

# SELECTED ASPECTS OF ENVIRONMENTAL MANAGEMENT IN POLAND AND THE WORLD

WYBRANE ASPEKTY ZARZĄDZANIA ŚRODOWISKIEM W POLSCE I NA ŚWIECIE

<https://doi.org/10.34739/zn.2023.60.05>

**Tomasz Śmietanka**

Poland, Siedlce University of Natural Sciences and Humanities  
Faculty of Social Science, Institute of Management and Quality Sciences  
tomasz.smietanka@uph.edu.pl, ORCID: 0000-0003-2623-9100

JEL Classification Codes: M19

**Abstract:** The purpose of the article is to identify and evaluate selected municipal government activities in environmental management for climate protection and to formulate recommendations for municipalities in this regard. The research methods used are: a literature review, and a quantitative analysis of CSO data on 13 specific indicators of municipalities (counties) on: climate change, air and groundwater protection, land use, biodiversity and waste management and qualitative analysis. The research examines the results of environmental management in municipalities in different parts of the world and on the territory of Polish municipalities (districts) of varying wealth. A comparative analysis of the management activity of municipalities (counties) in three groups of Polish local governments: the most wealthy, medium wealthy and least wealthy has been carried out. The study shows a higher intensity of pro-environmental activities among the more prosperous municipalities. The available CSO data are also insufficient to comprehensively assess the multi-faceted activity of municipalities in environmental management. The current priorities of local authorities and the natural conditions of the municipality due to its location are also important. It is recommended to increase the activity of municipal authorities, especially less wealthy ones, in environmental management, and to increase the activity of all municipalities in the legal protection of environmentally valuable areas and in the creation of biodiversity.

**Keywords:** environmental management, environmental protection, municipality, municipal

**Streszczenie:** Celem artykułu jest identyfikacja i ocena wybranych aktywności samorządów gminnych w zakresie zarządzania środowiskiem dla ochrony klimatu oraz sformułowanie rekomendacji dla gmin w tym zakresie. Zastosowane metody badawcze to: przegląd literatury, ilościowa analiza danych GUS w zakresie 13 wskaźników szczegółowych gmin (powiatów) dotyczących: zmian klimatu, ochrony powietrza i wód gruntowych, użytkowania gruntów, bioróżnorodności i gospodarki odpadami i analiza jakościowa. Badania dotyczą rezultatów zarządzania ochroną środowiska w gminach w różnych częściach świata oraz na terytorium polskich gmin (powiatów) o zróżnicowanej zamożności. Dokonana została analiza porównawcza aktywności zarządczej gmin (powiatów) w trzech grupach polskich samorządów: najzamożniejszych, średniozamożnych i najmniej zamożnych. Z badań wynika większa intensywność działań prośrodowiskowych wśród gmin bardziej zamożnych. Dostępne dane GUS są także niewystarczające, aby kompleksowo ocenić wieloaspektową aktywność gmin w zarządzaniu ochroną środowiska. Ważne są także aktualne priorytety władz lokalnych oraz naturalne warunki gminy wynikające z jej położenia. Rekomenduje się zwiększenie aktywności władz gmin, szczególnie mniej zamożnych, w zakresie zarządzania środowiskiem oraz zwiększenie aktywności wszystkich gmin w prawnej ochronie obszarów cennych przyrodniczo oraz w kreowaniu bioróżnorodności.

**Słowa kluczowe:** zarządzanie środowiskiem, ochrona środowiska, gmina, gminne

## Introduction

Climate change is nowadays a significant challenge for environmental management not only in commercial and governmental sectors, but also in local government at the local level. This is confirmed by the author's review of the literature

on municipal activities in environmental protection in Poland and around the world. The author's own research concerns the results of environmental protection management on the territory of Polish municipalities (districts) of varying wealth, based on available statistics from the Central Statistical Office (CSO) at the level of municipalities or

districts. Carried out was a comparative analysis of the management activity of municipalities (districts) in three groups of local governments: the most affluent, medium affluent and least affluent. The study reveals a partial inconsistency in the intensity of activities with the wealth of municipalities. Available CSO data are also insufficient to comprehensively assess the multifaceted activity of municipalities in environmental management. Also important are the current priorities of local authorities and the natural conditions of the municipality due to its location.

