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Trends in Environmental Protection Expenditure in Poland

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Abstract: The paper presents trends in environmental protection expenditure in Poland in selected years – from 2005 to 2020. It examines the structure and dynamics of the expenditure. The study shows that households have the largest share in the total amount of environmental protection expenditure in Poland, followed by investment expenditure on fixed assets (a much smaller share) and current costs of environmental protection (the smallest share). It was found that environmental protection expenditure in Poland is growing but is subject to periodical multidirectional fluctuations as reflected by the polynomial trend lines and the corresponding equations. The study also presents that the total gross costs of environmental protection in Poland increased in the study period due to macroeconomic and microeconomic effects – mainly inflation and rising operating costs of companies. Only the costs of research and development decreased.

Keywords: expenditure; environmental protection; Poland

JEL Classification: P28; R41; Q53

1. Introduction

Environmental protection expenditure comprises investment expenditure (on fixed assets and other outlays), net current costs, and household expenditure on environmental protection, pollution reduction, and remediation of environmental damage. Environmental expenditure does not include expenditure whose main purpose is to satisfy other needs, such as profit growth, occupational health and safety, and improved production efficiency, despite the fact that they may have a beneficial effect on the environment (Ekonomiczne aspekty ochrony środowiska, 2021).

The Polish Environmental Protection Act in force defines the meaning of the term, "environmental protection". It states that environmental protection is any act or omission that makes it possible to maintain or restore the balance of nature. The examples of environmental protection measures are given below:

- Efficient environmental development and the management of environmental resources in accordance with the principle of sustainable development;
- Anti-pollution measures;
- Restoration of natural elements to their proper status (Act no. 62/2001 item 627).

Some researchers, including Ciechanowicz-McLean, emphasize that the development of environmental regulations takes place in two stages. The first stage is associated with a variety of environmental regulations while the second stage marks the emergence of new legal institutions, e.g., liability for environmental damage. Legal institutions interrelate and merge into a whole to form environmental law (Ciechanowicz-McLean, 2021).

According to the Environmental Protection Act, sustainable development is the social and economic development that integrates political, economic, and social activities while maintaining the balance of nature and sustainability of basic natural processes to ensure that basic needs of particular communities or citizens of both the present and future generations can be satisfied (Act no. 62/2001 item 627).

The issue of sustainability is widely discussed in the literature, including by researchers such as Becla, Borys, Czaja, Fiedor, Graczyk, Poskrobko, Poskrobko, and Zielińska (Becla et al., 2014; Czaja et al., 2002; Borys, 2005; Poskrobko & Poskrobko, 2012; Zielińska, 2013).

The aim of the study is to analyse the structure and dynamics of environmental protection expenditure in Poland and present factors that influence changes in environmental protection expenditure. The study covers the years between 2005 and 2020.

2. Methodology and Data Sources

The study applies desk research, including descriptive, analytical, and mathematical statistical methods (using Excel). The paper incorporates selected items from the literature, specialised studies, and data from general statistics published in the yearbooks "Economic Aspects of Environmental Protection" and "Environmental Protection". The usage of high degree polynomials is only for the purpose of approximating the development within a certain time by polynomial regression. The trend line curves are not intended to be used for prediction.

3. Structure and Dynamics of Environmental Expenditure

Households have the relatively largest share in environmental protection expenditure in Poland. In the period from 2005 to 2020, they accounted for 63.5% of total environmental protection expenditure on average. The share of investment expenditure (on fixed assets) incurred by the whole Polish economy (excluding households) is much smaller (21%) and the share of current costs of environmental protection is the smallest (15.6%) (Figure 1).

Environmental protection expenditure in Poland is growing. In the period from 2005 to 2020, the expenditure increased to PLN 75.6 billion (2-fold compared to 2015). However, it was subject to periodical multidirectional fluctuations as reflected in the polynomial trend line (Figure 2) and the corresponding equation below.

$$y = 0.168x6 - 4.4466x5 + 45.464x4 - 225.54x3 + 560.1x2 - 646.02x + 309.04; \quad R2 = 0.09855 \tag{1}$$

Households generated the relatively most dynamic increase in environmental protection expenditure (PLN 51.5 billion in 2020, almost 2.4-fold compared to 2005). Investment expenditure (on fixed assets), and current costs of environmental protection increased much less dynamically, i.e., to PLN 11.4 billion (1.9-fold) and to PLN 12.6 billion (1.3-fold), respectively (Figure 2).

