



Resource efficiency as a precondition for securing environmental sustainability by the Visegrad Countries

Efektívne využívanie zdrojov ako predpoklad na zabezpečenie environmentálnej udržateľnosti krajín Vyšehradskej skupiny

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Abstract:

Sustainable development constitutes one of the priorities of the European Union for both the 2nd decade of the 21st century and the one to come. Environmental sustainability requires much higher resource efficiency. The Visegrad Group countries which joined the EU in 2004 are obliged to meet the targets underlined in Europe 2020 Strategy. However, their past adversely affected their socio-economic development. The main aim of the article is to diagnose and evaluate the environmental performance in regard to resource efficiency in Poland, Czechia, Slovakia and Hungary against the background of the EU. The comparative analysis included the following elements: domestic material consumption per capita, greenhouse gas emissions per capita, share of renewable energy in gross final energy consumption, generation of waste excluding major, recycling rate of municipal waste, recycling rate of e-waste, eco-innovation index, as well as total environmental tax revenues as a share of total revenues from taxes and social contributions and environmental tax revenues as % GDP. The conducted research confirmed the hypothesis according to which the environmental performance of the Visegrad Group economies has not been sufficient, though some progress has been noted since 2010. The analysed countries ought to focus more on environmental aspects in order to achieve a higher level of sustainability of development, and in particular of resource efficiency.

Keywords: Resource efficiency, environmental sustainability, Visegrad Group, Unia Europejska.



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Abstrakt:

Trvalo udržateľný rozvoj je jednou z priorít Európskej únie v druhej dekáde 21. storočia a v nasledujúcom desaťročí. Na rozvoj trvalo udržateľného rozvoja v environmentálnom rozmere je potrebná väčšia efektívnosť využívania surovín. Krajiny Vyšehradskej skupiny, ktoré vstúpili do EÚ v roku 2004, sú povinné dosiahnuť ciele stanovené v stratégii Európa 2020. Ich minulosť však negatívne ovplyvnila príležitosti na sociálno-ekonomický rozvoj. Cieľom tohto článku je diagnostikovať a vyhodnotiť súčasné vykonávanie predpokladov pre efektívnejšie riadenie zdrojov Poľskom, Českou republikou, Maďarskom a Slovenskom na pozadí Európskej únie. Vykonaná porovnávacia analýza zahŕňala tieto prvky: domáca spotreba materiálov na obyvateľa, emisie skleníkových plynov na obyvateľa, podiel energie z obnoviteľných zdrojov na celkovej spotrebe energie, produkcia odpadu, recyklácia komunálneho odpadu, recyklácia elektrického a elektronického odpadu, index ekologických inovácií, podiel na celkovom príjme z environmentálnej dane na celkových daňových príjmoch a príspevkoch na sociálne zabezpečenie, ako aj podiel výnosov z environmentálnych daní na HDP. Vykonaný výskum naznačuje nízku environmentálnu efektívnosť krajín Vyšehradskej skupiny, napriek určitému pokroku zaznamenanému v období rokov 2010 - 2018. Na dosiahnutie trvalo udržateľného rozvoja, a najmä na väčšiu efektívnosť využívania zdrojov, je potrebné viac sa zamerať na environmentálne aspekty.

Kľúčové slová: Účinnosť riadenia zdrojov, trvalo udržateľný rozvoj, Vyšehradska skupina, Európska únia.

Introduction

Environmental sustainability constitutes an important dimension of sustainable development. The two remaining dimensions are social sustainability and economic one. Environmental sustainability is central to development. The need for sustainable growth and development has been stressed by the European Union, as well as the United Nations Organization, the Organization for Economic Cooperation and Development, the World Bank, the European Bank for Reconstruction and Development and other international institutions and organizations. In 1992 the United Nations Conference on Environment and Development adopted Rio Declaration on Environment and Development [20]. Ensuring environmental sustainability can be found among the eight Millennium Development Goals presented by the United Nations in 2000 as part of the United Nations Millennium Declaration [21]. The environmental dimension of sustainability was strengthened furthermore in The 2030 Agenda for Sustainable Development by the 2030 Sustainable Development Goals adopted in 2015 [22; 23]. The intention of the World Bank is to support capacity development and institutional strengthening for environmental sustainability [25; 26]. European Bank for Reconstruction and Development (EBRD) treats environmentally sound and sustainable development as a central point for its mandate. Therefore, environmental and social requirements are incorporated into the appraisal and implementation of all projects funded by EBRD [7]. The Organization for Economic Cooperation and Development (OECD) promotes sustainable development, also in its environmental dimension. In 2016 OECD adopted an Action Plan on the Sustainable Development goals [16]. Sustainable growth was included in Europe 2020 Strategy adopted in 2010 as its second priority [9; 18]. In 2019 the European Commission stressed the importance of reaching environmental sustainability in the Reflection Paper. Towards a Sustainable Europe by 2030 [11; 12].

