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Stormwater fees. Are they really necessary?

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ABSTRACT

The current Polish regulations on water management and environmental protection, adapted to the European Union law, explicitly require that stormwater, as an element of sustainable development of urbanized areas, is treated, discharged and managed with natural methods, if only possible. Management of stormwater runoff involves not only decisions on technological and organizational solutions, but also reaching for necessary financial resources; the principle of costs reimbursement for water services (Polluter Pays Principle). The fees for stormwater discharge cover the costs of operation of closed and open sewage systems i.e. they pay for the costs related to the operation, maintenance and modernization of the sewage channels. The article presents the key issues related to stormwater and meltwater fees, including the discussion on the topic: why pay for rainfall?

Keywords: Stormwater; Fees for stormwater; Surface runoff; Water resources management

1. Introduction

The world is facing a major challenge to ensure that all people have access to sufficient amount of water of good quality. On one hand, we are dealing with depletion and degradation of water resources, while on the other hand, an increasing demand for water is observed. Extreme weather phenomena, such as longer and more severe heat waves or heavy rains, are becoming a trend due to climate changes. The drought we have been dealing with is the worst in many years. Water scarcity and natural disasters with increasingly dangerous social, economic and political consequences require an integrated approach to climate change and water management. The actions intended to adjust water management to anticipated climate change must be comprehensive. They should take into account a number of aspects: protection of water resources as well as ground and surface water quality, management of the catchment area, flood protection, water supply for agriculture and society, management of rainwater in cities and finally, water conservation.

According to the GUS data, the population of Poland was 38,354,000 with 60% of people living in cities (June 2020). There are areas where over the last few decades, twice as much area has been paved or covered with concrete as in the entire previous history of settlement. Such surfaces do not capture rainwater but let it quickly enter the sewage system; then the water is further quickly transported through the channels of stormwater or combined sewage systems and discharged into receiving waters. As a result, about 70% of the water is irretrievably lost. The environmental effects of this type of land drainage include, i.e., [1,5,8,9].

- lower groundwater table in aquifers that are directly in contact with the surface; changes in the natural water balance,
- soil degradation (drying) in urban areas,
- hydromorphological changes in watercourses, i.e. loss of surface watercourses or reduction of low-flow

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flows, degradation of their ecosystems or more intense flooding,
- limited use of rainwater by urban vegetation and lower air humidity, which in turn has a negative impact on the well-being of residents, mainly in summer.

That is why it is so important to reduce surface runoff by, i.e. increasing "field retention", as well as by pre-treatment of rainwater and its utilization in municipal economy, industry and individual households.

The Water Framework Directive 2000/60/WE is the basic EU document that defines the implementation of a comprehensive policy in the field of water resources in order to improve the quality of surface and groundwater. Another document is the Floods Directive 2007/60/WE, which tries to reduce the risks that floods can pose to human health, environment, economic activity and cultural heritage. In Poland, the Water Law Act of July 20, 2017, Journal of Laws 2017, No. 2017 item 1566 is the national act of law defining the principles of water management; it includes financial instruments such as a system of fees for discharge of stormwater and meltwater as well as for reduction of natural retention.

2. Materials and methods

2.1. Fees for the discharge of stormwater – legal status

Charges for water services have been recognized as one of the 5 instruments of water resources management, in addition to water management planning, water permits, water management control and water management information system. According to Art. 9 (1) of the Water Law, water management is carried out following the principle of rational and comprehensive treatment of surface and groundwater resources and taking into account their quantity and quality.

From 2018, the concept of stormwater or meltwater should be understood as water resulting from precipitation (Article 16 (69) of the Water Law) and their discharge is associated with the obligation to pay water service fees. As stated in the Art. 268 par. 1 point 3 of the Water Law, the water service is described as a discharge of stormwater or meltwater previously captured in water facilities, i.e. open or closed stormwater drainage systems or combined sewage systems to waters (environmental fee). In the amendment to the Water Law of 2018, Dz.U. 2018 poz. 1722, stormwater and meltwater were excluded from the category of wastewater and defined as water resources.

In the context of the objectives and principles of the Water Framework Directive, the Water Law introduces, in addition to the environmental fee, a fee for water services related to reduction of natural land retention, hence the law is called the "anti-drought law".

Following Art. 269 paragraph. 1 point 1 of the Water Law, the service fee is payable for reduction of the natural retention as a result of: carrying out works on the property with an area of more than 3,500 m^2 and building structures firmly attached to the land that reduce its retention by taking out more than 70% of the property biological active surface, in areas not connected to open or closed sewage systems. The overriding goal of the act is to stimulate owners and entities to capture rainwater on their property. In the planned draft amendment, the proposed threshold area would start from 600 m^2 with over 50% of occupied active surface (comparing to 3,500 m^2 and over 70% in the current regulations). The proposed changes currently undergo the public consultation process.