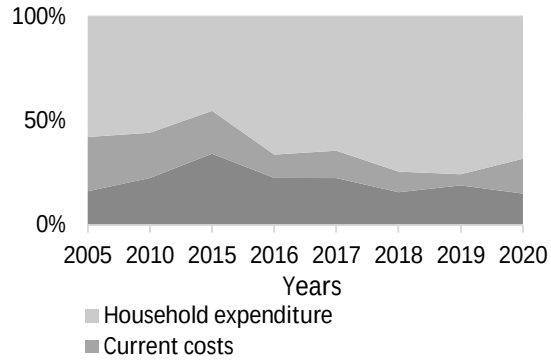

Figure 1. Structure of environmental protection expenditure in Poland in selected years – from 2005 to 2020 (%). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

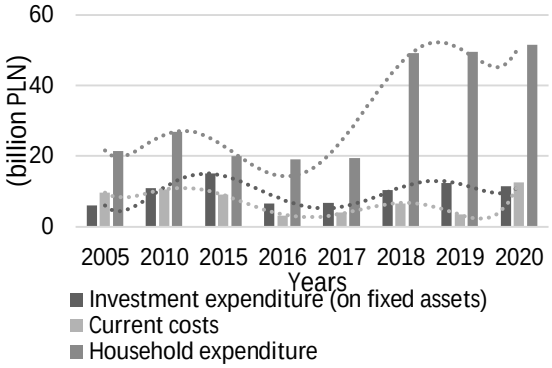

Figure 2. Environmental protection expenditure in Poland in selected years – from 2005 to 2020 (billion PLN). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

The periodic fluctuations that occurred for the studied values were the rationale for presenting the 6th degree polynomial trend lines due to the coefficient of determination (R2) reflecting a goodness of fit of the regression function to the empirical data (Ostasiewicz et al., 2006). The polynomial trend line equations in Poland for the period from 2005 to 2020 are following. (2) For household environmental protection expenditure, (3) for investment expenditure (on fixed assets) and (4) for current costs of environmental protection.

$$y = 0.0836x^6 - 2.1945x^5 + 22.139x^4 - 107.66x^3 + 261.07x^2 - 294.45x + 142.54; \quad (2)$$
$$R^2 = 0.9597$$

$$y = 0.0448x^6 - 1.2282x^5 + 13.078x^4 - 67.856x^3 + 176.11x^2 - 209.47x + 96.927; \quad (3)$$
$$R^2 = 0.9468$$

$$y = 0.0397x^6 - 1.0239x^5 + 10.247x^4 - 50.026x^3 + 122.91x^2 - 142.1x + 69.57; \quad (4)$$
$$R^2 = 0.9973$$

4. Household Environmental Protection Expenditure

Households are considered by analysts to be a specific group of ultimate consumers in environmental protection. On the one hand, they are buyers of environmental protection services, such as sewage disposal or domestic waste disposal. On the other hand, they are consumers of environment-related products specially designed to protect the environment, e.g., domestic wastewater treatment plants. Note that the household sector, unlike other sectors of the economy, does not differentiate between investment expenditure and current costs of environmental protection. Due the specific character of this sector, all outlays are taken jointly into account.

Household environmental protection expenditure includes the following expenses: (1) paid dues of households for environmental protection services, e.g., domestic sewage disposal); and (2) expenses related to the purchase, installation, and construction of equipment and products specially designed to protect the environment, e.g., domestic

wastewater treatment plants. This does not include expenditure whose main purpose is to meet other needs, not related to environmental protection, e.g., to meet the economic needs of households, even if it has a beneficial effect on the environment (Ekonomiczne aspekty ochrony środowiska, 2021).

The analysis of the data for selected years between 2005 and 2020 shows that expenditure on environment-related products have a slightly higher share of household environmental protection expenditure than expenditure on environmental protection services (54.4% and 45.6% per year on average, respectively) (Figure 3).

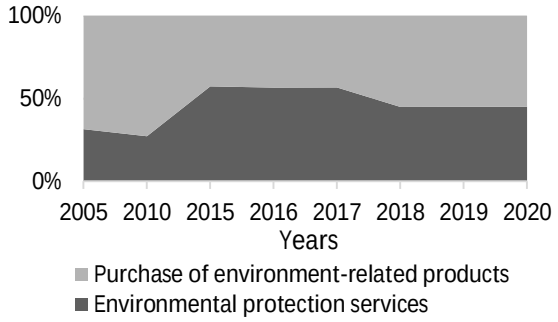

Figure 3. Structure of household environmental protection expenditure in Poland in selected years from 2005 to 2020 (%). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

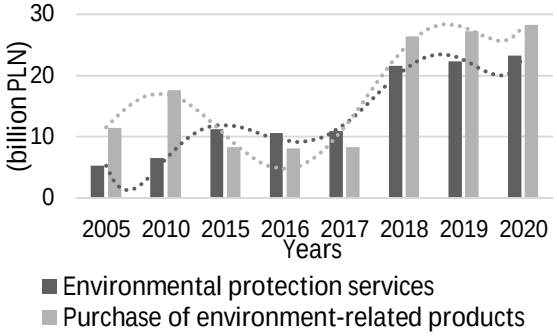

Figure 4. Household environmental protection expenditure in Poland in selected years – from 2005 to 2020 (billion PLN). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

Over the study period, there has been an increase in the household expenditure on both environmental protection services and on the purchase, installation, and construction of equipment and products specially designed to protect the environment (environment-related products) in Poland (Figure 4).

