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ENVIRONMENTAL AUDIT IN ASSESSING THE IMPACT OF REAGENTS ON SUSTAINABLE DEVELOPMENT IN LATVIA

Inna Stecenko[1], Baiba Rivza[2], Nataliia Lutska[3]

Abstract. Sustainable development in the environmental sector is a priority direction in Latvia, as in all EU countries. However, the use of different approaches does not provide effective results to achieve the SDG. *The purpose* of the research is to develop a model for carrying out an ecological audit based on the principle of inter-industrial assessment on the use of reagents on the country's roads. The authors suggest using an environmental audit for a comprehensive assessment of the influence of reagents on the environment. *Subject of research:* model of environmental audit in assessing the use of reagents. *The object* of the study is the Latvian approach to the use of reagents. *The research methodology* applied for this research study is qualitative and quantitative research methods. The monographic method and the method of deduction were used to analyze the corresponding theoretical concepts, the statistical method, the method of graphic analysis, correlation and regression analysis, Student's distribution were used for the evidence base of the research. *Conclusion of the study:* in the research the authors identified the following pattern: with the growth of income of the population of Latvia, the number of cars in the country increases (correlation 0.999, R = 0.754), however, there is also an increase in road accidents (correlation 0.946, R = 0.728), which leads to an increase in car repairs. In auto repair work, an anti-corrosion coating is used that releases non-methane volatile compounds. When conducting an environmental audit, it is necessary to take into account anti-corrosion coatings. As part of the research, the identified pattern was based on the use of the principle of intersectoral assessment. According to the authors, conducting an environmental audit according to the model proposed by the authors will lead to the identification of sources of environmental pollution, and subsequently to the development of a program to reduce or eliminate it. Regression equation analysis will make it possible to predict the expected number of accidents and will allow non-methane volatile compounds to be taken into account in environmental audits.

Key words: environmental audit, transport, reagents, principle of inter-industrial assessment, sustainable development, Latvia.

JEL Classification: M42, Q51, Q53, R11, R40

1. Introduction

Environmental protection is becoming a priority in the development of the country's economy, and ecology is an important part of modern economic development. The adoption of the document "Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development" by the UN is a new historical step for the sustainable development of the world. In the document, 17 goals were formulated, four of which relate to the environmental sustainability of the world (UN 2015).

Based on the strategy for the implementation of the UN Sustainable Development Programme, EU countries have developed the Sustainable Europe 2030 (European Commission, 2019), Europe 2050 (European Commission, 2018) and Latvia 2030 (Saema of the Republic of Latvia, 2010) programmes.

The authors believe that in order to achieve the above-mentioned goals in the field of sustainable development of the national economy and ecological balance of the world, the country should actively implement environmental audit programmes. The use of environmental audit is described in the works of the following authors (Neil Humphrey; Mark Hadley, 2010), (Price, Florence, Truitt, 1981), (Dieter

[1] Transport and Telecommunication Institute, Latvia *(corresponding author)*
E-mail: i.stecenko@yahoo.com
ORCID: https://orcid.org/0000-0002-0277-286X
[2] The Institute of Economics and Regional Development
at Latvia University of Life Sciences and Technologies, Latvia
[3] Institution of Higher Education "King Danylo University", Ukraine
ORCID: https://orcid.org/0000-0001-7210-7577

Helm, 2010), (McDonach, Yaneske, 2002). The authors agree on the following definition of environmental audit as a business activity of environmental auditors or environmental audit organisations to carry out independent private qualified analysis and assessment of economic activities that affect the environment and provide recommendations to reduce the negative impact on the environment and public health.