Once the changes come into force, the rain fee would cover a much larger group of entities than at present. The proposed changes show that not only entrepreneurs will be obliged to pay a fee, but also individual water consumers, i.e. owners of single-family houses. The fee would be paid by individuals, firms and enterprises, organizations, including companies without legal entity, which:

- own real estates or buildings,
- own independent real estate or buildings,
- perpetually use land,
- own real estates (or their parts) or buildings (or their parts) that are property of the State Treasury or local government – which reduce natural field retention, due to performed activities and constructed objects (Article 298).

The introduction of fees for lost retention is a global trend. The lost retention fee does not apply to all plots and real estate, but only to those in which the built-up area and an impervious surface reduce a natural retention capacity of soil or surrounding water reservoirs. The fee is charged when the built-up area locally reduces possible retention of rainwater or meltwater. The target issue here is not the revenue itself, but rather the idea of reversing the trend of using impervious surfaces in urbanized areas, and thus creating appropriate conditions for protection and restoration of water resources and their rational management without disturbing the environmental balance.

Currently, local governments (municipalities) are responsible for charging and collecting fees. The Polish Waters (National Water Holding "Wody Polskie"), which receive approximately 90% of the revenues, takes responsibility for control and supervision of this process as well as for interpretation of the provisions of the Act.

The lost retention fees constitute the product of:

- unit rate,
- the size of the lost biologically active area (m^2)
- time (years).

Unit rates has been set out in the ordinance of the Council of Ministers, Dz.U. 2017 poz. 2502 on unit charges and range from PLN 0,05 to 0,30 per m^2, depending on a retention system volume.

The lost retention fee in Poland has been introduced in January 1, 2018. According to the draft amendment to the Act on activities that limit the effects of drought, once the act is enforced, the highest annual fees for activities affecting reduction of natural land retention would be:

- no water retention from impervious surfaces firmly attached to the ground – PLN 1,50 per 1 m^2;
- with facilities for water retention from impervious surfaces, with a capacity of up to 10% of the annual runoff

from impervious surfaces firmly attached to the ground – PLN 0,90 per 1 m^2;
- with facilities for water retention from impervious surfaces, with a capacity from 10 to 30% of the annual runoff from impervious surfaces firmly attached to the ground – PLN 0,45 per 1 m^2.

The fee is charged on the basis of documents providing the data necessary to calculate the fee, submitted by the property owners. The declarations will be verified by the municipality offices that are competent to calculate the fees. The sample documents are published by the communes in the Public Information Bulletins. The actual fee is set by the head of the commune, mayor or city president and made public, together with the method of its calculation (Article 272 (22), Ustawa z dnia 20 lipca 2017 r. – Prawo wodne Dz.U.2021.0.624 t).

The more water is retained, the lower the fee. The reduction of a lost retention fee will depend on the size of the property and its development; the fee is directly dependent on a degree of retention of rainwater on the property (the so-called retention rate, e.g. 10%, 20% or 30%). If the building area covers 51% of a 1,000 m^2 plot, then:

- if the owner does not retain water on the property (retention rate – 0%) – the annual fee would be about PLN 255
- if the owner retains over 30% of rainwater (in tanks, containers, barrels, etc.), the annual fee would not exceed PLN 25,50, so it would be 10 times lower.

According to the proposed draft on investments in preventing drought, the amended regulations are to be enforced on January 1, 2022.

Following the proposed amendment, 80% of revenues from the lost retention fees would be hand over to the National Water Holding "Wody Polskie", while the remaining 20% would stay in municipalities; 80% of this revenue will be allocated to rainwater retention projects in catchments of the municipality, while 20% will cover the collection costs. The National Water Holding "Wody Polskie" will allocate 90%–95% of the revenue from lost retention fees for its statutory activities, including construction of retention units and preventing drought, while the remaining 5%–10% will be used to cover administrative costs.

Maintenance of a city stormwater discharge system that drains stormwater and snowmelt outside the sewage area is also associated with a fee for the service provided by the company operating the system (usually a water/sewage company), i.e. with the maintenance costs. The company bears system operation costs, including cleaning, maintenance, regular and emergency repairs, expansion and upgrading of stormwater and meltwater management infrastructure, etc. Poorly maintained and not upgraded stormwater and meltwater infrastructure could be source of severe and costly problems.