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The Visegrad Group was formed in 1991; it consists of four countries, i.e. Poland, Czechia, Hungary and Slovakia. Since May 2004 they have been European Union Member States [19]. They belong to the United Nations Organization. Moreover, they are also members of the Organization for Economic Cooperation and Development, as well as the World Bank and shareholders of the European Bank for Reconstruction and Development. Therefore, they are obliged to promote sustainable development and increase environmental sustainability of economic growth.

Considering resource efficiency as a precondition for securing environmental sustainability, an attempt has been made in the article to diagnose and evaluate the position of the Visegrad Group countries in regard to resource efficiency. The analysis was conducted for the period 2010-2018 with the use of statistical data provided by EUROSTAT. The situation in Poland, Czechia, Slovakia, Hungary and the Visegrad Group was compared to the European Union as a whole.

1. Resource efficiency for environmental sustainability

Environmental pollution and resource scarcity became global problems in the second half of the 20th century due to an unprecedented pace of economic development which required enormous exploitation of raw materials and resulted in unbelievable worsening of the condition of natural environment. Currently environmental pollution and degradation is one of the most serious problems facing humanity. The concept of sustainable growth and development constitutes a valuable proposal [6]. Environmental sustainability is understood as responsible interaction with the environment in order to avoid degradation and / or depletion of natural resources and create conditions for long-term environmental quality. Environmental sustainability is about ensuring that the needs of today's population are met without jeopardizing the ability of future generations to meet their needs [5]. Environmental sustainability embraces a number of issues, in that: climate change, renewable energy, air and water pollution, raw materials scarcity, water management, soil erosion, waste generation, recycling of municipal waste and e-waste. Research and development activity and innovation activity should focus on the creation of environmental-friendly solutions; research and innovations should help create and introduce sustainable practices in order to maintain resilient societal, cultural and economic requirements [1]. Education of societies in the field of environmental-friendly behavior should be part of a response to the environmental crisis and environmental challenges: education increases awareness and concern for the environment [8]. Promotion of environmental sustainability by local, regional, national and international authorities, institutions and organizations is also important and necessary. „Reduce, reuse and recycle“ is a sort of environmental sustainability mantra; it is both simply and true: reducing waste, reusing items and recycling whatever can be recycled form the trio of responsible options [15]. Due to the fact, that currently environmental sustainability is no longer a choice, but a necessity, multidimensional, multi-level and multi-layered actions must be implemented [4; 14]. Resource efficiency in Visegrad Countries against the background of the European Union – comparative analysis

Increased material consumption is a barrier for sustainability of development [17]. Unfortunately excessive consumption is characteristic for the EU societies and it does lead to rising material consumption. Table 1. presents material consumption per

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capita in Poland, Czechia, Hungary and Slovakia, as well as the average for the Visegrad 4 and the European Union.

Material consumption increased in each of the analyzed economies. Domestic material consumption in Poland amounted to almost 17 tonnes per capita in 2010, while in 2018 it reached 20.4 tonnes per capita (increase of 3.4 tonnes per capita between 2010 and 2018). In the case of Czechia, domestic material consumption equaled 16 tonnes per capita in 2010 and it rose up to 16.3 tonnes in 2018. In 2010 domestic material consumption in Hungary was quite low – it amounted to 9.8 tonnes per capita. The next years, however, brought considerable increase of material consumption in this country, which resulted in almost 16.3 tonnes of domestic material consumption per capita in 2018 (increase of 5.6 tonnes per capita). Slovakia noted domestic material consumption amounting to 13.3 tonnes per capita in 2010 and as much as 14.6 tonnes per capita in 2018. Material consumption for the Visegrad 4 equaled 14 tonnes per capita in 2010 and 16.7 tonnes per capita in 2018 (it increased by 2.6 tonnes per capita from 2010 to 2018). At the same time material consumption in the EU remained quite stable: it amounted to 13.8 tonnes per capita both in 2010 and 2018. The problem of excessive and still rising domestic material consumption is more serious in the Visegrad 4 than for the EU as a whole. More decisive measures ought to be taken by the Visegrad 4, and this is particularly important for Poland and Czechia.