Latvia, like other northern European countries, actively uses reagents on the roads in winter. The impact of reagents on the environment is monitored by a number of ministries, see Figure 2, but the authors believe that the use of environmental audit will allow a comprehensive assessment to be made. In EU countries, including Latvia, there are laws regulating environmental audit – the Environmental Protection Law (Latvijas Republikas Saeimas, 2020). The law defines the performers of environmental audits – specialised environmental companies. However, for the implementation of the SDG 17, Europe 2030 and Latvia 2030 programmes, the audit companies should not only consider the activities that affect the country's ecology as separate types of environmental pollution, but they should also carry out the audit of the integrated impact on all areas of ecology and life activity. It is an integrated approach that ensures sustainable development of the environment. Therefore, the focus should be on the principles that contribute to a comprehensive environmental audit and not on the assessment of a separate environmental impact. In the opinion of the authors, the first problem is the approach to conducting an environmental audit and the need to adapt the principles for its implementation.

2. Brief Literature Review

In developing the principles, it should be borne in mind that the modern economy is circular and represents an alternative to the classical linear economy. Therefore, the main principle is to solve problems in a comprehensive way. This approach is also used in environmental auditing: to assess the type of activity, including and evaluating all the consequences of the activity carried out. Both the circular economy, i.e., the economy of waste-free production, and the environmental audit with a comprehensive assessment will allow to comprehensively solve a number of problems in the state related to environmental pollution and to ensure its sustainable development.

The authors conducted a theoretical analysis to formulate the basic principles for conducting an environmental audit. It should be noted that a number of documents, such as the Environmental Audit Program Design Guidelines for Federal Agencies 1994 (U.S. 1994), (Leeuwen, 2002) describe the principles of environmental auditing. However, the author of the study (Jamtsho, 2014) actually describes the elements of environmental audit. In order to achieve the goals of sustainable development in the field of the environment, it is necessary to focus on the basic methodological issue of conducting an environmental audit: the definition of principles. The authors, using the monographic method, the deduction method, system analysis based on the study of documents (Secretariat Royal Government of Bhutan, 2011), (INTOSAI, 2019), (Environmental Audit Committee, 2019), formulated the basic principles for conducting an environmental audit, which are presented in Figure 1.

The "polluter pays" principle is widely used in the legal frameworks of a number of countries (Secretariat Royal Government of Bhutan, 2011), (INTOSAI, 2019), as is the principle of protecting and promoting health and safety (Environmental Audit Committee, 2019). There are a number of similar names for the principle of effectiveness: the principle of subsidiarity (Environmental Audit Committee, 2019), decision making (Humphrey; Mark Hadley, 2000).

As part of this research, the authors suggest using the principle of cross-sectoral assessment in an environmental audit. This will make it possible to find a balance in the quantitative and qualitative patterns of economic systems, to create a holistic vision of

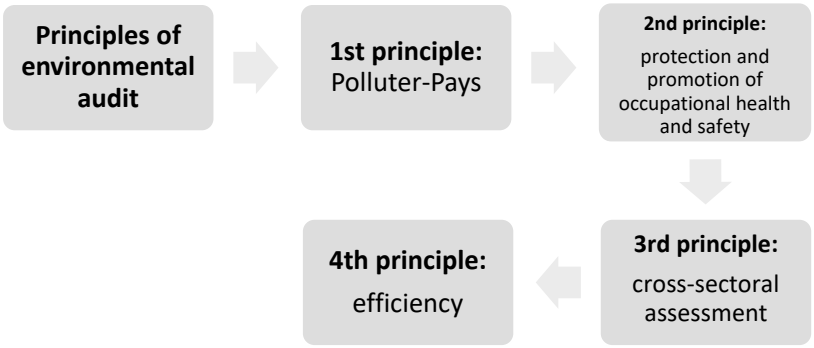

Figure 1. Principles of environmental audit developed by the authors

the impact of ecology on a number of factors and, as a result, an environmental audit will contribute to the implementation of a comprehensive programme of environmental sustainability and the development of a green economy of the world. The *cross-sectoral principle* should be understood as an integrated approach to conducting an environmental audit that assesses all related industries that are affected by a substance that pollutes the environment.

3. Materials and Methods

Ensuring the sustainable development of the environment in northern European countries is linked to controlling the use of reagents on roads in winter. The use of reagents reduces the number of accidents on the roads and saves lives. On the other hand, anti-corrosion paints used after accidents to protect the vehicle from the effects of reagents, paints and other chemicals are also harmful to the environment. The countries that use reagents on roads should coordinate work between ministries and agencies of the countries to take into account the environmental impact on different areas of life. Using Latvia as an example, the authors suggested an environmental audit model based on the inter-industry principle for EU countries and other regions of the world.