Ultimately, the fee for a stormwater and snowmelt discharge through open or closed rainwater drainage systems or in combined sewage systems combines the water fee and the fee for the service provided by the system operator.

The fee for a rainwater and snowmelt discharge in open or closed rainwater sewage systems or combined sewage systems is calculated based on:

- paved (impervious) surface from which sewage – stormwater and meltwater are drained and the average rainfall, calculated as the average rainfall from the last 10 years, as provided by the local branch of the Institute of Meteorology and Water Management (m^2), or
- amount (volume) of sewage discharged from paved surfaces, as a registered discharge to the sewage system, (m^3), or
- constant fee, for keeping sewage equipment ready to deliver services.

In Poland, there is a great deal of freedom in determining fees for a discharge of stormwater or snowmelt. In 2020, these fees have been introduced by 37 cities (4% of the total number of 944), including 7 cities with population over 100,000 (18.5% of the total number of 37). In general, 20 cities have introduced fees for a discharge of the actual rainfall (PLN/m^3) while 17 cities charge based on the size of the impervious area (PLN/m^2).

Calculation of fees for the actual amount of stormwater and snowmelt discharged is determined on the basis of:

- readings from measuring devices, if approved by the water and sewage company;
- a formula taking into account the size of the impervious surface; A (m^2), the average annual precipitation (calculated from previous years) provided by the Institute of Meteorology and Water Management; H_m ($m^3/m^2 \cdot y$), surface runoff coefficient; ψ (–) and the rate (price) set up in a given year for discharging stormwater or meltwater in open or closed stormwater sewage systems; S (PLN/m^3), $O_{wop}=A \cdot H_m \cdot S$

The price for a discharge of stormwater and meltwater into open or closed stormwater systems or combined sewage systems is determined on the basis of calculations of costs incurred for its maintenance as well as fixed and variable fees for water services.

In the city or commune, the fee for a discharge of stormwater and snowmelt into open or closed stormwater systems or combined sewage systems is introduced and approved by the resolution of the City Council.

Below, the Resolution of the City Council of Bydgoszcz is presented, as an example.

[https://www.mwik.bydgoszcz.pl/index.php/cena-wody-i-sciekow]

According to Resolution No. XVIII/418/19 of the Bydgoszcz City Council of November 27, 2019 on the price for a discharge of stormwater or meltwater into open or closed rainwater sewage systems used to drain precipitation, the following prices are set for the years 2020–2022:

- 4,04 PLN/m^3 net (4,36 PLN/m^3 gross) in year 2020,
- 4,44 PLN/m^3 net (4,80 PLN/m^3 gross) in year 2021,
- 4,88 PLN/m^3 net (5,27 PLN/m^3 gross) in year 2022.

Based on the above prices, a fee is charged for a discharge of stormwater or meltwater from the impervious surface, including roofs, to the rainwater sewage system. The fee does not apply to areas from which rainwater or meltwater are collected and managed and therefore are not introduced into the rainwater sewage system. The recipients of the service are individuals and legal entities as well as entities without legal representation, that use real estate or its part, including buildings and premises.

In 2021, the average annual amount of precipitation has been assumed as 0.5552 m^3/m^2, based on the data of the Institute of Meteorology and Water Management.

The resolution is valid from January 1, 2020 to December 31, 2022.

3. Results and discussion

3.1. Legitimacy of the lost retention fee

The lost retention fee, also known as the fee for concrete paving is not of a fiscal nature, and although it is similar to a tax it is not a tax. As the Ministry of Climate and Environment justifies, the proposed legal changes regarding the lost retention will reduce drought throughout the country, as well as prevent flooding and urban floods; this way material and health losses caused by these phenomena may be avoided. The hydrological resources of Central Europe (including Poland) are slowly but steadily deteriorating. Climate models, prepared for Poland up to year 2100, showed that extreme phenomena such as sudden rains and long periods of drought will intensify in nature. In order to achieve proper water management, about 20% of the average annual river discharge should be collected – the European water retention average [6]. Therefore, it is necessary to change the approach to the rainwater issue and strive to reduce surface runoff by increasing retention, as well as rainwater pre-treatment and use. Natural retention or possible systems for reuse of rainwater contribute not only to environmental balance, but also to protection of water resources.

Once the amendment is enforced, the fee for the lost retention will increase its incentive function as an economic instrument, helping to implement the objectives of the state policy concerning preventing drought, development and protection of green areas, as well as adaptation to a climate change. The overriding objective of the act is to stimulate owners and entities to implement measures aimed at retaining rainwater onsite and it possible use. If such actions are undertaken on estates submitted to amended regulations, the retention fee may be substantially reduced or even waved.

