EFFICIENCY OF ENVIRONMENTAL PROTECTION EXPENDITURE OF THE GENERAL GOVERNMENTS IN EUROPEAN UNION MEMBER STATES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT IN WASTE MANAGEMENT

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ABSTRACT

Aim: Pursuing sustainable development justifies incurring expenditure in the field of environmental protection because the state's active fiscal policy is an essential determinant of achieving sustainable development goals. The distribution of public funds should depend on the efficiency of their use. The purpose of the research procedure is (1) to analyze the structure of environmental protection expenditure of the general government in the European Union and the individual member states; (2) to assess the efficiency of environmental protection expenditure of the general government in the implementation of sustainable development goals in waste management. **Methods:** The study uses linear regression with regression confidence bounds. The indicator chosen to assess the efficiency of expenditure was the Recycling rate of municipal waste (SDG_11_60). **Results:** The structure of environmental protection expenditure of the general government in most member states in 2012–2021 was stable, which may result from the adopted national environmental policies or internal conditions of a given country. Waste management expenditure dominates the structure of environmental protection expenditure of the general government in many countries. The analysis of the efficiency of environmental protection expenditure of the general government in waste management confirmed its efficiency in a significant number of states. **Conclusions:** The research procedure indicated that positive relations between general spending on the environment and achieving sustainable goals can be confirmed. Unfortunately, there is a problem with data consistency of various indicators measuring sustainable goals. Therefore, extending such research to a multiple factor case, for example, can be difficult.

Key words: environmental protection expenditure, sustainable development indicators, sustainable development goals, efficiency, waste management

JEL codes: H41, H50, H72, F64

INTRODUCTION

Environmental deterioration and resource unsustainability are major global concerns as they pose serious threats to ecosystems, human health, and the economy [Ortega-Gil et al. 2022]. Ensuring sustainable development is the basis for the vision formulated in strategic documents and action plans at the national and supranational levels. The policy of the European Union is based on the desire to create conditions for running a modern, resource-saving, and competitive economy, ensuring a high quality of life for current and future generations. In the last five years,

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the European Commission has issued several essential documents, adopting many commendable policies with the primary aim of preventing waste generation while addressing the problem at its root and maximizing the recovery of raw materials and energy from waste [Jarczok-Guzy 2023]. One of these documents pertains to the obligation of selective waste collection, allowing for the recycling of waste such as paper, cardboard, glass, metal, plastic, and clothes [Kukuła 2016]. Sustainable development is not possible without appropriate financial adjustments. Striving for sustainable development justifies incurring expenditure in environmental protection because the active fiscal policy of the state is essential. The essential concept of sustainable development integrates three components: social development and economic development, and considering environmental aspects [Sobczak 2021]. The challenge of sustainable development is the pursuit of satisfying needs without exerting excessive influence on the natural environment.

Environmental protection expenditures play a significant role in shaping an effective environmental policy and achieving sustainable development goals. Therefore, these expenditures should be carefully monitored, and their effectiveness should be examined from the perspective of the sustainable development goals. Our study contributes to the existing literature by heightening the existing knowledge on environmental expenditures. While there are many studies on environmental expenditures, studies on their effectiveness in terms of achieving sustainable development goals are rather hard to find. The purpose of the research procedure is (1) to analyze the structure of environmental protection expenditure of the general government in the European Union and the individual member states, and (2) to assess the efficiency of environmental protection expenditure of the general government in the implementation of sustainable development goals in waste management. The research hypothesis is that the higher the government's environmental protection expenditures, the more efficient waste management should be.

Sustainable development – goals and measures

The 2030 Agenda for Sustainable Development, initiated by the United Nations in 2015, contains 17 Sustainable Development Goals (SDGs), which aim to solve the most urgent problems related to social, environmental, and economic development in the world. For the global implementation of the 2030 Agenda to take place, it is necessary to integrate the SDGs with the policies and practices of all countries at all levels of government [Mortimer et al. 2023]. The SDGs are based on the Millennium Development Goals established in 2000 and address global challenges in health, education, equity and social justice, economic security, and environmental issues. The SDGs include not only 17 general goals but also 169 specific objectives. All countries' economic and social development goals must have common general characteristics. They must result from a consensus on the basic concept of sustainable development and a broad strategic framework for their achievement [Ashford and Hall 2011]. In particular, knowledge about the benefits and pollution damage, or the costs and benefits of pollution reduction, is required [Perman et al. 2003].