The study used the following quantitative and qualitative research methods: monographic analysis, methods of deduction and induction, statistical data processing, graphical analysis, econometric methods using SPSS, Gretl, Excel software (Pearson correlation analysis, regression analysis).

4. Results and Discussions

4.1 What are the methodological aspects of environmental audits to assess the impact of reagents?

Consider using the principle of cross-sectoral assessment to calculate the environmental impact of reagents and conduct an environmental audit. Sub-zero temperatures and snowfall are typical of winter in Latvia, a number of northern EU countries and some other regions of the world. De-icing agents are used in winter for the safety of drivers and pedestrians on roads and pavements. De-icing agents prevent the formation of ice on roads when the air temperature is below zero and the humidity is high. However, according to the opinion of scientists and chemists, the reagents affect: the salinity of soil and water, the paws of animals, the dustiness of the air and the corrosion of metals (Environmental Audit Committee, 2019). This means that an environmental audit should assess all these parameters based on the principle of cross-sectoral assessment (Figure 2).

In this article, the authors focused on the need to take into account the problems associated with the impact of reagents on road transport: corrosion and recovery after accidents in winter.

It should be noted that environmental assessment in Latvia is regulated by law, which establishes the following principles: the polluter pays principle – a person bears the costs associated with his activity; the precautionary principle – it is permissible to restrict or prohibit actions or measures that may affect the environment or human health; the prevention principle – a person should, as far as possible, prevent pollution of the environment and other substances harmful to the environment or human health. The principle of assessment – the consequence of any such action or measure that may have a significant impact on the environment or human health shall be assessed before authorising or initiating the corresponding action or measure (Latvijas Republikas Saeimas, 2020).

As can be seen from the analysis, the principle of cross-sectoral assessment or integrated approach to environmental audit is not included in the legislation regulating environmental audit in Latvia. In the opinion of the authors, not only the results of the environmental audit will be more effective if the principle of inter-industry assessment is used, but also the implementation of Latvian, EU and global programme documents aimed at sustainable development of the ecology will be more efficient.

Furthermore, the use of the principle of cross-sectoral assessment will make it possible to conduct environmental audits in countries more effectively. Thus, in the table below, the authors suggest a methodology for conducting an environmental audit on the use of reagents in Latvia.

4.2 Calculations of the number of road accidents and emissions of non-methane volatile compounds

The following reagents are used in public institutions in Latvia in winter (VAS "Latvijas Valsts ceļi", 2019):
– Table salt;
– sand-salt mixture;
– calcium chloride;
– sodium chloride.

Table 1 shows the authors' analysis of the use of reagents depending on the type of road works.

As can be seen from the table, sodium chloride, or common salt, is the main substance responsible for the de-icing effect. Although salt is good at preventing icing, it can significantly accelerate the process of metal destruction (corrosion) (Wei, Cheng, 2022), (Xin, Hao, Lu, 2022).

