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Fiscal regulation policy and financial incentives impact on the environmental management

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Abstract. Effective environmental management is a key element of a country's sustainable social and economic development. This requires comprehensive environmental protection measures and stimulating the use of environmentally friendly technologies and innovations aimed at preserving the environment. One of the ways to achieve these goals is to apply environmental taxes. Environmental taxes are powerful tools for achieving environmental goals and ensuring sustainable development. The article analyzes the implementation and practice of applying environmental taxation. It is revealed that Ukraine had significantly higher greenhouse gas emissions per unit of energy produced in 2012–2021. It was established that emissions of pollutants from mobile sources make up 40% of the total emissions of pollutants into the atmosphere. Pollutant emissions from road transport make up 91% of pollutants emitted by mobile sources. The study examines the possibilities of stimulating emission reductions through an environmental tax in Ukraine and offers to improve the system of financing environmental measures, including through environmental taxation. International practice shows that countries that successfully implement environmental taxes and green taxation instruments are able to achieve more effective results in reducing pollution and rationalizing the use of resources. The right combination of environmental taxes with other instruments, such as regulatory standards and financial incentives, can significantly improve the environmental situation and ensure sustainable economic growth.

1. Introduction

The effectiveness of the environmental tax in Ukraine is ensured through the implementation of a fiscal, compensatory, and stimulating function. If the environmental tax does not perform any of these functions, it may be due to various reasons, such as low tax rates, insufficient control of tax collection, insufficient awareness of environmental problems and opportunities to reduce environmental impact, or insufficient monitoring and enforcement measures. In our opinion, to solve this situation, systems of environmental taxation in EU countries should be taken into account. This will make it possible to introduce best practices into modern Ukrainian realities [1, 2]. The military actions in Ukraine currently have a very serious impact on the general environmental condition in the country. As a result of numerous fires, explosions, and the destruction of industrial facilities, hazardous chemicals and pollutants are released into the air, soil, and water sources.

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Thus, the research topic is relevant and necessary in terms of achieving climate goals for reducing greenhouse gas emissions in Ukraine, restoring agricultural land after the war.

The following general scientific research methods were used: deduction (for the logical construction of the research presentation); synthesis and abstract-logical (to clarify the meanings of the categorical research tools); dialectical and analogies (to study the theoretical foundations of environmental taxation); induction and generalization (to formulate conclusions to the article).

2. Literature review

A. Pigou studied the relationship between economic activity and environmental externalities [3]. It was found that some economic activities can create negative externalities, such as environmental pollution, which are not taken into account by market mechanisms. For example, enterprises may emit pollutants into the air or water, which can lead to an increase in overall pollution and have a negative impact on human health and the environment.

Pigou offered a solution to this problem through the introduction of pollution taxes, also called environmental taxes or Pigou taxes. He considered that these taxes could be used to compensate for the damage caused to the public and the environment and to encourage enterprises to reduce pollution.

Many scholars and researchers have studied environmental taxes and their impact on the environment and the economy. The most prominent researchers who have worked in the field of environmental taxes and whose studies we have used as a basis are: N. Stern, who is known for his work on climate change economics and the effective implementation of environmental taxes to combat climate change [4, 5]; G. Marotta, who studied the effectiveness of green taxes and their impact on employment and the economy [6]; and W. Baumol, who compared the socially beneficial effect of introducing taxes on pollutant emissions and subsidies for overcoming environmental pollution and concluded that the present value of the tax is higher [7].

The need to apply environmental taxation is confirmed by the European Union's Environmental Action Program (1973), which is related to the implementation of the «polluter pays» principle.

The next stage in environmental taxation development is the idea of a win-win situation [8]. The idea of a win-win situation is a key concept related to environmental taxation development. In the context of environmental taxation, a win-win situation means achieving two positive results at the same time: ensuring environmental improvement and increasing economic efficiency.

The Scandinavian countries, in particular Sweden, Denmark, and Norway, were among the first to introduce environmental taxes back in the 1980s. They pioneered the use of such approaches to regulate environmental pollution and promote sustainable development [9].

