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DIRECTIONS OF INVESTMENT IN ENVIRONMENTAL PROTECTION IN POLAND

Key words: investment directions, fixed assets, environmental protection, Poland

ABSTRACT. The main objective is the analysis of changes in the level of investment outlays incurred for fixed assets serving environmental protection in Poland by investment directions. The adopted time horizon is the period 2002-2018. The investment directions of implemented investment outlays directed to fixed assets in environmental protection were analyzed from a regional perspective, showing the average share of investment outlays by investment directions in voivodships and the average dynamics of changes. A positive effect was the increase in the value of total outlays directed to fixed assets serving environmental protection and within individual investment directions in the field of environmental protection. It has been shown that in the structure of environmental guidelines in Poland and its voivodships, the most financial resources were directed to wastewater management and water protection, atmospheric air and climate protection, as well as waste management. In Poland, after 2004, there was a clearly outlined upward trend taking into account the dynamics of the level of total investment in fixed assets for environmental protection. There was also a growing dynamic of changes in the structure of directions of investment outlays implemented for fixed assets in environmental protection in Poland and individual voivodships. The effect of this was an increase in the share of total investment expenditure incurred for environmental protection in relation to GDP and total expenditure in the national economy, as well as an increase in expenditure per capita.

INTRODUCTION

Currently, an inseparable element of conducting business activities of enterprises is taking actions limiting their negative impact on the natural environment, taking into account the scope of legal regulations concerning environmental protection, increasing ecological awareness of society and popularizing the idea of corporate social responsibility [Dyduch 2018]. The last decade has revealed an increase in research interest in corporate social responsibility and environmental responsibility [Qiu et al. 2016, Trumpp, Guenther 2017, Tapver 2019]. Poles are aware of how threatened the planet is. Therefore, they should change their habits to more environmentally friendly ones, otherwise even the best environmental regulations and programs may prove ineffective in the fight against garbage flooding and air pollution [Mokrzycka 2019]. Public expenditure on investments related to the environment in Poland is surprisingly low, around 0.4% of GDP, despite huge needs. The low result could have been influenced by a lower use of EU funds. The

leader for years when it comes to public environmental investments is the Netherlands, spending 1.3-1.5% of GDP [Cieślak-Wróblewska 2019].

European Union membership and the need to intensify ecological activities is necessary to implement Poland's international obligations. According to Ewa Mazur-Wierzbicka [2015] and Barbara Bujanowicz-Haraś [2009], this means it is important to bear appropriately high financial resources for actions that result from the need to fulfil the tasks and recommendations contained in the Accession Treaty of the European Union [TFEU 2016, art. 11, 191-193]. Union policy on the environment is based on the principles of prudence, prevention and removal of pollution at source, as well as the "polluter pays" principle. Environmental action programs form the framework for future actions in all environmental policy areas. They form part of horizontal strategies and are included in international environmental negotiations [EP 2020]. Today, the aspect of increases in local development by eco-investment is also important according to Dorota Burzyńska [2011]. Ecological projects create a friendly and favorable climate for the development of a given territory, while at the same time improving living conditions. According to the Central Statistical Office, capital expenditure on environmental protection does not include capital expenditure on intangible assets: "capital expenditure is financial or material expenditure, which aims to create new fixed assets or improve (reconstruction, expansion, reconstruction, adaptation or modernization) existing fixed assets, as well as expenditure on the so-called first equipment of the investment" [GUS 2017].

Environmental investment includes expenditure related to conservation activities and the participation of methods, technologies, processes, equipment or parts thereof, where the main objective is to collect, process, monitor, control, reduce, prevent or eliminate pollution and other environmental degradation processes that result from the activities of economic operators [EUROSTAT 2005]. This appropriation can be allocated to machinery, equipment, or buildings and land. The purpose of the investment is to create new fixed assets or modernize existing assets. According to the methodology of the European Economic Information Collection System for Environmental Protection (SERIEE)[1], to compare data concerning environmental protection, the International Standard Statistical Classification of Activities and Expenditure on Environmental Protection – CEPA 2000 [EUROSTAT 2020] is applied. It is used as a tool to define environmental protection and present research results around the world. The Central Statistical Office has presented data on expenditure on fixed assets for environmental protection and their material effects since 1999 in accordance with the Polish Statistical Classification for Activities and Equipment Related to Environmental Protection (introduced by the Regulation of the Council of Ministers of March 2, 1999 [Journal of Laws No. 25, item 218]). CEPA distinguishes nine areas of environmental protection [GUS 2018]: the protection of atmospheric air and climate, sewage and water protection, waste management, the protection and restoration of utility value of soils and the protection of ground and surface waters, the reduction of noise and vibration, biodiversity and landscape protection, the protection against ionizing radiation, research and development activities, and other environmental protection activities (mainly environmental administration and management, education, and training).