Tab. 1 Domestic material consumption per capita (tonnes per capita) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2018 change
Poland	16.950	16.931	17.695	18.758	20.365	+3.415
Czechia	16.022	15.853	15.609	15.664	16.276	+0.254
Hungary	9.842	12.699	12.193	13.069	15.415	+5.573
Slovakia	13.332	12.651	13.353	13.064	14.569	+1.237
Visegrad 4	14.037	14.534	14.713	15.139	16.656	+2.619
EU	13.797	13.176	13.097	13.402	13.843	+0.043

Sustainable development targets of the Europe 2020 Strategy include the reduction of greenhouse gas emissions. Carbon dioxide (CO₂) makes up the vast majority of greenhouse gas emissions. Additionally smaller amounts of methane (CH₄) and nitrous oxide (N₂O) are also emitted. Increased emission of greenhouse gases results in the increased heat in the atmosphere and finally leads to global warming. Greenhouse gases emission is strongly the burning of fossil fuels, such as coal, oil, and natural gas, to produce electricity. Moreover, deforestation also causes CO₂ release and agriculture (livestock manure) causes huge CH₄ emission [24]. Table 2. presents greenhouse gas emissions (tonnes of CO₂ equivalent per capita) in Poland, Czechia, Hungary and Slovakia, as well as the average for the Visegrad 4 and the European Union.

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Poland and Czechia are the two economies with the biggest problem of excessive greenhouse gas emissions. Greenhouse gas emissions in Czechia amounted to 13.5 tonnes of CO₂ equivalent per capita in 2010 and it stood on the level of 12.3-12.4 tonnes of CO₂ equivalent per capita till 2017 (some reduction was observed, but it was not sufficient at all). As far as Poland is concerned, greenhouse gas emissions equaled 10.9 tonnes of CO₂ equivalent per capita in 2010, was slightly reduced in 2015-2016, but in 2017 an increase up to 11.0 tonnes of CO₂ equivalent per capita was noted. Undoubtedly, increased greenhouse gas emissions per capita in Poland is against the EU recommendations. The situation in Slovakia and Hungary in regard to greenhouse gas emissions per capita was definitely much better. Greenhouse gas emissions in Slovakia amounted to 8.6 tonnes of CO₂ equivalent per capita in 2010 and it was reduced to less than 8 tonnes of CO₂ equivalent per capita in 2015, 2016 and to 8 tonnes of CO₂ equivalent per capita in 2017. In the case of Hungary greenhouse gas emissions amounted to 6.6 tonnes of CO₂ equivalent per capita both in 2010 and in 2017. In the analyzed period of time the average greenhouse gas emissions per capita for the Visegrad 4 was higher than for the EU. Moreover, the gap widened over time: from 0.1 percentage point in 2010 to 1.3 percentage point in 2017. Measures undertaken in the Visegrad 4 economies (especially in Poland and Czechia) were not satisfactory and should be strengthened in the near future.

Tab. 2 Greenhouse gas emissions per capita (Tonnes of CO₂ equivalent per capita) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2017 change
Poland	10.9	10.3	10.6	11.0	l.d.	+0.1
Czechia	13.5	12.3	12.4	12.3	l.d.	-1.2
Hungary	6.6	6.2	6.3	6.6	l.d.	0.0
Slovakia	8.6	7.7	7.8	8.0	l.d.	-0.6
Visegrad 4	9.9	9.1	9.3	9.5	l.d.	-0.4
EU	9.8	8.8	8.7	8.8	l.d.	-1.0

Increased use of renewable energy constitutes another important element in terms of resource efficiency and sustainability of development. Renewable energy is energy from sources which are naturally replenished on a human timescale, such as wind, water (tide and wave), sunlight, geothermal heat. Nonrenewable energy sources (i.e. coal, gas and oil) are available in limited amounts. Moreover, nonrenewable energy is considered dirty energy, due to the fact that obtaining and using nonrenewable energy sources endanger the environment and human health (water and air pollution, as well as global warming). It is believed that renewable energy can accelerate the transition towards a clean energy future [3]. Therefore the EU adopted the target regarding increased share of renewable energy in gross final energy consumption (as part of

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Europe 2020 Strategy). Share of renewable energy in gross final energy consumption in the analyzed economies from 2010 to 2017 is shown in table 3.

