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FINANCIAL OUTSOURCING IN THE ANALYSIS OF ENVIRONMENTAL FISCAL REVENUE MANAGEMENT

ABSTRACT

Despite changes in regulatory policy, greenhouse gas emissions into the atmosphere have not decreased. A methodology for the search and selection of sources of financing for activities to combat climate change is proposed. The basis of the research methodology is the bibliometric and predictive analysis of the generated databases. It is proposed to use not only environmental tax revenues but also other sources of financing as part of mixed capital. It was revealed that the dynamics of environmental tax revenues are inferior to the dynamics of total tax revenues in GDP. The largest share of environmental taxes belongs to transport and energy taxes. The use of logical and predictive research approaches demonstrated that environmental revenues were insufficient and that extra funding and financial outsourcing were required for climate change activities. As a result of the correlation analysis, the most significant environmental revenues were for the following countries: France (0.981), Belgium (0.976), Greece (0.976), Austria (0.972), and Portugal (0.969). A negative Pearson correlation coefficient occurred for the countries: Denmark (-0.040), and Sweden (-0.101). To increase the significance of the coefficient, it is proposed to change the elements of environmental taxes in these countries. An outsourcer providing financial services to clients forms a regional environmental financial system. This will increase the rate of capital turnover and reduce the need for capital. The outsourcer will reduce "cash gaps" by promptly attracting financial tools and financial management techniques, accelerate the turnover period of mixed capital, and boost the effectiveness of managing environmental tax revenues.

Keywords: environmental management, environmental taxes, financial outsourcing, regional financial system, quotas for greenhouse gas emissions

JEL Classification: E40, E 44, G19, O12

INTRODUCTION

Despite strong evidence that anthropogenic impacts are largely responsible for global climate change, greenhouse gas emissions continue to rise (Perevozova et al., 2021; Hutorov et al., 2019). Decisions related to activities to combat climate change require significant financial resources (Carney, 2022; Suntsova, 2021), including the need for additional funding for activities to combat climate change, which is noted in the Paris Agreement (UN, 2015). In this regard, it is necessary to explore possible sources of funding for climate change activities. Accelerated action to combat climate change will only be taken if sufficient funding is secured. Insufficient and unbalanced funding is holding back the decarbonization process. To accelerate decarbonization, many national and international organizations are creating new partnerships at various levels. This is especially true for high-emission sectors (Climate Ambition Summit, 2023;). In this regard, the task arises to study possible sources of financing activities and the purposeful use of such a source of financing as environmental tax revenues in the budgets of different levels for activities to combat climate change. According to the authors, to develop and implement environmental measures aimed at reducing greenhouse gases, mixed capital is required: equity, equity, debt and borrowed capital (Famulska et al., 2022). Additionally, the establishment of an environmental financial system may benefit

from the use of financial outsourcing services designed to efficiently attract, utilise, distribute, redistribute, and control financial resources to support eco-activities.

LITERATURE REVIEW

As a result of increasing anthropogenic influence, intensive industrialization, and excessive use of fossil fuels, environmental risks associated with unacceptable levels of greenhouse gas emissions and abrupt climate change have increased. Environmental mitigation depends on the adoption of a set of specific measures and policies taken to promote the behaviour of polluters. In this context, environmental tax policy plays a key role (Yuldashev et al., 2022; Lytvyn et al., 2022). Revenues from environmental taxes in the budget can be a source of financing for environmental projects (Nesenenko, 2022). Filling the budget with revenue is not the main purpose of collecting environmental taxes. Environmental taxes are aimed at reducing the negative impact of economic activities on the environment (Lupenko et al., 2022; Oliinyk et al., 2022). The state can set such high rates of environmental taxes when it is profitable for the enterprise to sell environmental activities rather than pay environmental taxes. If used effectively, the share of environmental revenues used to cover environmental costs should be maximized.

The literature reports that environmental taxes are not only a financing instrument but also an instrument for regulating environmental activities (Hutorov et al., 2020; Kuznyetsova et al., 2021, Melnyk et al., 2022). The main purpose of environmental payments is to stimulate taxpayer behaviour to increase environmental protection measures. The question arises about the sufficiency of environmental payments as a source of financing environmental projects. Conducted empirical studies of the effectiveness of the tax policy of many countries. China showed that the adopted environmental tax policy is not effective. What requires further reform of the tax system by tightening tax standards and adjusting tax penalties to improve the effectiveness of environmental protection (Zhang, 2016). In turn, for environmental development, it is necessary to improve the structure of tax elements, and deepen the reform of the upper level of environmental taxes (Yu, 2016; Yunfeng, 2019). Analysis is done on the effectiveness of environmental taxation in encouraging the use of clean production technology in manufacturing and mining industries, as well as in small, medium, and big firms. It has been claimed that when supplemented with public money, even minimal levels of environmental taxation can be successful. The impact here is greater than if only public financing were used (Tchorzewska, 2022). Also, studies report the need to increase environmental tax rates to boost tax revenues (Tan et al., 2022). The share of environmental taxation in most cases for EU countries is 2.5% of GDP, 6% of total EU taxes. Significant convergence is observed for two types of eco-taxes - energy and transport (Delgado, 2021; Batrymenko and Tkach, 2023). Souza (2021) proved that environmental taxation is a key tool for the sustainable development of a country. Environmental taxation is a strategy and an important factor in the balance between environmental conservation and economic progress. Developing countries are undergoing environmental tax reforms to promote cleaner production. A key role in this is given to the reform of tax legislation, advertising, and management.

Current trends in the development of developing countries were discussed. Developing countries should reform the environmental tax system taking into account national conditions, social and historical background, and economic structure (Tan et al., 2022). Empirical evidence suggests that taxation in many countries is fiscal rather than incentive-based. Achieving sustainable development, net zero and energy safety requires significant financing and fiscal policy reform (Mate, 2023). The following steps are suggested as a clear road to decarbonization: swap energy taxes for carbon taxes; adopt the levels of carbon taxation required to fulfil emissions targets; use additional tax income from a carbon tax to undo any potential negative macroeconomic and distributional consequences of carbon taxation. Additionally, it suggests a solution to the widespread issue of harmful fossil fuel subsidies, which would make the tax system more effective as a result of their elimination (Pereira, 2023; Svyrydenko and Revin, 2022). In this regard, the importance and opportunity to contribute through taxation to reduce the anthropogenic impact and ensure a balance of private and public incentives is being updated (Delbono, 2022).

The work carried out in China has shown that the following taxes should be legislated for environmental pollution: on environmental protection, on consumption, on resources, on the purchase of vehicles and on pollutant emissions. It was found that green taxes do not ideally curb emissions of pollutants into the atmosphere. Revealed a great influence in the field of tax policy recommendations that actively promote the concept of ESG (Zhang, 2023).

In this regard, the general equilibrium model (CGE) is utilized, which emphasizes, among all existing environmental fiscal and tax policies, subsidies for cleaner manufacturing technologies and taxes on environmental pollution (Benkhodja et al., 2023). The findings indicate that while raising the environmental tax rate and the subsidy rate for cleaner manufacturing technologies can both significantly cut emissions, doing so will have a detrimental effect on macroeconomics and the

production of rare earth elements. The macro economy, the environment, and the manufacturing of rare earth elements will all benefit if we concurrently boost the environmental tax and subsidy rate to a particular level. The policy includes the definition of standards for the control and discharge of pollutants, the provision of deposits for the restoration of mine ecology, funds for compensation of soil and water conservation structures, and fees for the prevention and control of soil erosion. Chinese legislation has also approved an environmental protection tax. China provides financial subsidies and preferential tax policies. Some work argues that overly stringent environmental regulations can reduce industrial production and increase costs. This will lead to an increase in the price of products, a decrease in demand for products and a decrease in the economic development of the country (Liu, 2023; Sakun et al., 2021). The goal of (Liu, 2023) is to find a policy model that simultaneously benefits the macro economy, domestic rare earth production, and the environment.