[1] SERIEE – European System for the Collection of Economic Information on the Environment.

MATERIAL AND RESEARCH METHODS

The research problem relates to expenditures by investment directions incurred for fixed assets in environmental protection in Poland. The main purpose of the article was to identify changes in the structure and dynamics of investment outlays directed at fixed assets serving environmental protection by directions of investing in Poland and voivodships. In the context of the problem regarding the directions of investments made in environmental protection, the following detailed research tasks have been formulated:

– review of investment directions in fixed assets serving environmental protection in Poland and its voivodships taking into account their structure in total expenditure incurred for environmental protection;
– analysis of the dynamics of changes in expenditure on fixed assets in environmental protection by investing directions in Poland and voivodships.

The objective was achieved by answering the following research questions:

1. Has the structure of investment outlays for fixed assets serving environmental protection according to investment directions in Poland changed after joining the European Union?
2. Has accession to the European Union influenced the pace of changes in the structure of investment directions, taking into account investment outlays for fixed assets serving environmental protection?

In the analysis of the structure of capital expenditure incurred by investment directions in environmental protection, investment expenditure incurred the following: the protection of atmospheric air and climate, wastewater management and water protection, waste management, the protection and restoration of usable value of soil and the protection of ground and surface water, noise and vibration reduction, the protection of biodiversity and landscape, and other environmental activities including radiation protection, and research and development activities.

The pace of changes in the level of investment in the scope of environmental protection was assessed on the basis of dynamics indicators in the analyzed period, assuming the base year as 100%. A single-base comparison was applied in the study to allow to determine the change in the value of the phenomenon in a given period in relation to a previously determined base period [Krzeczewski 2015, Bąk et al. 2019]. Analyzing total investment outlays for Poland, the level of expenditure per capita and the share of total capital expenditure incurred on environmental protection in investment in the national economy and the share of capital expenditure incurred by investment direction in total capital expenditure on environmental protection was also determined. In addition, the regional structure of expenditure on environmental protection was analyzed according to the directions of investment in voivodships. The adopted time horizon was the period 2002-2018. The Main Statistical Office's data and available literature on the subject were used in the work. The data was developed using the descriptive, comparative and analytical method and the results are shown in the charts and tables herein [Stachak 2013, Sagan 2016].

RESEARCH RESULTS

These considerations lead to environmental action aimed at restoring or maintaining a natural balance. This requires, on the one hand, the rational use of natural resources and, on the other hand, bearing the right financial expenditure. It is also worth noting that total environmental expenditure is the sum of capital expenditure on fixed assets to protect the environment and current costs [GUS 2011, Bujanowicz-Haraś 2009]. Investments, in this case, should be regarded as intended and the rational spending of cash capital into fixed assets, whose task is to obtain informed benefits. It is worth remembering that the usability of these investments is long-term. It also seems important to draw attention to the directions of investment in the field of environmental protection, which is why this problem has been addressed in the development. Before analyzing the structure of the directions carried out in the framework of the financial expenditure incurred for environmental sustainability, attention was given to total capital expenditure incurred for fixed assets in the protection of the environment in Poland. Figure 1 shows that the level of environmental expenditure is increasing each year. This situation has a beneficial effect on the environment. The positive effect of these changes is also the increase in investment per capita in Poland from PLN 132 in 2002 to PLN 271 in 2018. The highest amount per capita – PLN 394, was recorded in 2015 when expenditure on fixed assets for environmental protection also reached the highest level of dynamics. A similar, upward trend is shown by the share of total investment outlays incurred for fixed assets in GDP and in investment outlays in the national economy in Poland. According to Ewa Mazur-Wierzbicka [2015], estimates adopted at the beginning of the transition period indicate that 2.0% of