Environmental taxes in the European Union (EU) have been receiving increased attention since the mid-1990s. During this period, many EU countries revised their approaches to environmental protection, in particular from command-and-control to economic management methods.

Currently, about 370 types of environmental taxes are widely used in EU countries, and they are an important tool for stimulating sustainable development, reducing pollution, and preserving the environment [10]. According to their purpose, they are divided into: taxes that are mainly intended to cover environmental costs; taxes that stimulate the environmental behavior of economic agents (producers and consumers); and taxes that perform a predominantly fiscal function for further financing of environmental protection measures [11].

The European Commission's Directorate-General for Taxation and Customs has divided environmental taxes into seven groups according to their application scope.

1. Energy taxes (on motor fuel; on power-generating fuel, on electricity).
2. Transportation taxes (on kilometers traveled, annual tax on owners, excise taxes when buying a new or used car).
3. Payments for pollution (emissions of pollutants into the atmosphere and discharges into water bodies).
4. Waste disposal taxes (payments for landfill disposal and recycling, as well as taxes on special products).

5. Taxes on emissions of substances that lead to global climate change (ozone-depleting substances, greenhouse gases).
6. Tax on noise impact.
7. Payments for the use of natural resources.

Each EU country has its own environmental taxes and fees that take into account specific pollution and resource use issues. Such measures contribute to the realization of the EU's environmental goals and ensure the sustainable development of the region. The increase in environmental payment rates should be made in accordance with the amount of environmental damage caused [12].

This study analyzes the level of air pollutant emissions in Ukraine in order to further determine the possibility of stimulating emission reductions through an environmental tax.

3. Result

3.1. Current state of air pollution and environmental protection costs in Ukraine

Compared to some of the best practices in the European Union and other developed countries, Ukraine had significantly higher greenhouse gas emissions per unit of energy produced. However, Ukraine has also witnessed some efforts to improve the situation by introducing energy-efficient technologies and promoting renewable energy sources. According to the State Statistics Service of Ukraine [13], total emissions of pollutants into the atmosphere from stationary sources in 2012–2021 tend to decrease (Fig. 1) with a decrease in production.

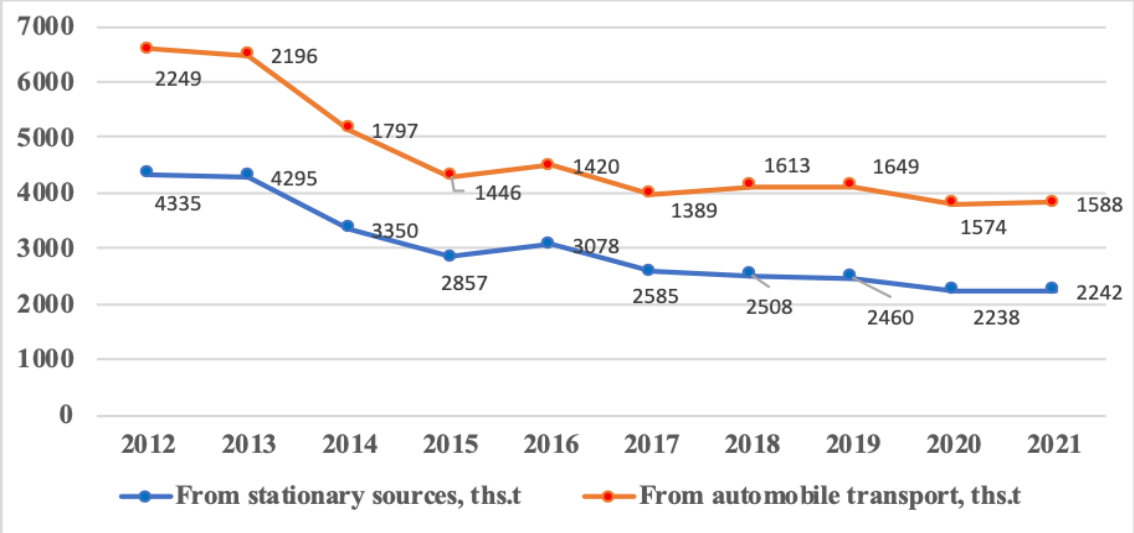


Fig. 1. Air pollutant emissions in Ukraine, thousand tons in 2012–2021 [13].