In the period from 2005 to 2020, expenditure on environmental protection services and expenditure on the purchase, installation, and construction of equipment and products specially designed to protect the environment (environment-related products) increased to PLN 23.2 billion and PLN 28.3 billion in 2020 (4.4-fold and 2.5-fold compared to 2005), respectively. However, it was subject to periodical multidirectional fluctuations as reflected in the polynomial trend lines (Figure 4) and the following corresponding equations. The polynomial trend line equations in Poland for the period from 2005 to 2020 are following. (5) For household expenditure on environmental protection services and (6) for household expenditure on the purchase of environment-related products.

$$y = 0.0498x^6 - 1.3618x^5 + 14.529x^4 - 76.294x^3 + 204.36x^2 - 256.87x + 120.91; \quad (5)$$

$$R^2 = 0.9894$$

$$y = 0.032x^6 - 0.7979x^5 + 7.3956x^4 - 31.097x^3 + 57.855x^2 - 38.756x + 16.962; \quad (6)$$

$$R^2 = 0.9478$$

In 2018, there was a sharp increase in this expenditure, as compared to the previous year. Household expenditure on environmental protection services increased almost 2-fold (to PLN 21.6 billion) while expenditure on the purchase of environment-related products grew

even more dynamically, 3.2-fold (to PLN 26.4 billion). The changes in household expenditure on environmental protection services are due to an increase in the prices of drinking water supply, domestic sewage discharge, and municipal waste collection (Ceny w gospodarce narodowej, 2006–2020). The increase in expenditure on the purchase of environment-related products coincide with Polish air protection programmes, including municipal programmes, such as Clean Air (a nationwide programme) and Kawka Plus (a programme for the inhabitants of the city of Wrocław). Households are encouraged to take advantage of them and increasingly do (Program Czyste Powietrze, 2022; Zmień piec, 2022). According to available information, Kawka Plus has contributed to the replacement of more than 11,500 furnaces by Wrocław residents so far. However, many furnaces still need to be replaced. The furnace replacement may be hindered by the inflation allowance, i.e., one of the elements of the Anti-Inflation Shield enacted by the Parliament of the Republic of Poland at the beginning of 2022. It was announced in the Journal of Laws at the beginning of August 2022 as part of the Coal Allowance Act governing the procedures for granting, paying, and determining the amount of the coal allowance (Act no. 2022 item 1692). Some consumers may not be interested in replacing their coal-fired furnaces for economic reasons (coal allowance).

From 1 July 2024, the use of out-of-class (black-smoke-belching) and the lowest class furnaces will be banned in Wroclaw (Sejmowy dodatek osłonowy: dostaniesz więcej, jeżeli… palisz węglem, 2022). The situation in other large Polish cities is similar; they are actively involved in fighting emissions. By contrast, small towns, especially health resorts, have made little progress in the fight against smog. The averagely lower environmental awareness of inhabitants of small towns is compounded by lower-income problems. For example, replacing a coal-burning furnace with a gas-burning furnace requires an initial financial contribution by investors.

5. Investment Expenditure (on Fixed Assets) for Environmental Protection

Investment expenditure for environmental protection comprises expenditure on fixed assets and other expenditure for environmental protection. It includes financial and in-kind expenditure related to environmental protection. It is intended to create new fixed assets or improve (redevelop, extend, reconstruct, adapt, or modernise) existing fixed assets. Investment expenditure also includes expenditure on the so-called initial equipment for the investment.

Expenditure on fixed assets for environmental protection includes expenditure incurred, inter alia, on the following assets: (1) acquisition of land, including the right of perpetual usufruct of land; (2) buildings, premises, and civil engineering structures, including construction and assembly works as well as design and cost documentation; (3) machines and equipment; (4) means of transport; (5) tools, devices, movables, and equipment; (6) other fixed assets intended for protection.

Expenditure on fixed assets for environmental protection also includes expenditure incurred on (a) improvements to environmental-protection fixed assets (redevelopment, extension, modernisation, or reconstruction); and (b) research and development (Ekonomiczne aspekty ochrony środowiska, 2021).