Implementation of sustainable development requires measurements, without which it is hard to discuss effective and efficient management [Szajczyk 2021, Broniewicz et al. 2022]. Adequate information and indicators are needed to monitor progress and evaluate results, and those indicators should meet the following criteria [Bąk and Cheba 2020]:
- policy relevance: the indicator must address issues that are of public interest and relevant to policy-making;
- analytical validity: ensuring that the indicator is based on the best scientific knowledge available;
- measurability: indicators must allow meaningful comparisons over time as well as over space (in the countries or regions under study);
- communication usefulness: delivering understandable, easily interpreted signals to the target audience.

The implementation of sustainable development goals by individual countries is verified at three levels. Firstly, the United Nations Statistical Commission has developed a set of global indicators to assess progress. At the regional level, within the European Union, Eurostat monitors progress in achieving the SDGs in the member states using a set of 100 indicators. Additionally, the governments of UN member states utilize their own national measures for SDG implementation [Krasodomska et al. 2022].

Public environmental protection expenditure

The environment is considered to be everything that creates the natural conditions necessary for the existence of organisms. Therefore, an ecologically sound environment is also a condition for human health and well-being, as well as the safe and healthy existence of all organisms [Mihaliková et al. 2022]. Stiglitz identified the natural environment as one of the five examples of global public goods, alongside international economic stability, national security, international humanitarian aid, and knowledge [Stiglitz 1995]. Global public goods have an intergenerational and transnational character, therefore requiring coordinated action at the international level. The intergenerational nature of global public goods is highlighted by Sandler [Sandler 2009]. This means that decisions, or the lack thereof, have implications for future generations.

Global public goods should be analyzed in contrast to global public bads [Kopiński and Wróblewski 2020]. If we consider the natural environment to be a global public good [Pearce and Palmer 2005], environmental pollution should be viewed as a global public bad (i.e., an undesirable state requiring action to limit the adverse effects). State intervention is an effective method of eliminating harmful phenomena caused by environmental pollution [Krasodomska et al. 2022]. Providing global public goods, also understood as corrective actions related to global public bads, requires the involvement of financial resources. As a rule, national public goods are financed from national public funds. On the other hand, the supranational character of global goods determines the necessity of actions and regulations at the international level. As a consequence, the assessment of public spending on environmental protection becomes particularly important [Mandalová 2012]. The implementation of conceptual assumptions depends to a large extent on the quality of the legal environment. Legal standards that regulate activities in environmental protection require consistency at the international level, including European Union law and national law. The coherence of the law should address issues related to the environmental goals being pursued, as well as the sources and level of funding for activities associated with these goals.

Expenditure resulting from the implementation of environmental activities by the public sector is referred to as environmental public expenditure. According to Bishop, public expenditure on environmental protection can be defined as the expenditure incurred by the relevant public authorities responsible for environmental protection [Bishop 2013]. It is possible to analyze the spending of public funds for environmental protection purposes using the EU methodology of public expenditure classification. Additionally, having uniform rules for classifying public expenditure allows for international comparisons. This is particularly important in the context of environmental protection, which is considered a global public good.

Public spending is a tool for influencing various entities' economic behavior in terms of their approach to environmental protection. As a consequence, expenditures on environmental protection are a crucial factor in shaping an effective environmental policy. Therefore, it is necessary to know the level of expenditure and the activities for which they were allocated, and to monitor and assess the effects of the actions taken. Hence, the question arises about the efficiency of environmental protection expenditures in implementing sustainable development goals.

MATERIALS AND METHODS

The subject of the research is the analysis of environmental protection expenditure of the general government by function (COFOG division 05) in the European Union from 2012 to 2021, in order to implement sustainable development goals. The research was conducted in two stages.

