.tandfonline.com/doi/pdf/10.1080/03057240.2017.1396966?needAccess=true

Ivanov, A. A. (2015). Legal liability for environmental offenses: prospects for development. *Samarskaya Luka: problems of regional and global ecology, 24*(2), 110-124.

Kashepov, V. P. (2012). Development of legislation on criminal liability for environmental crimes. *Journal of Russian law,* 6 (186), 29-39.

Krasnov, S. V., Kalmykova, S. V., Abushova, E. E., & Krasnov, A. S. (2018). Problems of Quality of Education in the Implementation of Online Courses in the Educational Process. In *Proceedings of the 2018 International Conference on High Technology for Sustainable Development (HiTech);* (pp. 127-131). Sofia; Bulgaria: IEEE.

Kuzmenkova, V. N. (2019). Features of business activity in the field of car service. In E.G. Holnova (ed.), *Collected book: Economics and management in the service industry: current state and prospects of development. The XVI all-Russian scientific and practical conference* (pp. 43-44). St. Petersburg, Russian, SPbGUP.

Naryshkina, S. V. (2007). Compensation of ecological harm. *Citizen and law, 1, 44-58.*

Necheukhina, N. S., Matveeva, V. S., Babkin, I. A., & Makarova, E. N. (2017). Modern approaches to the educational process aimed at improving the quality of highly qualified personnel training. In S. Shaposhnikov (Ed.), *Proceedings of the 2017 IEEE VI Forum Strategic Partnership of Universities and Enterprises of Hi-Tech Branches (Science. Education. Innovations) (SPUE)* (pp. 192–195). St. Petersburg, Russian Federation: IEEE.

Potapov, A. I., Khvatov, V. F., Nikolaev, S. N., Tsyplakova, E. G., Zhurkovich, V. V., Volkodaeva, M. V. … Denisov, V. N. (2006). *Ways to solve environmental problems of vehicles.* St. Petersburg: Humanistics.

Potapov, A. I., Tsyplakova, E. G., & Yankevich, K. A. (2016). *Fundamentals of environmental protection in metropolitan areas.* St. Petersburg: Polytechnic-print.

Sinko, G. I. (2014). Problems of world concept. In N. I. Ozerova (Ed.), *Collected book: actual problems of modern science. Scientific session "XVI Neva Readings" Proceedings of scientific conferences* (pp. 41-44). St. Petersburg: NIYK.

Sokolova, N. A., Pylkin, A. A., Stroganova, O. A., & Antonian, K. G. (2018). The pros and cons of distance learning. *The European Proceedings of Social & Behavioural Sciences*, *51*, 1478-1486. https://doi.org/10.15405/epsbs.2018.12.02.157

Trostinskaia, I. R., Safonova, A. S., & Pokrovskaia, N. N. (2017). Professionalization of education within the digital economy and communicative competencies. In S. Shaposhnikov (Ed.), *Proceedings of the 2017 IEEE VI Forum Strategic Partnership of Universities and Enterprises of Hi-Tech Branches (Science. Education. Innovations) (SPUE)* (pp. 29–32). St. Petersburg: IEEE.