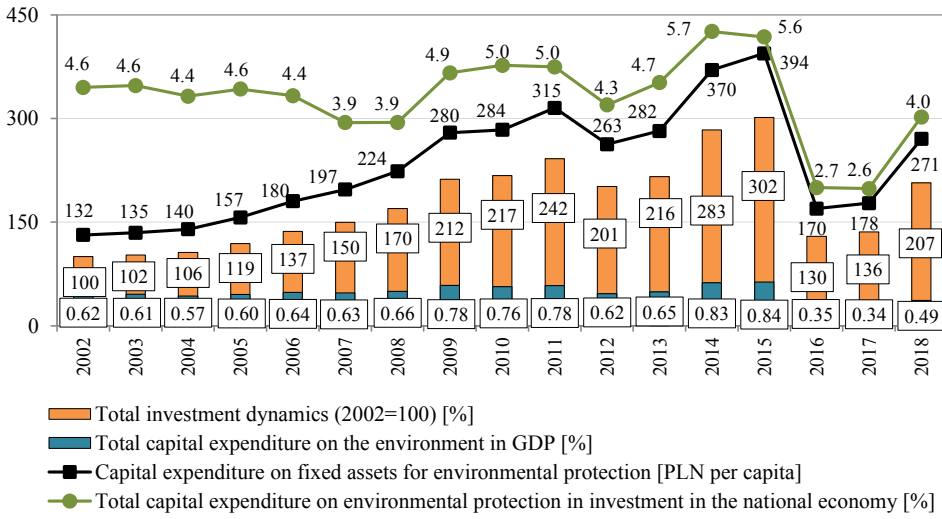

Figure 1. Total investment for environmental resources in Poland from 2002-2018
Source: own study based on Central Statistical Office (CSO) data [GUS 2002-2018]

GDP would be allocated in order to bring the environment to an EU level between 2001 and 2010, but for the next 10 years this should not be less than 1.5%. Calculations show that during the period being considered, the share of investment in GDP was, on average, 0.63%, with the highest value recorded in 2015 at 0.84%. Given these estimates, the level of environmental expenditure in Poland is still insufficient. In its study, a decrease in investment at that time was also observed by Małgorzata Kożuch [2018]. This was due to the completion and use of funds from the next stage of funding during the financial period 2007-2013 [GUS 2018].

In 2015, the value of environmental investment increased again, probably as a result of the completion of the investment from the perspective of 2007-2013 and the launch of the next funding program for the 2014-2020 financial period. This is not a settled period and should be considered further after the final results. However, the reduced dynamics of change in 2016 should not raise concerns as there is a significant increase in expenditure in 2018. Rather, this was the result of not-fully-invested funds from a new financial perspective. Figure 2 presents the regional structure of the average share of capital expenditure on fixed assets for the protection of the environment by voivodships in total capital expenditure incurred on environmental protection in Poland.

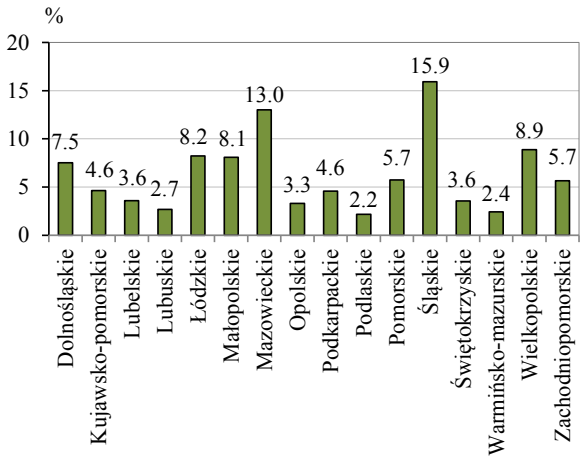

Figure 2. Regional structure of total capital expenditure on fixed assets for the protection of the environment in Poland by voivodships – average in 2002-2018

Source: own study based on CSO data [GUS 2002-2018]

Between 2002 and 2018, the highest average share of capital expenditure incurred on fixed assets for environmental protection – 16%, compared to the total incurred in Poland, was recorded in the Śląskie Voivodship. In second place, in the regional structure, with a share of 13%, was the Małopolskie Voivodship, then, with a 9% share, the Wielkopolskie Voivodship. In total, the lowest average share of investments incurred in environmental protection in Poland was seen in the Podlaskie (2.2%), the Warmińsko-mazurskie (2.4%) and the Lubuskie voivodships (2.7%).