Pollutant emissions from mobile sources account for 40% of the total amount of air pollution. Pollutant emissions from automobile transport account for 91% of pollutants emitted by mobile sources. The pollutants mainly emitted into the atmosphere include nitrogen dioxide (NO2), carbon monoxide (CO), sulfur dioxide (SO2), and other compounds, as well as dust. The number of cases of stationary sources exceeding the established standards of maximum permissible emissions of pollutants is increasing. The main reasons for the unsatisfactory state of atmospheric air quality in residential areas are non-compliance by enterprises with the operation of dust and gas cleaning equipment, failure to take measures to reduce pollutant emissions to the established standards, low rates of introduction of the latest technologies, and a significant increase in the number of vehicles, including those that have expired [14].

The dynamics of carbon dioxide emissions into the atmosphere, as well as costs and investments in air quality protection and climate change issues, are shown in Table 1.

Table 1. Dynamics of CO2 emissions and investments in climate change in Ukraine [13]

Years	Emissions of pollutants and carbon dioxide, thousand tons	Currency exchange rate (UAH /Euro)	Current costs of air quality protection and climate change issues, Euro million	Capital investments climate change, Euro million
2012	6821.1	10.48	128.01	234.99
2013	6719.8	10.62	133.31	227.11
2014	5346.2	12.12	102.19	158.01
2015	4521.3	26.03	58.35	54.66
2016	4686.6	27.56	63.88	90.81
2017	4230.6	29.79	70.64	87.55
2018	4121.2	30.20	95.95	116.10
2019	4119.0	29.40	100.81	145.47
2020	3703.8	29.95	79.33	186.82
2021	3796.4	32.30	74.67	n.d.

n.d. – no data.

The qualitative composition of the atmosphere directly depends on the level of anthropogenic pressure on the air environment [15]. According to Table 2, it can be stated that the volume of pollutant emissions into the atmosphere in Ukraine generally tends to decrease both from stationary sources and mobile sources. This situation is primarily due to a decline in the volume of production and an increase in the number of motor vehicles. Industrial emissions can be reduced either through the introduction of appropriate production technologies or through the use of technical means or technologies to control emissions, but both of these involve costs.

Table 1 shows an increase in air protection costs by 55.6% over the study period and a permanent increase in capital investment. It is estimated that environmental costs in the USA exceed USD 150 billion annually [14, 16].

Environmental protection costs include the country's expenditures on air quality protection (reducing harmful emissions, installing special filters) and climate change issues, return-water treatment (for reuse), waste management (setting up separate storage), and soil protection and rehabilitation. Monitoring of these costs from 2012 to 2021 is presented in Table 2.

Table 2. Environmental protection costs in Ukraine for 2012–2021 Euro million [13].

Year	Total	Air quality protection	Water treatment	Waste management	Soil protection and rehabilitation	Other measures
2012	13286.88	128.01	591.14	453.84	709.42	847.68
2013	13501.94	133.31	581.53	456.15	869.34	922.61
2014	11522.88	102.19	463.00	446.95	795.99	605.46
2015	6498.48	58.39	255.26	261.31	442.84	306.10
2016	18223.49	63.88	283.02	243.83	434.40	588.08
2017	6870.23	70.64	270.74	252.04	330.24	605.87
2018	8052.31	95.95	318.66	292.39	426.62	555.72
2019	9347.00	100.80	334.15	347.86	538.75	623.30
2020	13800.40	79.33	358.82	373.86	526.55	1129.53
2021	12616.81	77.36	332.89	362.72	494.28	n.d.

n.d. – no data.