### Literature review

Beginning our review with **Polish** literature on the subject, it is worth noting the conclusion of A. Marciniak-Kluska, who states that: "Sustainable development is the right to satisfy the development aspirations of the current population without restricting the rights of future generations. This means that the economic and civilisation development of the present generation should not restrict the rights of future generations and at their expense" (Marciniuk-Kluska, 2013). Sustainable development should respect the laws of nature and economics by observing in economic activities the law of purpose, region, as well as the law of scale and quality (Marciniuk-Kluska, 2013). Environmental education is an important issue in promoting sustainable development and environmental management.

Rational environmental management is an important element when it comes to creating the positive image of large cities and nearby towns. The efficient management of environmental resources, based on their protection and careful planning of their use, is essential for promoting a positive image of the city and building an urban development strategy. To this end, it is necessary to implement innovative environmental projects based on assumptions derived from the low-carbon green city and low-carbon green city models (Szalata, 2013).

The removal and prevention of environmental damage and the cost of these activities have become problems which have had to be faced by government authorities. Local governments have mainly taken measures to contribute to the economic, environmental and social development of the municipality. The tasks of the municipality within the framework of environmental protection include, among others: maintenance of spatial order, water supply, sewage disposal, waste management, and the protection of green areas (Wyrebek, 2010).

One aspect of the modern environmental crisis is the growing problem of the effectiveness of environmental law, applied at all levels of environmental management. This raises the issue of implementing appropriate and effective mechanisms, methods and procedures for implementing environmental policy (Wojciechowski, 2012). The improvement of the environmental management system within the framework of environmental policy should refer to the proper mechanism for environmental decision-making by all actors in environmental proceedings, including and especially by environmentalists (environmental organisations).

For 2014-2020 (the third period of EU budgeting for Poland), further programs have been planned to support specific areas of the country's economic activity, including environmental activities. Environmental projects implemented between 2004 and 2013 were primarily aimed at improving water and wastewater management, as well as waste management. During this period, almost 36,000 kilometres of sewerage network, 12,000 kilometres of water supply network, as well as 683 municipal sewage treatment plants were built, expanded or modernised, which increased by about 63 the number of cities supported by these installations. The funds allocated to Poland under the program as an EU contribution of €27,413.75 million, including €3,508.17 million for environmental measures, and their subsequent use by local government units can ensure better environmental management in these municipalities (Bien, 2018) and at the same time improve the quality of life in them.

The purpose of the following research was to assess the role of municipal authorities in environmental impact assessment and the main problems in issuing environmental decisions. The article presents the leading objections that municipal authorities have to the environmental impact assessment process. The relationship between municipal authorities and nature conservation authorities in the context of the previously conducted assessment process is defined. The study covered municipalities covered by NATURA 2000 areas, located in the Kujawsko-Pomorskie, Podkarpackie, Śląskie and Świętokrzyskie provinces (Nowak 2015).

The quality of environmental management in municipalities is an important segment of quality of life management for residents not only in Polish municipalities. Based on a review of selected **foreign literature**, various exemplary experiences and areas of environmental management in

European municipalities, in Brazil and in China are presented.

Local governments play an important role in improving the quality of life of their citizens by managing environmental and social issues for the sustainable development of the territory. While an increasing number of municipalities are implementing Environmental Management Systems (ISO14001-EMAS) to manage environmental issues, there is still a lack of standardised tools for social issues. Research results (Botta, Comoglio, Petrosillo, 2013) presented a theoretical framework for developing an Integrated Environmental and Social Management System by incorporating the requirements of SA 8000 (Social Responsibility) with an innovative focus on informing and consulting citizens, and highlighted the main results of its application in an exemplary small **Italian** municipality.