The average share of total investment in fixed assets in environmental protection in relation to total investment in the national economy and in relation to GDP in Poland by voivodships is presented in Figure 3. The highest average share of investment in environmental protection in relation to GDP was recorded in the Opolskie and Świętokrzyskie voivodeships, at 0.95%, exceeding the value of the indicator for Poland by over 30%. The

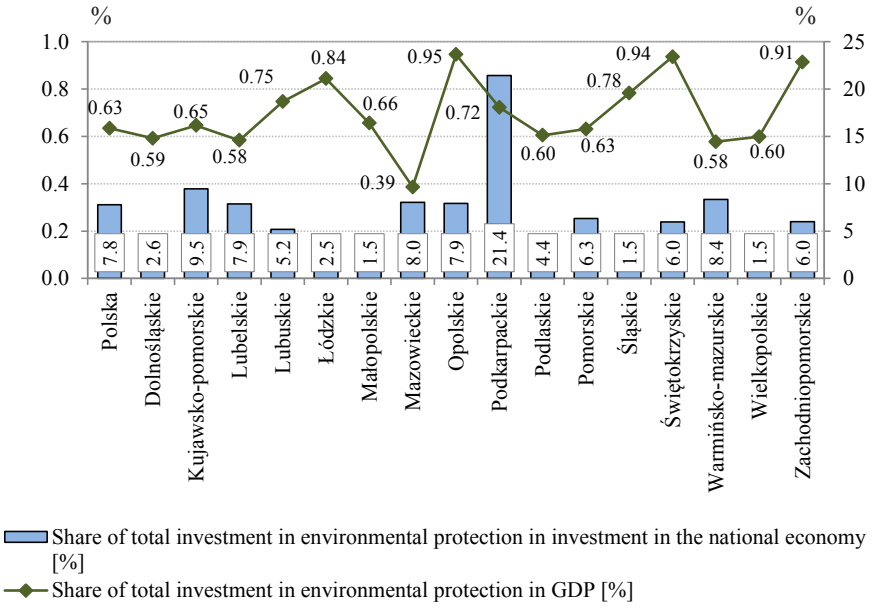

Figure 3. Total investment outlays on fixed assets in environmental protection in Poland by voivodships – average in the years 2002-2018

Source: own study based on CSO data [GUS 2002-2018]

lowest level of the indicator, at 0.39%, was obtained by the Mazowieckie Voivodship. By taking estimates of the level of this indicator at the beginning of the transformation period into account and defining its maintenance at a level not lower than 1.5% by 2020 to bring the state of the natural environment to the level of the European Union, it can be concluded that the level of investment expenditure in the field of environmental protection in Poland is not enough. Despite growing investment outlays, which is beneficial, the amount of financial resources for environmental protection should be increased, as much remains to be done in this area. When analyzing the capital expenditure incurred for fixed assets in environmental protection in individual voivodships in relation to total expenditure incurred in the national economy, we observe that the highest average indicator was recorded in the Podkarpackie Voivodship, at a level of 21%, exceeding the value for Poland over 2.5 times. On the other hand, the lowest level of the indicator, at 1.5%, was obtained by the Małopolskie, Śląskie and Podlaskie voivodships.

Capital expenditures incurred according to investment directions were also analyzed taking into account the level of investment incurred on fixed assets for environmental protection, specifying the share of the funds incurred in the voivodships for the investment direction in question, as a proportion total expenditure incurred in this direction in Poland.

The structure is represented in Table 1. Share of implemented investments by investment directions in total investment outlays in voivodships varied.