Water management investments include the construction of intakes for water extraction (including treatment facilities and main water supply and distribution networks), the construction of water quality control laboratories (including automatic water quality measurement stations), the construction of storage reservoirs (except for fire reservoirs and continuous buffer vessels), barrages, navigation dams, power dams, locks, and weirs, river engineering, development of streams, the construction of flood embankments, and the construction of pumping stations in collapses and depressions (Ekonomiczne aspekty ochrony środowiska, 2021).

With respect to investment expenditure (on fixed assets) incurred for environmental protection and water management (considered jointly) in Poland in the period from 2005 to 2020, expenditure on fixed assets for environmental protection prevailed (Figure 5).

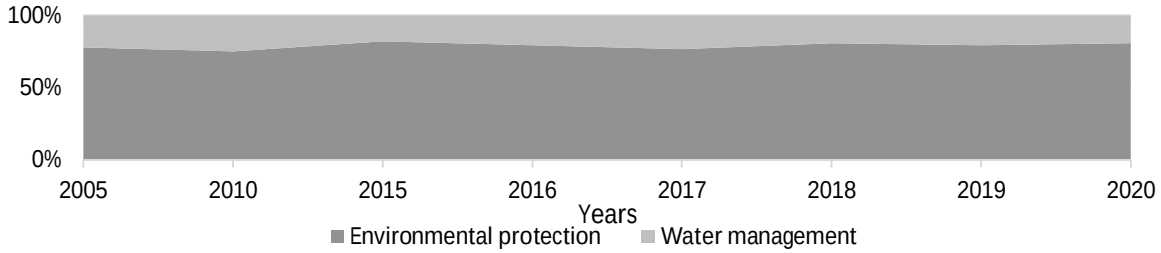

Figure 5. Structure of investment expenditure (on fixed assets) for environmental protection (environmental protection and water management considered jointly) in Poland in selected years from 2005 to 2020 (%). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

The average annual share of this expenditure was 79.1%, with the remaining percentage going to investment expenditure allocated to fixed assets related to water management. The percentage distribution results from the need to improve sanitation, especially in rural areas (Ministerstwo Rolnictwa i Rozwoju Wsi, 2018; Ministerstwo Rolnictwa i Rozwoju Wsi, 2020).

Investment expenditure (on fixed assets) for environmental protection and water management in Poland is growing. Between 2005 and 2020, the expenditure for environmental protection increased more dynamically with regard to environmental protection than water management, i.e., to PLN 11.4 billion and PLN 2.7 billion in 2020 (1.9-fold and 1.6-fold compared to 2005), respectively (Figure 6).

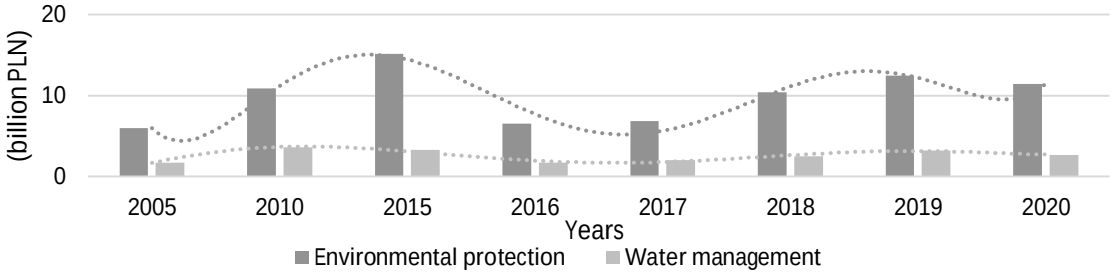

Figure 6. Investment expenditure (on fixed assets) for environmental protection and water management in Poland in selected years from 2005 to 2020 (billion PLN). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

The periodic fluctuations that occurred for the studied values were the rationale for presenting the 6th degree polynomial trend lines due to the coefficient of determination (R2)

reflecting a goodness of fit of the regression function to the empirical data (Figure 6). The polynomial trend line equations in Poland for the period from 2005 to 2020 are following. (7) For investment expenditure (on fixed assets) for environmental protection and (8) for investment expenditure (on fixed assets) for water management.

$$y = 0.0444x^6 - 1.2236x^5 + 13.087x^4 - 68.259x^3 + 178.19x^2 - 212.77x + 96.892; \quad (7)$$
$$R^2 = 0.9465$$
$$y = 0.0024x^6 - 0.062x^5 + 0.5879x^4 - 2.3794x^3 + 3.1955x^2 + 1.9839x - 1.6363; \quad (8)$$
$$R^2 = 0.9441$$