Cao (2023) conducted a study and concluded that introducing a dynamic carbon tax and trade restrictions can effectively incentivize firms to reduce carbon emissions through industrial symbiosis. They adopted a mixed strategy that only existed under dynamic carbon taxation and cap-and-trade. Maximizing environmental tax rates does not always impact the sustainability of recycling suppliers. As the top tax rate increases, the proportion of producers using carbon reduction measures decreases (Cao, 2023).

The instability of pollutant discharges may be due to transboundary environmental instability and the dependence of environmental sustainability not only on internal factors of the country but also on the influence of neighbouring countries with worse ecology and other environmental policy goals (SDGs 7, 12 and 13) (Ahmad et al., 2023).

In studies, Laktionova et al., 2022; Omelchuk et al., 2022; Koval et al., 2023 suggest using financial outsourcing services in maintaining accounting and tax records for clients. It is proposed to form a regional ecological system, including a financial one. The system will increase the efficiency of managing economic relations between business entities as clients of services, creditors, investors, insurers attracted to the region. The system will allow you to effectively attract, distribute, redistribute, use and control financial resources. The outsourcer, as the organizer of the financial system, will attract innovative financial instruments and financial management mechanisms. This will increase the rate of capital turnover and reduce its need. The findings demonstrate that outsourcing is a method for achieving flexibility and that financial restrictions are crucial (Jongmoo, 2021).

A multi-industry neoclassical model has been developed in which external investors can play a role in monitoring suppliers. Financial development increases the effectiveness of investor control and encourages firms to outsource more products, especially to suppliers who are more dependent on external financing (Liang, Yu. 2022).

AIMS AND OBJECTIVES

The purpose of this study is to explore both the theoretical and practical aspects of managing environmental tax revenues using outsourcing and determining their sufficiency for financing measures to combat climate change. The objectives of the study are to be achieved:

- justifying the importance of environmental taxation for sustainable development;
- identify clients of financial outsourcing services;
- attract additional fiscal instruments for the proposed regional environmental system.

METHODS

The research methodology used biometric, prognostic and other analysis methods. The outsourcer analyzes the green financial market. Promptly identifies innovative financial instruments and determines trends in their development. The methodology allows for the timely transformation of financial outsourcing services, specifically for clients engaged in the creation and use of engineering breakthroughs for the purpose of establishing a sustainable financial system. The study examined trends in environmental tax revenues to the consolidated budget of the EU and to the budgets of EU member states. An analysis was carried out of documents relating to environmental tax revenues, green, sustainable and credit technologies, green investments, green insurance and strategies for increasing the efficiency of municipal budget revenue generation. Data collection, visualization of bibliographic references and other steps were part of the analysis technique created for this methodology. The first stage is devoted to gathering a carefully chosen group of research-related documents from the Scopus and Web of Science databases. To provide the most accurate result, the set of input keywords from the search query was employed. The second stage is aimed at identifying: the dynamics and trends in the development of environmental tax revenues in the EU consolidated budget; dynamics of EU budget revenues compared to total

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tax revenues and GDP; identifying the largest share of environmental revenue by tax type (energy tax revenue, transport tax, greenhouse gas emission tax) in the EU budget; dynamics of the share of total environmental tax revenues from % of TSC, % of GDP; application of the index method for revenue dynamics to compare total tax revenues, environmental tax revenues, including by type, GDP at present prices; environmental tax revenues by EU countries; dynamics of total tax revenues and from auctions for the sale of emission allowances according to the data of the 1st and 2nd group of EU member states; trends; dynamics of percentages of the total amount of income from taxes and social contributions (excluding imputed social contributions); dependencies by the method of correlation analysis: input field - total and by types of receipts of environmental taxes; output field - total tax revenues, GDP at present prices, environmental tax revenues to the EU budget; the input field is revenues from environmental taxes in the EU countries, the output field is the total values of the EU budget, etc. The calculation of the correlation coefficient was carried out according to the formula:

$$\rho = corr(X,Y) = \frac{cov(X,Y)}{\sqrt{Var(X)\times Var(Y)}} = \frac{E(XY)-EX\times EY}{\sqrt{Var(X)\times Var(Y)}}, \quad (1)$$

where: X and Y are random variables, which are characterized by a pair correlation coefficient determined by formula (1).

The targeted use of environmental tax revenues is not sufficient to finance climate action and eco-activities. In this paper, this hypothesis is proved by the methodology proposed above with the use of rationale. To ensure eco-events, effective attraction, distribution, redistribution, and control of financial resources are required. These actions are proposed to be carried out by attracting financial outsourcing services. Funding is needed to carry out the process of developing and implementing eco-activities, i.e., effectively attract, allocate and reallocate environmental (EFI) and other financial instruments (FI) throughout the process. To reduce the risk of cash gaps when receiving financial instruments, there is a need to involve insurers as well. Financial outsourcing services are involved in the organization of lending, investment, insurance, and control services in the emerging regional (new) ecological financial system. The outsourcer is the organizer of the system and is responsible for the effective management of financial flows in the regional ecological financial system. Effective management requires further development of the theory and practice of financial management. It allows speed up the turnover of capital and improves its structure by doing this. The analysis of funding sources is not included in many works devoted to the creation and implementation of environmental policies in the EU member states. Eco-activities can be financed by environmental earnings if they are used strategically, according to logical and statistical analyses. The amounts of environmental revenues, both by type and by country, are, nevertheless, negligible, necessitating the need for additional financial instruments and financial management systems. Equity (SK), debt (QK), equity (GK) and borrowed capital (PK) can be used as sources of financing (IF):

$$IF=SK+QK+GK+PK \quad (2)$$

For each component of these funding sources, certain financial instruments and financial mechanisms are attracted.

RESULTS

In order to carry out the process of developing and implementing eco-activities, financing is necessary, i.e., effectively attracting, distributing, and redistributing environmental (GFI) and other financial instruments (FI) throughout the entire process. To reduce the risk of cash gaps when receiving financial instruments, there is a need to involve insurers. In the developing regional environmental financial system, financial outsourcing services are involved in the organization of lending, investment, insurance, and control services (Tomašević et al., 2023). The financial system's organizer, the outsourcer, is in charge of efficiently managing financial flows (Chumak, & Filipishyna, 2017). Additionally, it is important to consider that eco-measure project indicators are typically negative, with NPV values below zero. The provider of financial services effectively handles money flows through the use of financial instruments and financial management strategies. This makes it feasible to strengthen the structure of capital and speed up capital turnover. Eco-activities cannot be sufficiently funded even by the focused use of environmental tax revenues in EU countries. When compared to total tax collections and GDP, environmental tax revenues are negligible in the dynamics of the EU budget (Figure 1).

