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Participation of environmental taxes in government expenditures for environmental protection: the case of selected EU countries

Učešće ekoloških poreza u državnim izdacima za zaštitu životne sredine: slučaj izabranih zemalja EU

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Abstract

The aim of this paper is to show whether the current system of environmental taxation and environmental policies of the states is efficient for solving environmental problems. We analyze the link between environmental tax revenues and total government expenditure as independent variables and government expenditures for environmental protection as dependent variable in selected EU countries. By the implementation of panel data regression analysis on a defined sample, we came to the conclusion that among the observed variables there is a positive relationship. However, this relationship shows that the growth of expenditures for environmental protection is slower than the growth of total expenditure. The results also suggest that the relationship between revenues from environmental taxes and expenditures of the state in the area of environmental protection is a little weaker. With respect to the result of analysis, it can be concluded that the existing state policy in is not sufficiently effective.
Keywords**:** *environmental taxes, the environment, government spending, ecological tax reform, earnmarked revenues.*

Sažetak

Cilj ovog rada je da pokaže da li je postojeći sistem ekološkog oporezivanja i ekološke politike država efikasan za rešavanje ekoloških problema. U radu se analizira veza između prihoda od ekoloških poreza i ukupnih državnih rashoda kao nezavisnih varijabli i državnih rashoda za zaštitu životne sredine kao zavisne varijable u odabranim zemljama EU. Implementacijom regresione analize panel podataka na definisanom uzorku, došli smo do zaključka da među posmatranim varijablama postoji pozitivna veza. Međutim, ovaj odnos pokazuje da je rast izdataka za zaštitu životne sredine sporiji od rasta ukupnih rashoda. Rezultati takođe govore da je odnos između prihoda od ekoloških taksi i rashoda države u oblasti zaštite životne sredine nešto slabiji. S obzirom na rezultat analize, može se zaključiti da postojeća državna politika nije dovoljno efikasna.
Ključne reči*: ekološki porezi, životna sredina, državna potrošnja, reforma ekološkog poreza, namenski prihodi.*

1. Introduction

From the moment a sustainable development has become a key component of the development strategy of almost all countries of the world, care for healthy human environment was getting more and more important. Ambumozhi et al. (2015) note that over time, the role of individual instruments in the field of environmental protection has been changed. Command and control instruments, which had a dominant role for many years, proved to be inefficient of solving the accumulated environmental problems, which led, since the seventies, to the increasing use of instruments that are based on the market – environmental taxes, environmental charges, permits for pollution etc.

The tax system, in addition to providing the means to supply users with public goods and meet their public needs (Leach, 2004; Pirvu, 2010; Schratzenstaller, 2014), can also make a significant contribution to the protection

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of public goods. The introduction of environmental taxes on those goods that lead to environmental degradation reduces their production and consumption, making natural resources more rationally used. (Stojanović & Đorđević, 2017; Babić, 2012; Glachant, 2002) Environmental taxes or environmental pollution taxes are levies paid by environmental polluters or paid on goods whose use pollutes the environment. Such taxes are introduced in order to reduce the occurrence of external effects, such as pollution, and are called corrective or Pigu taxes. Environmenal taxes provide revenues for the state, but also help to connect private incentives and social benefits, which leads to improved overall efficiency of the economy (Stiglic, 2004: 736-738).

Miceikiene et al. (2016) argue that environmental taxes play an important role in countries that have implemented environmental tax reforms. Nerudova and Dobrancshi (2015) emphasized that the collected revenues from environmental taxes through revenue-neutral reform enabled resolving the problem of unemployment. According to OECD (2015) there is a tendency of growth of sum of these revenues from year to year. This gives governments the opportunity to allocate more resources in the field of environmental protection. Also, the tendency of growth of earmarked revenues in the group of environmental taxes enabled these allocations to be higher.

The basic motive of this paper is to show, through econometric analysis which includes 11 EU member states, the connection between government expenditures for environmental protection as a dependent variable and revenues from environmental taxes and total government expenditure as independent variables.