Table 1. The structure of investment outlays by investing directions incurred for fixed assets in environmental protection in voivodships – average in the years 2002-2018

Specification	Protection of ambient air and climate	Sewage management and water protection	Waste management	Protection and restoration of soil useful value, protection of groundwater and surface waters	Noise and vibration reduction	Protection of biodiversity and landscape	Other environmental protection activities
	%						
Poland	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Dolnośląskie	8.1	7.5	7.0	5.4	3.5	3.9	9.3
Kujawsko-pomorskie	3.0	4.7	7.3	6.5	1.8	1.5	5.2
Lubelskie	2.5	4.1	3.1	3.3	3.3	4.4	2.4
Lubuskie	3.1	2.7	1.3	2.0	2.4	5.6	2.4
Łódzkie	7.8	6.3	11.6	15.0	12.8	33.0	12.1
Małopolskie	7.4	8.5	7.4	8.7	9.2	5.3	8.4
Mazowieckie	17.2	12.8	9.5	12.4	22.0	9.7	9.2
Opolskie	3.7	3.4	2.7	2.7	2.4	1.1	3.3
Podkarpackie	2.6	5.7	4.2	8.9	6.3	1.5	2.3
Podlaskie	1.3	2.3	3.2	2.4	0.3	0.4	4.5
Pomorskie	5.7	5.8	7.3	4.1	3.4	7.3	2.8
Śląskie	17.5	14.7	12.4	10.5	24.7	7.8	26.4
Świętokrzyskie	5.9	3.2	2.3	1.8	1.1	0.3	2.3
Warmińsko-mazurskie	1.9	2.7	3.3	2.6	0.2	1.8	1.6
Wielkopolskie	5.7	10.8	10.0	5.2	5.4	6.3	4.0
Zachodniopomorskie	6.8	4.7	7.4	8.3	1.2	10.3	3.7

Source: own study based on CSO data [GUS 2002-2018]

Taking the average value of air and climate expenditure suffered in the time frame analyzed into account, more than 17% of the funds for this purpose were allocated in the Silesian and Mazowieckie Voivodships. This is probably due to the characteristics of these areas and the severity of phenomena requiring such actions. In other Polish voivodships, expenditure on this direction of investing in environmental protection ranged between 1% in the Podlaskie Voivodship to 8% in the Dolnośląskie Voivodship. The most funding was also allocated to wastewater management and water protection in the Silesian and Mazowieckie Voivodships, with approximately 15% and 13% of the total targeted for this purpose in Poland, respectively. The least investment – about 2% was in the Podlaskie Voivodship. The highest financial expenditure was on waste management, at 2.4%, and on reducing noise and vibration – 25%, seen in the Śląskie Voivodship. In the Lubuskie Voivodship, waste management expenditure was at least more than 1%, while the lowest amount was in the Podlaskie Voivodship – 0.3%. In the Łódzkie Voivodship, the most funding was allocated to protecting and restoring soil useful value, protecting groundwaters and surface waters – 15%, and protecting biodiversity and the landscape – 33%. The lowest expenditure on these categories was in the Świętokrzyskie Voivodship.

The proportion of the various lines of investments targeted at fixed assets for the protection of the environment in Poland in the following years is presented in Figure 4.

The data shows that in all years studied, three investment directions have dominated the structure of total investment for environmental protection. The most financial resources, more than 56%, were spent on wastewater management and water protection. Investment expenditures in the field of atmospheric air and climate protection with a share of about 30% came second, followed by expenditure on waste management, constituting about