The framework of the first stage was to initially examine the structure of environmental protection expenditure of the general government by function (COFOG) in the European Union (EU) and individual member states (MS). The data used in the research procedure comes from the Eurostat database. The methodological framework is the European System of Accounts (ESA 2010); [Dz.UE L 174 z 26.06.2013]. Environmental protection expenditure of the general government by function (COFOG division 05); (GF05) includes [Manual on sources… 2019]: Waste

Table 1. Selected measure of sustainable development in waste management

Environmental protection expenditure	No	SD IndicatorCode	Measure	Indicator
waste management	Y1	SDG_11_60	% of total waste generated	Recycling rate of municipal waste

Source: own study.

management (GF0501); (X1), wastewater management (GF0502), pollution abatement (GF0503), protection of biodiversity and landscape (GF0504), R&D environmental protection (GF0505), and environmental protection N.E.C. (GF0506).

The second stage of the research procedure assessed the efficiency of environmental protection expenditure of the general government in the area of interdependence of spending on waste management (GF0501) with a selected measure of sustainable development. For this purpose, linear regression with regression confidence bounds was used after an initial graphical analysis of scatter plots and identification of unequivocal linear patterns. The linear regression has been chosen because the paper tries to analyze the situation in every state and the EU separately. The confidence bounds help to understand the relation between the expenditure under examination and the chosen indicator. Additionally, a regression slope and an intercept have been provided together with the determination coefficient for each state and the EU. The confidence interval has also been calculated for regression slopes (95% confidence level) to indicate the range of possible error. The *p*-values have been calculated to decide whether the relation is statistically significant or not in the case of a particular state. The indicator chosen to assess the efficiency of expenditure was the recycling rate of municipal waste (SDG_11_60); (Table 1).

In the case of SDG_11_60 (Y1), the sample consisted of 10 yearly values, which is a relatively small sample size. The research procedure aims to: (1) analyze the structure of environmental protection ex-

penditure by the general government in the European Union and its individual member states; (2) assess the efficiency of environmental protection expenditure by the general government in implementing sustainable development goals, using the relationship between expenditure on waste management and selected measures of sustainable development as an example.

RESULTS

The structure of environmental protection expenditure of the general government in most member states in 2012–2021 was stable. This stability may have resulted from the adopted national environmental policies or the internal conditions of a given country. This stability allowed for the summing up of environmental protection expenditure of the general government in the period 2012–2021, in order to determine the ranking of countries according to the dominant outlay (Table 2).

The structure of environmental protection expenditure of the general government among the EU-27 member states is diversified. Taking into account the largest share of the total multi-annual spending in the structure, it is possible to indicate five groups of countries with dominating outlay: waste management, wastewater management, pollution abatement, protection of biodiversity and landscape, environmental protection N.E.C. (Table 2).

The largest group of countries (15 countries[2]) is where the greatest share of the structure is spent on waste management. In this group of countries, the share of expenditure on waste management varied significantly. The percentage of waste management expenditure

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[2] Given the incomplete data for Bulgaria, this country was not analyzed. Just like Portugal, the residual data for these countries distort the overall picture.

Table 2. Ranking of Member States by dominant outlay in the structure [%] of environmental protection expenditure of general government (multi-annual spending for 2012–2021)