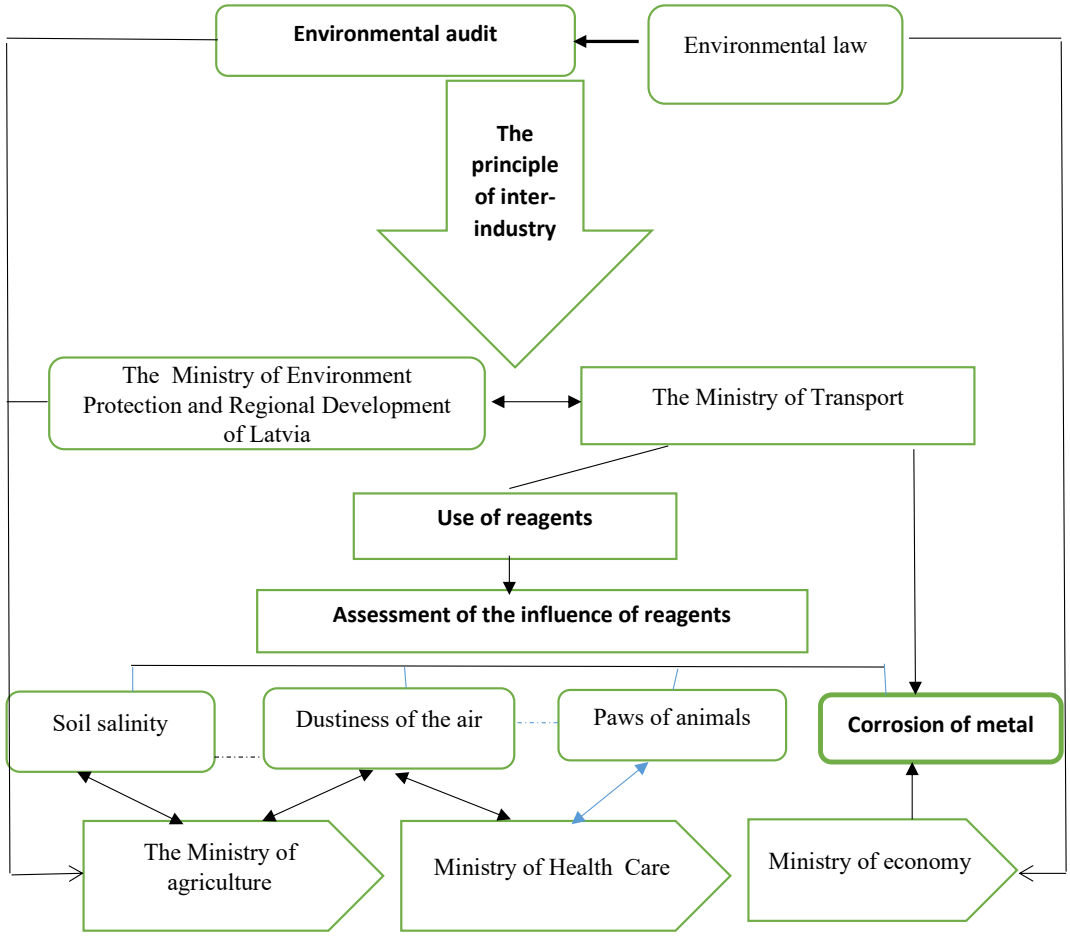

Figure 2. The model for conducting an environmental audit, based on the principle of cross-sectoral assessment of reagent use

Source: developed by the authors

The total length of roads in Latvia is 70 437 km, but the length of public roads is 20 066 km. In 2020, winter road maintenance will cost 10.236 million EUR (Latvijas valsts ceļi, 2019).

Calculations show that the minimum amount of reagents used on Latvian roads during a single snowfall is **24.5 tonnes** per day, and approximately 500 000 tonnes of salt are used on Latvian roads per season (VAS "Latvijas Valsts ceļi" Tehniskajā komisijā, 2019).

3.2 Factors influencing the number of road accidents and emissions of non-methane volatile compounds as a result of car repairs

To carry out an environmental audit – the impact of reagents on vehicles, based on the principle of cross-sectoral assessment, consider the calculation of the amount of anti-corrosion agents used as a result of car repairs after accidents.

This will allow to calculate the amount of anti-corrosion agent to restore the car.

Table 1
Analysis of snow removal types and material consumption in winter in Latvia

Type of works	Cleaning compound	Norm for materials
Snow removal with wet salt distribution on the roadway	– the amount of NaCl > 90 mass %; – the amount of sulphates ≤ 3 mass %; – in the water NaCl or $CaCl_2$	0.8 tons of mineral material per 1 km
Reducing slippage with sand	NaCl 23-25 %, $CaCl_2$ 20-32 %.	0.8 tons of mineral material per 1 km
Clearing medium-width snow from the road		Depending on icing 0.4-1.28 tons spread per 1 km of roadway.

