ORIGINAL PAPER

DOI: 10.26794/2404-022X-2024-14-1-32-43
UDK 338.2,502.1,352(045)
JEL R00, Q56, H17

Economic Methods of Managing the Environmental Safety of Cities Abroad: Tax Aspect

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ABSTRACT

The purpose of the study is to analyze and generalize the economic methods used abroad for managing the environmental safety of a city and to assess the possibility of their use in the practice of Russian cities. The relevance of the work is conditioned by the fact that a significant part of large Russian cities and megalopolises are faced with serious problems in the environmental sphere. Abroad, many years of experience have been accumulated in solving similar issues through the use of methods for managing the environmental safety of the city, which is an argument in favor of its study. The article analyzes the practice of OECD countries in applying economic measures to reduce environmental pollution, ensure environmental balance and comfortable living conditions for the city population. Particular attention is paid to the powers of local governments in the environmental sphere and the degree of their financial autonomy; the benefits of environmental taxation in EU countries, including the transition to a low-carbon economy; organization of ecological cooperation on the principles of the circular economy and within the framework of the model of industrial symbiosis for the processing or use of industrial and household waste. In the course of the work, general scientific and special methods were used, including content analysis of literary sources, comparison, grouping, analogy, systemic and structural analysis, logical generalization. The results of the study consist in assessing the possibilities and determining the conditions for introducing the best foreign practices in environmental safety management in Russian cities; they can be useful to specialists dealing with both the problems of forming management decisions to stabilize the environmental situation in the city, greening the tax system at the local level, and ensuring the rational use of resources in a mobilization economy through cooperative relations in the processing of industrial and household waste through recycling.

Keywords: management; environmental safety; city; powers of local self-government bodies; environmental taxation; environmental cooperation

For citation: **Bogachov S.V., Malis N.I. Economic methods of managing the environmental safety of cities abroad: Tax aspect. *Upravlencheskie nauki = Management Sciences*. 2024;14(1):32-43. (In Russ.). DOI: 10.26794/2404-022X-2024-14-1-32-43**

INTRODUCTION

Nowadays, environmental safety is an important task of city management, as it is one of the key parameters for assessing the quality of life of the population. Urbanisation, high technogenic and anthropogenic load on the environment require the city management to take measures of administrative, economic, and organisational nature aimed at reducing air, water pollution and soil contamination, which arise as a result of the activities of industrial facilities located in the city limits, as well as dense traffic and, accordingly, a large amount of exhaust gases, industrial waste dumps and household waste disposal. Economic methods of environmentally safe development of the city include the establishment of tax rates, fees, fines, subsidies; regulation of the activities of economic entities, compliance with the principles of distribution of responsibility for environmental damage; taking into account the interests of participants in environmental projects.

The use of such methods makes it possible to incentivise environmental protection, compensate for damage from air, water pollution and soil contamination, fulfil the tasks of collecting payments for the use of natural resources and compensation for environmental damage, and promote motivation to expand environmental protection measures.

The above is discussed in the works of N.P. Ketova, O.I. Lyakhovenko and D.I. Chulkov, P.O. Mosorova and Yu.V. Yoda, Yu.I. Pyzheva and E.V. Zander, K.N. Khazov [1–5]. According to scientists, the authorities of the largest Russian cities do not widely apply such economic tools as ensuring the correlation between the powers of local governments in the environmental sphere and their financial capabilities; targeted attraction and use of local budgets for the implementation of environmental protection measures; application of direct and indirect incentives for the organisation of industrial and household waste recycling (with the participation of urban enterprises) to solve the problems of sustainable development of the territory and rational use of resources for environmental protection, which is an important factor in the mobilisation model of the economy.