Expenditure	GF0501	GF0502	GF0503	GF0504	GF0505	GF0506
Independent variable	X1					
Country	Waste management	Wastewater management	Pollution abatement	Protection of biodiversity and landscape	R&D environmental protection	Environmental protection n.e.c.
Bulgaria*	**82.7**	3.9	0.0	0.9	0.0	12.5
Cyprus	**79.1**	12.1	6.7	2.1	0.0	0.0
Italy	**65.6**	2.4	6.2	14.3	8.6	2.9
Spain	**61.1**	14.7	3.5	10.3	4.1	6.4
Latvia	**59.3**	6.8	16.9	4.2	0.7	12.0
Malta	**51.1**	20.3	4.9	17.9	0.0	5.8
France	**50.9**	20.8	8.9	8.3	3.1	8.1
Slovakia	**49.9**	11.4	7.7	8.1	2.9	20.0
Greece	**48.5**	6.7	44.0	0.2	0.0	0.6
EU27	**44.0**	18.8	15.5	9.8	4.5	7.4
Lithuania	**46.2**	8.4	16.2	8.0	0.3	21.0
Romania	**45.5**	19.5	32.7	0.1	0.0	2.1
Hungary	**42.9**	33.1	8.3	7.5	0.4	7.8
Netherlands	**41.7**	29.7	17.1	8.4	1.5	1.5
Portugal*	**36.8**	20.6	9.4	14.1	10.1	9.1
Estonia	**31.6**	11.7	17.3	18.2	11.9	9.3
Czechia	**31.5**	31.3	4.4	25.6	2.4	4.7
Germany	**29.4**	22.8	25.1	8.6	6.9	7.2
Ireland	3.9	**60.1**	6.2	22.7	1.5	5.6
Slovenia	11.7	**45.9**	17.2	9.5	7.0	8.6
Luxem-bourg	21.5	**45.4**	16.5	11.8	0.2	4.6
Poland	19.6	**38.6**	11.8	4.5	5.0	20.5
Sweden	26.4	**38.4**	2.0	8.1	2.2	22.9
Belgium	29.4	6.6	**48.5**	4.3	1.2	10.0
Austria	12.0	24.9	**39.9**	5.0	5.7	12.4
Finland	12.0	0.0	**32.1**	18.5	14.8	22.6
Denmark	8.3	2.5	11.0	**45.5**	5.9	26.9
Croatia	18.2	16.7	3.2	14.9	1.2	**45.8**

*Incomplete data

Source: own study.

Table 3. Linear relationship between GF0501 expenditure and SDG_11_60 measure in the Member States in 2012-2021 (yearly interval, 10 samples)

Region / Country	% of GF05	b1	b0	R^2	df	s(b1)	b1 − CI	b1 + CI	F	p	Y1 change
Netherlands	41.73%	0.0075	20.9013	95.9%	8	0.0005	0.0063	0.0088	188.5663	0.000001	8.4%
Luxembourg	21.47%	0.1555	33.0216	91.7%	8	0.0165	0.1175	0.1936	88.8818	0.000013	7.9%
France	50.86%	0.0025	11.5024	91.7%	8	0.0003	0.0019	0.0031	87.9402	0.000014	7.4%
EU27	43.97%	0.0007	13.1387	88.3%	8	0.0001	0.0005	0.0009	60.2192	0.000054	8.7%
Croatia	18.15%	0.0761	15.8345	80.3%	8	0.0133	0.0454	0.1067	32.7056	0.000445	16.7%
Czechia	31.48%	0.0622	-3.5532	72.5%	8	0.0135	0.0310	0.0934	21.1344	0.001762	20.1%
Germany	29.37%	0.0047	41.5151	71.8%	8	0.0010	0.0023	0.0071	20.3810	0.001964	5.9%
Spain	61.12%	0.0043	7.4658	63.6%	8	0.0011	0.0016	0.0069	13.9646	0.005731	6.9%
Latvia	59.32%	0.5236	-20.5893	56.4%	8	0.1627	0.1484	0.8987	10.3570	0.012272	29.5%
Poland	19.64%	0.0467	7.3834	51.5%	8	0.0160	0.0098	0.0836	8.4974	0.019439	28.3%
Romania	45.49%	-0.0054	16.0068	36.8%	8	0.0025	-0.0112	0.0004	4.6512	0.063118	-3.5%
Estonia	31.61%	0.1400	19.8748	33.3%	8	0.0701	-0.0217	0.3018	3.9873	0.080915	11.2%
Hungary	42.92%	0.0124	27.3051	30.2%	8	0.0067	-0.0030	0.0278	3.4610	0.099871	9.4%
Sweden	26.37%	-0.0531	77.2697	28.8%	8	0.0295	-0.1211	0.0149	3.2417	0.109476	-7.4%
Malta	51.08%	-0.0407	14.9037	27.3%	8	0.0235	-0.0950	0.0135	2.9979	0.121612	-1.2%
Lithuania	46.19%	0.1425	24.6045	11.8%	8	0.1375	-0.1745	0.4594	1.0745	0.330249	20.8%
Slovenia	11.70%	-0.1310	56.2255	7.4%	8	0.1643	-0.5099	0.2479	0.6353	0.448423	17.9%
Denmark	8.30%	0.0438	41.2034	5.4%	8	0.0648	-0.1056	0.1933	0.4574	0.517895	-8.2%
Portugal	36.78%	-0.0049	30.9561	2.9%	8	0.0102	-0.0284	0.0185	0.2352	0.640687	4.4%
Belgium	29.44%	-0.0006	54.5679	2.3%	8	0.0014	-0.0040	0.0027	0.1897	0.674642	-0.1%
Finland	11.96%	0.0728	34.2682	1.9%	8	0.1826	-0.3483	0.4939	0.1589	0.700609	3.8%
Slovakia	49.89%	0.0308	16.0987	0.7%	8	0.1300	-0.2690	0.3306	0.0561	0.818654	35.5%
Cyprus	79.08%	-0.0123	16.0859	0.4%	8	0.0691	-0.1716	0.1470	0.0319	0.862719	2.8%