Taking environmental inequalities into account is important in environmental management. Laurian presented the first national study on environmental inequality in **France** (2008). It applied the Anglo-American concept of environmental justice, which focuses on the distribution of environmental burdens, to French conditions and tested the hypothesis that poor and immigrant communities are disproportionately exposed to environmental hazards. The location of eight types of hazardous sites (industrial and nuclear sites, incinerators, waste management facilities) and the socioeconomic characteristics of the population were correlated at the municipality or city level for all 36,600 French cities. The analysis showed that cities with a high percentage of immigrants tend to host more hazardous sites, even when controlling for population size, income, city and regional industrialisation. The study confirms the presence of environmental inequality in France and raises new questions about public policy. However, it does not explore the mechanisms that may explain inequality, which may include procedural injustices, land market dynamics and historical patterns of industrial and urban development.

The application of the 2008/98/CE Municipal Solid Waste (MSW) Directive implies the need for waste-to-energy technologies. Incineration, the most common method, is difficult to implement in low-population areas because it requires a large volume of waste to be cost-effective (100,000 tons per year). The study presented here analyzed the economic and environmental costs of different technologies for converting MSW to energy (WtE) in an area consisting of 13 municipalities in southern **Spain** (Fernández-González et al.,

2017). Anaerobic digestion (Biomethanation), solid recovered fuel (SRF) production and gasification were analyzed, and these approaches were compared to current Biological-Mechanical Treatment (BMT) with elimination of landfill rejects, and incineration with energy recovery. From an economic point of view, the implementation of WtE systems reduces the operating costs of current BMT and incineration systems; gasification presents the lowest value. From an environmental perspective, life cycle assessment shows that all WtE alternatives, including incineration, present significant environmental benefits compared to BMT. Finally, a multi-criteria method was used to select the best alternative, which showed that anaerobic digestion is the optimal solution for the study area.

At the end of a brief review of the literature on environmental management in municipalities, it is worth noting the activity of municipalities in this area, particularly in Brazil, given its greatest environmental potential in the world, and in China, given its booming economy and its global impact on the climate.

The goal of the Brazilian study was to assess the forested status of the Rainha das Águas Environmental Protection Area (APA Rainha das Águas) and its capabilities and potential, with the aim of laying the groundwork for a management plan. The APA covers the entire municipality of Paraíba do Sul, state of Rio de Janeiro, **Brazil** (Lima, de Menezes, de Almeida, 2020). Over 600 forest fragments were detected, with a forest cover percentage of 23.01%. Deforestation and forest fires are among the problems identified in the APA, which has resulted in the reduction and fragmentation of native forests. Hunting, predatory fishing, improper development, agriculture and forestry carried out inappropriately, sewage pollution, introduction of species, lack of public knowledge of the APA, and inadequate funding were also significant problems. Among the management measures recommended were reforestation, environmental control, environmental planning, encouraging polyculture and agroecological practices, and wastewater treatment. Environmental education should be widely used to minimise these problems in the municipality of Paraíba do Sul.

The Green Municipalities Program (PMV) was created in 2011 by the Pará state government. The research aimed to analyze the management process, with PMV, in Abaetetuba, Pará, **Brazil**. Through semi-structured interviews and content analysis, the main observed result was

a significant reduction in deforestation. Management in Abaetetuba still faces obstacles, but the undeniable fact is that adherence to PMV has brought the municipality significant environmental progress (Castello et al., 2017).

Environmental spending can be classified as an indicator that measures the efforts of public entities to protect the environment. Cities and countries are trying to understand the determinants of environmental spending over time. The selected study aims to analyze the variables that affect the environmental spending of **Brazilian** (Broietti et al., 2022) municipalities from 2012 to 2016. Thus, this study helps fill the gap regarding the lack of longitudinal studies that cover local contexts in relation to municipal public environmental spending. The research method consisted of a panel data model. Data were collected on municipal environmental expenditures and other variables of 4269 Brazilian municipalities, the collection generated 21,329 observations. The results showed that municipalities in the state of Amapá had better relative average expenditures, and it was also observed that municipalities in the Northeast region showed the worst performance. The municipality of Itamaracá, located in the state of Pernambuco, presented the best percentage in the country, 9.47% of environmental spending in relation to total spending. Regarding panel data results, the variables income, population, density, GDP and HDI presented significance in all models; models estimated by fixed effects ensure consistency of parameters.