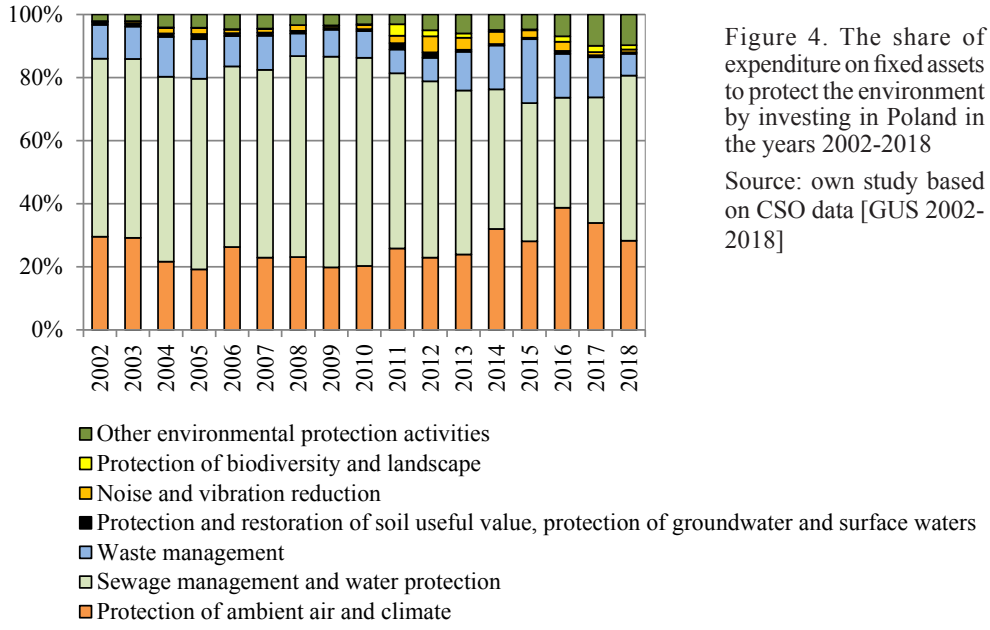

Figure 4. The share of expenditure on fixed assets to protect the environment by investing in Poland in the years 2002-2018

Source: own study based on CSO data [GUS 2002-2018]

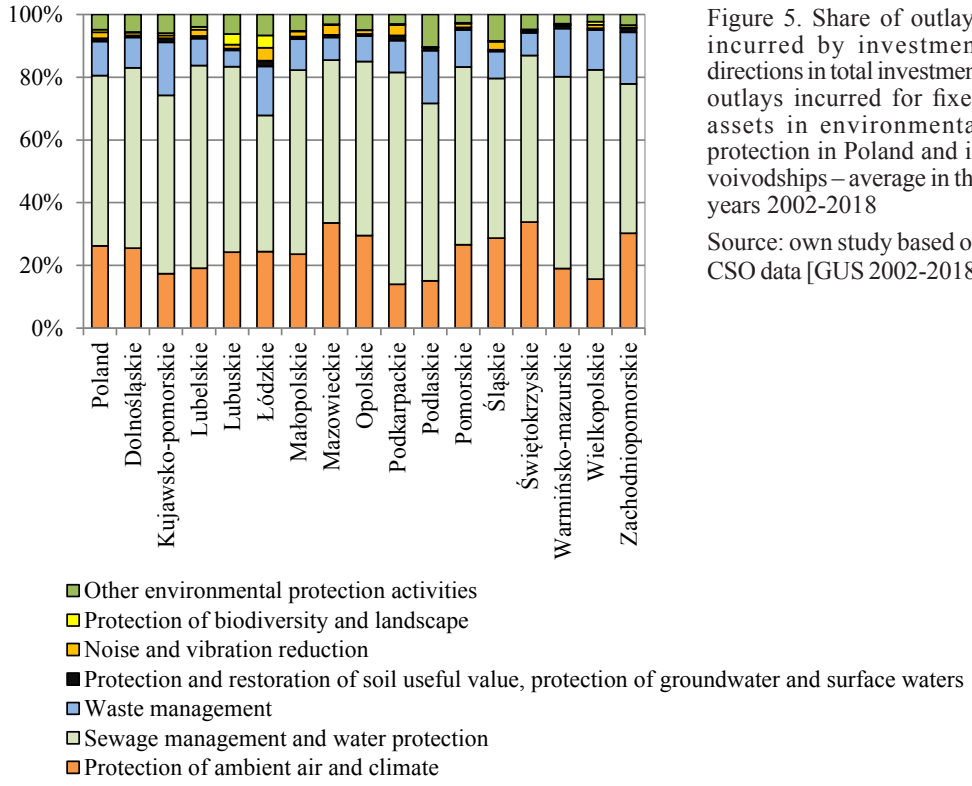

Figure 5. Share of outlays incurred by investment directions in total investment outlays incurred for fixed assets in environmental protection in Poland and in voivodships – average in the years 2002-2018

Source: own study based on CSO data [GUS 2002-2018]

11%. About 3% of total investment outlays incurred in Poland for environmental protection were realized for other activities related to environmental protection.

Analyzing the investment directions of expenditure incurred in environmental protection in individual voivodships in relation to total expenditure incurred in environmental protection, a similar tendency as in Poland is observed (Figure 5). The most financial resources for wastewater management and water protection in the years 2002-2018 were allocated by the Podkarpackie – 68%, Greater Poland – 67%, Lublin – 65% and Warmińsko-Mazurskie voivodships – 61% of total financial resources in the country. The least, 43% of funds at that time, were allocated for this purpose by the Łódzkie Voivodship.