Source: developed by the authors, adapted from (VAS "Latvijas Valsts ceļi", 2019)

Table 2

Calculation of the amount of reagents (NaCl or $CaCl_2$) used per hour/day in Latvia, tonnes

Types of road	Black surfaced, km	Calculation of the amount of reagents (NaCl or $CaCl_2$) used per hour/day, kg
Public roads	**9 356**	**14970**
Main roads (A)	1 673	2677
Regional roads (P)	4 652	7443
Local roads (V)	3 031	4850
Local government	**5923**	**9477**
Roads	1203	1925
Streets	4720	7552
Sum of roads and street	**14 959**	**24 447**

Source: (Price, Florence, Truitt, 1981)

Figure 3 shows the graphic representation of the number of road traffic accidents registered in Latvia.

It becomes apparent that despite the use of reagents in the country, the number of accidents between November and February is quite high.

Using SPSS software, the minimum and maximum number of accidents in the period from 2010 to 2020 was calculated taking into account the use of reagents (Table 3).

The data calculated by the authors show that the minimum number of accidents during the study period was in December – 2970 accidents per month, and the maximum value was in January – 4029.

The standard deviation is 117 accidents in February and 325 in January over the period under review.

Considering that, according to the standards, an average of 2.5-3 kg of substance is used to treat a car with an anticorrosion agent, which results in emissions of 1.6-1.9 kg of non-methane volatile organic compounds NMVOCs (Li et al., 2019), (Peng et al., 2015), (Kuenen, Trozzi, 2016), (COMMISSION, 2019), (Portney, 2010), summary data is given in Table 4.

Table 3

Analysis of general statistics on road traffic accidents in Latvia in the period from November to February 2010–2020

	Nov	Dec	Jan	Feb
N	10	10	10	10
	0	0	0	0
Mean	3505	3114	3667	3371
Std. Deviation	304,930	127,005	325,349	117,874
Minimum	3157	2970	3399	3294
Maximum	3724	3211	**4029**	3507

Table 4

Calculation of emissions of non-methane volatile compounds after application of anti-corrosion coating on vehicles in Latvia, kg

	November	December	January	February
Average number of accidents per month	3505	3114	3667	3371
Sum of NMVOC, kg	3330	2958	3484	3202
Sum, kg				**12 975**

In the calculations, the assumption is that only half of the cars will need to be repaired after accidents, and multiplying the paint standards, the result is 12,975 kg of NMVOC emissions in just 4 months. This is about 40 000 kg or 40 tonnes of NMVOC emissions per year, assuming that 50% of the cars that were repaired after accidents in Latvia received an anti-corrosion coating. This amount is minimal, since the authors used the amount of anti-corrosion agent in the calculations only for cars, it is clear that the consumption for trucks will be higher.

Furthermore, it is worth assessing the causes of accidents on the country's roads. The main hypothesis is that the number of accidents depends on the number of cars; the second hypothesis is that the number of cars depends on the standard of living of the population or GDP per capita; the third

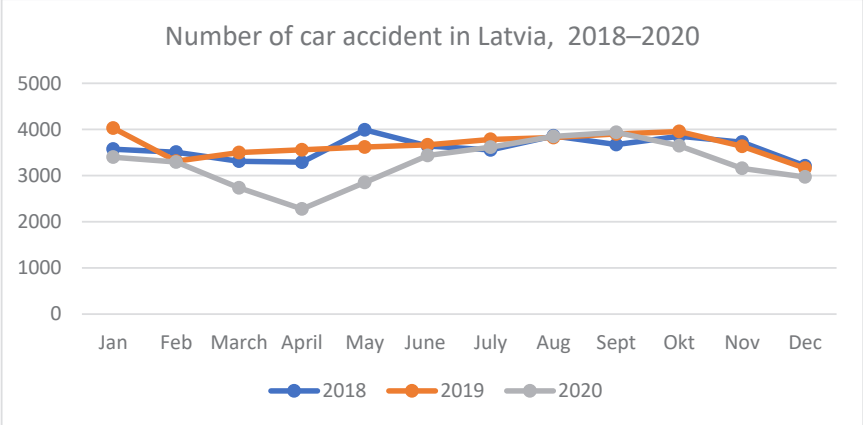

Figure 3. The number of road traffic accidents in the period from 2018 to 2020

Source: the authors' graph

Table 5
Calculation of the Pearson correlation between the number of cars, road accidents and income level in Latvia in the period from 2010 to 2020