METHODOLOGICAL APPROACH TO ANALYSING THE PROBLEM

The complexity of the environmental situation is emphasised by the data of experts from KB "Strelka" [6], which indicate that in 2022 in 1/3 of the 173 largest cities of Russia there is an increased, and in 1/10 of them — a high level of the integral index of atmospheric pollution by such substances as carbon monoxide, formaldehyde, nitrogen dioxide, sulphur dioxide and aerosols [6]. Maximum indicators are observed in megacities and one twentieth of industrial cities. To stabilise the environmental situation in these settlements, specialised programmes and projects are developed and implemented at the federal, regional, and local levels. In particular, the national project "Ecology" consists of a set of measures in ten main areas of environmental protection and environmental activities.[1] The projects "Clean Air". "Clean Country" and "Formation of an Integrated System of Solid Municipal Waste Management" are focused on the reduction of pollutant emissions into the atmosphere through the transition to environmentally friendly public transport, modernisation of the heat and power industry, greening of the territory, elimination of landfills and growth of household and industrial waste recycling. Financing of such initiatives is mainly carried out at the expense of the federal budget or, as Yu.I. Pyzheva and E.V. Zander note, "at the expense of the enterprises' own sources" and "practically no financing from

[1] National Project "Ecology". Ministry of Natural Resources and Environment of the Russian Federation (official website). URL: https://www.mnr.gov.ru/activity/np_ecology/?ysclid=lsxensdcpm455607446

local budgets is envisaged" [4]. At the same time, O. I. Lyakhovenko and D. I. Chulkov draw attention to the fact that "the main problem of Russian cities is that they cannot solve their problems themselves. As a rule, they have deficit budgets, and most of their expenditures are social. In such a situation, there are not enough finances for environmental expenditures" [2]. The main source of revenues of local budgets is tax revenues. However, S. M. Mironova [7] emphasises that the funds coming to the budget from environmental taxes and fees do not correspond to the amount of environmental expenditures. E. Kirova and A. Bezverkhiy, G. N. Semyonova, D. A. Smirnov and A. A. Zavorikin, S. I. Chuzhmarova and A. I. Chuzhmarov agree with her [8–11]. They refer to the experience of environmental taxation in OECD and EU countries and propose the development of an environmental tax policy that motivates careful environmental management and the introduction of innovative technologies [8], as well as justify the need to comply with the principles of "polluter pays" to "provide incentives for investment in innovative eco-technologies for the protection of the natural environment" [9]; identify the advantages of using tax instruments to regulate activities in the environmental sphere and the need to humanise the tax system in the environmental aspect [10]; argue in favour of the expediency of combining "tax incentives for investment in green technologies and tax disincentives for environmental pollution" [11].

As mentioned above, an important task both in the development of environmental policy of a smart city [1] and in the formation by local governments of a favourable environmental situation as the most important indicator of the quality of life of the population [3, 5] is the processing of industrial and household waste on the principles of recycling, as well as through the organization of industrial symbiosis, which, in turn, will promote the rational use of local resources. B. G. Preobrazhensky, T. O. Tolstykh and N. V. Shmeleva [12], Yu. V. Nikulichev [13], E. E. Utkina [14] adhere to this viewpoint.

Based on the presented scientific works and our own research, we will analyse the three mentioned aspects of the use of economic methods of urban environmental safety management in OECD countries and substantiate the possibilities of their application in the Russian practice.

As an information base, we use a sample of countries with the cleanest cities in the world, according to the results of the rating compiled in 2021 by Yale University for the World Environment Forum (hereinafter — Rating 2021),[2] which is due to the methodological approach proposed in the work "Local self-government autonomy in comfortable cities of the world" [15]. Its authors confirm the hypothesis about the influence of local government powers in various spheres of city life (including the environment) on ensuring comfortable living conditions for the population.

This methodological approach is based on the assessment of the correlation between the powers of local self-government bodies (LSG) and their organisational and financial autonomy, as well as independence in the formation and distribution of city budget funds, setting local taxes and tariffs for public services [15]. Let us use this approach to analyse the powers in the environmental sphere, as well as the financial autonomy of local governments in the most environmentally friendly cities in the world, which, according to the Rating 2021, were determined by the following parameters: environmental condition, ecosystem vitality, biodiversity, air, and water pollution. The top 30 include 17 cities from Europe, six from North America, two each from Asia and New Zealand, and one each from Australia, Africa, and South America. This

[2] World Ecological Forum. 2021. URL: https://worldecologicalforum.com//

ranking is confirmed by Mercer agency,[3] analytical company IQAir,[4] Global Gridded Model of Carbon Footprints project.[5]