Given that the total government expenditure on environmental protection very much depends of the earmarked revenue in the group of environmental taxes, as well as from the policy of the government, identified links will show how countries that are the subject of the analysis really give importance to the realization of the objectives of the green dividend. The green dividend is a benefit provided by environmental taxation. It refers to changing the behavior of economic entities, in the sense of making their behavior environmentally friendly. (OECD,2011; OECD, 2012)

In addition, the results of analysis which is to be conducted will give us insight whether within countries observed authorities truly gives a lot of importance to environmental policy. If a coefficient closer to 1 are obtained, it could be concluded that the growth trend of environmental protection expenditures is in line with the growth trend of environmental tax revenues and total government expenditures. A relatively higher coefficient indicates that environmental taxation in the observed countries ensures the realization of the green dividend. (Stojanović, 2016; Agung, 2009).

Although the issue of environmental taxation is significantly represented in the literature, when it comes to the link between revenues from environmental taxes and total government expenditures and government expenditures for environmental protection, there is the adequate gap. The analysis of previous research on a similar topic and attitudes of researchers, as well as research that will be conducted in this paper will give the contribution to this issue and make a partial mitigation of the mentioned gap.

In their theoretical analysis of the environmental taxation Breet and Keen (2000) indicate that dedicated revenues from environmental taxes have great significance for the protection of the environment because this revenue prevents politicians to use them for other purposes except for their defined purposes. Earmarked environmental taxes are also proposed as a way of solving environmental problems by Dias-Soares (2011) and Tsai et. al (2016).

Ehrlich and Padam (2010) have analyzed the expenditures for environmental protection in Estonia. In their research based on the calculated values of the index numbers, they realize that in Estonia, based on data for the period 1995-2008 and the draft of budget for 2009, there was a decrease in expenditures for environmental protection at the local government level. On the other hand, the growth of these expenditures at the level of central government was significant. GDP and revenues from environmental taxes in the observed period had a tendency to increase. The growth of government expenditures, as the authors emphasize, are influenced by higher earmarked revenues from environmental taxes and availability of EU funds for environmental protection for the budget period 2007-2013.

Cadoret et al. (2020) empirically verified whether countries that used environmental taxes relatively more were also more engaged in environmental policies, or alternatively, that they used such taxes for general expenditures purposes. The autors have examined the EU-27 countries that have committed themselves to attain a set of individual targets of reduction of greenhouse gas emissions by 2020. They have found evidence of the combination of greater intensity in the use of environmental taxation, a fiscal instrument that usually benefits of a positive outlook by citizens and thus represents a less politically costly tax to levy. They also found a lack of correlation between environmental taxation and the pursuit of the environmental goal, clearly specified as the reduction of GHG emission.

Through a comparative analysis of revenues from environmental taxes and expenditures for environmental protection in developed countries and developing countries, Stojanović and Đorđević (2016) argue that developed countries take more care for protection of the environment and that the allocations for a given area are much higher.

Stojanović (2016) demonstrates through panel data analysis, by taking into account the EU countries which conducted an ecological tax reform, that environmental taxes had a positive effect on expenditure on environmental protection and on the reduction of unemployment for the period 1997-2008. Also

determined regression coefficient shows that there is a faster growth of revenues from environmental taxes compared to growth of expenditures in this field.

Blauvelt (2014), exploring a sample of 49 USA countries for the period 2000-2009, finds in 17 countries a high Pearsion correlation coefficient between total expenditures of the state and state expenditures for environmental protection, which is statistically representative. The author's analysis proves that the level of expenditures for environmental protection for given period had a major impact of total government spending, as well as of population (in 15 states), GDP (in 21 states) and share of GDP produced by the manufacturing and mining sectors (in 12 states).

Using correlation tests, Young et al. (2012) analyze the expenditures for environmental protection in Brazil during the period 2003-2010. Besides they argue that in Brazil there is a trend of reducing expenditures for these purposes at the federal level, but also the growth of expenditures at the state level. Furthermore, through the correlation analysis between the expenditures and Human Development Index (HDI), the autors found that the growth of expenditures for environmental protection had no negative impact on social and economic development, but rather positive.

The contribution of this paper in relation to the available literature is reflected in the fact that it clearly indicates whether the observed countries really give importance to environmental protection. That is, whether environmental taxation and environmental tax reform have been properly implemented, thus making recommendations to other countries where environmental taxation is underrepresented.

