DOI:10.17951/h.2023.57.4.183-200

A N N A L E S
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. LVII, 4 SECTIO H 2023

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Fee for Reducing Natural Field Retention as an Instrument of Sustainable Public Finance

Keywords: stormwater management; environmental fee; stormwater fees; sustainable development finance; sustainable development goals

JEL: H23; H30; Q25; Q56

How to quote this paper: Sygut, E. (2023). Fee for Reducing Natural Field Retention as an Instrument of Sustainable Public Finance *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *57*(4), 183–200.

Abstract

Theoretical background: Active national fiscal policy is an important determinant of sustainable development. Poland falls below the water security level, which is why natural retention is a particularly important issue, as the poverty of societies begins with a lack of access to water. This also poses a challenge for public finance, which should encourage specific behaviors. As of 1 January 2018, a fee for the reduction of natural land retention is levied in Poland.

Purpose of the article: The aim of the article is to analyze and evaluate the fee for reducing natural field retention as an instrument of sustainable public finance and to assess its fiscal efficiency in terms of its ability to raise public revenue, in particular the revenue of municipalities on the example of cities with county rights in the Silesian Voivodeship.

Research methods: The paper draws on literature reviews and the conducted empirical research. Data were collected using the direct method via access to public information. First, an analysis was carried out on the amount of revenue generated from the fee for reducing natural field retention, constituting the income of the State Water Holding – Polish Waters. Subsequently, an analysis was made on the amount of revenue generated from the fee for reducing natural field retention in municipalities with county rights

in the Silesian Voivodeship. The study covered the years 2018–2022, i.e. from the introduction of the fee until the last year for which the data are available.
Main findings: The fee for reducing natural field retention is a sustainable public finance instrument designed to shape attitudes and influence behavior. Although levying a fee for reducing natural field retention does not solve the problem of insufficient retention, it encourages discussion and implementation of measures to improve it. The mandatory fee is intended to discourage the construction of impervious surfaces and, at the same time, encourage property owners to incorporate retention systems into their construction plans to counteract the lowering of groundwater levels. It is of great importance, not in an economic or fiscal sense (public revenue), but rather in a social sense, by raising public awareness of the problem of natural retention.

Introduction

Local self-government units in Poland face a wide range of problems. Issues related to the economic and social crisis attract the most attention. The climate crisis, on the other hand, brings into focus the problems related to both of them. In Poland's case, the climate crisis primarily means a water crisis. Water resources in Poland are relatively minor compared to other EU member states. Water is not only one of the basic goods essential for human life, but also fulfils other important roles, notably in the economy. It is necessary to ensure its undisturbed circulation in the environment, while also minimizing waste and eliminating pollution. The availability of water, in adequate quantity and quality, is essential to sustain life and for all kinds of human activity.

Sustainable development is not possible without appropriate adjustments in the realm of finance. Striving for a balance between environmental, social, and economic development necessitates building sustainable finance, including public finance. Active national fiscal policy is an important determinant of sustainable development. The challenge for finance, including public finance, is the need to protect the common good, i.e. the natural environment, including water resources, and the shaping of appropriate behavior, reconciling the rational and responsible use of resources with the pursuit of economic development. Such activities are in line with sustainable development goals. The government administration, recognizing the need to implement coordinated actions in this area, also involves the self-government administration in the implementation of these tasks. The delegation of powers to collect fees for reducing land retention to municipalities, as basic units of local government, can serve as an example.

The aim of this article is to analyze and evaluate the fee for reducing natural land retention as an instrument of sustainable public finance, as well as to assess the fiscal efficiency of this fee, understood as the ability to generate public revenue.

Literature review

The state is the primary actor involved in the process of ensuring and achieving sustainable development goals (Zioło, 2020, p. 92). The role of the state is to determine the instruments of environmental management. Economic incentives are important in the pursuit of sustainable development (Kłos, 2017; Zhao et al., 2019; Pancewicz, 2021). Among the economic instruments of environmental management, those of a fiscal nature are of particular importance (Rogall, 2010). Sustainable public finance refers to the processes involved in collecting and spending public funds, while taking into consideration the importance of the social and environmental context. As such, a distinction is made between revenue and expenditure instruments of sustainable public finances. Economic instruments, including fiscal instruments, usually have two functions in achieving sustainable development (Poskrobko & Poskrobko, 2012, p. 139; Rosiek, 2016a; Zioło, 2020, p. 92):

– fiscal function – they are intended to raise the revenue needed by the state to finance running costs and investments,

– stimulative function – they are intended to encourage certain actions and shape desired attitudes and behaviors.