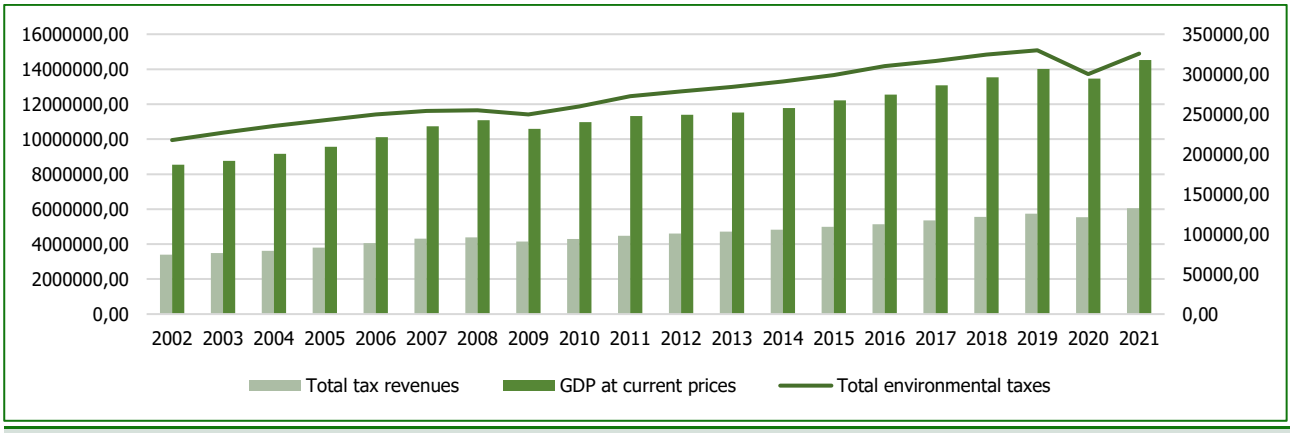

Figure 1. Dynamics of total environmental taxes in comparison with total tax revenues, GDP at current prices, 2002-2021, EUR million. *(Source: Eurostat, 2022)*

The largest portion of environmental revenues comes from energy taxes, followed by environmental taxes on transportation. The smallest portion of environmental earnings in the EU budget comes from taxes on greenhouse gas emissions (Figure 2).

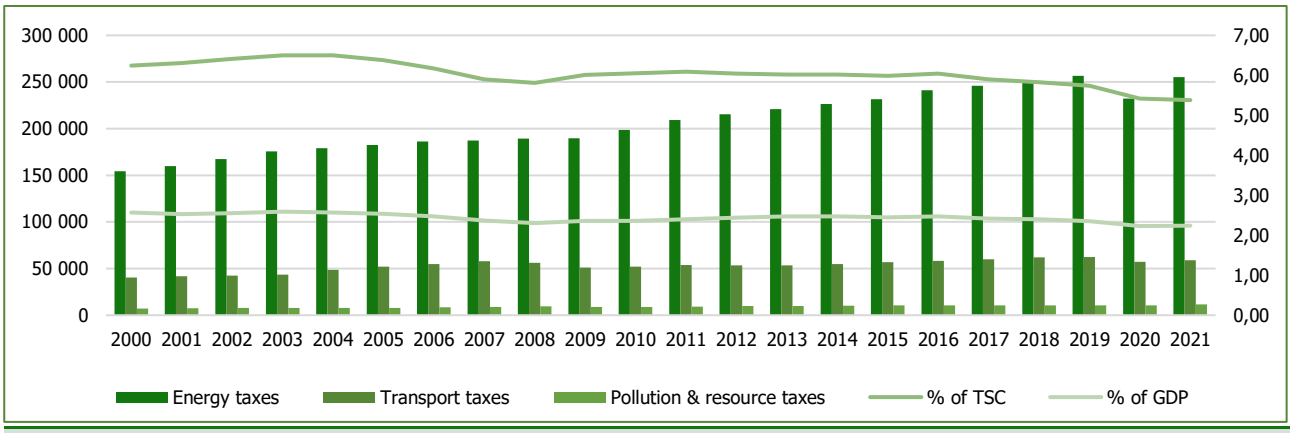

Figure 2. Dynamics of environmental revenues by types of taxes to the EU budget, 2000-2021, EUR million, % of total environmental tax revenues from TSC, % of GDP. *(Source: Eurostat, 2022)*

According to the dynamics of environmental income in the EU budget from 2000 to 2021, all sorts of environmental taxes have slightly increased in total amount. The amount of environmental tax receipts as a percentage of GDP varies between 2% and 3%; from 2002 to 2021, the share slightly fell. The share of environmental revenues to TSC varies between 6.5%-5.5% and its decrease is observed over the period 2002-2021. This is presented in more detail for the period 2020-2021 in Table 1.

Table 1. Change in environmental revenues by type in the EU Budget 2020-2021. *(Source: Eurostat, 2022)*

Indicators	EUR million	% of total environmental taxes	% of GDP	% of total government revenue from taxes and social contributions	% of (specific type of) environmental tax revenue (by tax 6,5-5,5 % payer)		
2021					2020		
					Corporations	Households	Non-residents
Total environmental taxes	325 837	100.0	2.24	5.38	47.6	48.6	3.8
Energy taxes	255 297	78.4	1.76	4.21	52.0	43.3	4.6
Transport taxes	59 066	18.1	0.41	0.97	31.0	68.2	0.8
Taxes on Pollution/Resources	11 474	3.5	0.08	0.19	42.0	56.8	1.2

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Energy taxes make up 78.4% of environmental taxation; it accounts for 1.76% of GDP and 5.38% of TSC. The GDP proportion of transportation taxes is 0.41%, and the TSC share is 0.97%. 3.5% of all environmental taxes in 2021 will be pollution and resource taxes. Even with the intended usage, tax revenues from all forms of taxes do not make up a big enough portion of GDP or the entire amount of environmental taxes to serve as a reliable source of funding for environmental initiatives. The growth of the EU budget's environmental revenue is outpacing it at a quicker rate than the growth of the GDP and labour taxes. Figure 3 displays the patterns of environmental tax revenues by categories of taxes from 2002 to 2021. The dynamics of growth in environmental tax collections are most pronounced for taxes on pollution and resources (Figure 3). Increasing tax rates on both the use of resources and the release of greenhouse gases into the atmosphere for the creation and implementation of eco-activities, the tax income amounts are insufficient. A search for additional financial resources is required.

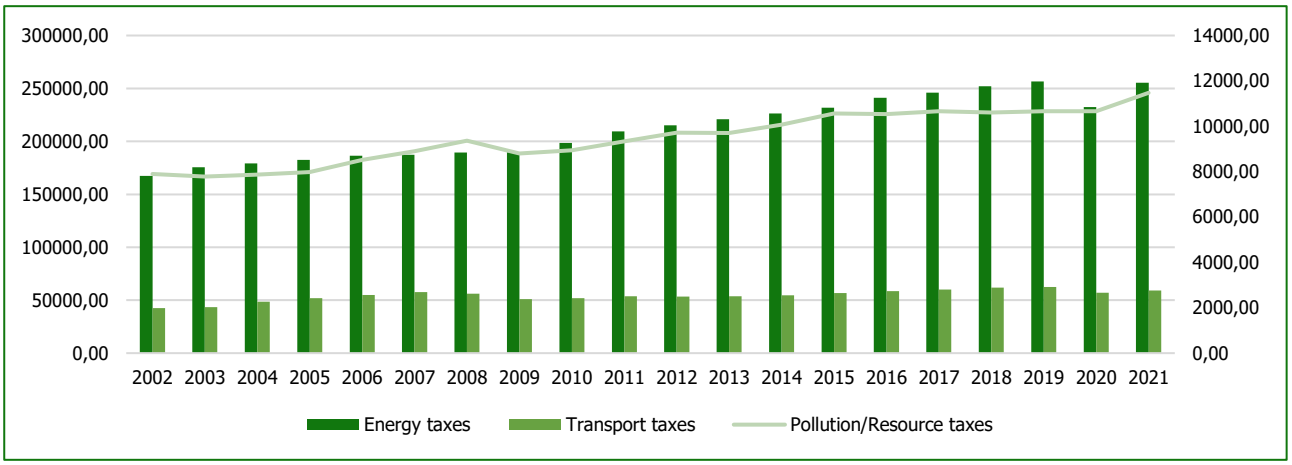

Figure 3. Dynamics of environmental tax revenues by tax type, 2002-2021, EUR million. *(Source: Eurostat, 2022)*

There is an increase in the dynamics of all types of environmental tax revenues to the EU budget using the index comparison method (Figure 4).