On average, for the protection of atmospheric air and climate in the period from 2002 to 2018, most investments were carried out in the Świętokrzyskie – 34%, Mazowieckie – 33%, and West Pomerania voivodships, over 30% of total expenditure. The least investments were made by the Podkarpackie and Podlasie voivodships (14% and 15%). In the analyzed period, almost 17% was allocated to waste management in the Kuyavian-Pomeranian and Podlaskie voivodships and 16.5% in the West Pomorskie Voivodship, while the least, over 5% in the Lubelskie Voivodship.

The dynamics of changes in the direction of investments targeted at fixed assets for the protection of the environment in Poland and according to its voivodships, as the

Table 2. Dynamics of changes in outlays incurred for fixed assets in environmental protection by directions of investing in Poland and by voivodships – average in the years 2002-2018

Specification	Total investment	Protection of ambient air and climate	Sewage management and water protection	Waste management	Protection and restoration of soil useful value, protection of groundwater and surface waters	Noise and vibration reduction	Protection of biodiversity and landscape	Other environmental protection activities
	%							
Poland	178.2	160.7	170.4	185.4	228.9	824.1	1,961.5	408.9
Dolnośląskie	111.0	56.6	208.6	104.7	175.0	188.0	1,335.3	194.6
Kujawsko-pomorskie	157.4	185.3	133.4	227.2	216.9	1,761.1	186,109.3	236.0
Lubelskie	213.2	299.3	180.2	146.6	692.7	765.8	1,137.8	3,641.7
Lubuskie	97.8	50.4	187.6	97.6	147.9	701.7	8,063.0	1,092.4
Łódzkie	177.1	117.2	194.3	170.7	1,311.0	12,283.3	4,567.8	141.9
Małopolskie	220.5	239.7	193.2	244.6	78.8	1,103.4	40.2	462.8
Mazowieckie	189.7	231.8	150.8	479.4	241.5	563.9	918.6	485.6
Opolskie	235.3	305.4	195.4	250.2	124.2	213.5	658.5	657.5
Podkarpackie	168.3	168.8	146.6	199.1	271.1	3,492.9	6.4	16,461.2
Podlaskie	215.9	245.2	142.8	884.2	738.9	2,173.3	987.3	11,140.7
Pomorskie	188.4	322.4	138.5	280.3	287.2	1,688.9	63.6	659.6
Śląskie	207.0	230.6	201.5	96.6	133.2	540.3	243.6	708.8
Świętokrzyskie	316.6	711.7	206.2	251.8	290.8	584.2	1,189.2	3,080.9
Warmińsko-mazurskie	175.2	187.2	141.2	693.1	157.5	12,706.2	452.1	151.5
Wielkopolskie	162.1	251.2	146.6	143.3	104.9	4,494.4	1,143.1	328.4
Zachodniopomorskie	177.7	169.6	208.3	259.3	284.2	262.1	571.0	1,823.3

Source: own study based on CSO data [GUS 2002-2018]

average for the period 2002-2018, are presented in Table 2. The dynamics of changes in total capital expenditure on fixed assets for environmental protection in Poland have been positive. The level of expenditure during this time increased by an average of 78% over 2002 levels. We also see positive changes by analyzing every direction of environmental investment. Atmospheric and climate spending increased by 61% during this time, funding for wastewater management and water protection increased by more than 70%, and waste management by 85%. The highest increases in the time frame under consideration concerned the protection and restoration of soil usable value and groundwater and surface water protection (229%), noise and vibration reduction (825%), and biodiversity and landscape (1962%). Dynamics in financial expenditure on other environmental activities, including R&D activities, ionizing radiation protection, administration, environmental management, and education and training increased by an average of 409% during this time. The dynamics of changes in the level of capital expenditure on fixed assets for the protection of the environment in Poland suggest that in individual regions of the country, the level of these expenditures has also increased. The highest average dynamics of changes in environmental expenditure overall were recorded in the Świętokrzyskie Voivodship – 317%, where the most funding was directed towards the protection of atmospheric air and climate – about 712%. Negative dynamics of changes in total environmental expenditure were only recorded in the Lubuskie Voivodship, where there was an average of a more than 2% decrease in the level of expenditure for this purpose. In this voivodship, there was also an almost 50% decrease in atmospheric and climate protection expenditure. Expenditure on wastewater management and water protection increased the most in the Dolnośląskie Voivodship, on average by about 209%, and by the least in the Pomorskie Voivodship, more than 133%. Large differentiations and disparities in the level of changes during the analyzed time frame can be seen in waste management with most voivodships showing positive change dynamics, except for an approximate 3.5% decrease in the Śląskie Voivodship, whereas, it increased by 884% in the Podlaskie Voivodship. More than 1311% of increased investment in the protection and restoration of soil useful value, as well as the protection of groundwater and surface waters, was observed in the Łódzkie Voivodship but in the Małopolskie Voivodship investment decreased by about 21% in this regard. High positive dynamics of changes in all voivodships are evident in reducing noise and vibration, protecting biodiversity and landscape, and other environmental activities. In the Małopolskie, Podkarpackie and Pomorskie voivodships a negative dynamic of changes in the protection of biodiversity and landscape was noted.