Source: own study.

ranged from 29.4% in Germany to 79.1% in Cyprus. Additionally, five countries had the largest proportion of expenditure allocated to wastewater management. Among these countries, Ireland spent the most (60.1%), while Sweden spent the least (38.4%). Belgium, Austria, and Finland had the highest pollution abatement spending. On the other hand, Denmark and Croatia allocated the most significant proportion of their expenditure to biodiversity and landscape protection and environmental protection N.E.C., respectively. In the second stage of the research procedure (Table 3), the efficiency of environmental protection expenditure by the general government was assessed in relation to spending on waste management (GF0501) and a measure of sustainable development (SDG_11_60). Due to incomplete time series, Bulgaria, Italy, Greece, Ireland, and Austria were excluded from the analysis.

Countries in which the relationship between GF0501 expenditure and the SDG_11_60 measure is positive, with a 95% confidence level, are the Netherlands, Luxembourg, France, EU27, Croatia, Czechia, Germany, Spain, Latvia, and Poland. It should be noted that in these countries, the GF0501 expenditure acts as a stimulant for the SDG_11_60 measure, as expected. The p-value for these countries was lower than the 5% significance level adopted in the research procedure, indicating that the positive slope value in these countries is statistically significant. At the same time, these indicated countries are the ones in which changes in GF0501 expenditure explain more than 50% of the changes in the SDG_11_60 measure. This suggests that the efficiency of GF0501 expenditure in implementing the concept of sustainable development is high. The coefficient of determination was 95.93% in the Netherlands, 91.74% in Luxembourg, 91.66% in France, 88.27% in EU27, 80.35% in Croatia, 72.54% in Czechia, 71.81% in Germany, 63.58% in Spain, 56.42% in Latvia,

and 51.51% in Poland. Among these countries, Spain has a relatively high share of GF0501 expenditure in total GF05 expenditure, while Croatia has a relatively low share. This allows us to conclude that relatively low spending can be effectively allocated. On average, during the period under consideration, the share of GF0501 expenditure in total GF05 expenditure was as follows: Spain (61.12%), Latvia (59.32%), France (50.86%), EU27 (43.97%), the Netherlands (41.73%), Czechia (31.48%), Germany (29.37%), Luxembourg (21.47%), Poland (19.64%), and Croatia (18.15%). For the entire group, this share averaged to 37.71%. Interestingly, the coefficient of determination in this group exceeded 90%, as illustrated for the Netherlands (Fig. 1), Luxembourg, and France. The efficiency of GF0501 expenditure in implementing the concept of sustainable development, as determined by the SDG_11_60 measure, can be considered exceptionally high. During the analyzed period, an increase in the SDG_11_60 measure was observed in all countries with a clearly positive relationship: Latvia (by 29.5%), Poland (by 28.3%), Czechia (by 20.1%), Croatia (by 16.7%), EU27 (by 8.7%), the Netherlands (by 8.4%), Luxembourg (by 7.9%), France (by 7.4%), Spain (by 6.9%), and Germany (by 5.9%). The countries that joined the EU after 2004 showed a higher level of improvement in the SDG_11_60 measure compared