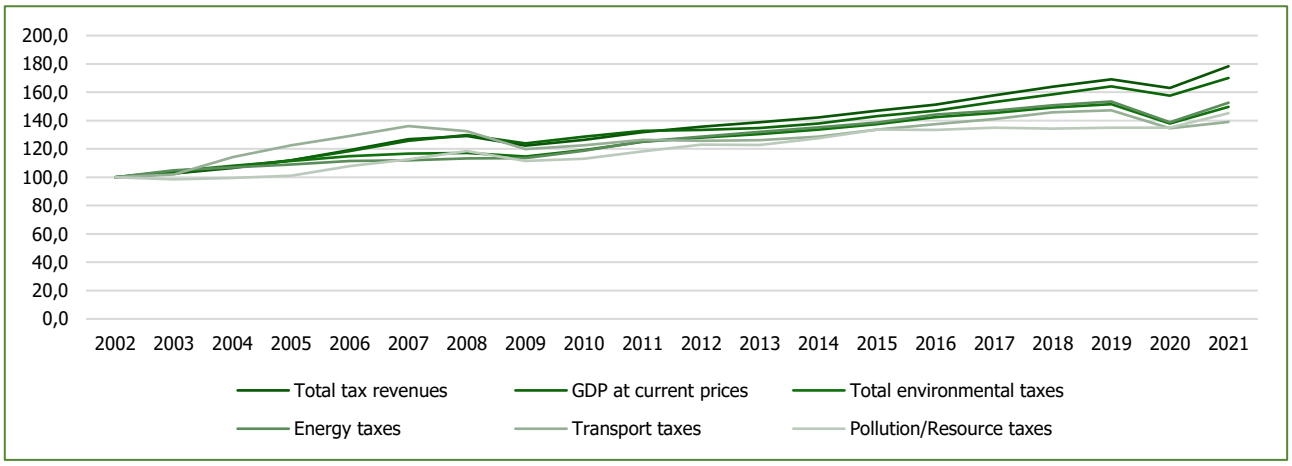

Figure 4. Dynamics of revenues to the EU budget, 2002-2021, (index 2002=100). *(Source: Eurostat, 2022)*

The paper proposes to investigate the dependence: the input field is the total and by types of receipts of environmental taxes; output fields are total tax revenues, GDP at current prices, and environmental tax revenues to the EU budget (Table 2, Figure 5).

Table 2. EU budget revenues (million euro), GDP at current prices. *(Source: Eurostat, 2022)*

Year	Total tax revenues, EUR million	Total environmental taxes, million euro	Energy taxes, EUR million	Transport taxes, EUR million	Pollution/ Resource taxes, EUR million	European Union - 27 countries (from 2020), EUR million
2002	3396708	217638	167269	42468	7901	8538773
2003	3487041	226668	175551	43335	7783	8767565
2004	3621154	235454	179056	48532	7866	9167939
2005	3800849	242524	182496	52048	7980	9560869
2006	4049403	249774	186378	54879	8518	10112451
2007	4307581	254040	187347	57788	8906	10738859
2008	4386905	255000	189353	56287	9360	11085412
2009	4151685	249490	189759	50925	8806	10587691
2010	4292152	259603	198633	52036	8934	10980485
2011	4475190	272358	209376	53644	9338	11328291
2012	4610862	278460	215326	53412	9722	11396450
2013	4716621	284143	220823	53615	9705	11516211
2014	4832431	290986	226251	54662	10074	11782085
2015	4989119	298975	231682	56731	10562	12215146
2016	5139284	310194	241241	58419	10533	12548706
2017	5363502	316580	245994	59924	10661	13074833
2018	5565506	324699	252147	61942	10610	13533327
2019	5747173	329919	256727	62531	10662	14018686
2020	5537597	300193	232383	57150	10660	13461161
2021	6058075	325837	255297	59066	11474	14523530

The dynamics of revenues to the EU budget by types of tax revenues are shown in Figure 5.

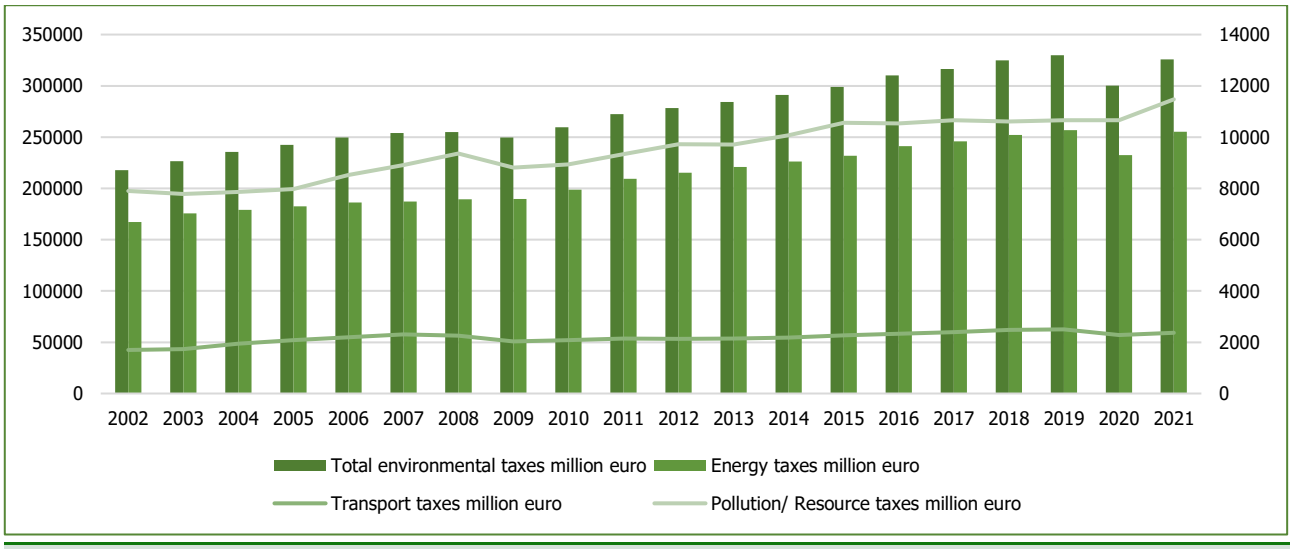

Figure 5. Dynamics of EU budget revenues, 2002-2021, by types of tax revenues, EUR million. *(Source: Eurostat, 2022)*

As a result, it is possible to draw the conclusion that environmental income on the revenue side of the EU budget for the years 2002 to 2021 tended to grow in amount. The EU budget only contains a small portion of the total environmental earnings. The largest portion is made up of energy taxes, followed by transportation-related environmental levies. A minor percentage of environmental tax revenue comes from taxes on greenhouse gas emissions and resources. Depending on the country of payment (Table 3), different amounts of environmental earnings are included in the EU budget.