CONCLUSIONS

After 2004, Poland saw an upward trend taking into account the dynamics of total capital expenditure on environmental protection. There are also growing dynamics of changes in the structure of direction of investment outlays targeted at fixed assets for environmental protection in Poland and its voivodships. This results in an increase in the share of environmental investment relative to GDP and total expenditure in the national economy, as well as an increase in expenditure per capita. The review of capital expenditure

incurred for fixed assets in environmental protection by investing directions in Poland and voivodships allowed to determine their structure and dynamics of changes in the analyzed period of time. Poland's accession to the European Union influenced the pace of change in the structure of all investment directions in investing funds in environmental protection. The increase in dynamics occurred with varying intensity within individual investment directions in voivodships. The highest dynamics of change have been observed in the protection of biodiversity and landscape and other environmentally related activities. Changes in the structure of the level of expenditure by investment directions have highlighted the trend of implementing investments in three directions. It has been shown that in the structure of implemented directions in the field of environmental protection in Poland and its voivodships, the most financial resources were directed towards sewage and water protection, the protection of atmospheric air and climate, and waste management. There were also visible changes in the structure of expenditure implemented within other investment directions in Poland and voivodships. Despite growing investment outlays incurred for environmental protection in Poland, we still have not reached the level of the European Union in this area. It can be stated that the level of investment outlays in the field of environmental protection in Poland is insufficient, and therefore the amount of financial resources for environmental protection should be increased, as much remains to be done.

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KIERUNKI INWESTOWANIA W OCHRONIE ŚRODOWISKA W POLSCE

Słowa kluczowe: kierunki inwestowania, środki trwałe, ochrona środowiska, Polska

ABSTRAKT

Celem głównym artykułu jest określenie struktury i dynamiki zmian poziomu nakładów inwestycyjnych, poniesionych na środki trwałe służące ochronie środowiska w Polsce, według kierunków inwestowania. Za okres badawczy przyjęto lata 2002-2018. Analizie poddano kierunki inwestowania realizowanych nakładów inwestycyjnych skierowanych na środki trwałe w ochronie środowiska w ujęciu regionalnym. Wykazano średni udział nakładów inwestycyjnych według kierunków inwestowania w województwach oraz średnią dynamikę tych zmian. Pozytywnym efektem był wzrost wartości nakładów ogółem skierowanych na środki trwałe służące ochronie środowiska oraz w ramach poszczególnych kierunków inwestowania w dziedzinie ochrony środowiska. Wykazano, że w strukturze realizowanych kierunków inwestowania w ochronie środowiska w Polsce i w województwach najwięcej środków finansowych skierowano na gospodarkę ściekową i ochronę wód, ochronę powietrza atmosferycznego i klimatu oraz gospodarkę odpadami. W Polsce po 2004 roku widoczny był trend wzrostowy dynamiki poziomu nakładów inwestycyjnych ogółem na środki trwałe w ochronie środowiska. Obserwowano również rosnącą dynamikę zmian w strukturze kierunków realizowanych nakładów inwestycyjnych na środki trwałe w ochronie środowiska w Polsce i poszczególnych województwach. Efektem tego był wzrost udziału nakładów inwestycyjnych ogółem poniesionych na ochronę środowiska w relacji do PKB oraz do nakładów ogółem w gospodarce narodowej, a także wzrost nakładów przypadających na 1 mieszkańca.

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