2. Materials and metods

2.1. Definition of dependent and independent variables and data source

With regards to conduct a panel data, regression analysis is defined a sample of 11 EU Member States (Germany, Finland, Denmark, Austria, the Netherlands, Slovenia, Estonia, Belgium, France, Italy and Sweden). The main criterion by which the countries have been selected for analysis was the increase of total government expenditures and government expenditures for environmental protection, as well as the availability of data to make the results of the analysis more reliable. (Stojanović, 2016; Tsai et al., 2016; Eurostat, 2021) The period from 2003 to 2016 was chosen because after this period, the European Union faced a migrant crisis, and then a pandemic of the coronavirus. These problems had an impact on the movement of all economic variables, so we left out the period after 2016. (Eurostat, 2021, Cadoret et al., 2020)

In accordance with the used econometric literature, defined countries pattern, as well as the analyzed time period it would be adequate to conduct a panel data regression analysis; this will be a base to make valuable conclusions (Agyng, 2009). Total state government expenditures for environmental protection will be used as a dependent variable in a given model. This variable is defined by international classification COFOG which was developed from its current version in 1999 by the OECD (Moe & Braathu, 2014). This classification is also used by the EU to present statistical data on government expenditure (IMF, 2014).

Independent variables in the model will be the revenues from environmental taxes and the total government expenditures. Revenues from environmental taxes which will be used in model as variable include revenues from all types of environmental taxes. Dedicted and non-dedicated revenues from environmental taxes are included in the given revenues data. Total government expenditures as a variable is defined in European system of accounts – ESA 2010 (European Commision, 2013). These data on expenditures include expenditures on all levels of government (Casey, 2014). All data for calculation are downloaded from Eurostat (access to data 28 September 2021) and expressed in millions of euros.

2.2. Definition of hypotheses and model

Analysis of defined data set by panel data regression analysis enables the analysis of structure and heterogeneity between the defined observation units, as well as an analysis of changes in the structure in the reporting period (Dragutinovic-Mitrovic, 2002).

By combining time series and interceptions of data increases the number of degrees of freedom increases and, therefore, strength of the conducted tests shows the same tendency (Agung, 2009). This allows us to test the following hypotheses:

1) *Growth of total government expenditure has a positive impact on the amount of funds that the government allocates in the field of environmental protection, but not strong enough for solving environmental problems*;
2) *The positive trend of revenues from environmental taxes has a positive impact on the allocation of resources in the field of environmental protection*.

The choice of panel data analysis in this research can be justified by a benefit listed by Hsiao (2003) and Klevmarken (1989):

- Controlling for individual heterogeneity – Panel data suggests that individuals (in this paper countries) are heterogeneous. Time-series and cross-section studies not controlling this heterogeneity, run the risk of obtaining biased results;
- Panel data analysis give more information, more variability, less collinearity among the variables, more degrees of freedom and more efficiency – unlike panel data analysis, time-series studies are plagued with multicolinearity;
- Panel data are able to study the dynamics of adjustment – cross-sectional distributions that look relatively stable hide a multitude of changes;

– Panel data are better capable to identify and measure effects – which are not detectable in pure cross-section or pure time-series data analysis…

In the literature, usually of the models are listed pooled model, the model with the fixed effect model and random effect model (Greene, 2002; Dragutinović-Mitrović, 2002). In order to conduct panel data regression analysis, firstly, it is necessary to make a decision about an appropriate model (Asteriou and Halll, 2016). For this purpose, some econometric tests have been conducted.

The first step in deciding which model is appropriate is F-test (Agung, 2009). This test provides an answer to the question whether the pooled model is appropriate for a given analysis (Newbold et al., 2010). The null hypothesis of this model is: $\alpha 1 = \alpha 2 = ... = \alpha N$, or constant members are homogeneous (Asteriou and Hall, 2007).

Given regression analysis was performed in 8 Eviews software package for pooled panel model, using the following formula (Aritenang, 2016):

$$y_{it} = \alpha + \beta_1 x_{it1} + \cdots + \beta_k x_{itk} + \varepsilon_{it} \quad (1)$$
$$i = 1,\ldots, N;\ t = 1,\ldots, T;\ k = 1,\ldots, K.$$

where: N - number of units of observation, T - period, K - value of k independent variable in i observation unit in the period t.