The implementation of environmental policy, including environmental management in **China**, still has low efficiency. This is a key global problem in terms of negative environmental impacts, as China's economy is one of the largest and fastest growing in the world. The Environmental Intelligence Policy (EIP) has been a tool used by China's central government to mobilise local authorities to more effectively fulfill their environmental responsibilities. The analyses used panel data of 261 cities in China from 2009 to 2018 and applied a spatial difference-in-differences (SDID) model to examine the relationship between EPI policies and air pollution. The study found that EPI policies can not only reduce air pollution in the surveyed cities, but can also reduce air pollution in neighboring cities with a spatial attenuation limit of up to 400 kilometers. The results of the mechanism study showed that EPI policies can improve air quality by modernising the industrial structure and promoting technical progress. The

environmental pollution reduction effect of the EPI was more significant in resource-based cities (Pan et al., 2022).

Another recent study conducted in **China** also looked at the impact of air pollution on the innovation capacity of cities (Ai et al., 2022). The innovation capacity index was built on the basis of innovation performance. Air pollution significantly slowed down the innovation capacity of cities. There was a "loss of human resources" effect and a "resource displacement effect". Technological innovation undoubtedly helps reduce air pollution, but previous research has not answered the question of whether and how air pollution affects urban innovation capacity? Accordingly, based on a fixed-effect model, a panel study analyzed 281 prefecture-level cities in China from 2003 to 2015, and found that air pollution significantly inhibits the improvement of urban innovation capacity in the Chinese cities studied. In addition, due to the "human resource loss effect", air pollution in large-scale cities or eastern China has a much greater limiting effect on urban innovation capacity.

To address the practical shortcomings of sensitive environmental target management, a sensitive environmental target information management system was also designed based on ArcGIS Engine i.NET technology. Three function modules have been designed. They are: the basic environmental information module, the information input module, and the audit and information retrieval module. The system has been applied in Dalian Municipality, China (Ma, Zhang, Chen, 2013).

### The test sample

The selection of the research sample should be dictated by the process of selecting the most representative elements of the population, on the basis of which the results obtained can be generalised with a high degree of certainty to the entire population, without having to analyze all its members. It was assumed that the main criterion for selecting the research sample is the type of municipalities (urban-rural municipalities, at the same time district cities) and their wealth.

Therefore, the subject of the author's own research are urban-rural municipalities, which have been aggregated into three groups of 10 municipalities each in terms of their budget income. In order by income per capita in ascending order: wealthiest (Słubice, Grodzisk Mazowiecki, Goleniów, Gryfino, Świecie, Drawsko Pomorskie, Police, Koźnice, Piaseczno, Polkowice), moderately wealthy (Wołomin, Łobez, Bytów,

Grójec, Ząbkowice Śląskie, Myślenice, Strzelce Opolskie, Wieliczka, Pszczyna, Kartuzy), and the least affluent (Kazimierza Wielka, Opatów, Mońki, Miechów, Wschowa, Nisko, Łęczna, Jędrzejów, Dąbrowa Tarnowska, Szydłowiec). The 30 municipalities make up a total of about 10% of all 314 municipalities, “micro-capital” counties in Poland.

The choice of municipalities – county cities of varying wealth was determined by a comparative analysis of the three groups of municipalities in terms of the possibility of equalising development in the environmental segment, as well as the previous activity of municipalities in environmental management. The selection of municipal indicators for analysis (environmental management elements) was determined by their availability. For quantitative analyses, available detailed indicators of the Central Statistical Office for environmental governance from 2016-2019 were used and averaged, for a more objective comparative analysis.

### Research method

Quantitative and qualitative techniques were used in our research. The quantitative analysis reviewed detailed CSO indicators of sustainable development in municipalities, in particular 13 indicators of environmental governance. They were divided into two groups. Those that significantly depend on the environmental policy of municipalities in a total of 10 (items 1, 4, 5, 7, 8, 9,

10, 11, 12, 13), and 3 detailed indicators that are significantly independent of the environmental policy of the municipality (items 2 and 3 – business sector) and item 6 – forest cover (especially dependent on the location of the municipality). The analyzed municipalities were presented in order of increasing wealth in three subgroups: least wealthy, medium wealthy and most wealthy.