The Visegrad 4 was characterized by a much lower share of renewable energy in gross final energy consumption than the EU: in 2010 the share of renewable energy in gross final energy consumption in the Visegrad 4 amounted to 10.4%, while the EU average was almost 3 percentage points higher, i.e. 13.1%. In 2017 the gap between the Visegrad 4 and the EU average widened: it amounted to 4.9 percentage points, as the share of renewable energy in gross final energy consumption for the Visegrad 4 equaled 12.6% and the one for the EU – 17.5%. The analysis of the situation of individual economies forming the Visegrad Group showed considerable differences. The worst situation was observed in Poland. The share of renewable energy in gross final energy consumption in Poland amounted to 9.3% in 2010, and even though it exceeded 11.7% in 2015, the next years brought a downward tendency which resulted in the share of renewable energy in gross final energy consumption in Poland of 10.9% only in 2017. The best situation was noted in Czechia. Czechia managed to increase the share of renewable energy in gross final energy consumption from 10.5% in 2010 up to 14.8% in 2017. In the case of Slovakia, the share of renewable energy in gross final energy consumption equaled 9.1% in 2010, it was increased up to 12.8% in 2015, but the following years showed a downward tendency (similar as in Poland), and in 2017 the share of renewable energy in gross final energy consumption in Slovakia amounted to 11.5%. When it comes to Hungary, the share of renewable energy in gross final energy consumption rose from 12.7% in 2010 to 14.4% in 2015, but later it was reduced and in 2017 it amounted to 13.3%.

Tab. 3 Share of renewable energy in gross final energy consumption (%) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2017 change
Poland	9.253	11.743	11.267	10.903	l.d.	+1.650
Czechia	10.523	15.022	14.871	14.760	l.d.	+4.237
Hungary	12.742	14.427	14.268	13.335	l.d.	+0.593
Slovakia	9.108	12.875	12.034	11.490	l.d.	+2.382
Visegrad 4	10.407	13.517	13.110	12.622	l.d.	+2.215
EU	13.118	16.716	17.021	17.526	l.d.	+4.408

Wise and responsible resource management requires reduced generation of waste. Unfortunately, rising waste generation remains a problem in the Visegrad 4 and in the whole European Union. Hence, it can be seen as a barrier for sustainability of growth and development. Generation of waste (excluding major mineral waste) in Poland, Czechia, Hungary and Slovakia, the Visegrad 4 and the EU from 2010 to 2016 is presented in table 4.

The worst situation was noted in Poland. In 2010 generation of waste excluding mineral waste in Poland amounted to 1754 kg per capita and it increased over time up

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to 2090 kg per capita in 2016. In the case of Hungary the problem of waste generation was not so huge. In 2010 generation of waste excluding major mineral waste equaled 1156 kg per capita and it was reduced to 1119 kg per capita in 2016. When it comes to Czechia, generation of waste excluding major mineral waste amounted to 1182 kg per capita in 2010 and it increased a bit between 2010 and 2016 up to 1214kg per capita in 2016. As far as Slovakia is concerned, generation of waste excluding major mineral waste equaled 1230 kg per capita in 2010 and an upward tendency was observed in the analyzed period of time (in 2016 generation of waste excluding major mineral waste in Slovakia reached 1459 kg per capita). It should be stressed here, that the average generation of waste excluding major mineral waste in the Visegrad 4 was lower than the EU average (in 2010: 1331 kg per capita for the Visegrad 4 and 1713 kg per capita for the EU, in 2016: 1471 kg per capita in the Visegrad 4 and 1772 kg per capita for the EU). At the same time, however, it must be underlined that both the Visegrad 4 and the EU noted increased level of generation of waste excluding major mineral waste in the analyzed period of time.