Data on investment expenditure for environmental protection in Poland is presented in accordance with the Polish Statistical Classification regarding Environmental Protection Activities and Equipment. It was developed on the basis of the UN/ECE International Standard Statistical Classification of Environmental Activities and Equipment and the European System for the Collection of Economic Information on the Environment (SERIEE). The Classification of Environment Protection Activities and Expenditure (CEPA 2000, 2022) is used to compile data related to environmental protection. Environmental protection areas defined by CEPA include the following: (1) protection of ambient air and climate; (2) wastewater management and water protection; (3) waste management; (4) protection and restoration of the use value of soils, protection of ground and surface water; (5) reduction of noise and vibration; (6) protection of biodiversity and landscape; (7) protection against ionising radiation; (8) research and development; (9) other environmental protection measures, including, in particular, administration and management of the environment, education, and training (Act no. 25/1999 item 218).

The structure of expenditure on fixed assets for environmental protection in Poland is dominated alternately by expenditure on wastewater management and water protection and expenditure on ambient air and climate protection (Ekonomiczne aspekty ochrony środowiska, 2021). In the period from 2005 to 2020, expenditure on wastewater management and water protection accounted for between 35% and 66% of total expenditure on fixed assets for environmental protection, expenditure on ambient air and climate protection accounted for between 19% and 39%, and expenditure on waste management accounted for between 6% and 20%. The share of expenditure on research and development was also quite significant (between 3% and 10%). Out of the total expenditure on environmental protection in Poland in 2005–2020, the following percentages were allocated to the areas specified below: (1) reduction of noise and vibration (from 1% to 3%); (2) protection of soil, groundwater, and surface water (from 0.5% to 1.7%); (3) protection of biodiversity and landscape (from 0.1% to 2%); (4) other environmental protection measures, including, in particular, administration and management of the environment, education, and training (from less than 0.1% to 0.3%); protection against ionising radiation (to less than 0.1%); in some years, e.g., 2019–2020, no expenditure was incurred (Ekonomiczne aspekty ochrony środowiska, 2019-2021). On the whole, other areas of environmental protection had a relatively small share of expenditure.

The directions of expenditure on fixed assets for environmental protection in Poland result from the need to improve sanitation, especially in rural areas, as pointed out earlier in this study.

The overall increase in expenditure on fixed assets for environmental protection in Poland in the study period was influenced by the increase in expenditure in the following areas: protection of ambient air and climate (to PLN 3.74 billion in 2020, 3.3-fold compared to 2005); wastewater management and water protection (to PLN 5.53 billion, 1.5-fold); protection of soils, groundwater, and surface water (to PLN 0.2 billion, 2.2-fold); reduction of noise and vibration (to PLN 0.13 billion, 1.2-fold); protection of biodiversity and landscape (to PLN 0.2 billion, 28.6-fold); research and development (to PLN 0.005 billion, 12.5-fold); and other environmental protection activities (to PLN 0.91 billion, 4.6-fold). Expenditure on fixed assets for waste management slightly decreased (to PLN 0.74 billion, by 1.33%). There was no expenditure on protection against ionising radiation in 2020 (in 2005, it amounted to PLN 0.3 million and remained similar in subsequent years, until 2018). The material effects of environmental investments are shown in Table 1.

Table 1. Selected material effects achieved as a result of the commissioning of environmental investments in Poland from 2005 to 2020 (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

Item/Years	2005	2010	2015	2016	2017	2018	2019	2020
Number of wastewater treatment plants (pcs)	118	80	49	17	21	50	56	39
of which: - biological sewage treatment plants (pcs)	70	49	45	15	19	47	52	37
- with enhanced nutrient removal (pcs)	9	4	2	1	2	2	3	2
Landfills, tailing ponds, and dumps for industrial and municipal waste (ha)	53	24	14	19	9	9	24	20
Landfill site restoration (ha)	26	76	443	64	49	115	92	33
Sewage disposal system (km)	5,417	8,462	7,961	2,642	2,058	3,712	4,225	3,364
Rainwater drainage system (km)	352	837	866	457	506	605	633	593

In the period from 2005 to 2020, the following facilities were commissioned in Poland: 430 wastewater treatment plants, including 334 biological treatment plants and 25 plants with enhanced nutrient removal (the remaining plants include mechanical and chemical treatment plants); 172 hectares of landfills, tailing ponds, and dumps for industrial and municipal waste; 898 hectares of landfill sites (rehabilitation); 37.84 thousand km of sewage disposal system; 4,849 km of rainwater drainage system.

The effects of environmental protection measures are good but there is still much to be done.