Public authorities seek out instruments to support the implementation of sustainable development policy also with regard to the management of water, rainwater, and stormwater. The fee for reducing natural field retention was introduced by the Water Law Act of 2017 (Ustawa z dnia 27 lipca 2017 r. – Prawo wodne). It is a typical revenue-based fiscal instrument used in environmental management. The purpose of the fee is to increase the importance of stormwater retention implementing the principle that water should stay where it falls. For this reason, the levy is colloquially referred to as a "rain tax"[1] (less commonly as a retention fee or concrete tax). Unfortunately, the term "rain tax" used in the media creates a negative public perception of this levy. It implies that the public levy is imposed on an atmospheric phenomenon whose occurrence is unplanned and independent of human will. While it is true that the levy relates to the effects of precipitation (not just rain), it is not the atmospheric phenomenon that is subject to the levy, but human action that results in a reduction in natural field retention. Therefore, the term concrete levy is much closer to the levy's purpose.

The concept of retention is not defined in the Act. In hydrology, retention is understood to be the temporary removal of water from circulation and the holding back of water in an area for a longer or shorter period of time (Bajkiewicz-Grabowska, 2020). Why is retention important? Urbanization leads to an increase in impervious

[1] The term "rain tax" is sometimes also used to refer to a fee for water services related to the discharge into waters (not directly to the ground) of stormwater or snowmelt previously collected in designated types of water facilities, i.e. open or closed stormwater drainage systems used for the discharge of precipitation or common sewer systems.

surfaces, which significantly reduces the infiltration of stormwater into the ground and consequently reduces groundwater supply and intensifies the effects of droughts. In addition, impervious surfaces increase surface run-off, causing flash floods. Increasing natural water retention is a way of reducing the effects of droughts and floods. Given the increasing water deficit in Poland, there exists a need to encourage measures to improve natural retention. Almost 25% of Poland's territory consists of areas at high and very high risk of hydrological droughts (Kędziora et al., 2014).

Poland is a country relatively scarce in water resources (Suchożebrski, 2018). Some regions of Poland are already experiencing periodic problems with water supply. The scale of the problem is best illustrated by the data in Figure 1.

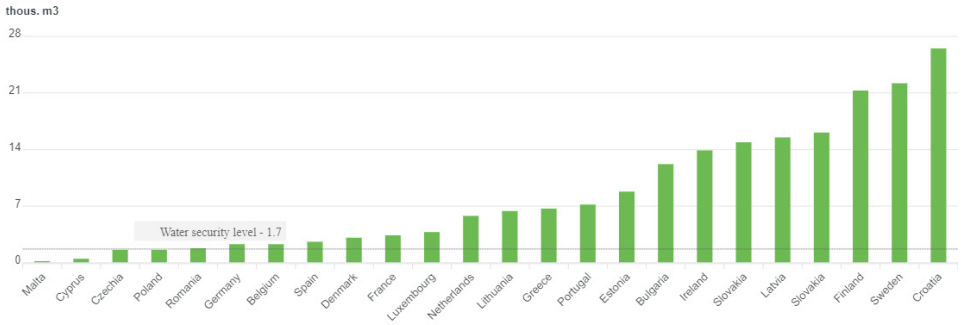

Figure 1. Renewable freshwater resources per capita in the EU
(Long-Term Annual Average – Average from 1999–2020)

Source: (Statistics Poland, 2022b).

In Poland, the volume of renewable freshwater resources per capita is less than 1,600 m3, which is below the UN established water security level of 1,700 m^3 per capita (Statistics Poland, 2022b). Considering that the data presented are annual averages over 11 years, we are not talking about an accidental fluctuation but an established trend. The only EU countries with a worse situation in terms of freshwater resources are the Czech Republic, Cyprus, and Malta. Projections for the future show that more severe hydrological droughts can be expected to cover increasingly larger areas (Gutry-Korycka et al., 2014).

Access to water is a fundamental element of our local security (Potoczka, 2017). Difficulties related to water shortages in both the environmental and social, and economic areas will primarily affect municipalities as the local government units responsible for carrying out the tasks of collective water supply and collective sewage disposal (Ustawa o samorządzie gminnym, art. 7 ust. 1 pkt 3). Furthermore, these tasks are mandatory own tasks, and thus the municipality is obliged to perform them even if it does not have adequate own income (Czesak, 2014). The declining water resources are becoming a challenge, especially financially, for municipal governments. Reduced water availability means that they will have to tap into ever

deeper groundwater reservoirs, which will increase water acquisition costs and water supply charges.