Tab. 4 Generation of waste excluding major mineral waste (kg per capita) [13]

Economy	Year				
	2010	2012	2014	2016	2010/2016 change
Poland	1754	1857	1979	2090	+336
Czechia	1182	1197	1118	1214	+32
Hungary	1156	1136	1214	1119	-37
Slovakia	1230	1250	1166	1459	+229
Visegrad 4	1331	1360	1369	1471	+140
EU	1713	1716	1733	1772	+59

Due to such a huge problem of excessive waste generation, recycling is of great significance. Increased recycling can result in lower demand for new resources and, therefore, help achieve a more sustainable growth and development. Table 5. presents recycling rate of municipal waste in Poland, Czechia, Hungary and Slovakia, the Visegrad 4 and the European Union from 2010 to 2018. The indicator measures the share of recycled municipal waste in the total municipal waste generation. Recycling includes material recycling, composting and anaerobic digestion.

Tab. 5 Recycling rate of municipal waste (%) [13]

Economy	Year					2010/2018 change
	2010	2015	2016	2017	2018	
Poland	16.3	32.5	34.8	33.8	34.3	+18.0
Czechia	15.8	29.7	33.6	34.1	34.5	+18.7

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Hungary	19.6	32.2	34.7	35.0	37.4	+17.8
Slovakia	9.1	14.9	23.0	29.8	36.3	+27.2
Visegrad 4	15.2	27.3	31.5	33.2	35.6	+20.4
EU	38.3	44.7	46.0	46.2	47.0	+8.7

In 2010 recycling rate of municipal waste in the Visegrad Group countries was very low. It ranged from only 9.1% in Slovakia, through around 16% in Czechia and Poland, up to 19.6% in Hungary. Therefore the average recycling rate of municipal waste in the Visegrad 4 was much lower than the average for the EU: 15.2% and 38.3% respectively. All Visegrad 4 economies did undertake decisive steps in order to significantly increase rates of municipal waste recycling. Hence, the situation in 2018 looked much better. Recycling rate of municipal waste in Poland amounted to 34.3% (increase by 18 percentage points). In Czechia it also reached 34.5% (increase by 18.7 percentage points). When it comes to Hungary rate of municipal waste recycling equaled 37.4 (increase by 17.8 percentage points). In the case of Slovakia it reached 36.3% (increase by 27.2 percentage points). As a result of such considerable improvement, the gap between the Visegrad 4 and the EU average in terms of recycling rate of municipal waste was reduced from over 23 percentage points in 2010 to 11.4 percentage points in 2018.

Electrical and electronic equipment constitutes especially sensitive waste (e-waste). Hence, e-waste recycling is so important. Recycling rate of e-waste in Poland, Czechia, Hungary and Slovakia, the Visegrad 4 and the European Union is shown in Table 6. The indicator is calculated by multiplying the „collection rate“ as set out in the Waste Electrical and Electronic Equipment (WEEE) Directive (i.e. the volumes collected of WEEE in the reference year divided by the average quantity of electrical and electronic equipment (EEE) put on the market in the previous three years (both expressed in mass unit) with the „reuse and recycling rate“ set out in the WEEE Directive (i.e. the weight of the WEEE that enters the recycling/preparing for re-use facility divided by the weight of all separately collected WEEE (both in mass unit) in accordance with Article 11(2) of the WEEE Directive 2012/19/EU, considering that the total amount of collected WEEE is sent to treatment/recycling facilities.

Tab. 6 Recycling rate of e-waste (%) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2017 change
Poland	17.7	33.1	38.9	36.1	l.d.	+18.4
Czechia	22.7	37.9	46.1	46.5	l.d.	+23.8
Hungary	26.0	50.7	53.4	51.1	l.d.	+25.1
Slovakia	34.9	40.3	50.3	46.5	l.d.	+11.6
Visegrad 4	25.33	40.5	47.18	45.05	l.d.	+19.73

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EU	27.8	l.d.	l.d.	l.d.	l.d.	l.d.
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In 2010 recycling rate of e-waste in the Visegrad 4 was really low. It ranged from only 17.7% in Poland to 34.9% in Slovakia. In Czechia recycling rate of e-waste amounted to 22.7% and in Hungary it was 26% then. The situation was considerably improved between 2010 and 2017. In Poland recycling e-waste rate reached 36.1% (it increased by 18.4 percentage points). Both Czechia and Slovakia achieved recycling e-waste rate of 46.5% (increase by 23.8 percentage points and 11.6 percentage points respectively). The most significant improvement was noted in the case of Hungary; recycling rate of e-waste in Hungary reached 51.1% in 2017 (it increased by over 25 percentage points).