All these cities are guided by Goal 11 of the UN Resolution: "Ensure transparent, inclusive, safe, resilient and environmentally sustainable cities",[6] as reaffirmed in the Urban Agenda adopted at the October 2016 United Nations Conference on Housing and Sustainable Urban Development (Habitat III). According to this document, the smart city concept "harnesses the power of digitalisation, clean energy and clean technology, and innovative transport technologies, thereby empowering residents to make more environmentally friendly choices and stimulate sustainable economic growth, as well as enabling cities to improve service delivery".[7]

Each city implements a sustainable development strategy, in which a significant place is given to environmental safety management through administrative and economic methods. Application of ecological and economic approaches affects budget and extra-budgetary fund revenues, stimulates enterprises to reduce destructive impact on the environment and improve the rational use of natural resources, energy and resource saving through alternative energy sources and expansion of opportunities for processing industrial and household waste. An important condition in this case are the principles of management of the city environmental safety system, including the distribution of powers of public administration and local self-government bodies; priority; stage, motivation; risk consideration; informativeness; publicity and transparency, public engagement.

Let us dwell more on the powers of local self-government bodies (LSG) in the environmental sphere. Local self-government bodies in the countries where ecologically clean cities are located are vested with them to a greater or lesser extent. The differences lie in the fact that some states, in addition to environmental protection, include fire protection (Great Britain, Spain), waste collection and disposal (Great Britain, Denmark, Spain, Netherlands, Sweden). At the same time, the financial capacity (the degree of financial autonomy and the level of tax independence) to implement these powers also varies (*Table 1*).

ENVIRONMENT AND FINANCE

According to the authors [15], there are the following degrees of financial autonomy: *high*, which implies fiscal autonomy of local self-government bodies; *medium*, in which local self-government bodies play the leading role in financing social payments; *relative*, which implies autonomy of budgets of different levels and their interaction; *low*, characterised by centralised distribution of funds. In turn, M.V. Gracheva defines tax independence of local self-government bodies in the following way [16]: *broad*, i.e., local self-government bodies are free to establish tax rates and tax benefits; *moderately broad* — local self-government bodies are free to establish tax rates or tax benefits; *moderately narrow* — local self-government bodies participate in tax distribution schemes between the state and local self-government bodies both in terms of proportions and terms; *narrow* — tax rates and benefits are established by the state.

Let us consider the experience of implementation of environmental and financial powers of local self-government bodies in some EU countries, where ecologically clean cities

[3] Quality of Living. City Ranking. 202.3 URL: https://www.mercer.com/insights/total-rewards/talent-mobility-insights/quality-of-living-city-ranking/

[4] AQ Air. URL: https://www.iqair.com/ru/world-air-quality-ranking

[5] Global Gridded Model of Carbon Footprints. URL: https://www.citycarbonfootprints.info/

[6] The transforming our world: 2030 Agenda for Sustainable Development. 2015. URL: https://sustainabledevelopment.un.org/post2015/transformingourworld

[7] The New Urban Agenda. United Nations. 2017. URL: http://habitat3.org/wp-content/uploads/NUA-English.pdf

are located. For example, in Denmark local self-government bodies within the framework of environmental protection — plan the placement of water treatment facilities, water supply systems, collection and utilisation of domestic and industrial waste, regardless of the level of their danger. Expenditures on environmental protection account for approximately 4 per cent of the consolidated budget, nine tenths of which are covered by local budgets; the latter are formed mainly from environmental taxes and payments by nature users [17, 18].