6. Current Costs of Environmental Protection

Current costs of environmental protection include gross and net current costs. Gross current costs are the costs of operation and maintenance of environmental protection activities (technology, process, and equipment). Their main purpose is to prevent, reduce, neutralise, or eliminate pollution and any other environmental losses resulting from the

entity's current activities. They include the costs of in-house activities, including the costs of operation and maintenance of environmental protection equipment (end-of-pipe and pollution prevention measures) and the costs of services provided by external parties, service charges (for wastewater pollution and waste disposal), environmental charges, and the costs of inspection, monitoring, and laboratory testing.

Net current costs are gross current costs less revenues and savings achieved from the operation of protective equipment, subsidies received, and revenues for environmental services, including, in particular, wastewater treatment, waste transport, and waste disposal.

Current costs of environmental protection do not include: (1) the costs of health and safety measures; (2) the costs of water and forest management; (3) the costs of activities related to conservation of natural resources or energy savings – if their main purpose is other than environmental protection (Ekonomiczne aspekty ochrony środowiska, 2021).

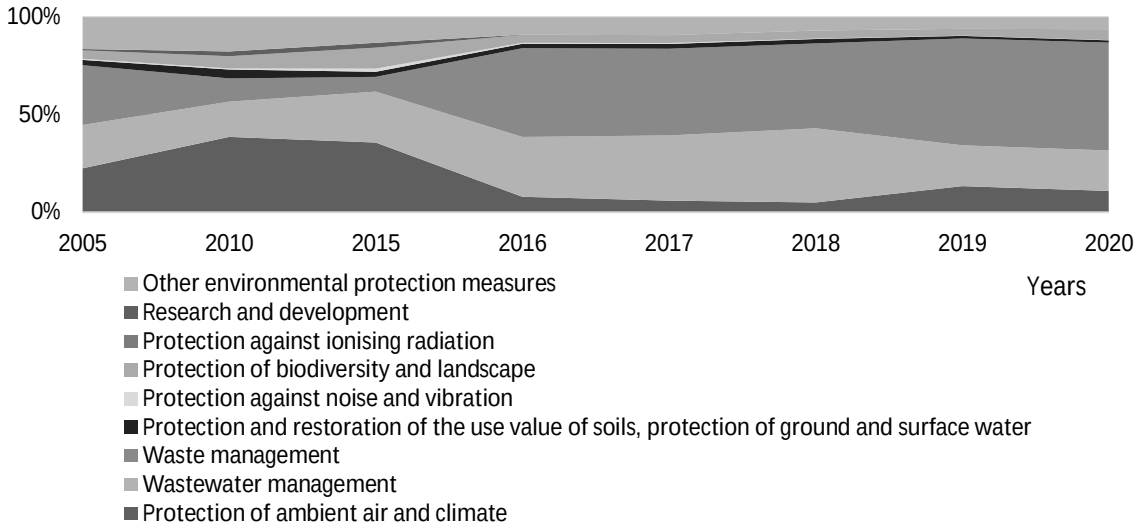

Figure 7. Structure of gross costs of environmental protection in Poland in selected years – from 2005 to 2020 (%). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

The costs of waste management have the largest share of gross costs of environmental protection (36.7% of total costs incurred annually in the study period on average). They are followed by the costs of wastewater management (26.3%) and the costs of air and climate protection (17.5%). The following costs have much smaller share in the gross costs of environmental protection: other environmental protection activities (10.5%); protection of biodiversity and landscape (5.3%); protection and restoration of the use value of soils, protection of groundwater and surface water (2.4%); research and development (0.8%); protection against noise and vibration (0.5%); and protection against ionising radiation (0.04%) (Figure 7).

Environmental costs are growing. In 2020, the following costs increased as compared to 2005 (in descending order): waste management (14.3-fold, i.e., to PLN 41 billion); protection of biodiversity and landscape (10.3-fold, i.e., to PLN 4.1 billion); wastewater management (7.4 fold, i.e., to PLN 15.4 billion); air and climate protection (3.8-fold, i.e., to PLN 8.1 billion); protection and restoration of the use value of soils, protection of groundwater and surface

water (3.4-fold, i.e., to PLN 0.86 billion); other environmental protection activities (3-fold, i.e., to PLN 4.5 billion); protection against noise and vibration (1.6-fold, i.e., to PLN 0.08 billion); and protection against ionising radiation (1.3-fold, i.e., to PLN 0.01 billion). Only the costs of research and development decreased (by 38.7%, to PLN 0.04 billion) in the study period (Figure 8; Figure 9).