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Table 3. Environmental tax revenues by EU countries, 2012-2021, EUR million. *(Source: Eurostat, 2022)*

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
European Union	278460	284143	290986	298975	310194	316580	324699	329919	300193	325837
Belgium	9735	9906	10255	10618	11469	11997	12423	12628	11588	12537
Bulgaria	1119	1201	1221	1352	1451	1469	1470	1839	1859	1979
Czechia	3606	3331	3347	3477	3728	3897	4129	4595	4148	4373
Denmark	10099	10713	10622	10847	11065	10808	10933	10221	9892	9704
Germany	58198	57947	58293	58073	58442	59259	59731	61119	57476	64714
Estonia	489	485	533	563	645	681	709	890	657	717
Ireland	4173	4445	4684	4977	5117	5232	5119	5020	4487	4953
Greece	6265	6585	6628	6749	6656	7129	6822	7086	6226	7136
Spain	16325	19611	19344	20821	20793	21371	22075	22018	19600	21265
France	40946	42897	43716	47493	50125	53052	56039	56327	50226	54421
Croatia	1125	1250	1380	1503	1620	1728	1844	1915	1648	1816
Italy	56251	55257	58070	56144	59481	58000	58575	58299	50444	53383
Cyprus	503	490	534	544	554	602	613	583	520	562
Latvia	660	723	790	859	908	942	983	900	916	918
Lithuania	548	587	634	692	748	807	900	921	954	1045
Luxembourg	1039	1008	980	954	933	953	1028	1094	893	1048
Hungary	2533	2490	2558	2784	2942	3095	3094	3308	2983	3096
Malta	205	206	240	270	277	303	322	346	297	289
Netherlands	21178	21564	22216	22925	23754	24635	25877	27570	25366	26419
Austria	7665	7725	7975	8204	8384	8845	8784	9059	7975	8775
Poland	10055	9503	10562	11402	11557	12512	13474	13545	13330	16590
Portugal	3682	3758	3932	4344	4819	5052	5272	5418	4729	5025
Romania	2667	2957	3587	3952	4085	3640	4034	4732	4196	4730
Slovenia	1389	1428	1453	1509	1569	1578	1560	1615	1383	1453
Slovakia	1744	1873	1932	1998	2019	2149	2226	2362	2294	2383
Finland	5949	5953	5957	6118	6709	6693	6848	6730	6487	6289
Sweden	10311	10251	9544	9801	10341	10150	9814	9779	9618	10218
Iceland	264	261	288	337	387	482	470	443	382	368
Liechtenstein	39	37	42	47	46	47	44	48	:	:

Dynamics and total values of environmental revenues by EU countries 2012-2021 showed that the most active paying countries are (Table 3): Germany (EUR 593252 million), Italy (EUR 563904 million), France (EUR 495242 million), the Netherlands (EUR 241504 million), Spain (EUR 203223 million), Poland (EUR 122530 million), Belgium (EUR 113156 million). Out of 27 countries, 7 countries are the most active payers of environmental taxes, contributing 81% of all environmental tax revenues. The remaining twenty countries are contributors to 19% of environmental revenues. It is clear that not all countries can count on funding eco-activities from this amount to the same extent. This means that for most countries it is necessary to search for additional sources of funding. Among the countries with insignificant eco-revenues are Liechtenstein, Iceland, Malta, and Lithuania, which joined the EU later and their environmental revenues are inferior to other countries (Table 4).

Table 4. Correlation analysis matrix, the input fields are receipts from environmental taxes by EU countries, output field is the total values of the EU budget. *(Source: Eurostat, 2022)*

Country	Pearson correlation coefficient	Country	Pearson correlation coefficient	Country	Pearson correlation coefficient
Belgium	0.976	Greece	0.791	Hungary	0.949
Bulgaria	0.745	Spain	0.877	Netherlands	0.931
Czechia	0.833	France	0.981	Poland	0.829
Denmark	-0.040	Croatia	0.976	Romania	0.852
Germany	0.700	Italy	0.212	Slovakia	0.875
Estonia	0.924	Cyprus	0.874	Sweden	-0.101
Ireland	0.822	Latvia	0.869	Switzerland	0.840
Lithuania	0. 846	Luxembourg	0.293	Malta	0.918
Austria	0.972	Portugal	0.969	Slovenia	0.729
Finland	0.820	Iceland	0.866	Norway	-0.612

As a result of the correlation analysis, the most significant environmental revenues by country in decreasing order were France (0.981), Belgium (0.976), Croatia (0.976), Austria (0.972), and Portugal (0.969). The least significant environmental revenues were in Denmark (-0.040) and Sweden (-0.101). The greater the absolute value of r_{xy}, the tighter the connection (see Figure 6). Total environmental revenues to the EU budget by country for the period 2012–2021 are shown in Figure 6.

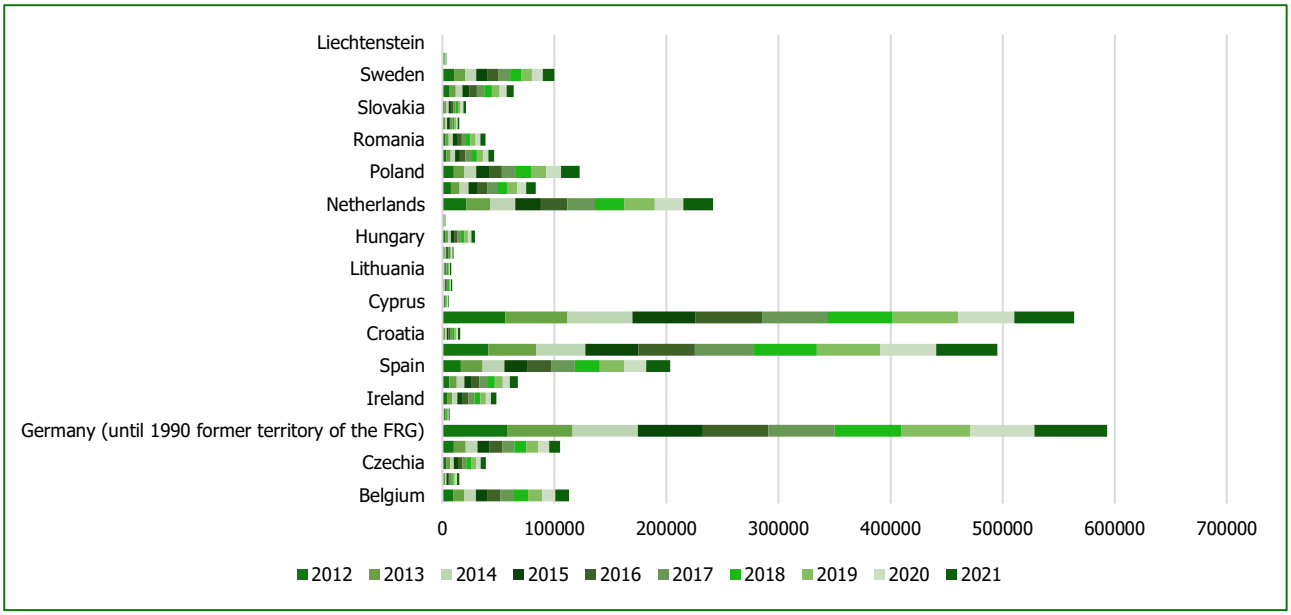

Figure 6. Total environmental revenues to the EU budget by country (EUR Million), 2012-2021. *(Source: Eurostat, 2022)*

In its turn greenhouse gas permits can be sold and additional funding can be obtained (Koval, 2023; Laktionova, 2022). The total volume of eco-tax revenues and the sale of emission allowances according to the EU Member States also show significant differences (Figure 7). To increase the significance or closeness of the connection, it is necessary to change the elements of the environmental taxes of these countries. Thus, there is a need to increase the amount of environmental revenues by increasing the tax rate. This is a mandatory payment, the main purpose of which is to economically stimulate taxpayers to reduce environmental pollution.