By calculating the logarithm and entering the defined variables in the model, the model can be shown by formula:

$$\ln ENV\_EXP_{it} = \alpha + ß_1 \ln ENV\_TAX_{it} + \ldots + ß_k \ln TOT\_EXP_{it} + Ɛ_{it} \quad (2)$$

where: lnENV_EXP - log of government expenditure on environmental protection, lnENV_TAX – log of revenues from environmental taxes and lnTOT_EXP - log of total government expenditure.

If the null hypothesis of the F-test is accepted, the pooled panel model is more appropriate in the given analysis than the model with fixed effects. Otherwise, the panel model with fixed effect can be a good option for the implementation of the analysis (Kennedy, 2008). As opposed to the pooled panel model in which the parameter α is constant for all observation units and in all periods, in the model with fixed effects α changes with each unit or observation, but this parametar is constant in time. Model with fixed effects can be represented in the following form (Aritenang, 2016):

$$y_{it} = \alpha_i + \beta_1 x_{it1} + \cdots + \beta_k x_{itk} + \varepsilon_{it} \quad (3)$$
$$i = 1,\ldots, N;\ t = 1,\ldots, T;\ k = 1,\ldots, K.$$

With the aim to determine whether the random effect model is appropriate for the given analysis we conduct Breusch-Pagan LM test. This test is based on the hypothesis that the variance of the member units is equal to zero. If this hypothesis is rejected, it can be concluded that there is a significant stochastic effect, i.e., the model with stochastic effects is more appropriate than a pooled model (Breusch & Pagan, 1980).
Model with stochastic effects can be represented using the following form (Allison, 2009):

$$y_{it} = \alpha + \beta_1 x_{it1} + \cdots + \beta_k x_{itk} + \varepsilon_{it} \quad (4)$$
$$i = 1,\ldots, N;\ t = 1,\ldots, T;\ k = 1,\ldots, K.$$

where: v_i – a random effect for each spatial unit i, α - a common member of a constant for all observation units.

If the F-test and Breusch-Pagan LM test show that the model with fixed effects and random effect model can be a good alternative, the final decision on the model that will be applied is made on the basis of Hausman test. Through this test we come to the answers about the adequacy of the model and its application presupposes making the following hypotheses (Asterious & Hall, 2016):
1) H0: Random effects model is adequate for analysis;
2) H1: Fixed effects model is adequate for analysis.

If the model with fixed effects is selected, then we should take into account the internal dimensions of data (differences within the same country in a given analysis), while the choice of random effect models means that we take into the account internal differences, and differences between individual subjects (Hsiao, 2003).
The implementation of all these tests will give an answer to the defined hypotheses and will enable us to come to the appropriate conclusions.

3. The results of the research

As it was defined in the methodology of the research, F-test was conducted first (Table 1). The obtained value of F statistic 703.3685 with a level of significance (p = 0.0000 <5%), leads to the conclusion that we reject the null hypothesis that the constant members are homogeneous, and accept the alternative hypothesis. In this way, it is concluded that the model with fixed effects in a given analysis can be a good alternative (Kennedy, 2008; Agung, 2009).

Table 1. Results of pooled model – F test

Dependent Variable: ln_ENV_EXP
Method: Panel Least Squares
Periods included: 14
Cross-sections included: 11
Total panel (unbalanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.037805	0.529439	-5.737782	0.0000
ln_ENV_TAX	0.535975	0.177876	3.013193	0.0030
ln_TOT_EXP	0.482578	0.172619	2.795628	0.0059

Source: Authors based on the conducted analysis

In table 2, the results of a panel analysis with a fixed effect are presented. These results show that with increasing of environmental taxes by 1%, expenditures for environmental protection are expected to increase by 0,36%. Also results indicate that changes in expenditure for environmental protection by 1 percentage, can be

explained with the change in total government expenditures by 0.90 percentage. But before we accept these results, we need to perform additional testing.

Table 2. Results of fixed effect testing

Dependent Variable: ln_ENV_EXP
Method: Panel Least Squares
Periods included: 14
Cross-sections included: 11
Total panel (unbalanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.470650	0.763545	-8.474486	0.0000
ln_ENV_TAX	0.365164	0.125420	2.911537	0.0042
ln_TOT_EXP	0.902261	0.133500	6.758533	0.0000
R-squared	0.794230			

Source: Authors based on the conducted analysis

On the basis of Table 3 results of Breusch - Pagan Lagrange multiplier (LM) test, we can see that the obtained value of probability p = 0.0000, which is less than 5% (0.0000 <0.05). For this reason, the null hypothesis is rejected and the alternative hypothesis is accepted, which suggests that in a given model there is a significant stochastic effect. This indicate that the model with random (stochastic) effects may be appropriate for a given analysis.