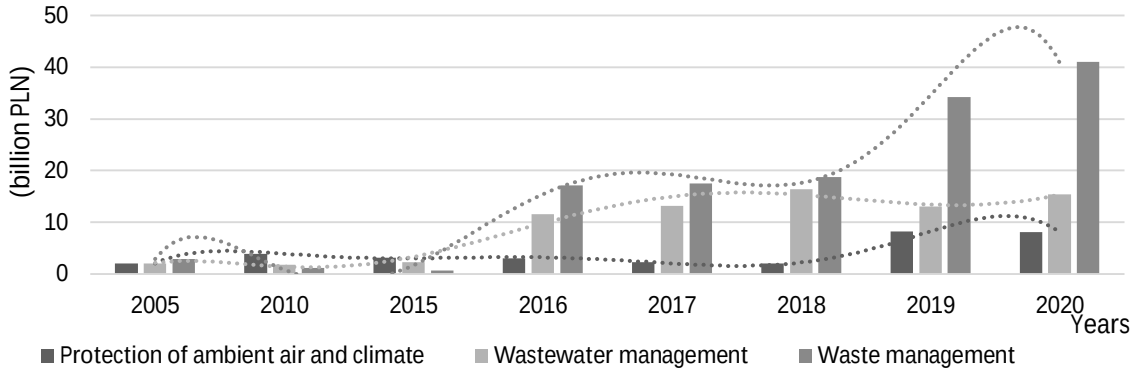

Figure 8. Gross costs of environmental protection in Poland with respect to ambient air and climate protection, wastewater management, and waste management in selected years – from 2005 to 2020 (%). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

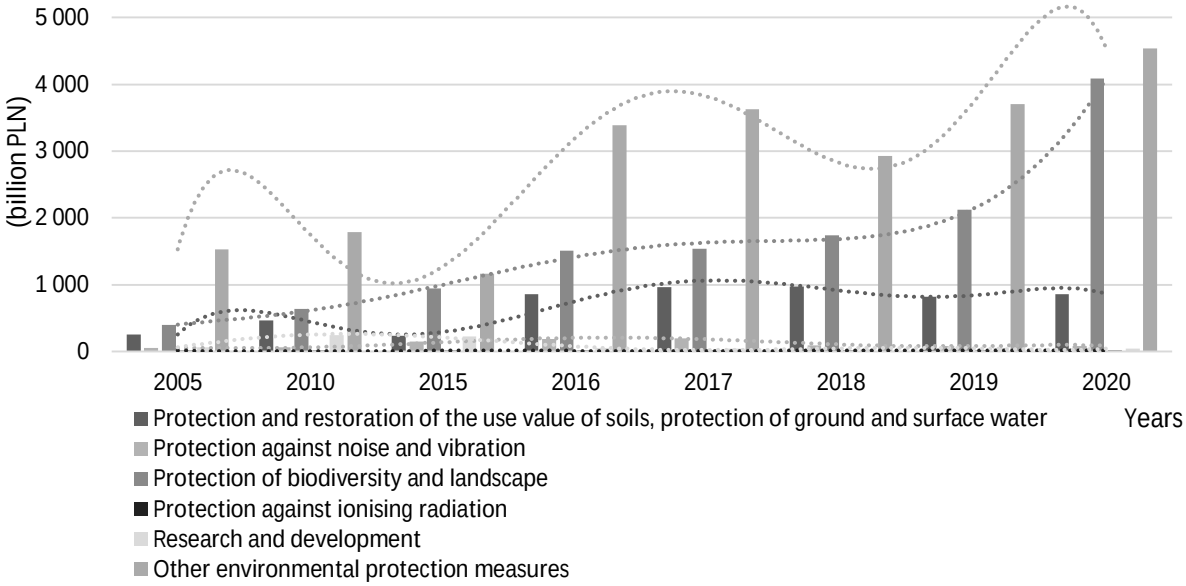

Figure 9. Gross costs of environmental protection in Poland with respect to protection and restoration of the use value of soils, protection of groundwater and surface water, protection of biodiversity and landscape, protection against noise and vibration, and protection against ionising radiation in selected years from 2005 to 2020 (%). Internal analysis (Ochrona środowiska, 2006–2018; Ekonomiczne aspekty ochrony środowiska, 2019–2021).