Considering the classification of taxes by economic function, Ukraine has a dominant position in the application of consumer taxation (58% in 2021), while the rest of the analyzed countries and the EU-27 rely mainly on labor taxation. In Germany, employees fill the budget by almost 60% of GDP, in Slovakia by 55%, and in Estonia by 51%. Poland, in turn, distributes the burden more proportionally, although labor taxation remains the dominant source at 42% of GDP. In terms of greenhouse gas emissions, carbon dioxide takes the largest share. Germany (more than 25% of total emissions among EU member states), Poland (about 11% of CO_2 emissions among EU-27), and Ukraine, which emits 235 million metric tons of CO_2 (8% of total CO_2 emissions among EU-27), remain among the largest polluters. The second place is occupied by methane, which captures emissions more efficiently and has a global warming potential 30 times higher than carbon dioxide. Nitrous oxide («laughing gas») is the third largest greenhouse gas emission in terms of CO_2 equivalent.

3.2. Possibilities of stimulating emission reductions through an environmental tax in Ukraine

A comparison of environmental taxes in the EU and Ukraine makes it possible to see that there are no noise pollution or product taxes in the state environmental taxation system. It is worth noting the special role of product taxes in regulating the level of environmental safety. Environmental taxes on products include taxes charged per unit of finished products that, at one stage of their life cycle, cause environmental pollution.

Product taxes are most commonly imposed on automobile tires, batteries and accumulators, detergents, plastic packaging, and many other goods. The stimulating function of these taxes is implemented by increasing the price due to the tax, which leads to a decrease in the consumption of these products [17].

In general, the world uses a variety of instruments to stimulate greenhouse gas emission reductions:

– tax instruments (environmental taxes, including taxes on energy resources, transportation, natural resource use and emissions)

– market-based instruments (tradable permits);

– regulation and subsidization (support for the introduction of environmental and energy-saving technologies, innovative industries, deposit return systems and subsidies).

The EU practices show that the active use of environmental taxes helps reduce the overall level of environmental pollution [18]. From this perspective, we will analyze the effectiveness of environmental pollution fees that were in effect in Ukraine during 2012–2021. The main purpose of these payments was to encourage taxpayers to engage in environmental activities, which should result in a reduction in the total volume of emissions and discharges of pollutants into the environment, a decrease in the volume of solid waste generation and, accordingly, an increase in the level of environmental safety of the state. According to the Budget Code of Ukraine, until 2014, environmental tax revenues were transferred to special funds of the state and local budgets, which ensured their targeted environmental use. At the same time, environmental taxes in the structure of budget revenues in Ukraine were low, mostly around 1% of the consolidated budget revenues (Table 3).

In 2021, the share of environmental taxes in Ukraine's GDP was 0.33%, which is significantly lower than in EU member states, but Ukraine was characterized by high energy intensity and significant carbon use in the energy sector. This was due to a number of factors, such as the obsolescence of some technologies, lack of energy-efficient solutions, as well as large coal production and its use in thermal power plants.

The International Monetary Fund offers to introduce a tax (fee) per ton of carbon dioxide emissions at the level of USD 70 to achieve the Paris Agreement's goal of reducing carbon dioxide emissions by one third by 2030 [19]. The revenues from the environmental tax, which is imposed on emissions of pollutants into the atmosphere by stationary sources of pollution and discharges of pollutants directly into water bodies (except for discharges into water bodies located exclusively within one administrative-territorial unit), should be allocated in the following proportions: 25% to the state environmental protection fund, and 75% to the regional environmental protection fund.

Table 3. Share of environmental tax in the consolidated budget revenues of Ukraine [13].