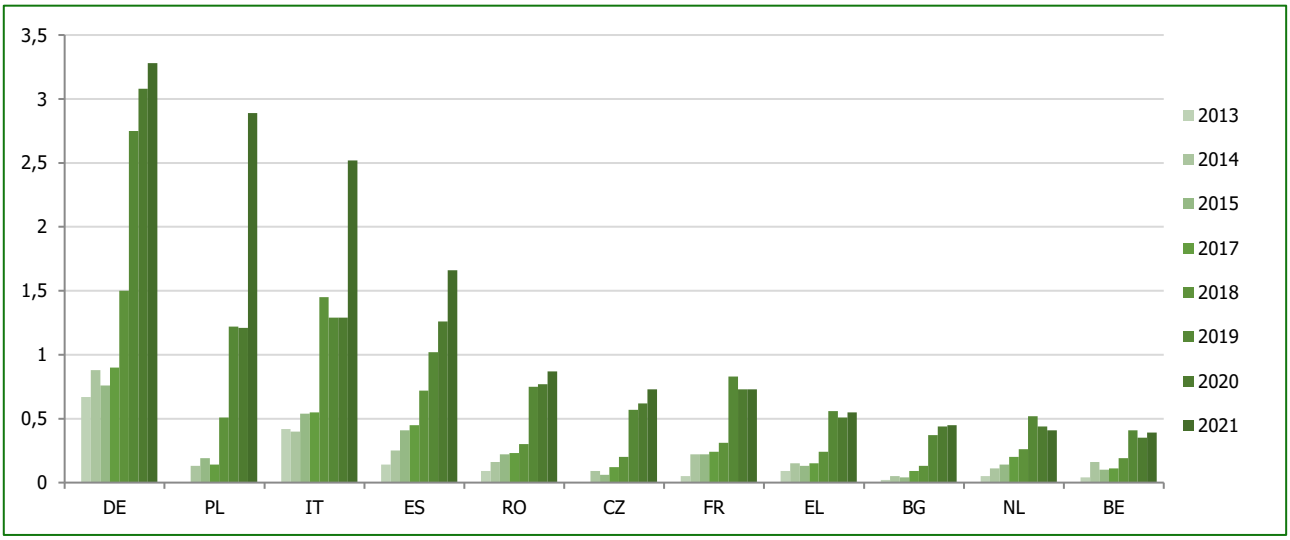

Figure 7. Dynamics of total tax revenues and from auctions for the sale of emission allowances according to the data of the 1st group of EU Member States (EUR billion), 2013-2021. *(Source: Eurostat, 2022)*

There has been an increase in payments from environmental taxes and revenues from the sale of CO2-equivalent emissions permits, but their amounts also vary across countries (Figure 8).

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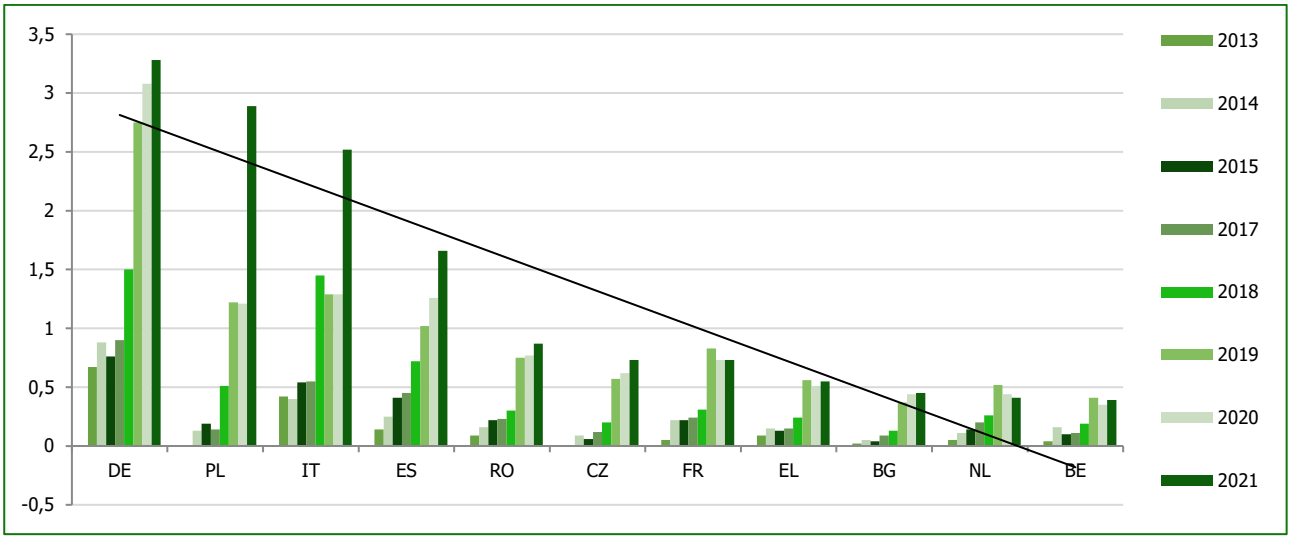

Figure 8. Trends in the dynamics of total tax revenues and from auctions for the sale of emission allowances according to the 1st group of EU Member States (EUR billion), 2013-2021. *(Source: Eurostat, 2022)*

The dynamics of total tax revenues and from auctions for the sale of emission allowances according to the data of the 2nd group of EU Member States, EUR billion, 2013-2021 is shown in Figure 9.

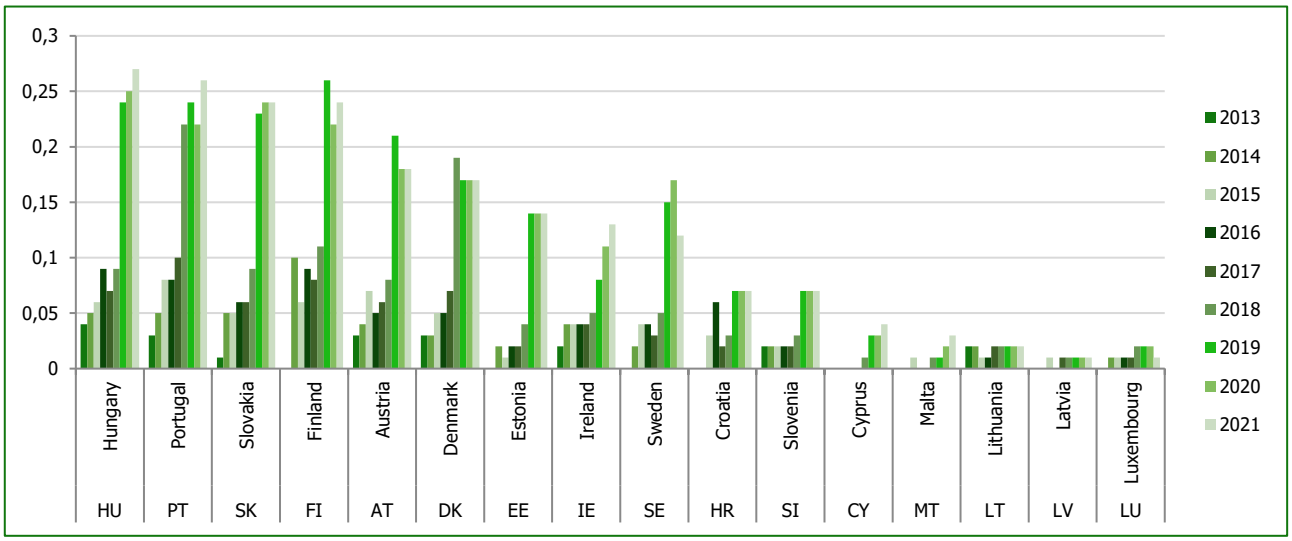

Figure 9. Dynamics of total tax revenues and from auctions for the sale of emission allowances according to the 2nd group of EU Member States (EUR billion), 2013-2021. *(Source: Eurostat, 2022)*

In 2021, there is an increase in environmental revenues, in almost all countries compared to 2020 (Figure 9). The largest amounts of environmental revenues in 2021 were provided by: Germany (EUR 3.28 billion euros); Poland (EUR 2.89 billion); Italy (EUR 2.52 billion); Spain (EUR 1.66 billion). Countries that transfer significantly less funds include Hungary EUR (EUR 0.27 billion); Portugal (EUR 0.26 billion); Slovakia (EUR 0.24 billion); Finland (EUR 0.24 billion). The countries that do not have to count on receiving budget funding for eco-activities are those that transferred insignificant funds: Lithuania (EUR 0.02 billion); Latvia EUR (EUR 0.01 billion); Luxembourg (EUR 0.01 billion). The presented insignificant amounts, if used in a targeted manner in these countries, cannot be a sufficient source of financing for medium and large eco-projects. Additional funding is required (Table 3).