In addition, the qualitative analysis reviewed and evaluated the municipalities achieving the most favorable or least favorable values of detailed environmental indicators, which could be based on the nature of the municipality: agricultural, industrial, service, “bedroom”, etc.

### Results of research

The results of the survey are included in Table 1, divided into 3 parts (a, b and c). The first part (a) presents the urban municipalities with the lowest per capita wealth. The second (b) municipalities with average per capita wealth and the third (c) municipalities with the highest per capita wealth. All municipalities are ranked according to increasing per capita wealth, from the smallest – Kazimierza Wielka – to the largest – Polkowice.

The CSO’s specific indicators for environmental governance, totaling 13, are grouped into five domains: climate change, air and groundwater protection, biodiversity and waste management.

At the end of the comparative analysis, detailed indicators of environmental governance for the ten wealthiest, Polish municipalities, district cities.

**Table 1a.** Comparison of 30 Polish municipalities with varying wealth in ascending order – 10 least wealthy municipalities (\*-data for district)

Domains	Indicators	Kazimierza Wielka	Opatów	Mońki	Miechów	Wschowa	Nisko	Łęczna	Dąbrowa Tarnowska	Jędrzejów	Szydłowiec
Climate change	1 Municipal expenditures on air and climate protection per capita (in zł)*	34,6	29,7	51,8	68,2	1,0	13,0	14,8	12,2	34,1	87,5
Protection of air and groundwater	2 Share of pollutants retained or neutralised in pollution abatement facilities at <b>sensitive</b> facilities in total pollutants generated – gaseous (excluding CO2) (in %)*	0,0	1,0	0,0	49,6	0,0	0,0	0,0	0,0	0,0	0,0
	3 Share of pollutants retained or neutralised in pollution abatement facilities at sensitive facilities in total pollutants generated – particulate (in %)*	0,0	98,7	91,5	47,6	0,0	0,0	99,1	0,0	100,0	95,3

	4	Users of gas facilities as a % of total population	0,0	41,2	0,0	5,7	65,5	74,5	89,1	76,5	2,1	35,7
	5	Using sewerage system as % of total population	51,8	48,7	60,9	51,5	76,4	72,9	83,2	69,1	52,4	59,8
<b>Land use</b>	6	Forest cover (in %)	2,9	2,3	12,5	4,7	28,2	51,6	4,0	15,2	23,2	38,1
<b>Biodiversity</b>	7	Share of legally protected areas in total area (in %)*	19,1	14,5	31,6	86,4	22,4	0,0	29,8	11,0	66,2	38,1
	8	Share of parks, greens and green spaces in total area (%)	0,1	0,1	0,1	0,2	0,2	0,2	1,2	0,1	0,2	0,3
<b>Waste management</b>	9	Amount of mixed municipal waste from households collected during the year, per capita (in kg)	57,9	109,8	158,3	90,7	178,4	132,5	183,5	143,9	81,7	144,2
	10	Wastewater treated biologically and with enhanced nutrient removal in total wastewater (in %)	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	11	Number of household treatment plants	51,3	77,5	171,5	298,0	53,8	25,8	119,8	37,5	3,0	11,3
	12	Wild landfills – number per 100 km <sup>2</sup> *	0,6	0,0	0,2	0,4	0,6	0,0	0,4	0,2	0,3	2,9
	13	Wild landfills – area per 100 km <sup>2</sup> (in m <sup>2</sup> )*	106,3	0,0	20,0	24,0	4130	3,8	235,5	13,0	600,3	24,3

Source: own compilation based on CSO, points 12 and 13 – destimulants of environmental management.