Not all property owners are obliged to pay a fee for reducing natural field retention. The property must fulfil a total of three conditions before a fee obligation arises. The conditions for the obligation to pay the fee referred to above include (as per the Water Law Act, Section 269(1)(1)):

– the appropriate area and location of the property,

– exclusion of a designated area of the property from the biologically active area,

– performance of specified activities on the property.

Accordingly, the fee applies to properties over 3,500 m^2 in areas not covered by open or closed drainage systems. Smaller properties are not subject to the fee. At the same time, the legislator does not define the term "area not covered by open or closed drainage systems" in the Water Law Act. According to the judgement of the Voivodship Administrative Court in Bydgoszcz of 16 October 2019, II SA/Bd 523/19 (Wyrok Wojewódzkiego Sądu Administracyjnego…), this means that it should be defined as understood in everyday speech.

Another premise triggering the fee obligation of the analyzed fee is the exclusion of more than 70% of the area of the property from the biologically active area. The legislator does not define the term "biologically active area" in the Water Law Act. The provisions of the Regulation of the Minister of Infrastructure, i.e. Journal of Laws of 2022, item 1225, (Rozporządzenie Ministra Infrastruktury…) concerning technical conditions to be met by buildings and their location, can be referred to. However, it may not be entirely correct in its interpretation, as this regulation is not an executive act to the Water Law Act. Although this regulation does not use the term "biologically active area" (*powierzchnia biologicznie czynna*), but "biologically active terrain" (*teren biologicznie czynny*). The key element in this definition seems to be that it is an area with a surface that ensures natural vegetation of plants and retention of stormwater.

Performing specified activities on the property. The legislator distinguishes between two types of activities leading to a reduction in natural field retention:

– performance of works (e.g. ground levelling, land grading, raising the ground level),

– construction of buildings permanently connected with the ground.

The fact that the public levy in question is a fee (not a tax) fundamentally affects the determination of the beneficiary of these funds. In Poland, revenue from environmental fees is accumulated in the accounts of targeted environmental funds, and the income from the fees should be allocated back to the financing of environmental protection and management processes (Poskrobko & Poskrobko, 2012, p. 139). Since January 1, 2018, the main entity responsible for national water management is the State Water Holding "Polish Waters" (further referred to as Polish Waters). As a result, 90% of the revenue from this fee constitutes revenue for Polish Waters and 10% goes to the budget of the relevant municipality, i.e. the municipality responsible for

collecting the fee, that is, the municipality where the property is located. This 10% should be considered as a form of compensation for the performance of activities related to the collection of the fee.

Factors determining the amount of the fee for reducing natural field retention include:

– size of the biologically active area lost,
– period of the reduction of natural retention expressed in years,
– use and effectiveness of water retention devices.

Thus, on the one hand, we are dealing with an essentially unchanging factor (the size of the sealed area), while on the other hand, the amount of the fee depends on the presence and effectiveness of water retention devices (Białek et al., 2018, p. 92). The more efficient the devices (in relation to the annual runoff from sealed surfaces), the lower the rate. Reducing the rate when stormwater retention devices are used promotes pro-environmental measures, which take into account the ideas of sustainable development already at the stage of investment planning. The current rates are published in the relevant executive regulation of the Act.

Noteworthy is the fact that stormwater fees were first introduced in the US in the 1970s but were not widely used until the 1990s (Zhao et al., 2019; LeClere, 2000). In the US, at least 1,600 local governments in 40 states have introduced stormwater fees since the mid-1970s (Chalfant, 2018). The three most common methods for calculating stormwater utility fees are an equivalent residential unit (ERU), tier fee, and flat fee structure (Aladesote & Hunter, 2019). Both the ERU-based and tier flat fee structures take into account impervious surfaces, with tier flat additionally considering the way in which land is used. ERU is more popular in places with high population density and high property values, while flat fee is more popular in places with low population densities and low property values (Kea et al., 2016).

In Canada, on the other hand, most municipalities do not directly charge for stormwater (Abebe et al., 2021). According to the Smart Prosperity Institute, among the 24 municipalities in Canada that have already introduced a stormwater fee, flat-rate approaches predominate – only one has chosen to base the fee structure on impervious area (Smart Prosperity Institute, 2023).