Years	Consolidated budget revenues, in total, Euro million	Environmental tax revenues		Including those related to harmful impact on the atmosphere	
		Euro million	% of consolidated budget revenues	Euro million	% of consolidated budget revenues
2012	42511.93	268.70	0.63	147.61	0.35
2013	41693.88	367.118	0.89	229.10	0.55
2014	37629.29	398.59	1.06	261.88	0.70
2015	25049.21	103.38	0.41	45.52	0.18
2016	28405.66	180.95	0.63	113.64	0.40
2017	33897.99	157.70	0.47	86.04	0.25
2018	39214.93	162.98	0.42	85.46	0.22
2019	43872.41	207.24	0.47	122.82	0.28
2020	45965.74	180.23	0.39	101.67	0.22
2021	51462.63	168.30	0.33	64.18	0.12

This distribution of revenues from the environmental tax is intended to ensure more efficient financing of environmental measures and projects aimed at reducing air and water pollution. The distribution of revenues between the state and regional environmental protection funds will help ensure more flexible and balanced financing of various environmental projects.

In this context, the above research data confirm the need to improve the system of financing environmental measures, including through environmental taxation, in particular:

– further introduction of market-based elements of the public finance management model. Currently, only the program-targeted budgeting method, medium-term budget forecasting, and strategic planning of the main spending units' activities are used;

– transition from indicative to medium-term budget planning, which will ensure systematic budget financing of long-term environmental investment projects and improve the predictability of such expenditures in the field of environmental, natural and anthropogenic security;

– balancing expenditures and revenues to regional budgets. It provides for expenditures on environmental protection in amounts not less than the revenues to regional budgets from fees for the special use of natural resources, environmental tax and penalties for violations of environmental legislation. The main source of such expenditures should be the funds of polluting enterprises, which makes it necessary to attract private capital;

– environmental insurance in the field of environmental safety as one of the types of civil liability insurance for owners or users of high environmental hazard objects in connection with possible accidental environmental pollution from them and damage to the vital interests of third parties, which provides for partial compensation for the damage caused. Such measures to optimize and appropriate financing will help to use financial resources in the environmental sphere more efficiently [20, 21].

These directions of improvement of the financing environmental measures system are aimed at increasing the efficiency of financial resources usage in the field of ecology and long-term support of investment projects aimed at preserving the environment and environmental safety. This is achieved based on:

1. Implementation elements of a market-based model of public finance management. This approach involves a shift from program-targeted budgeting to a more flexible and efficient system where environmental projects can attract private capital and make investments based on market mechanisms.

2. Medium-term budget planning. This allows for stable and systematic financing of long-term environmental projects, which contributes to the predictability of environmental and natural-anthropogenic security expenditures.

3. Balancing regional budget expenditures and revenues. Increasing environmental expenditures at the regional level, depending on revenues from fees for the special use of natural resources and environmental taxes, will ensure more efficient financing of environmental measures.

4. Environmental insurance. The introduction of an environmental insurance system will provide compensation for damage caused to the environment or third parties due to accidental pollution. This will encourage companies to be more cautious in their approach to ecology and environmental protection.

These measures will help to optimize and efficiently use financial resources in the environmental sector, improve the environment and ensure sustainable development. At the same time, it is important to ensure transparency and effective control over the expenditure of funds to maximize positive results.

4. Conclusions

Environmental taxes play a significant role in strengthening the state's environmental policy. This economic instrument of environmental policy becomes effective only when the types of taxes affect environmental safety risks and the tax rates are set in such a way that it is much more profitable for each producer to reorient its activities in an environmentally friendly direction than to pay environmental payments. The studies conducted show that the Ukrainian environmental taxation system is inefficient. In 2021, the share of environmental taxes in Ukraine's GDP was 0.33%, which is significantly lower than in EU member states, but Ukraine was characterized by high energy intensity and significant carbon use in the energy sector. To improve the environmental taxation system and increase the effectiveness of environmental policy, it is necessary to increase the number of types of taxes, in particular to introduce a tax on products that negatively affect the environment and an annual transport tax as one of the important factors in air pollution as soon as possible, as well as to increase the rates for existing types of taxes to the European level. Regulation of the environmental safety level in the state through environmental taxes should take into account the positive practices of the European Union.

Prospects for further research include investigating various types of tax benefits, preferential loans, and preferential credit to support and stimulate the environmental activities of business entities in Ukraine.

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