It is of vital importance to conduct research, development activity and innovation activity in order to rise resource efficiency and, finally, achieve sustainability of growth and development. European Commission strongly promotes the eco-innovation concept [10]. Table 7. presents eco-innovation index for Poland, Czechia, Hungary and Slovakia, the Visegrad 4 and the European Union from 2010 to 2018. The eco-innovation index is based on 16 sub-indices from eight contributors in five thematic areas, namely: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency outcomes and socio-economic outcomes. The overall score of an EU Member State is calculated by the unweighted mean of the 16 sub-indicators. It shows how well individual Member States perform in eco-innovation compared to the EU average, which is equated with 100 (index EU=100). The index complements other measurement approaches of innovativeness of EU countries and aims to promote a holistic view on economic, environmental and social performance [13].

Tab. 7 Eco-innovation index (EU=100) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2018 change
Poland	40	44	56	59	59	+19
Czechia	74	87	80	82	100	+26
Hungary	69	73	61	63	73	+4
Slovakia	43	61	79	74	68	+25
Visegrad 4	56.5	66.25	69	69.5	75	+18.5
EU	100	100	100	100	100	-

The analysis of eco-innovation indices for Poland, Czechia, Hungary and Slovakia, as well as for the Visegrad 4 confirmed the development gap between the studied economies and the EU core. In 2010 eco-innovation index for Poland amounted to 40, in the case of Slovakia it equaled 43, while for Hungary it was 69 and Czechia (eco-innovation leader among the Visegrad 4) noted eco-innovation index of

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74. The eco-innovation gap even for the EU average was really enormous (it ranged from 60 in the case of Poland to 26 in the case of Czechia, while the eco-innovation gap for the Visegrad 4 amounted to 44.5 then). Some positive tendency was observed for Poland, Czechia, Slovakia and (to a small extent) Hungary. In 2018 Poland noted eco-innovation index of 59 (increase by 19 in comparison to 2010). Czechia reached the EU average eco-innovation index (100) in 2018 (increase by 26). Slovakia increased its eco-innovation index up to 68 in 2018, i.e. by 25 (one should underline here, that eco-innovation index in Slovakia was the highest in 2016 when it amounted to 79). In the case of Hungary eco-innovation index rose by 4 between 2010 and 2018 (to 68). In 2018 the eco-innovation gap of the Visegrad 4 to the EU average amounted to 25 (eco-innovation index for the Visegrad 4 amounted to 75 in 2018). Hence, there is still the need for further promotion of eco-innovation activities in the Visegrad 4 countries, especially in Poland and Hungary, due to the fact that the eco-innovation gap is still huge for them both.

Resource efficiency can and ought to be promoted through wise, fair and responsible policy, including fiscal measures, like e.g. environmental taxation [2]. Two dimensions of environmental taxation can be listed here: the proportion of environmental tax revenues in total revenues from all taxes and social contributions and the proportion of environmental tax revenues in GDP. The first dimension evidences the different taxation splits in different economies between environment and other factors such as labour and capital, while the other one makes it possible to compare environmental taxation in different states taking into account the size of the different national economies. Total environmental tax revenues (as % of total revenues from taxes and social contributions) in Poland, Czechia, Hungary and Slovakia, as well as the Visegrad 4 average and the European Union from 2010 to 2018 is presented in table 8. Table 9 shows environmental tax revenues as % GDP in Poland, Czechia, Hungary, Slovakia, in the Visegrad 4 and in the EU from 2010 to 2018.

Tab. 8 Total environmental tax revenues (as % of total revenues from taxes and social contributions) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2018 change
Poland	8.68	8.18	8.13	7.86	7.72	-0.96
Czechia	6.99	6.09	6.07	5.86	6.00	-0.99
Hungary	7.36	6.46	6.56	6.52	6.25	-1.11
Slovakia	7.41	7.41	7.58	7.47	7.30	-0.11
Visegrad 4	7.61	7.04	7.09	6.93	6.82	-0.79
EU	6.39	6.35	6.33	6.18	6.12	-0.27

The highest share of total environmental tax revenues in total revenues from taxes and social contributions was noted in Poland 2010: it amounted to 8.68%. The successive reduction of this ratio was observed and in 2018 it equaled 7.72%. In the

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case of Slovakia total environmental tax revenues accounted for a bit over 7.4% in 2010 and was reduced to 7.3% in 2018. When it comes to Hungary, total environmental tax revenues amounted to 7.36% in 2010, while in 2018 it equaled 6.25%. As far as Czechia is concerned, total environmental tax revenues accounted for almost 7% in 2010 and in the next years covered by the analysis – 1 percentage point lower, i.e. 6%. It is worth mentioning here, that in each and every studied year, the share of total environmental tax in total revenues from taxes and social contributions in the Visegrad 4 was higher than the EU average: e.g. in 2010 in the Visegrad 4 it was over 7.6%, while in the EU – about 6.4%; in 2018 in the Visegrad 4 it was 6.8% and in the EU – 6.1%.