In Germany, stormwater management fees have been introduced in several cities since the 1990s, based on the polluter pays principle, taking into account the impervious area (Novaes & Marques, 2022). Dresden introduced the imperviousness fee based on a property's actual imperviousness in 1998, as one of the first cities in Germany (Ehrenfried et al., 2018). There are two different approaches to calculating the imperviousness fee in Germany: based on the assumed imperviousness of a property (which assumes that properties within a neighborhood are of a similar character and their imperviousness is alike) and based on the actual imperviousness of a property (requiring actual measurement of each property's imperviousness which is more accurate but requires more customer engagement and assessments upfront) (Ehrenfried et al., 2018).

Research methods

The analysis and assessment of the performance of the fee for reducing natural field retention can be carried out with regard to its "efficiency" or "effectiveness". The term "effectiveness" is understood, in a general sense, as the ability to achieve a desired effect/objective. In the fiscal space, the effect/objective should be understood as generating the highest possible revenue from a fee (or tax) while keeping the cost of collection low. A fiscally effective fee (or tax) should not only be fiscally efficient (provide high budget revenues) but should maximize the welfare of society at the same time. This means that a fiscally effective tax also achieves intended non-financial results (e.g. in the area of social or economic policy). Consequently, the efficiency of a fee (or tax) should be associated with numerical measures, whereas determining the effectiveness of a fee (or tax) does not require numbers but can be expressed in words (Laukkanen, 2019). In the case of a fee for reducing natural field retention (or, more broadly, fees related to stormwater management), examples of criteria for assessing effectiveness include answering:

– whether the fee leads to a change in behavior,
– whether the fee improves living conditions.

By contrast, the primary criterion for analyzing and assessing the fiscal efficiency of a fee for reducing natural field retention (or stormwater management fees more broadly) is the amount of revenue generated from the collection of the fee. The amount measure is widely used due to its simplicity and the fact that it specifically represents the scale of the fiscal function performed. This measure can be used to construct more complex measures through comparison with a variety of reference bases (e.g. total tax revenue or GDP).

The carried-out research was intended to verify the assumed research hypothesis that the fee for reducing natural field retention is not an efficient instrument of sustainable public finance. The analysis covered revenue collected by Polish Waters from the fee for reducing natural field retention and revenue collected by municipalities from the fee on the basis of cities with county rights in the Silesian Voivodeship. Data were collected using the direct method via access to public information. The study covered the years 2018–2022, i.e. from the introduction of the fee until the last year for which the data are available.

A relevant public information request regarding the amount of revenue collected by Polish Waters and the revenue collected by municipalities in Poland in connection with the fee for reducing natural field retention was initially submitted to Polish Waters. In its response, Polish Waters provided data on the total amount of revenue from the fee for the specified years, indicating at the same time that they do not have information on how much individual municipalities contributed and how much revenue individual municipalities received from the fee in question. The Local Data Bank of Statistics Poland could not provide such information either. Under these circumstances, obtaining the data required direct contact with the individual municipalities.

The strength of the research procedure conducted based on directly obtained data is their original and unprocessed nature. However, the acquisition of data in this manner is time-consuming, thus necessitating a smaller study group, which certainly limits the ability to formulate conclusions regarding the evaluation of the fee for reducing natural field retention as an instrument of sustainable public finance.

A particular type of municipalities was selected for the study, i.e. cities with county rights from the Silesian Voivodeship as the most built-up, and voivodeships in Poland. In 2020, built-up and urbanized land comprised 5.6% of Poland's area, the largest share of which took up the Silesian Voivodeship (13.2%), while the smallest share of this land was in the Warmińsko-Mazurskie and Podlaskie Voivodeships (3.9% each) (Statistics Poland, 2022a, p. 26). The indicator is calculated as a share of built-up and urbanized areas, i.e. residential areas, industrial areas, other built-up areas, urbanized undeveloped areas, leisure and recreation areas, transport areas, and mining land in use, in the total area of the land.

The request for public information included a question on the total amount collected from the fee for reducing natural land retention, including:

– the amount transferred as revenue to Polish Waters,

– the municipality budget revenue amount.

In addition, the request included a question about the number of entities obliged to pay fees for reducing natural field retention. The requests were submitted to the following municipalities: Bielsko-Biała, Bytom, Chorzów, Częstochowa, Dąbrowa Górnicza, Gliwice, Jastrzębie-Zdrój, Jaworzno, Katowice, Mysłowice, Piekary Śląskie, Ruda Śląska, Rybnik, Siemianowice Śląskie, Sosnowiec, Świętochłowice, Tychy, Zabrze, Żory. Out of 19 requests for public information, only Piekary Śląskie refused to provide public information.