to the EU27. The relatively low improvement of the SDG_11_60 measure in countries with exceptionally high determination coefficients should not be seen as negative, as these countries exhibited significantly higher determination levels at the beginning of the analyzed period.

In the remaining 13 countries, the linear regression slope is positive in six countries and negative in seven countries. It cannot be confirmed with 95% confidence whether it is positive or negative. The *p*-value for the remaining 13 countries was higher than the assumed 5% significance level. Therefore, the slope value in these countries should not be considered statistically significant. Consequently, it is impossible to unequivocally assess the efficiency of GF0501 expenditure in terms of improving the SDG_11_60 measure. Nevertheless, it is interesting to note that there are countries with a negative linear regression coefficient. This suggests that the expenditure does not contribute to improving the measure characterizing sustainable development. Negative linear regression coefficients were found for Romania, Sweden, Malta, Slovenia, Portugal, Belgium, and Cyprus. The share of GF0501 expenditure in total GF05 expenditure in the period under consideration was, on average, as follows in these countries: Cyprus (79.08%), Malta (51.08%), Romania (45.49%), Portugal (36.78%), Belgium
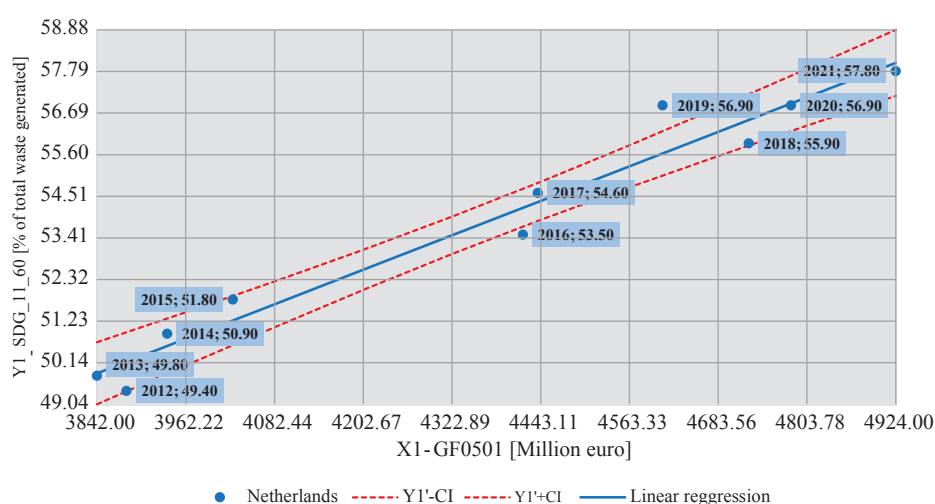

Fig. 1. Linear relationship between GF0501 expenditure and SDG_11_60 measure – Netherlands in 2012–2021
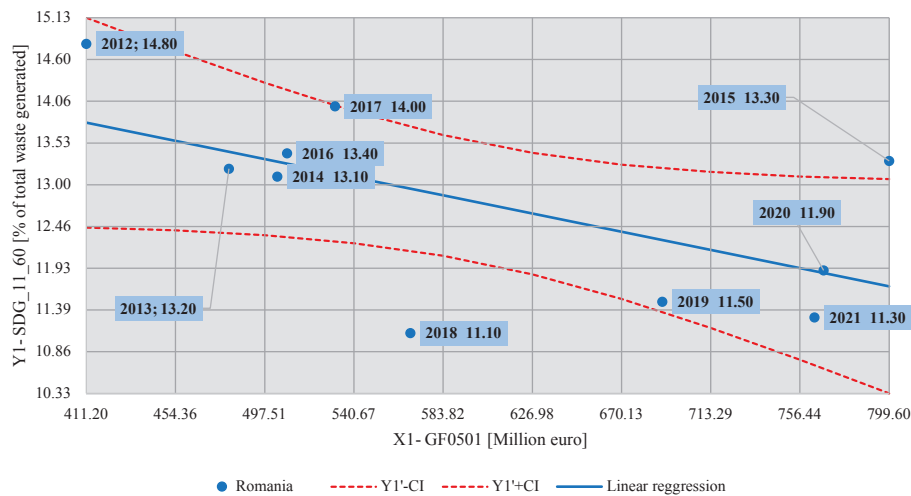Source: own study.