Indicators		Cars	Wage	Accidents
cars	Pearson Correlation	1	**,999***	**,946**
	Sig. (2-tailed)	-	,0025	,0045
wage	Pearson Correlation	**,999***	1	**,728**
	Sig. (2-tailed)	,0025	-	,0048
accidents	Pearson Correlation	,946	**,728**	1
	Sig. (2-tailed)	,0045	,0048	-

hypothesis is that the number of cars depends on the income level of the population and its salary. The number of cars is taken as the main factor. Using SPSS software, the following data obtained (Table 5).

Pearson's correlation coefficients showed a high correlation between accidents, the number of cars and the salary level of the population. The second hypothesis put forward by the authors was not confirmed: the level of GDP per capita does not affect the number of cars in the country, but there is a high correlation between the number of cars and the level of salaries – 0.999 (!).

However, it is necessary to check whether the Pearson correlation coefficient is statistically significant or whether its difference from zero can be explained by random causes. Therefore, the statistical hypothesis will be analysed:

H_0 the sampling coefficient is randomly different from zero

H_1: the sampling coefficient is naturally different from zero. Let p be the correlation coefficient:

H_0:p=0

H_1: p≠0

If the null hypothesis is confirmed, then there is no relationship between the variables; if the alternative hypothesis is accepted, it means that the variables are linearly related (Jain, Ohri, 2021). Calculate the value of p by selecting the Student's distribution using the Gretl program (Adkins, 2018).

D_f = 18, p value 2,0530

T (18): area to the right of 2,0530 = 0,02745

two – tailed value = 0,05; supplement = 0,9451

Thus, at the significance level of a=0.05, H_1 is true: the variables number of accidents and income are correlated. A linear relationship was found.

Having proved the relationship between the number of road accidents, cars and income level using correlation analysis, the form of this relationship will be expressed using regression analysis, which will allow to predict the expected average number of road accidents, and therefore to calculate the amount of anti-corrosion agent for car repair. This, in turn, will allow to calculate the amount of non-methane volatile compounds emitted into the atmosphere.

Using the Anova software, the coefficient of determination (R) is calculated, which characterises the quality of the regression equation. The calculations showed a high level of relationship between the variables of accidents and the number of cars, as well as accidents and income level, which is confirmed by sig. In the calculations, sig.=0.04<=0.01, which proves that the coefficient of determination is significant. The results of the calculations are summarised in Table 6.

Table 6
Regression analysis of the relationship between the number of road accidents, cars and income, 2010–2020

Indicators	R	R^2	Constant	S yx	Linear
Cars	0,754	0,568	37,35		Y= 37,35+ 0,568 * x
Wage	0,728	0,530	123,63		Y=123,63+ 0,530 * b

The linear equation thus obtained makes it possible to predict the number of accidents in the coming years as a function of the number of cars and the growth in the population's income. The relationship between the indicators presented has been established on the basis of correlation coefficients for the ten years from 2010 to 2020.

5. Conclusions

The use of environmental auditing should be based on the principles described by a number of authors (Jamtsh, 2005), (INTOSAI, 2019), (Wei, Cheng, 2022). However, the principle of effectiveness suggested by a number of authors can only be achieved through the principle of cross-sectoral assessment. The model presented by the authors shows that reagents affect different areas of human life: from soil and air pollution to metal corrosion. Therefore, the assessment should be carried out in a comprehensive manner. Assessment through an environmental audit will contribute to the sustainable development of environmental protection. Although reagents are intended to protect drivers and pedestrians in winter, the use of corrosion inhibitors to protect cars from corrosion or for repair purposes leads to an increase in environmental pollution.