**Table 1b.** Comparison of 30 Polish municipalities with varying wealth ascending – 10 moderately wealthy municipalities (\*-data for district)

Domains	Indicators	Wolomin	Łobez	Bytów	Grójec	Ząbkowice Śląskie	Mysienice	Strzelce Opolskie	Wieliczka	Pszczyna	Kartuzy	
<b>Climate change</b>	1	Municipal expenditures on air and climate protection per capita (in zł)*	11,0	0,4	0,5	2,1	38,4	31,0	2,9	66,1	36,7	3,8
<b>Protection of air and groundwater</b>	2	Share of pollutants retained or neutralised in pollution abatement facilities at sensitive facilities in total pollutants generated – gaseous (excluding CO <sub>2</sub> ) (in %)*	24,1	0,0	0,0	0,0	0,0	0,0	0,0	23,4	0,0	0,0
	3	Share of pollutants retained or neutralised in pollution abatement facilities at sensitive facilities in total pollutants generated – particulate*	80,3	90,8	94,3	76,5	0,0	55,1	92,8	0,0	99,2	53,9
	4	Users of gas facilities as a % of total population	73,5	52,6	61,1	84,2	68,8	74,6	49,0	84,6	73,8	11,3
	5	Using sewerage system as % of total population	69,6	77,3	88,6	62,2	70,3	89,7	80,5	51,8	53,1	67,1
<b>Land use</b>	6	Forest cover (in %)	15	37	39	11	8	31	30	8	29	45

Biodiversity	7	Share of legally protected areas in total area (in %)*	20,8	2,8	20,8	23,0	15,9	11,6	45,3	0,3	2,2	49,6
	8	Share of parks, greens and green spaces in total area (in %)	0,5	0,3	0,1	0,2	0,3	0,1	0,6	0,8	1,2	0,2
Waste management	9	Amount of mixed municipal waste from households collected during the year, per capita (in kg)	169,6	166,2	164,7	282,3	306,1	62,0	139,7	274,0	167,0	202,2
	10	Wastewater treated biologically and with enhanced nutrient removal in total wastewater (in %)	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	11	Number of household treatment plants	37,3	112,5	77,0	258,0	156,0	103,3	9,0	1169,3	74,3	146,0
	12	Wild landfills – number per 100 km <sup>2</sup> *	1,6	0,4	0,0	0,4	0,3	0,2	0,8	4,3	0,2	0,1
	13	Wild landfills – area per 100 km <sup>2</sup> (in m <sup>2</sup> )*	65,5	138,8	0,0	286,8	227,0	4,5	60,0	213,3	13,0	490,5

Source: own compilation based on CSO, points 12 and 13 – destimulants of environmental management.

**Table 1c.** Comparison of 30 Polish municipalities with varying wealth in ascending order – 10 most wealthy municipalities in points (1-30) (\*-data for district)

Domains	Indicators	Drawsko Pomorskie	Gryfino	Ślubice	Świecie	Police	Goleniów	Grodzisk Mazowiecki	Kozienice	Piaseczno	Polkowice	
Climate change	1	Municipal expenditures on air and climate protection per capita (in zł)*	no data	0,07	1,93	1,32	no data	0,44	16,67	16,95	4,27	11,93
	Protection of air and groundwater	2	Share of pollutants retained or neutralised in pollution abatement facilities at sensitive facilities in total pollutants generated – gaseous (excluding CO <sub>2</sub> ) (in %)*	0,00	78,98	0,00	69,43	1,45	27,53	93,35	82,68	97,05
3		Share of pollutants retained or neutralised in pollution abatement facilities at sensitive facilities in total pollutants generated – particulate (in zł)*	77,8	100,0	92,9	96,6	99,7	96,4	0,00	100,0	0,00	87,3
4		Users of gas facilities as a % of total population	68,0	66,1	77,5	82,1	59,1	59,6	78,5	65,1	78,8	79,8
5		Using sewerage system as % of total population	77,8	82,7	82,0	93,8	91,1	85,1	70,6	90,1	84,6	99,7
Land use		6	Forest cover (in %)	36,9	20,6	37,3	48,2	21,9	48,4	3,9	40,3	27,1
Biodiversity	7	Share of legally protected areas in total area (in %)*	47,1	24,5	38,7	3,3	50,8	8,0	23,6	11,9	52,5	26,7
	8	Share of parks, greens and green spaces in total area (in %)	0,1	0,2	0,1	0,3	1,4	0,2	0,5	0,2	0,7	0,8