The research concerned two aspects. First, an analysis was carried out on the amount of revenue generated from the fee for reducing natural field retention, constituting the revenue of Polish Waters. Subsequently, an analysis was made on the amount of revenue generated from the fee for reducing natural field retention in cities with county rights in the Silesian Voivodeship.

Results

The amount of revenue collected by Polish Waters from the fee for reducing natural field retention in 2018–2022 showed an upward trend (Table 1). The highest rate of change occurred in 2019, i.e. in the second year the fee was implemented and levied. Among other things, this is due to the increased awareness of business entities of the obligation to pay it.

Between 2018 and 2022, revenue from the fee for reducing natural field retention was of marginal importance in the revenue structure of Polish Waters, as its share did not exceed 0.5%. Table 2 shows the amounts collected from the fee for

reducing natural field retention in municipalities with county rights in the Silesian Voivodeship in 2018–2022.

Table 1. Revenue collected by Polish Waters from the fee for reducing natural field retention in 2018–2022

Specification	2018	2019	2020	2021	2022
revenue amount (in PLN)	2,239,449.39	6,242,787.66	6,362,448.45	7,315,656.71	7,637,113.85
rate of change [100 = last year's revenue] (in %)	–	2.79	1.02	1.15	1.04
revenue from the fee for reducing natural field retention as a share of total revenue of Polish Waters (in %)	0.19	0.39	0.45	0.47	0.35

Source: Author's own study based on information obtained through access to public information and budget implementation reports for 2018–2022 (Ministerstwo Finansów, n.d.).

Table 2. Amounts collected from the fee for reducing natural field retention in municipalities with county rights in the Silesian Voivodeship in 2018–2022 (in PLN)

Specification	2018	2019	2020	2021	2022
amount collected from the fee for reducing natural field retention					
Bielsko-Biała	24,639.80	24,633.00	24,638.40	44,362.80	86,291.10
Bytom	12,068.84	12,068.84	12,068.84	12,068.84	12,068.84
Chorzów	0.00	0.00	0.00	0.00	0.00
Częstochowa	No data	4,508.10	4,508.10	2,739.60	2,150.10
Dąbrowa Górnicza	0.00	2,166.88	2,056.40	2,741.87	2,056.40
Gliwice	15,949.41	88,529.17	51,405.68	107,854.49	28,769.03
Jastrzębie-Zdrój	0.00	0.00	0.00	0.00	0.00
Jaworzno	9,814.50	16,558.20	19,873.48	14,052.40	14,254.15
Katowice	275.94	277.20	491.40	4,071.60	4,071.60
Mysłowice	18,700.95	19,861.97	22,871.56	23,188.02	28,408.80
Piekary Śląskie	No data	No data	No data	No data	No data
Ruda Śląska	26,374.18	26,374.18	26,374.18	25,617.56	25,617.56
Rybnik	6,924.13	3,578.40	3,578.40	3,578.40	3,578.40
Siemianowice Śląskie	11,335.90	19,742.80	15,476.04	10,429.59	8,809.35
Sosnowiec	1,270.80	50,220.90	89,610.30	206,691.01	434,667.02
Świętochłowice	No data	0.00	0.00	0.00	0.00
Tychy	75,213.54	102,155.58	99,572.67	91,757.43	140,610.33
Zabrze	No data	0.00	0.00	0.00	0.00
Żory	No data	10,852.00	19,544.00	18,210.00	56,183.00
10% of the amount collected from the fee for reducing natural field retention, constituting municipality revenue					
Bielsko-Biała	2,737.76	2,737.00	2,737.60	4,929.20	95,879.00
Bytom	1,340.99	1,340.99	1,340.99	1,340.99	1,340.99
Chorzów	0.00	0.00	0.00	0.00	0.00
Częstochowa	No data	500.90	500.90	304.40	238.90
Dąbrowa Górnicza	0.00	240.76	228.49	304.65	228.49
Gliwice	6,749.51	10,408.11	5,765.88	3,652.61	3,295.19
Jastrzębie-Zdrój	0.00	0.00	0.00	0.00	0.00
Jaworzno	1,090.50	1,839.80	2,208.15	1,561.36	1,561.36
Katowice	30.65	30.80	54.60	452.40	452.40
Mysłowice	2,077.90	2,206.89	2,541.27	2,576.45	3,156.20