Table 3. Breusch – Pagan LM test

Lagrange multiplier (LM) test for panel data
Total panel observations: 150

Null (no rand. effect)	Cross-section	Period	Both
Alternative	One-sided	One-sided	
Breusch-Pagan	**824.5070**	5.605083	830.1121
	(0.0000)	(0.0179)	(0.0000)

Source: Authors based on the conducted analysis

By applying Hausman test, whose results are presented in the Table 4, the final decision was made that the random effect model is appropriate for a given analysis, because the p value of Chi - Sq statistics is greater than 5% (Asterious and Hall, 2016). This means that, in the model, the internal differences within observed subjects, as well as differences between the countries covered by the analysis, will be taken out.

Table 4. Hausman test

Correlated Random Effects - Hausman Test
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.930661	2	**0.0850**

Source: Authors based on the conducted analysis

On the basis of Table 5 which shows the results of the random effect model, it can be seen that the coefficient for LnENV_TAX has a positive sign (0.366876) and statistically is significant, given that the resulting of p value is less than 5% (p = 0.0000 <0.05).

This means that between the government expenditure for environmental protection and revenues from environmental taxes, there is a positive and statistically significant relationship (increasing in environmental taxes by 1%, expenditures for environmental protection are expected to increase by 0,36%). Taking into account the fact that solving of environmental problems is of crucial importance for the survival of humanity, the established connection between the observed variables shows us that a higher share of environmental taxes can significantly contribute to solving these problems and contribute to a higher quality of the environment and the lives of people in general.

Table 5. Results of random effect testing

Dependent Variable: ln_ENV_EXP
Method: Panel EGLS (Cross-section random effects)
Periods included: 14
Cross-sections included: 11
Total panel (unbalanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.678860	0.700194	-8.110412	0.0000
ln_ENV_TAX	**0.366876**	0.123869	2.961803	**0.0036**
ln_TOT_EXP	**0.836123**	0.129171	6.472982	**0.0000**
R-squared	**0.778052**			

Source: Authors based on the conducted analysis

When it comes to the relationship between expenditure on environmental protection by the government and total government expenditure, also a positive correlation can be noticed. As can be seen based on the Table 5 realized significance level is p = 0.0036 < 0.05. The obtained result shows that changes in total government expenditure by 1 percentage, can be explained with the change in environmental expenditures by 0.83 percentage. This means that changes in total government expenditures by 1% in relation to the the average of the total government expenditures, lead to a change in expenditures for environmental protection by 0.83% in relation to the average expenditure on environmental protection in the observed countries. So, this shows us that in the observed countries, the government attaches great importance to environmental issues, but that there are still some other issues ahead of environmental ones.

As we can see the growth trend of environmental protection expenditures is not in line with the growth trend of environmental tax revenues and total government expenditures. In order to ensure adequate environmental protection, this coefficient must be higher in the future.

R-squared of the given regression model is 77%, which suggests that a given model explains the relative change of government expenditures for environmental protection and that this model is adequate for prediction. Although the R-squared value is high, the variables in the regression model are realized appropriate level of significance, and it can be concluded that there is no reason for the presence of multicollinearity in any of the analyses or conclusions that are made in this paper.

4. Disscusion and recommendations for future research

According to obtained results in selected countries exist a strong link between government expenditure for environmental protection and total government expenditures, while the relationship with the revenues from environmental taxes is slightly lower; however, this

was expected given that the fiscal significant of those revenues from environmental taxes which are not earmarked is high. The global economic crisis also has had an impact on the results obtained, which had a negative impact on the flow of revenues from environmental taxes after 2008.

The largest part of revenues from environmental taxes is collected through taxes on energy. Almost the entire amount of this income has no dedicated character in the countries observed. In fact, one part of these revenues in the countries which implemented ecological tax reform, are used as the basis for the blaze taxation of labor, while the rest of the revenues is used to finance the usual state functions (Stojanović & Đorđević, 2016). A large number of researchers suggests that the demand for energy is not sufficiently elastic (Poltimae, 2014), and the impact of environmental taxes to lower energy consumption is not very strong. This means that the results in the field of environmental protection are relatively modest.