Tab. 9 Environmental tax revenues (% GDP) [13]

Economy	Year					
	2010	2015	2016	2017	2018	2010/2018 change
Poland	2.72	2.65	2.71	2.68	2.72	0.0
Czechia	2.28	2.07	2.11	2.07	2.17	-0.11
Hungary	2.73	2.52	2.59	2.50	2.35	-0.38
Slovakia	2.08	2.41	2.51	2.54	2.49	+0.41
Visegrad 4	2.45	2.41	2.48	2.45	2.43	-0.02
EU	2.38	2.44	2.45	2.41	2.40	+0.02

Environmental tax revenues in Poland accounted for about 2.7% GDP in the analyzed period of time (with no change between 2010 and 2018). In Hungary environmental tax revenues amounted to 2.73% GDP in 2010 and were gradually reduced to 2.35% GDP in 2018. In the case of Slovakia an upward tendency was observed, with environmental tax revenues amounting to 2.08% GDP in 2010 and rising up to about 2.5% GDP in 2016-2018. Czechia noted environmental tax revenues of 2.28% GDP in 2010 (maximum for the analyzed period of time), while in 2018 it was a bit less, i.e. 2.17% GDP. Average for the Visegrad 4 was similar to the EU average – it equaled around 2.4% GDP.

Conclusion

The last decades of the 20th century and the beginning of the 21st century have brought numerous global challenges. Decades of pollution and reckless consumerism brought us to the edge of a global crisis. The globalized world economy requires new strategy in order to use the full potential of growth and development. Sustainability in its environmental, economic and social dimension constitutes an important theme in current global scientific and political discourse. Sustainable development is a solution in terms of meeting human needs and having the environmental awareness integrated, achieving human development, social protection, a qualitative improvement of human life and simultaneously maintaining the natural and fragile

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balance of nature. Green transition, environmental protection and ethical production should be implemented altogether. Such a complex attitude should result in the achievement of structural changes in the globalized world economy.

The European Union has a role to play in the climate debate, as well as in terms of environmental-friendly regulations and investments. In 2010 the European Union introduced the Europe 2020 Strategy in order to promote smart, sustainable and inclusive growth. The second priority of the Strategy focused on environmental sustainability. Moreover, environmental sustainability remains an important element of the EU scenario for the 3rd decade of the 21st century, as well. The EU strategies do fall in line with recommendations of international organizations (including the United Nations, the World Bank, the Organization for Economic Cooperation and Development, the European Bank for Reconstruction and Development). The Visegrad Group countries, being members of the EU, the UN, the OECD, the World Bank, the EBRD ought to undertake actions in order to achieve higher environmental sustainability.

The conducted research, literature studies and comparative analysis confirmed the hypothesis according to which the environmental performance of the Visegrad Group economies has not been sufficient, though some progress has been noted between 2010 and 2018 in. The Visegrad Group countries ought to focus more on environmental aspects in order to achieve a higher level of environmental sustainability, and in particular of resource efficiency. Undoubtedly, the current situation in the Visegrad Group countries partly results from the inherited difficult environmental situation which could not be dramatically improved instantly. However, a real and true change of attitude in order to create conditions for a more responsible socio-economic development is a must. The areas of special concern include: rising waste generation, low share of renewable sources of energy, not sufficient recycling of municipal waste and e-waste. Undoubtedly, the future Multiannual Financial Framework of the EU adopted for the period 2021-2027, focusing even more on pro-environmental actions and activities could and should help achieve higher environmental standards by the studied economies. The wise use of EU funds will be important, but not enough. Stronger educational campaign in regard to the importance and significance of environmental sustainability seems to be another crucial element. Wiser use of the environment by the Visegrad countries does require: reduced material consumption, reduced greenhouse gas emission, increased promotion of renewable energy sources, reduction of waste generation, increased recycling of municipal waste and e-waste.

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