In Norway, municipalities play an important role in the implementation of environmental policy. The subject of bills on environmental safety are directly the sources of emissions of harmful substances; the volume of the latter is regulated on the basis of obtaining an emission permit [19]. In France, local self-government bodies are vested with environmental powers not only in terms of environmental protection, but also in the maintenance of water bodies and coastal territories, collection of household waste, sanitary control, landscaping, water supply and drainage — these powers are financed by appropriate taxes and fees [17, 18]. Environmental taxation at the local level in the USA is aimed at solving the tasks of environmental protection from harmful industrial production. For example, additional excise taxes on oil are introduced to finance a special fund programme to clean up hazardous waste, which is also funded by a percentage of the Alternative Minimum Tax (AMT) [9, 19]. As M.A. Urazgalieva notes, "in order to mobilise funds for cleaning groundwater from harmful contaminants coming from oil storage in underground storages that threaten the purity of drinking water, a tax on petrol, diesel fuel and special motor fuel has been introduced. New York has a tax on cleaning up oil slicks on bodies of water." [19]. In some U.S. states and Canadian provinces there is a so-called "carbon tax — "a tax on carbon, methane, greenhouse gas emissions that is levied on the carbon content of fossil fuels"" [11]. In the EU countries (Germany, Ireland, the Netherlands, Norway, Sweden), as well as in the UK, Japan, and Singapore, where there are environmentally friendly cities (*Table 1*), "carbon taxes (on coal, motor and heating fuels) are levied" [11]. In addition, some EU states sell carbon quotas, which are set at the national level. Carbon taxes and these quotas have a compensatory nature, so the most important task is to control the targeted use of the former within the framework of quotas.

ENVIRONMENT AND TAXATION

It should be noted that the base of environmental taxation in the OECD member states, on the territory of which the environmentally friendly cities from the sample are located (*Table 1*), covers both "environmentally destructive factors and goods and services that may cause negative impact on the environment and human health" [20]. The share of environmental taxes in the total revenue of these countries is 7.5 per cent. Since the sample (*Table 1*) includes mostly European cities (17 out of 30), let us consider the experience of environmental taxation on the example of EU countries.

The environmental taxes applied in them do not bear a significant fiscal burden, but determine the environmental policy of local governments and, in addition, stimulate the environmental behaviour of taxpayers, contribute to the reduction of technogenic and anthropogenic load on the environment [10, 18], as well as provide regulation of the process of nature management based on the rational use of resources. The functions of environmental taxes include: compensation of damage from environmental harm, accumulation of funds for the implementation of environmental protection measures of territorial

Table 1

Financial opportunities for the implementation of the powers of local self-government bodies in the countries where environmentally friendly cities are located

Country	City	Rating place	Local self-government bodies	
			The degree of financial autonomy	The degree of tax independence
Europe				
Austria	Vienna	7	Relative	Narrow
United Kingdom	Nottingham	14	High	Moderately wide
Germany	Hamburg Freiberg Berlin	1 20 26	Relative	Moderately narrow
Denmark	Copenhagen	3	Medium	Moderately wide
Iceland	Reykjavik	6		
Spain	El Hierro Oviedo	21 29	Medium	Wide
Luxembourg	Luxembourg	12	Medium	Moderately wide
Netherlands	Amsterdam	18	Low	
Norway	Oslo	22	Medium	
Finland	Helsinki	5	Medium	
France	Paris	27	Medium	
Switzerland	Geneva Zurich	8 25	Relative	Wide
Sweden	Stockholm	15	Medium	Moderately wide
North America				
Canada	Calgary Toronto	11 19	High	Wide
USA	Chicago Honolulu Portland New York	2 4 16 27		
Australia and Oceania, Asia, Africa, South America				
Australia	Brisbane	17	High	Wide
New Zealand	Wellington Auckland	24 30		
Singapore	Singapore	10	Low	Narrow
Japan	Kobe	13	Medium	Moderately wide
Morocco	Infran	23	Low	Narrow
Brazil	Curitiba	9	Relative	Moderately narrow

Source: compiled by the authors based on Political atlas of modern times. URL: http://www.hyno.ru/ [16].