Many authors indicate great importance and efficiency of earmarked environmental taxes in solving environmental problems. (Tsai et al., 2016; Brett & Keen, 2000; Dias Soares, 2011) Taking into account the obtained research results, recommendations can be made that the share of these revenues in the total revenues from environmental taxes should be higher. To the importance of earmarked environmental taxes indicates the results of the practice in some countries. Swedish charge on nitrogen oxide emissions (Larsson, 2015), Svalbard ecological fee, congestion taxes in Stockholm and Gothenburg) are just a few examples of successful earmared environmental taxes.

Increasing the participation of earmarked revenues in total revenues from environmental taxes would enable the realization of a large number of environmental projects, which would certainly have a positive impact on increasing the quality of the environment. Also, in this way, taxpayers would have been clearly instructed in the way of using the funds that are collected on the basis of environmental taxation, which would cause less resistance for payment.

The link between total government expenditure and those for the protection of the environment is strong; however, taking into account the need for serious approach to solving environmental problems, it is necessary that this relationship be stronger in the future. This means that it is necessary that the participation of government expenditures for environmental protection in the total government expenditure should increase, because these expenditures have a positive impact on the environment, and, at the same time on the social and economic development (Young et al., 2012). The need for increase expenditures for environmental protection in addition to the established result of the analysis is confirmed by the fact that only in the field of housing and community amenities allocations from the state was lower than the allocations for environmental protection. For other purposes have been allocated more funds from the budget in the analyzed countries.

Thus, identified links between our observed variables suggest that, despite the fact that in the analyzed countries a healthy environment stands out as one of the main objectives of the economic policy makers` that this is not really the case. That conclusion is especially indicated by the fact that the total state expenditures have faster growth than government expenditure in the field of environmental protection. This points to the need that significant reforms in the context of environmental policy are necessary in the forthcoming period, with a view that sustainable development goals be realized. According to obtained results it can be concluded that the initial research hypothesis is proven. Consequently, appropriate recommendations for the policy of environmental taxation in the future have been proposed. Further research in the field of environmental taxation policy and expenditures for the environment are necessary. The aim of this researches should have an influence on creators of taxation and economic policy generally to perform greening of their tax systems and thereby contribute to the realization of the objective of preservation and improvement of the environment.

5. Conclusion

In order to be able to achieve environmental objectives within the strategy of sustainable development, it is necessary that government allocate significant resources to environmental protection. On the level of these allocations, revenues from environmental taxes levied by the state, primarily those earmarked, but also environmental and economic policy of the country, have a great influence.

This paper gives the possibility to observe links between government expenditures for environmental protection on the one hand and revenue from environmental taxes to total government expenditure on the other. Variables defined in the model mostly had a tendency to increase from year to year, resulting in a positive relationship between the variables, which contributed the defined hypothesis to be proven.

Based on the conducted analysis of panel data time series, we identified stronger link between government expenditures for environmental protection and the total government expenditure, in comparison to the link with the revenues from environmental taxes. It should also be borne in mind that, the global economic crisis, which affected the volatility of revenues from environmental taxes had an impact on the obtained results. Weaker strength regression links between expenditures for environmental protection and revenues from environmentally related taxes suggests that earmarked revenues in total revenues from environmental taxes are not sufficiently present, and it is necessary to change the given situation in the future. The importance of their participation is reflected in the way how they are used in the field of environmental protection and there is no political influence on spending of collected funds.

In the future it is necessary to increase the share of expenditures for environmental protection in the total government expenditures in order to realize the objectives of environmental police, given that the analysis in selected countries of European Union showed that there was slower growth in expenditure on environmental protection in relation to the growth of total government expenditures. Higher allocations for the environmental protection in the future are necessary in order to achieve the objectives of sustainable development.

There are still some limitations in this research. First, the results of this research may be vulnerable. As this study covers 11 EU member states, different results can be obtained if the area covered by the research changes or more extensive data is included. Secondly, in order to see an even clearer picture, special environmental taxes should be included in econometric research. However, in the official statistics, they are not shown as a separate item.

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