Due to periodic fluctuations in costs relating to ambient air and climate protection, wastewater management, waste management, protection and restoration of the use value of soils, groundwater and surface water protection, protection of biodiversity and landscape, protection against noise and vibration, protection against ionising radiation, research and

development, and other environmental protection activities (Figure 8; Figure 9) that occurred during the study period, the trend lines are presented as polynomial trend lines. The polynomial trend line equations for the corresponding types of costs are following. (9) Ambient air and climate protection, (10) wastewater management, (11) waste management, (12) protection and restoration of the use value of soils, protection of groundwater and surface water, (13) protection of biodiversity and landscape, (14) protection against noise and vibration, (15) protection against ionising radiation, (16) other environmental protection activities and (17) research and development.

$$y = -0.0206x^6 + 0.5267x^5 - 5.2826x^4 + 26.424x^3 - 69.063x^2 + 88.284x - 38.775;\ R^2 = 0.9966 \quad (9)$$

$$y = -0.0088x^6 + 0.2692x^5 - 3.1255x^4 + 17.163x^3 - 45.097x^2 + 53.537x – 20.588;\ R^2 = 0.9683 \quad (10)$$

$$y = -0.0919x6 + 2.422x5 - 24.817x4 + 124.52x3 - 315.51x2 + 375.75x – 159.32;\ R^2 = 0.9944 \quad (11)$$

$$y = -2.4817x^6 + 70.279x^5 – 778.47x^4 + 4244.2x^3 – 11752x^2 + 15389x – 6915.3;\ R^2 = 0.9579 \quad (12)$$

$$y = -0.2539x^6 + 8.66x^5 - 98.881x^4 + 492.54x^3 - 1101.7x^2 + 1302.4x – 202.95;\ R^2 = 0.9976 \quad (13)$$

$$y = -0.219x^6 + 5.5716x^5 - 53.062x^4 + 232.6x^3 - 471.7x^2 + 433.51x – 95.425;\ R^2 = 0.972 \quad (14)$$

$$y = 0.024x^6 - 0.6728x^5 + 7.5074x^4 - 42.146x^3 + 123.7x^2 – 175.82x + 98.412;\ R^2 = 0.9946 \quad (15)$$

$$y = -13.656x^6 + 372.15x^5 - 3954.5x^4 + 20651x^3 - 54775x^2 + 68621x – 29373;\ R^2 = 0.9908 \quad (16)$$

$$y = 0.2981x6 - 7.7444x5 + 75.355x4 - 330.69x3 + 591.55x2 – 180.2x – 86.075;\ R^2 = 0.977 \quad (17)$$

The increase in gross costs of environmental protection in Poland in the study period results from both macroeconomic and microeconomic effects. A further increase of these costs is expected, mainly due to the rising inflation, which is an unfavourable effect, and the growing costs of the functioning of enterprises carrying out environmental protection activities, such as waste collection, handling, and management, water supply, and wastewater collection and treatment.

7. Conclusion

The analysis of the data shows that households have the largest share in environmental protection expenditure in Poland. Investment expenditure (on fixed assets) for environmental protection and current costs of environmental protection have much smaller share. On the one hand, households are buyers of environmental protection services, such as sewage disposal or domestic waste disposal. On the other hand, they are consumers of environment-related products specially designed to protect the environment, e.g., domestic wastewater treatment plants.

The research reveals that environmental protection expenditure in Poland is growing. Households generated the relatively most dynamic increase in environmental protection expenditure. This is primarily due to an increase in the prices of domestic sewage and municipal waste collection as well as air protection programmes, including municipal programmes. Households benefit from the programmes by replacing old and inefficient solid fuel heat sources with modern sources that meet the highest standards and the improvement of the thermal efficiency of homes. Another factor that plays an important role is the growing environmental awareness of Polish society.

The analysis of the data also shows that the structure of expenditure on fixed assets for environmental protection in Poland is dominated alternately by expenditure on wastewater management and water protection and expenditure on ambient air and climate protection. This results from the national needs and the need to adjust to the requirements of the European Union.

Expenditure on fixed assets for environmental protection in Poland in 2005–2020 helped achieve specific goals. They include the commissioning of new wastewater treatment plants, including, in particular, biological sewage treatment plants and wastewater treatment plants with enhanced nutrient removal, new landfills, tailing ponds, and dumps for industrial and municipal waste, and a new sewage disposal and rainwater drainage system, and the rehabilitation of waste disposal areas. These developments are favourable, both in terms of environmental protection and for socio-economic reasons.

Furthermore, the analysis of the data shows that the total gross costs of environmental protection in Poland increased in the study period. In structural terms, virtually all types of costs increased, including costs covering the following areas: waste management, protection of biodiversity and landscape, wastewater management, air and climate protection, protection and restoration of the usable value of soils, protection of groundwater and surface water, other environmental protection activities, protection against noise and vibration, and protection against ionising radiation. Only the costs of research and development decreased. The increase in the costs is due to both macroeconomic (especially rising inflation) and microeconomic (rising operating costs of companies, e.g., waste management companies) effects.

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