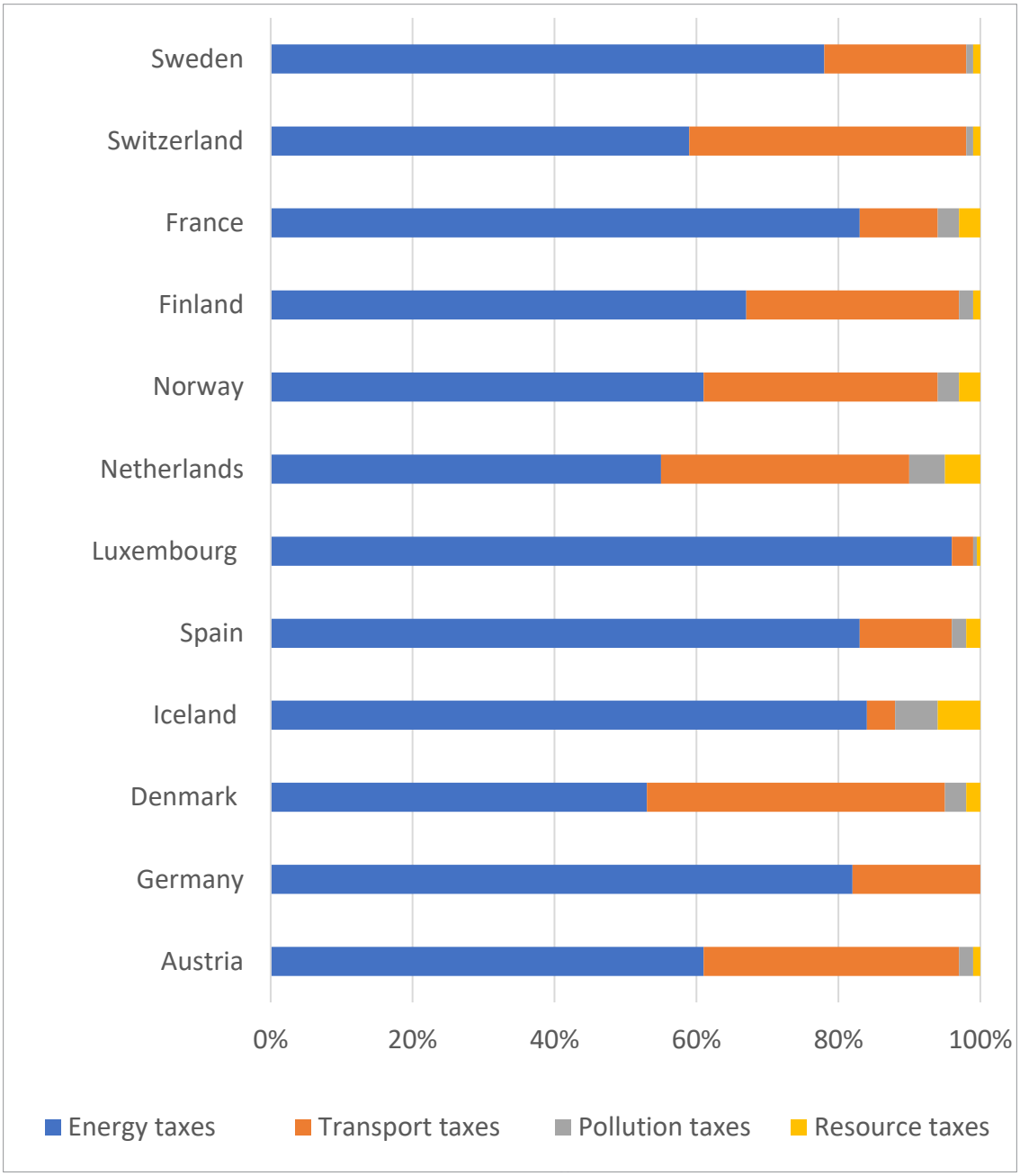

Fig. **The structure of environmental taxes in EU countries where environmentally friendly cities are located**

Source: compiled by the authors according to Statistical guide to Environmental Taxes. URL: https://ec.europa.eu/eurostat/documents/3859598/5936129/KS-GQ-13–005-EN.PDF.pdf/706eda9f-93a8–44ab-900c-ba8c2557ddb0?t=1414782946000

and spatial nature, stimulation of decisions aimed at reducing the anthropogenic load on the environment [8, 19], and are a specific part of the tax system, because along with the classical (fiscal and regulatory) play also resource-saving and controlling roles [9, 17].