The trend in the dynamics of total tax revenues and from auctions for the sale of emission allowances according to the data of the 2nd group of EU Member States (EUR billion), 2013-2021 is shown in Figure 10.

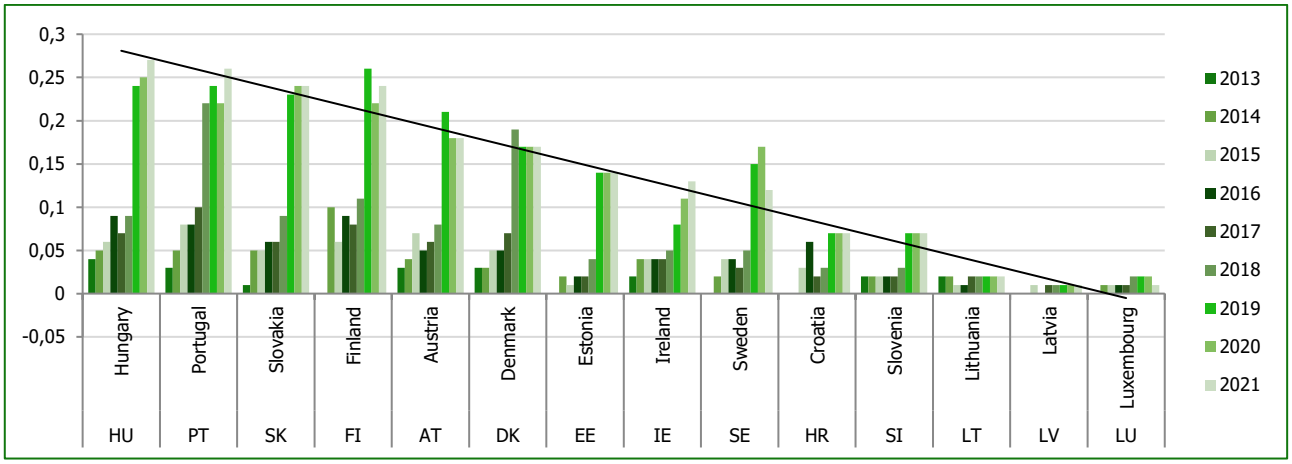

Figure 10. Trend in the dynamics of total tax revenues and from auctions for the sale of emission allowances according to the data of the 2nd group of EU Member States (EUR billion), 2013-2021. *(Source: Eurostat, 2022)*

From the analysis of the charts, it follows that the lowest revenues from the environmental tax and the sale of emission permits from auctions by EU member states were mainly in 2013, gradually increasing towards 2021. The largest receipts were from Germany. Then comes Poland, Italy, Spain, Romania, France, the Czech Republic, Greece, the Netherlands, and Bulgaria. The smallest receipts were from Belgium. Analyzing the trend line, we can assume that in the future, the largest revenues should be expected from Germany and the smallest from Belgium.

Table 5. Environmental tax revenues in the EU countries. *(Source: Eurostat, 2022)*

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
European Union - 27 countries (from 2020)	6.22	6.20	6.20	6.16	6.21	6.06	5.99	5.89	5.57	5.52
Belgium	5.56	5.48	5.57	5.66	6.03	6.02	6.02	6.07	5.80	5.72
Bulgaria	10.15	10.15	9.99	10.23	10.20	9.38	8.81	9.85	9.89	9.06
Czechia	6.43	5.99	6.21	5.98	5.99	5.67	5.44	5.67	5.35	5.12
Denmark	8.67	8.95	8.17	8.57	8.55	8.02	8.15	7.02	6.71	6.00
Germany	5.53	5.36	5.20	4.95	4.76	4.61	4.45	4.39	4.26	4.38
Estonia	8.61	8.09	8.27	8.19	8.85	8.71	8.31	9.57	7.20	6.81
Ireland	8.42	8.61	8.33	8.15	8.02	7.78	7.01	6.42	6.05	5.51
Greece	9.15	10.20	10.29	10.46	9.82	10.24	9.49	9.79	9.69	9.98
Spain	4.88	5.80	5.52	5.70	5.54	5.42	5.28	5.09	4.74	4.59
France	4.40	4.45	4.45	4.73	4.91	4.98	5.13	5.10	4.78	4.82
Croatia	7.11	7.80	8.66	9.12	9.30	9.41	9.38	9.22	8.92	8.75
Italy	8.03	7.93	8.32	7.92	8.33	7.99	7.94	7.70	7.14	6.93
Cyprus	8.15	8.56	9.09	9.17	9.05	9.03	8.55	7.37	6.98	6.50
Latvia	10.28	10.81	11.28	11.75	11.66	11.23	10.87	9.58	9.81	8.97
Lithuania	6.09	6.23	6.31	6.40	6.48	6.49	6.58	6.23	6.23	5.77
Luxembourg	6.12	5.66	5.23	5.05	4.67	4.45	4.33	4.43	3.61	3.75
Hungary	6.49	6.32	6.26	6.37	6.47	6.43	6.16	6.22	6.01	5.94
Malta	8.85	8.24	8.70	9.12	8.59	8.40	8.20	8.25	7.68	6.46
Netherlands	9.12	9.05	8.93	8.99	8.73	8.63	8.62	8.64	7.99	7.77
Austria	5.75	5.58	5.59	5.51	5.61	5.71	5.39	5.35	4.97	4.99
Poland	8.06	7.55	8.05	8.17	8.11	7.85	7.70	7.23	7.12	7.84
Portugal	6.91	6.49	6.65	7.03	7.59	7.56	7.41	7.33	6.71	6.63
Romania	7.21	7.52	8.66	8.79	9.27	7.78	7.59	8.14	7.30	7.43
Slovenia	10.11	10.45	10.31	10.34	10.31	9.84	9.08	8.90	7.85	7.29
Slovakia	8.28	8.16	7.98	7.70	7.55	7.51	7.31	7.28	7.10	6.74
Finland	6.98	6.71	6.62	6.65	7.05	6.90	6.92	6.63	6.51	5.81
Sweden	5.69	5.46	5.16	5.05	5.03	4.80	4.76	4.79	4.72	4.45
Iceland	6.77	6.27	5.77	6.07	4.09	5.93	5.80	5.72	5.56	4.85
Norway	5.62	5.84	5.97	6.09	6.18	5.90	5.54	5.24	5.16	4.03
Switzerland	5.17	5.03	5.06	5.03	5.11	5.00	5.15	5.07	4.97	4.78

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As a percentage of the total amount of tax and social contribution money, the share of environmental tax receipts in the EU budget tends to decline (Table 5). This is also shown by the correlation coefficient, where the input fields are the shares of environmental tax revenues by country, and the output fields are the share of environmental tax revenues in the EU budget as a percentage of taxes and social contributions. The strongest correlation coefficient ρ>0 is observed in the countries - Denmark, Greece, Germany, Ireland, Spain, Italy, Cyprus, Latvia, Hungary, Slovenia, and Slovakia. In this case, there is a direct linear relationship between the quantities.