Specification	2018	2019	2020	2021	2022
Piekary Śląskie	No data	No data	No data	No data	No data
Ruda Śląska	2,930.46	2,930.46	2,930.46	2,846.30	2,846.30
Rybnik	769.35	397.60	397.60	397.60	397.60
Siemianowice Śląskie	1,358.43	2,094.78	1,754.01	1,232.23	1,099.84
Sosnowiec	141.20	5,580.10	9,956.70	22,965.66	48,280.34
Świętochłowice	No data	0.00	0.00	0.00	0.00
Tychy	8,357.06	11,350.62	11,063.63	10,195.27	15,623.37
Zabrze	No data	0.00	0.00	0.00	0.00
Żory	No data	1,206.00	2,171.00	2,023.00	6,242.00

Source: Author's own study.

Noteworthy is the lack of available data for 2018 in a number of municipalities. The majority (14 out of 19, no data available for one) of the surveyed cities were collecting the fee for reducing natural field retention in 2018–2019. The range of amounts collected from the fee between cities and in a given city from year to year is significant. It ranges from several hundred PLN (275.94 – Katowice in 2018) to several hundred thousand PLN (434,667.02 – Sosnowiec in 2022). These are the amounts collected from the fee for reducing natural field retention in total, with 90% of these amounts transferred to Polish Waters and 10% credited to the municipal budgets. The cities in which the amount collected from the analyzed fee was the highest in the whole period under consideration include: Bielsko-Biała, Gliwice, Mysłowice, Ruda Śląska, and Tychy. Sosnowiec presents an interesting case, where a sharp increase in the amount collected from the analyzed fee was observed: from over PLN 1,200 (in 2018) to over PLN 424,000 (in 2022).

The fiscal efficiency of this fee, understood as the ability to collect public revenue, calls into question the rationality of its collection, as in many municipalities the costs of its collection are most likely higher than the revenue from it. The reasons for the low efficiency are to be found in how the fee is structured and in the rules of its collection.

Firstly, the fee is levied on properties in areas not covered by open or closed drainage systems, which can be of great importance in the case of large cities. The collection of this fee in a given municipality is dependent on the internal conditions in the municipality and the fee is levied accordingly. Similar conclusions can be drawn from the information provided in the *NIK about Rain and Stormwater Management*[2] audit, as the audit showed that not in all cities covered by the audit conditions justified the collection of the fee for reducing natural field retention (the fee was collected in 11 out of 18 cities audited). It should be noted that among cities with county rights in the voivodeship, no funds were collected from the analyzed

[2] The report *NIK about Rain and Stormwater Management* is an audit for the period 2018–2020 covering 18 municipal offices (municipalities). Among them were three municipalities from the Silesian Voivodeship (Gliwice, Katowice, Racibórz). The audit covered, among other things, the charging and collection of fees for reducing natural field retention.

fee in 4 municipalities (Chorzów, Jastrzębie-Zdrój, Świętochłowice, Zabrze), which constitutes 21% of the analyzed sample.

Secondly, the legislator has obliged the obliged entities to make appropriate statements, however, given the level of public awareness, it may cause some practical problems. Municipalities do not have any register of entities obliged to pay the fee and rely on statements made by the entities, which may significantly affect the fiscal efficiency of the fee. According to the audit information of the Supreme Audit Office (*Najwyższa Izba Kontroli*, NIK), the failure to submit a statement under Section 552(2b)(2) of the Water Law Act did not constitute an absolute bar to determining the fee. In such a situation, the authority should determine the amount of the fee based on the data at its disposal (*NIK about Rain…*, 2021, p. 56). Irregularities in this respect were found, among others, in Katowice. According to the NIK audit information, The City of Katowice communicated information on the determination of the fee for reducing natural field retention to the obliged entity with a delay, which made it impossible to comply with the quarterly settlement period referred to in Section 272(10) of the Water Law Act. In addition, two properties that should have been subject to fees for reducing natural field retention due to meeting the criteria set out in Section 269(1)(1) of the Water Law Act were not identified and these fees were not calculated, despite the fact that the necessary data were stored in the Department of Building and Spatial Planning of the Katowice City Hall. According to the city's Vice-Mayor, the wording of the provisions of the Water Law Act does not specify the procedure to be followed by the authority in a situation when an entity fails to submit the statement referred to in Section 552(2b)(2) of the Water Law Act and, therefore, the relevant information on the determination of the fee was provided to the entity after receiving the aforementioned statement from it (*NIK about Rain…*, 2021, p. 56). This case exemplifies uncertainties in the interpretation and application of the provisions governing the fee for reducing natural field retention. The ambiguities in the interpretation may have affected the fiscal efficiency of the fee especially in the first year of its collection.