According to the definition by the European Environment Agency,[8] environmental taxes are defined as "all taxes whose base has a specific

[8] European Environment Agency (official site). URL: https://www.eea.europa.eu/en

Table 2

Complex of environmental taxes applied in the UK

Name of the tax	Purpose of taxation	Stimulation of the taxpayer	Features / Results applications
Landfill tax	Reducing the volume of waste, encouraging recycling and the introduction of environmentally friendly disposal methods	Privileges are provided for companies exploiting landfills if they invest in environmental protection measures	Reduced tax revenue due to high rates of reduction in waste disposed of in landfills
Climate change tax	To incentivise measures to reduce greenhouse gas emissions	To be introduced in stages, taking into account inflation; incentives are provided for energy-intensive industries and to eliminate disproportionate distribution of the tax burden.	Charged by energy suppliers acting on behalf of the tax authority
Tax on quarrying	Incentivising the use of recycled materials and preventing the disposal of industrial waste in dumps through a tax on the extraction of sand, gravel, and crushed stone for industrial purposes	Benefits if sand, gravel, or crushed rock is obtained as a co-product of mining or construction material production, drilling, dredging, highway construction	A portion of the tax is channelled to the Sustainable Development Fund, which is used to finance environmental measures related to compensation of negative impact of mineral extraction operations

Source: compiled by the authors based on [9, 13, 21].

negative impact on the environment". They are divided into seven groups: energy taxes; transport taxes; pollution charges; charges for landfill disposal and recycling; taxes on emissions of substances that lead to global natural and environmental changes; and noise impact taxes. Energy taxes account for almost three quarters of the total number of environmental taxes, transport taxes account for a fifth, and only one twentieth are pollution and resource taxes (*see Figure below*). In the countries studied, various instruments are used to stimulate investment and innovation activities in the environmental sphere and the introduction of technologies to reduce the negative environmental impact of enterprises, including tax incentives, reduction of some taxes by increasing others, tax refunds, favourable loans, direct financing of environmental projects (grants), and subsidies [9, 20]. This makes it possible to motivate the polluting enterprise to reduce its harmful environmental impact and correct consumer behaviour (incentive taxation). In addition, a number of derivative instruments are used to ensure the financing of environmental protection measures at the expense of revenues from environmental taxes (grants and soft loans); tax rebates are provided and specialised funds that invest in the development of low-carbon economy are used [9, 21]. However, we should agree with the results of the research conducted by the Centre for Strategic Research Foundation on tax incentives for low-carbon development in Russia and abroad.[9]

The authors identify potential areas of application of foreign experience in providing tax

[9] Activities of the Centre for Strategic Developments Foundation URL: https://omorrss.ru/upload/csr-presentation-20220218.pdf?ysclid=lsxmuhjvrd658294415

incentives to stimulate low-carbon development in accordance with Russian legislation, but before developing specific solutions, they propose to assess the effectiveness of existing tax incentives for compliance with the Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050 (RF Government Order No. 3052-o of 29.10.2021)[10] [21].

Environmental taxes affect the growth rate of household waste and the level of its recycling — Denmark and the Netherlands were the first to introduce them [17, 19, 21]. Currently, they are in force in all European countries where environmentally friendly cities from the Rating 2021 are located and are aimed at reducing the volume of waste and transition from the disposal of those that are considered household waste to recycling, reuse, or recovery [13, 21]. Interesting is the experience of Great Britain, where a complex of taxes is applied: on waste disposal, climate change and development of quarries [9, 21]. The characteristic of the complex of environmental taxes, including their purpose, incentives, features of the results of their application, is presented in *Table 2*.

In Russia, separate components of this method are currently being implemented in the industrial sector of a number of regions [12, 14].

The concept of industrial symbiosis is implemented in the formation of eco-industrial parks — a network of enterprises interacting with each other to obtain economic and environmental benefits based on the exchange of energy and materials [12, 22]. In this case, by-products of production are used, a minimum of waste is generated and natural resources are saved. This is how the eco-industrial park of Kolundborg (Denmark) is organised, which received the Gothenburg Sustainability Award in 2018. Gothenburg Award for Sustainable Development — due to the industrial symbiosis of enterprises of 4 industries and recycling of waste annually, with cost savings of 24 million euros [14]. It should be noted the active participation of the municipality in the activities of the park and the construction of a heat distribution network using a secondary energy resource — steam from the power plant.