Fig. 2. Linear relationship between GF0501 expenditure and SDG_11_60 measure – Romania in 2012–2021
Source: own study.

(29.44%), Sweden (26.37%), and Slovenia (11.70%). It should be noted that these percentages vary greatly. Moreover, among the countries with a negative coefficient, some have a very high share of GF0501 expenditure in the overall spending structure. Within this group, special attention should be given to Romania, as the *p*-value of 0.063118 is close to the significance level adopted in the research procedure (Fig. 2).

Although the observed relationship is not statistically significant, the graphical assessment indicates that the measure has deteriorated. Therefore, it can be presumed that the GF0501 expenditure is ineffective. With nearly double the expenditure of GF0501, there is a noticeable decline in the SDG_11_60 measure.

DISCUSSION

Previous studies have included an analysis of the amount of expenditure on environmental protection [Bobáková and Mihaliková 2019, Dziawgo 2022] and the structure of expenditure on environmental protection based on spending purposes [Bobáková and Mihaliková 2019, Sobczak 2021, Dziawgo 2022]. However, their geographical and temporal scope was fragmented. This article covers all European Union countries over a relatively long period (2012–2021), which allows for formulating conclusions regarding

the policy of spending public funds for environmental purposes in individual member states.

The concept of sustainable development and the financing of environmental protection are widely discussed issues in the literature. However, the efficiency of environmental protection activities, including waste management, has remained a niche topic. Monitoring progress is a necessary step in implementing the concept of sustainable development correctly. Sustainable development often has a non-financial dimension in social or economic policy, which makes progress monitoring challenging. As a result, numerous studies have focused on the selection of indicators in sustainable development management [Balas and Molenda 2016, Szyja and Michalak 2023].

Tasks in this area require both time and financial resources, which raises the question of their efficiency. Efficiency is understood in two ways in the literature. First, efficiency, as the efficacy of action, means that its result aligns with the intended goal. Second, efficiency expresses the relationship between the achieved goal (result) and the expenditure incurred to achieve it [Penc 1997]. Previous studies indicate that an increase in expenditure on environmental protection does not necessarily lead to a proportional increase in efficiency [Barrell et al. 2021, Mihaliková et al. 2022]. This study is part of the research on the efficiency of expenditure

on environmental protection [Ercolano and Romano 2018, Barrell et al. 2021, Sobczak 2021]. The research conducted by the authors builds upon previous studies on the efficiency of expenditure on environmental protection in waste management, specifically in the context of sustainable development goals [Mihaliková et al. 2022]. The study by Mihaliková et al. [2022] utilized data for the entire European Union, treating both the EU as a whole and individual member states as subjects of research. Their research confirmed the effectiveness of funds spent on waste management in the European Union by examining the relationship between public spending and the recycling rate of municipal waste, as well as energy recovery of communal waste [Mihaliková et al. 2022]. In this research procedure, the recycling rate of municipal waste was used as a common measure. The efficiency of spending funds was confirmed for both the European Union and individual member states. The use of the recycling rate of municipal waste as a measure confirmed the efficiency of waste management expenditure for the entire European Union, although not for all member states.