An inverse linear relationship is observed in the three countries: Belgium, France, and Croatia (Table 6).

Table 6. Share of environmental tax revenues in the EU budget as a percentage of total tax and social security revenues (%), 2012-2021.

Country	Pearson correlation co-efficient	Country	Pearson correlation co-efficient	Country	Pearson correlation coefficient
Belgium	-0.217	Greece	0.139	Hungary	0.897
Bulgaria	0.523	Spain	0.789	Netherlands	0.958
Czechia	0.884	France	-0.379	Poland	0.597
Denmark	0.952	Croatia	-0.271	Romania	0.475
Germany	0.784	Italy	0.948	Slovakia	0.875
Estonia	0.632	Cyprus	0.889	Sweden	0.780
Ireland	0.961	Latvia	0.803	Switzerland	0.840
Lithuania	0. 533	Luxembourg	0.847	Malta	0.918
Austria	0.945	Portugal	0.235	Slovenia	0.985

The pair correlation coefficient can be considered a measure of the dependence of two random variables. According to the definition, it is necessary to revise environmental taxation in countries where the correlation coefficient is $\rho < 0$. This suggests that environmental tax revenues as a sufficient source of funding in many countries cannot be considered and requires the involvement of additional financial instruments, especially when there are slight decreases and, in some cases, even increases in volumes. In order to effectively manage climate finance, there is a need for more research on the attraction and search for environmental fiscal methods.

DISCUSSION

Decisions related to climate change require significant financial resources. The works of Carney (2022), Suntsov (2021), and others have been devoted to this. The need for additional funding to combat climate change has been noted in the Paris Agreement (UN, 2015). It is necessary to note the significant contribution of these studies to solving the problems of environmental taxation development. In this study, as a result of the analysis using various methods, it is shown that revenues from environmental taxation are an insufficient source of financing environmental activities and the development of clean technologies. Thus, it is necessary to search for and attract additional financial instruments and financial management mechanisms. For this purpose, it is proposed to attract the services of an outsourcer as the organizer of the regional ecological financial system. The use of financial outsourcing services will allow one to effectively attract, use, distribute, redistribute, and control financial resources to support environmental activities.

CONCLUSIONS

The study explores the problems of financing activities aimed at combating climate change. It has been shown that greenhouse gas emissions continue to grow. It can be concluded that decisions related to activities to combat climate change require significant financial resources. In this regard, the paper explores possible sources of funding for activities related to climate change. It was revealed that a stable financial system is gradually being built, which will counteract climate risks. Accelerated action on climate change will only be realistic if funding for climate change increases many times over. The environmental tax revenues of the revenue part of the EU budget and the budgets of individual countries have been studied. The dynamics of EU budget revenues show insignificant amounts of environmental tax revenues compared to general tax revenues and GDP. There is a slight increase in the share of environmental tax revenues in the EU budget and in individual countries. A hypothesis has been formulated and proved: with the purposeful use of environmental revenues,

their amounts are not sufficient to finance activities to combat climate change. There is a need to attract additional sources of funding. As a result of the correlation analysis, the most significant environmental revenues by country in decreasing order were France (0.981), Belgium (0.976), Greece (0.976), Austria (0.972), Portugal (0.969), and others. The least significant environmental revenues were in Denmark (-0.040) and Sweden (-0.101). To increase the significance or closeness of the connection, it is necessary to change the elements of the environmental taxes in these countries.

It is concluded that the largest share of environmental revenues is occupied by energy tax revenues (78.4% of environmental taxation), the share of GDP (1.76%), and social contributions (TSC) (5.38%). Using econometric methods of analysis, it was found that the increase in GDP and labour taxes occurs at a faster rate than the increase in environmental revenues to the EU budget. It is shown that the purposeful use of environmental taxes in EU countries cannot be a sufficient source of financing for eco-events. There is a need to find additional sources of funding for eco-activities in EU countries. An inverse linear relationship is observed in the countries of Belgium, France, and Croatia. The pair correlation coefficient can be considered a measure of the dependence of two random variables. According to the definition, it is necessary to revise environmental taxation in countries where the correlation coefficient is < 0. This indicates that the proceeds from environmental taxes as a sufficient source of financing in many countries cannot be considered and require the involvement of additional financial instruments. Dynamics and total values of environmental revenues by EU countries 2012–2021, in millions of euros, showed that the most active paying countries are: Germany (EUR 593252 million), Italy (EUR 563904 million), France (EUR 495242 million), Netherlands (EUR 241504 million), Spain (EUR 203223 million), Poland (EUR 122530 million), and Belgium (EUR 113156 million). Out of 27 countries, seven are the most active payers of environmental taxes, contributing 81% of all environmental tax revenues. The remaining twenty countries contribute 19% of environmental revenues. Not all countries can count on funding eco-activities from this amount to the same extent. A regional environmental financial system created by the outsourcer will make it possible to attract financial instruments and financial management techniques, which will speed up the rate at which capital is exchanged in the financial system. Not all nations can rely on funding eco-activities from this sum to the same degree. The outsourcing company will be able to draw up fiscal policy strategies that will hasten the interchange of capital in the financial system.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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ФІНАНСОВИЙ АУТСОРСИНГ В АНАЛІЗІ УПРАВЛІННЯ ЕКОЛОГІЧНИМИ ПОДАТКОВИМИ НАДХОДЖЕННЯМИ

Дослідження спрямоване на оцінку впливу податкової ефективності та пошук вирішення проблем фінансування діяльності з протидії зміні клімату. Незважаючи на зміни в регуляторній політиці, викиди парникових газів в атмосферу не зменшилися. Запропоновано методологію пошуку та відбору джерел фінансування заходів із протидії зміні клімату. Основою методології дослідження є бібліометричний і прогнозний аналіз сформованих баз даних. Запропоновано структуру змішаного капіталу як джерела фінансування, що включає не лише надходження екологічного податку, а й інші джерела фінансування. Виявлено, що динаміка надходжень екологічного податку поступається динаміці загальних податкових надходжень у ВВП. Найбільша частка екологічних податків належить транспортним та енергетичним податкам. Використання методів логічного та прогнозного аналізу показало недостатність екологічних надходжень і необхідність залучення інших фінансових інструментів та механізмів фінансового менеджменту для фінансування діяльності зі зміни клімату. За результатами кореляційного аналізу найзначніші екологічні доходи

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отримали країни: Франція (0,981), Бельгія (0,976), Греція (0,976), Австрія (0,972), Португалія (0,969). Виявлено, що коефіцієнт кореляції Пірсона менше за «нуль» у таких країнах: Данія (-0,040), Швеція (-0,101). Для підвищення значущості коефіцієнта пропонується змінити елементи екологічних податків у цих країнах. Аутсорсер, який надає фінансові послуги клієнтам, формує регіональну екологічну фінансову систему. Це збільшить швидкість обороту капіталу й зменшить потребу в капіталі. Аутсорсер ліквідує «касові розриви» за рахунок своєчасного залучення фінансових інструментів та механізмів управління фінансами, прискорить оборотність змішаного капіталу, підвищить ефективність управління надходженнями екологічного податку.

Ключові слова: екологічний менеджмент, екологічні податки, фінансовий аутсорсинг, регіональна фінансова система, квоти на викиди парникових газів

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