As a consequence of the conditions indicated above, the number of entities obliged to pay the fee for reducing natural field retention, which submitted the relevant statement, in municipalities with county rights of the Silesian Voivodeship in 2018–2022 was not very high (Table 3).

The number of entities paying the fee varies from city to city. Interestingly, in 2022, 6 out of 19 cities saw a decrease in the number of entities obliged to pay the fee for reducing natural field retention that submitted a statement, while only three saw an increase in the number of entities when compared to the numbers from 2018 (or 2019, if data for 2018 is unavailable). In 2022, in the majority of cities (12 of 19), the number of entities did not exceed 10, with 4 cities without a single entity submitting a statement, and no data obtained for 1 city. In 2018–2022, the largest increase in the number of entities paying the fee under analysis was observed in Bielsko-Biała (from 8 in 2018 to 22 in 2022).

Table 3. Number of entities obliged to pay the fee for reducing natural field retention, which submitted the relevant statement, in municipalities with county rights of the Silesian Voivodeship in 2018–2022

Specification	2018	2019	2020	2021	2022
Bielsko-Biała	8	8	8	14	22
Bytom	3	3	3	3	3
Chorzów	0	0	0	0	0
Częstochowa	No data	2	2	1	1
Dąbrowa Górnicza	0	1	1	1	1
Gliwice	12	11	11	10	10
Jastrzębie-Zdrój	0	0	0	0	0
Jaworzno	8	8	8	7	7
Katowice	1	1	2	2	2
Mysłowice	11	11	12	11	10
Piekary Śląskie	No data	No data	No data	No data	No data
Ruda Śląska	5	5	5	5	5
Rybnik	5	1	1	1	1
Siemianowice Śląskie	5	7	7	7	5
Sosnowiec	5	9	12	11	18
Świętochłowice	No data	0	0	0	0
Tychy	11	11	11	11	11
Zabrze	No data	0	0	0	0
Żory	No data	3	3	4	5

Source: Author's own study.

Discussion

Stormwater management fees are the subject of much interest in the international literature. Most notably, consideration is given to the fact that raising funds through stormwater fees can provide a stable source of funding for infrastructure investments (Brisman, 2002; Fedorchak et al., 2017; Tasca et al., 2018; Chalfant, 2018; Ehrenfried et al., 2018). In addition, stormwater fees are an important mechanism inducing changes in the behavior of residents, who are at the same time fee payers, users of public infrastructure, and victims of flooding and urban pollution (Chouli & Deutsch, 2008). Furthermore, it has been pointed out that the determination of the stormwater fee depends on a number of factors, such as the benefits and challenges of stormwater collection (Fedorchak et al., 2017; Ehrenfried et al., 2018; Aladesote & Hunter, 2019; Tasca et al., 2019). At the same time, the literature also emphasizes that affordability at the household level should be taken into consideration when determining fees (Porse et al., 2022).

Previous research in water management in Poland has mainly focused on water consumption (e.g. Kolendo, 2016; Kolendo, 2018; Rakoczy, 2018; Fura & Bonga, 2020), water usage fees (e.g. Lorek & Lorek, 2017; Rauba, 2018), water supply and wastewater disposal fees (e.g. Łyszczak, 1995; Berbeka, 1997; Bartoszczuk, 1999a; Bartoszczuk, 1999b; Kotapski, 2016; Kotapski, 2017; Staniszewski & Chwat, 2017), profitability of water supply and wastewater disposal companies (Grzymała, 1994;

Roman, 2001), and implementation of environmental policies (Bogacka-Kisiel, 1992; Poskrobko et al., 1995).