The quasi-model of industrial symbiosis between the municipality of Tanapaca in Peru and the largest US nuclear power plant Palo Verde on the use of wastewater for cooling the plant is of considerable interest. On the principles of circularity, the closed loop of the urban water supply and wastewater disposal system as an integral part of the powers of local self-government bodies in the sphere of environmental safety is implemented [11, 19].

As Y.V. Nikulichev [13] notes, from the point of view of using eco-innovations for household waste utilisation, Stockholm's experience seems interesting from the point of view of using eco-innovations for household waste utilisation, where waste packed in special containers is transported to the sorting station by vacuum method through special pipelines. There they are distributed and transferred for recycling or composting, or to an incineration plant. Eco-innovation processes are implemented on the principles of partnership between local self-government bodies and business, as the pipeline, sorting station and incinerator are owned by the municipality, while recycling and composting are performed by private business [13, p. 37]. Household waste management is carried out on an inter-municipal basis in Denmark, where this function is performed by municipalities in cooperation with private business, which makes it possible to provide heat supply to one third of the housing stock through the use of waste incineration products [23].

The introduction of foreign experience in the system of environmental safety of the city requires significant preparatory work not only

[10] Order of the Government of the Russian Federation No. 3052-o of 29.10.2021 URL: http://publication.pravo.gov.ru/Document/View/0001202111010022?ysclid=lsxn77u6fk65054163

in the legal aspect (implementation of legislative norms), but also in the organisational and economic aspect (coordination of interests of participants in the adoption and implementation of strategic and situational decisions in the environmental sphere). Some European practices of circular economy development, resource and energy saving require a comprehensive analysis of the consequences of these actions for the environment and living conditions of the urban population [20, 23], which, in particular, relates to waste recycling and its transformation into an alternative energy source in order to improve the energy efficiency of the housing stock, as it is necessary to take into account the restrictions on harmful emissions into the atmosphere.

It should also be noted that certain issues of ensuring environmental safety require the application of both administrative and legal instruments and economic methods at the same time. In this case, the former should not significantly limit the use of natural resources, but encourage economic entities to switch to environmentally friendly production. This can be achieved by creating operating conditions under which green production is more profitable than the use of outdated business practices that cause significant damage to the environment. At the same time, the system of fines and penalties for violations of legislation in the field of environmental protection should be designed in such a way as to compensate for the damage caused by such activities and, in the future, to minimise the occurrence of such environmentally unsafe situations.

CONCLUSIONS

Thus, the following conclusions can be drawn. In the OECD and EU countries, economic methods are widely enough used to manage the environmental safety of the city. They are aimed both at compensating the damage caused to the environment (air, water and soil pollution) and at stimulating measures to reduce the negative impact of anthropogenic and technogenic factors and improve the environmental situation in the territory as an integral component of sustainable urban development and ensuring comfortable living conditions for its population. Three aspects of the use of such economic methods deserve special attention:

- powers of local self-government bodies in the environmental sphere in the countries where these bodies have really wide financial autonomy;
- ecological cooperation on processing of household and industrial waste, organised on the principles of circular model of industrial symbiosis and contributing to the solution of resource saving tasks in the conditions of transition to mobilisation economy;
- environmental taxation, which allows not only to accumulate funds in the budget, but also to ensure their targeted use (implementation of environmental protection measures), as well as to stimulate the transition to the introduction of green technologies and low-carbon development.

These aspects of the application of economic methods in the management of urban environmental safety abroad have both advantages and difficulties in implementation, strengths, and weaknesses, which should be comprehensively taken into account by local governments together with authorised state bodies when making decisions on their adaptation for the practice in Russian cities. At the same time, it is necessary to assess the multidimensionality in the application of the considered economic methods and differentiation of approaches, taking into account the existing environmental situation in the city due to both differences in the level of environmental impact of technogenic and anthropogenic load factors and administrative, economic and organisational opportunities

for its reduction. This should be the subject of further research.

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ACKNOWLEDGEMENT

The paper is based on the research results carried out at the expense of budget funds under the state task of the Financial University.

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Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

Article was submitted on 16.10.2023, revised on 19.12.2023, and accepted for publication on 26.02.2024. The authors read and approved the final version of the manuscript.