Waste management	9	Amount of mixed municipal waste from households collected during the year, per capita (in kg)	177,6	189,7	324,4	231,4	211,7	311,4	267,6	209,6	201,1	200,0
	10	Wastewater treated biologically and with enhanced nutrient removal in total wastewater (in %)	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	11	Number of household treatment plants	97,5	231,3	63,0	25,0	0,5	339,0	76,0	21,3	6,3	20,0
	12	Wild landfills – number per 100 km <sup>2</sup> *	0,1	0,2	0,6	0,8	0,1	0,3	no data	0,45	0,53	1,60
	13	Wild landfills – area per 100 km <sup>2</sup> (in m <sup>2</sup> )*	34,0	1 546	22,5	5 178	100,0	31,5	no data	191,5	26,6	4 172

Source: own compilation based on CSO, points 12 and 13 – determinants of environmental management.

### Conclusions and recommendations

1. A brief review of the Polish literature on the issue of environmental management in Polish municipalities presents the multidimensionality of the subject matter taken up in the following aspects: sustainable development, rationalisation of management, management tasks, effectiveness of the law and results of management financing from EU funds.
2. In addition, a brief search of foreign literature carries additional information on the direction of municipal activity in various aspects of environmental management, which are determined by: implementation of environmental goals beyond current legal requirements, Environmental Management Systems (ISO, Directives, Social Responsibility), identification of environmental inequalities and converting municipal waste to energy.
3. Foreign literature clearly recognises the key role of Brazilian municipalities in environmental management, given the country's leading role in terms of environmental assets ("lungs of the world) and Chinese municipalities, given the need to intensify environmental management activities, determined by the greatest dynamism and scale of China's contemporary global economic development and associated environmental pollution.
4. The CSO data, in the context of the multifaceted subject of environmental management at the local level, give an incomplete picture of the issues addressed, but allow a comprehensive comparative analysis of the detailed indicators of the surveyed, Polish municipalities (districts\*) in quantitative terms.
5. The intensity of environmental management in Polish municipalities of varying wealth in all the four domains studied, which are dependent on municipalities, is generally dependent on their wealth (highest in the most wealthy and lowest in the least wealthy), which indicates that the least wealthy municipalities still have little ability to equalise development and need more external funding for them in the environmental segment.
6. Forest cover is the only area, among the five surveyed, that is independent of municipal environmental management directly, and related more to the natural conditions of each municipality.
7. However, in one of the four domains (climate change), the least affluent municipalities recorded the highest unit spending rates on ambient air protection and the most affluent municipalities recorded the lowest unit spending rates, which may indicate a partial levelling off of local development in the environmental segment across the entire sample of municipalities surveyed.
8. In the domains of air and groundwater protection management and waste management, inputs and positive effects in municipalities are clearly correlated with their wealth, while in the area of biodiversity (the share of legally protected areas and the share of parks, greens and green spaces), no correlation with the wealth of municipalities was seen.
9. The least affluent municipalities still have significantly less favourable values than the most affluent municipalities for the detailed indicators of environmental governance that shape residents' quality of life and sustainable development at the local level.



10. It is recommended to continue to recognise as important and urgent the financial expenditures of the least and middle-income municipalities on air and groundwater protection management and waste management, and to support them within the framework of the environmental policies of the European Union, the national government, regional government and municipal-counties.
11. The authorities of the surveyed municipalities, especially the least affluent and middle-income ones, should pay special attention to municipal environmental management by first increasing current and investment expenditures on environmental protection and obtaining government and European funds for this purpose.
12. The authorities of all surveyed municipal governments should make efforts to increase biodiversity on the territory of municipalities, especially the various forms of legal environmental protection and parks, greens and green spaces.