The fee for reducing natural field retention is a relatively new solution in public finance in Poland. This novel measure was introduced by the Water Law Act on 1 January 2018. It should be recognized that the basis for the introduction of the fee for reducing natural field retention lies in the observed problem of stormwater drainage and public fees charged in this regard. In Poland, fees for stormwater drainage function at two levels. On the national level, the fees are collected for the discharge of stormwater into rivers, and on the municipal level, the fees are collected for the discharge of stormwater into the drainage system. Stormwater discharge fees have been the subject of research (e.g. Matej-Łukowicz & Wojciechowska, 2015; Godyń et al., 2020; Godyń, 2022; Sobota, 2021; Sobota et al., 2022). Research indicates that residents' willingness to incur additional costs for stormwater management stems from their own negative experiences with local flooding and is dependent on their income (Mrozik, 2022). The discussion of the financial and environmental benefits of managing stormwater on the property provided the impetus for the introduction of a public charge related to the loss of natural retention. Particularly noteworthy in this regard is the research of Rosiek, who as early as 2016 advocated the need for a fee related to impervious surfaces (Rosiek, 2016a). As Rosiek notes, stormwater should be treated not as waste, but as a valuable resource that should be managed wisely to reduce the risk of flooding and floods, counteract drought, improve the quality of life in urban areas, and provide irrigation for agricultural use (Rosiek, 2016b). Currently, the fee for reducing natural field retention works in addition to fees for the discharge of stormwater collected in drainage systems within the administrative boundaries of cities (Godyń et al., 2022).

Previous research on the fee for reducing natural retention mainly includes substantive aspects of its introduction, validity, and collection (e.g. Rakoczy, 2019; Grabarczyk, 2019), additional costs of property maintenance (Turkowski, 2018) and assessment of the impact of this fee on the construction of green infrastructure by property owners and the potential efficiency of these investments (Godyń et al., 2022).

Due to the short period of validity and collection of the analyzed fee, no studies have yet been undertaken to analyze the fiscal efficiency of the fee for reducing natural field retention, understood as the ability to raise public revenue, especially municipalities' own revenues. This article aims to fill this research gap.

Conclusions

The use of economic incentives is particularly important in the pursuit of sustainable development goals. Regulations governing water management fees are an interdisciplinary issue, and if the law is to be implemented correctly it is essential that specialists in, among others, law, economics, hydrology and urban planning

work together. The fee for reducing natural field retention is an instrument of sustainable public finance. However, analysis of the functioning of this fee exposes its substantive inadequacies and low fiscal efficiency. From a fiscal perspective, the fee for reducing natural field retention in its current form is an instrument with a minimal impact – both the number of entities covered by the fee and the funds collected are small. The low fiscal performance of this fee does not undermine the legitimacy of its collection, but it should be an incentive to identify and expand the entities paying it using the polluter pays principle.

A particular difficulty for municipalities obliged to collect the fee is the lack of necessary data. The rules for its collection should also be changed by creating a register of entities obliged to pay it and by moving away from a system based on statements submitted by the entities, which would improve not only the fiscal efficiency of the fee, but also its effectiveness in achieving the sustainable development goals of natural retention. Perhaps, the business entity should be required to submit a statement on the parameters necessary for calculating the amount of the fee for reducing natural field retention at the registration stage. A municipality could download from the database the relevant report on business entities on its territory that meet the conditions for the collection of the fee. On the other hand, municipal employees should be granted the powers necessary to verify the information contained in the statements. This would positively influence the charging and enforcement of the fee in the appropriate amount.

A mandatory fee for reducing natural field retention will certainly not eliminate the phenomenon of the ecological debt regarding water management in Poland, i.e. it will not stop water consumption exceeding the Earth's ability to regenerate it on an annual basis. It does not solve the problem of insufficient natural retention, but it draws the public's attention to the issue. It stimulates public discourse on natural retention and measures to improve it. It becomes an impetus for greater public awareness of the phenomenon of natural retention. The fee is intended to discourage the construction of impervious surfaces and, at the same time, encourage property owners to incorporate retention systems into their construction plans to counteract the lowering of groundwater levels. In Poland, there are relatively few readily available surface water resources per capita compared to other European Union countries, which emphasizes the importance and significance of the problem of improving the absorption of precipitation and, consequently, the ability to regenerate water resources. It does not guarantee 100% protection against drought, but it does draw attention to an important problem – the problem of the retention and availability of drinking water. Even if it does not have astounding effects in the economic sense, the preventive (and perhaps educational) effect of this fee is more valuable in the long run. It is of great importance, not in an economic or fiscal sense, but rather in a social sense, by raising public awareness of the problem of natural retention. It should be considered an economic instrument to shape attitudes and influence the behavior of (as it stands now) business entities. From this point of view, the fee must be evaluated positively. We should not forget that the

poverty of societies begins with the lack of access to water, and many Polish municipalities are already facing the problem of drought and lack of (or limited) availability of water on a periodic basis.

Funding

Publication subsidized from the state budget under the program of the Minister of Education and Science called "Excellent Science", project number DNK/SP/549676/2022 subsidy amount PLN 44,000 total project value PLN 81,000 (Poland).

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