The authors' calculations revealed an important pattern:

1) The growing prosperity of the country's population leads to an increase in the number of cars. An increase in the number of cars leads to an increase in the number of road accidents, which means an increase in air emissions when using anti-corrosion paints and varnishes in repair work.

2) Protecting the public from accidents on the roads with the use of reagents is leading to an increase in the use of anti-corrosion coatings to protect vehicles.

However, further research should use both the amount of precipitation (in the form of snow) and the average winter temperature as a parameter to trace the relationship between precipitation, reagents and the number of accidents.

5.1. Theory contribution

An analysis of the principles for conducting an environmental audit showed that the use of existing principles doesn't meet the requirements of a circular economy and its sustainable development. The inclusion of the principle of cross-sectoral assessment will make it possible to comprehensively assess the impact of the source of pollution on all areas of human life. Northern European countries use road safety reagents for roads and pavements, which have an active impact on a number of areas. The model suggested by the authors will make it possible to carry out an environmental audit and contribute to a comprehensive assessment of environmental pollution, ensuring the sustainable development of the environmental protection system.

5.2. Practice contribution

Based on the analysis conducted for the period from 2010 to 2020 and the calculation of Pearson's correlation, the authors found the following pattern: as the income of the Latvian population increases, the number of cars in the country increases (correlation 0.999, R=0.754), but there is an increase in road accidents (correlation 0.946, R=0.728), which leads to an increase in car repairs. In the car repair process, an anti-corrosion coating is used that emits non-methane volatile compounds. Taking into account the use of standards for car treatment, per 1 kg of anti-corrosion paint, 636 g of non-methane volatile compounds are emitted into the atmosphere, resulting in total emissions, according to the authors' calculations, of at least 40 tonnes per year. It should be noted that car owners not only apply an anti-corrosion coating after an accident, but also to protect their cars from corrosion caused by the use of salt on the roads. This results in a double impact on the environment: on the one hand, reagents are used to protect motorists in winter and, on the other hand, drivers use an anti-corrosion coating to protect their vehicles from reagents.

Within the framework of the research carried out, the identified pattern was based on the use of the principle of inter-industrial assessment. According to the authors, conducting an environmental audit according to the model proposed by the authors will lead to the identification of the sources of environmental pollution and, subsequently, to the development of a programme aimed at reducing or eliminating them.

The regression analysis of the equation proposed by the authors makes it possible to predict the expected number of accidents and to calculate non-methane volatile compounds during corrosion protection work.

References:

Basic Principles of Auditing: Comprehensive Methods. Evidence and Verification, Relevant Measures and Standards. Written Reports. 2005.

Choida Jamtsho Environmental auditing and sustainable development from the perspective of a government auditing. Dissertation Environment Management Systems and Auditing, in accordance with the regulations of the University of East Anglia. School of Environmental Sciences University of East Anglia Norwich NR4 7TJ UK August 2005.

Chunhua Xin; Xiaolu Hao; Lu Cheng (2022). Do Environmental Administrative Penalties Affect Audit Fees? Results from Multiple Econometric Models. *Sustainability*, *14*(7), 4268. DOI: https://doi.org/10.3390/su14074268

Ceļu specifikācijas 2019 (ietverot Autoceļu uzturēšanas darbu tehniskās specifikācijas) VAS "Latvijas Valsts ceļi" Tehniskajā komisijā 2019. gada 25.janvārī. Available at: https://lvceli.lv/wp-content/uploads/2020/09/Celu_specifikacijas_2019-1.p

COMMISSION, E.-E. Directive (EU) 2016/2284 of the European Parlament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC Official J. European Union, 344, pp. 1–31, 2016.

Dieter Helm (2010). Environmental policy: Objectives, instruments, and implementation – Oxford University Press Distribution Services.

Environmental Auditing in The Context of Financial and Compliance Audits, INTOSAI Guidances are issued by the International Organisation of Supreme Audit Institutions, INTOSAI, as part of the INTOSAI Framework of Professional Pronouncements. INTOSAI, 2019.