## References

- Ai, H., Wang, M. Zhang, Y.-J., Zhu, T.-T. (2022). How does air pollution affect urban innovation capability? Evidence from 281 cities in China. *Structural Change & Economic Dynamics* 61: 166-178.
- Bień, E. (2018). Availability of funds from the cohesion fund on environmental measures within OPI&E for 2014–2020 and the effectiveness of their use by municipalities in the field of water and sewage management. *Desalination and Water Treatment* 117: 168-174.
- Botta, S., Comoglio, C., Petrosillo, I., (2013). Implementing the environmental and social policies of a municipality through an integrated management system: theoretical framework and case study. *Journal of Environmental Planning & Management* 56(7): 1073-1095.
- Broietti, C., Flach, L., Rover, S., Salvador de Souza, J.A. (2022). Public expenditure and the environmental management of Brazilian municipalities: a panel data model. *International Journal of Sustainable Development and World Ecology* 25(7): 630-641.
- Castello, R.N., Vidal, J.P., Begot, L.H., Faria, T.L.M. Nunes, S.F. (2017). Environmental management in Pará: The Green Municipalities Program in the municipality of Abaetetuba [Gestão ambiental no Pará: O Programa Municípios Verdes no município de Abaetetuba] *Espacios* 38(34): 18.
- Fernández-González, J.M., Grindlay, A.L., Serrano-Bernardo, F., Rodríguez-Rojas, M.I., Zamorano, M. (2017). Economic and environmental review of Waste-to-Energy systems for municipal solid waste management in medium and small municipalities. *Waste Management* 67: 360-374.
- Laurian, L. (2008). Environmental Injustice in France. *Journal of Environmental Planning & Management* 51(1): 55-79.
- Lima, M.D.C., de Menezes, S.J.M.D.C., de Almeida, F.S. (2020). Rainha das Águas environmental protection area in the municipality of Paraíba do sul (RJ, Brazil): Forest cover, contingencies, and management study [Área de proteção ambiental rainha das águas do município de Paraíba do sul (RJ, Brasil): estudo da cobertura florestal, contingências e manejo]. *Ciencia Florestal* 30(4): 1130-1146.
- Ma, S.M., Zhang, S.S., Chen, Y. (2013). To design a vulnerable environmental target information management system of Dalian municipality, China. *Advanced Materials Research* 726-731: 4641-4644.
- Marciniuk-Kluska A. (2013). Zarządzanie środowiskiem w aspekcie zrównoważonego rozwoju gospodarczego Zeszyty Naukowe Uniwersytetu Przyrodniczo-Humanistycznego w Siedlcach [Environmental management in the aspect of sustainable economic development]. *Administracja i Zarządzanie* 23 (96): 129-140.
- Nowak, M.J. (2015). Ocena oddziaływania przedsięwzięcia na środowisko jako instrument zarządzania środowiskiem w wybranych gminach polskich [Assessment of the environmental impact as an instrument of environmental management in selected Polish municipalities]. *Ekonomia i środowisko* [Economics and environment] 1(52): 56-78.
- Pan, M., Zou, W., Lv, K., Qian, X. (2022). Can environmental protection interview policy reduce air pollution? A spatial difference-in-differences approach. *Applied Economics* 55(11): 1217-1233.
- Szałata, Ł. (2013). Zarządzanie środowiskiem poprzez implementację modelu miasta niskowęglowego/niskoemisyjnego drogą do zrównoważonego rozwoju aglomeracji miejskich [Environmental management through the implementation of a low-carbon/low-carbon city model as a way to sustainable development of urban agglomerations]. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu* 318: 286-293.
- Wojciechowski, R. (2012). Polityka ekologiczna a zarządzanie środowiskiem [Environmental policy and environmental management]. *Zeszyty Naukowe Uniwersytetu Przyrodniczo-Humanistycznego w Siedlcach. Administracja i Zarządzanie* 22(95): 417-429.
- Wyrębek, H. (2010). Zarządzanie ochroną środowiska w jednostkach samorządu terytorialnego na przykładzie gminy [Environmental management in local government units on the example of a municipality]. *Zeszyty Naukowe Akademii Podlaskiej. Administracja i Zarządzanie* 11(84): 47-57.