CONCLUSIONS

The concept of sustainable development and broadly understood environmental protection is a priority of European Union policy. Economic incentives, including fiscal incentives, are important factors in achieving sustainable development goals. The need to spend on environmental protection is constantly increasing and is mainly driven by the need to balance economic development with environmental care. When assessing expenditure on environmental protection, European Union countries should consider the expected environmental effects. Firstly, waste management expenditure dominates the structure of environmental protection expenditure for most countries. Secondly, an analysis of the efficiency of environmental protection expenditure in waste management confirms its efficiency, specifically in terms of the recycling rate of municipal waste. The efficiency of expenditure was verified using the SDG_11_60 measure in the Netherlands, Luxembourg, France, EU27, Croatia, Czechia, Germany, Spain, Latvia, and Poland. The hypothesis that higher government expenditure on environmental protection leads to more efficient waste management has been confirmed for these countries. However, in other countries, it is not possible to unequivocally assess the efficiency of GF0501 expenditure in improving SDG_11_60, and the hypothesis cannot be confirmed. It is worth noting that Romania deserves special attention as a negative relationship was observed, indicating that an increase in GF0501 expenditure would decrease the value of the measures, which is contrary to logic. Thirdly, conducting research on the efficiency of environmental protection expenditure is essential, not only in the field of waste management but also in other areas. However, the quality of the measures poses an obstacle to such studies. Analyzing the efficiency of spending public funds in a sustainable context requires complete and consistent data at annual intervals. The limitation lies in the availability and number of samples. Some SDGs are collected yearly while others are collected every two years, and this inconsistency hinders a deeper analysis of general spending efficiency. Fourthly, an alternative solution would be to use a method that allows for simultaneous consideration of multiple measures in assessing the efficiency of environmental protection expenditure of general government.

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EFEKTYWNOŚĆ WYDATKÓW SEKTORA INSTYTUCJI RZĄDOWYCH I SAMORZĄDOWYCH NA OCHRONĘ ŚRODOWISKA W PAŃSTWACH UNII EUROPEJSKIEJ W KONTEKŚCIE ZRÓWNOWAŻONEGO ROZWOJU

STRESZCZENIE

Cel: Dążenie do zrównoważonego rozwoju uzasadnia ponoszenie wydatków w zakresie ochrony środowiska naturalnego, bowiem aktywna polityka fiskalna państwa jest istotną determinantą osiągania celów zrównoważonego rozwoju. Dystrybucja środków publicznych powinna zależeć od efektywności ich wykorzystania. Celem postępowania badawczego jest: (1) analiza struktury wydatków sektora instytucji rządowych i samorządowych na ochronę środowiska w Unii Europejskiej i w poszczególnych państwach członkowskich; (2) ocena efektywności wydatków sektora instytucji rządowych i samorządowych na ochronę środowiska w realizacji celów zrównoważonego rozwoju w zakresie gospodarowania odpadami. **Metody:** W badaniu wykorzystano regresję liniową z granicami ufności regresji. Do oceny skuteczności wydatków wykorzystano wskaźnik poziomu recyklingu odpadów komunalnych (SDG_11_60). **Wyniki:** Struktura wydatków publicznych na ochronę środowiska w większości krajów członkowskich w latach 2012–2021 była stabilna, co może wynikać z przyjętych krajowych polityk środowiskowych lub uwarunkowań wewnętrznych danego kraju. W największej liczbie państw w strukturze wydatków sektora instytucji rządowych i samorządowych na ochronę środowiska dominują wydatki w zakresie gospodarowania odpadami. Analiza efektywności wydatków sektora instytucji rządowych i samorządowych na ochronę środowiska w gospodarce odpadami potwierdziła ich efektywność w znacznej liczbie państw. **Podsumowanie:** Postępowanie badawcze wskazało, że można potwierdzić zależność pozytywną pomiędzy wydatkami a osiąganiem celów zrównoważonego rozwoju. Niestety, istnieje problem spójności danych dotyczących różnych wskaźników mierzących zrównoważony rozwój, przez co rozszerzenie postępowania badawczego do przypadku wielowymiarowego jest utrudnione.

Słowa kluczowe: wydatki na ochronę środowiska, mierniki zrównoważonego rozwoju, cele zrównoważonego rozwoju, efektywność, gospodarowanie odpadami