The Environmental Audit Program Design Guidelines for Federal Agencies, U.S. Environmental Protection Agency, Washington, 1994.

Environmental management tools & techniques – National Capacity Self Assessment Project National Environment Commission Secretariat Royal Government of Bhutan, Thimphu, 2011.

Environmental Protection Law. Available at: likumi.lv/ta/en/en/id/147917#:~:text=(1)%20The%20purpose%20of%20this,of%20the%20Republic%20of%20Latvia

Jeroen Kuenen, Carlo Trozzi (2016). EMEP/EEA Emission Inventory Manual, European Environment agency.

Jian Deng, Zong-Yue Zhang, Qing Yang, Xu-Dong Wu (2022). Overview of non-methane volatile organic compounds for world economy: From emission source to consumption sink. *Energy Nexus*, vol. 6, 100064. DOI: https://doi.org/10.1016/j.nexus.2022.100064

Chao Peng, Jianying Yu, Zhijie Zhao, Jing Dai, Jingyi Fu, Meiling Zhao, Wei Wang (2015). Synthesis and Properties of a Clean and Sustainable Deicing Additive for Asphalt Mixture. *Journal plos one.* DOI: https://doi.org/10.1371/journal.pone.0115721

K. McDonach & P. P. Yaneske (2002). Environmental management systems and sustainable development. *Environmentalist*, vol. 22, pp. 217–226.

Latvijas valsts ceļi. Available at: https://lvceli.lv/celu-tikls/buvnieciba-un-uzturesana/celu-klasifikacija/

Lee, C. (2018). Adkins Using Gretl for Principles of Econometrics, 5th Edition, Oklahoma State University, p. 745.

L. Price, D. T. Florence, L. S. Truitt (1981). Environmental audit: Basic principles of environmental compliance auditing, Executive Enterprises Publications, pp. 23–37.

Neil Humphrey, Mark Hadley (2000). Environmental Auditing, Tarquin, 258 p.

P. R. Portney (2010). Air pollution policy Public Policies for Environmental Protection, Routledge.

M. Li, Q. Zhang, B. Zheng, D. Tong, Y. Lei, F. Liu, C. Hong, S. Kang, L. Yan, Y. Zhang (2019). Persistent growth of anthropogenic non-methane volatile organic compound (NMVOC) emissions in China during 1990–2017: drivers, speciation and ozone formation potential, Atmos. Chem. Phys., 19, pp. 8897–8913. DOI: https://doi.org/10.5194/acp-19-8897-2019

Sylvia van Leeuwen (2004). Auditing International Environmental Agreements: The Role of Supreme Audit Institutions. *Environmentalist*, vol. 24.

Scrutiny of the Draft Environment (Principles and Governance) Bill, Environmental Audit Committee, Eighteenth Report of Session 2017–19, London, 2019.

Sustainable Development Strategy of Latvia until 2030. Available at: https://pkc.gov.lv/sites/default/files/inline-files/LIAS_2030_en_1.pdf

Towards a sustainable Europe by 2030. Available at: https://ec.europa.eu/info/publications/towards-sustainable-europe-2030_en

T. R. Jain, V. K. Ohri (2021). Statistics for Economics, VK global publications Pvt. Ltd, p. 550.

United Nations official website on SDGs. Available at: https://sustainabledevelopment.un.org/sdg17

Wei, S., Cheng, S.-T. (2022). Estimating Pruning-Caused Loss on Ecosystem Services of Air Pollution Removal and Runoff Avoidance. *Sustainability*, 14, 6637. DOI: https://doi.org/10.3390/su14116637

Xiang Li, Benoit Van Aken, Erica Mckenzie, Huichun Zhang, Bechara Abboud, William Davenport (2019). Evaluating the environmental impact of selected chemical de-icers. *Transportation Safety and Environment*, Oxford, vol. 1, issue 3, pp. 220–229. DOI: https://doi.org/10.1093/tse/tdz05

2050 long-term strategy. Available at: https://ec.europa.eu/clima/policies/strategies/2050_en

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