Building and restoring of small retention in urban and rural areas should be a part of cooperation between municipalities (local governments and communities) and National Water Holding "Wody Polskie", with a continuous support of the Ministry of Climate and Environment.

Investments in rainwater retention tanks and stormwater infiltration devices are beneficial for property owners as well as for environmental protection.

In order to encourage residents and develop their pro-ecological (saving water) behaviors, many municipalities organize competitions on stormwater use and grant financial subsidies for implementation of installations that would promote a rational rainwater management, e.g. "Catch rainwater", "Małopolska rainwater", "Rainwater", "Warsaw Catch Water", "Catch the Rain", "The City of Sponge" or "Bielsko-Biała is catching the rain" [https://www.wody.gov.pl/mala-retencja/blekitno-zielona-infrastruktura/program-dofinansowan].

Municipalities could also apply for the EU funding for the construction, expansion or renovation of the stormwater sewage system and stormwater reservoirs. The Ministry of Climate and the National Fund for Environmental Protection and Water Management allocated for these projects PLN 60 million from the Infrastructure and Environment Operational Program 2014–2020. A support was also given to projects concerning, e.g.: construction, extension or renovation of a rainwater sewage system and its infrastructure, which contributes to capture, retention, use and/or treatment of rainwater, as a part of the EU competition.

At the national level, a program My Water Priority Program for 2020–2024 was created that co-finances projects dealing with retention of rainwater within the property. From July 1, 2020, Provincial Funds for Environmental Protection and Water Management (PFFEPAWM) have been to the program on a continuous basis.

In urbanized areas, green and blue infrastructure plays a key role in creating and restoring small retention. It helps to:

- maintain water in the landscape for as long as possible, minimize runoff from the catchment and increase surface and ground retention, as well as stretch a water discharge in time,
- maximize transport of water from the soil to the atmosphere via plants and minimize direct evaporation from the soil.

Green infrastructure is based on natural and semi-natural elements that make up the environment; as a "natural technology" is designed and managed to create nature-base solutions [2,10].

The simplest examples of such projects are rain gardens and pocket parks. The rain garden helps the residents of nearby houses to deal with rainwater accumulation. However, once it blooms, it will also become a decorative element in the area.

A good example is the city of Krakow, where 5 new parks have been created, 29 parks have been modernized and revitalized, and 21 pocket parks have been created in recent years. The city allocated half a billion zlotys for this purpose. The municipality has received many awards for the undertaking such projects and investments. The green revolution in Krakow continues, and the city will allocate approx. PLN 190 million for greenery in 2021.

Grants for activities that prevent climate change, including those related to green and blue infrastructure, can be obtained by cities under the European City Finance Lab platform, financed by Climate-KIC. City Finance Lab is the first European platform to support the development of innovative, repeatable and scalable financial solutions that aim to increase investments limiting climate change and low-carbon and green urban projects for sustainable cities.

The "City with Climate" program is a support mechanism for cities undertaking activities for implementation of ecological and climate policy. As part of the "City with Climate" program launched in 2020, PLN 140 million was distributed in 27 programs, involving e.g. research on advancement of cities in the environmental policy, a series of municipal workshops, and a competition for the best urban solution of green and blue infrastructure. As part of this year's edition of "Cities with Climate", the Ministry of Climate and Environment has planned, i.e. an analysis of activities undertaken by cities; the analysis will measure the effects in implementation of ecological and climate policy in five categories: air quality, urban greenery, zero-emission transport, energy transformation and urban retention

With regard to urban greenery, the analysis will be carried out by the Ministry of Climate and Environment using the following indicators: area of parks, lawns and other green areas per capita (m^2/capita), tree planting per 1000 residents (pcs/1000 residents) and expenditures on development and maintenance of green areas per capita (PLN/capita). In the urban retention category, the following indicators will be analyzed: catchment area covered by retention systems and rainwater management in the rainwater catchment area within the city limits (%), capacity of rainwater retention devices per 1resident (m^3/resident) and the indicator the nature-friendly retention potential of the city (%).

Cities distinguished in the above-mentioned analysis will receive the title of "Cities with Climate", in one or more categories. They will be able to inform about the title on information plaques placed on public buildings and via a visual identification system used in public communication (e.g. on the Internet, in correspondence). Such cities will also be included into strategic consultancy coordinated by the Institute of Environmental Protection and financed by the National Fund for Environmental Protection and Water Management. Strategic consulting, together with the cities, will review selected strategic and planning documents and develop recommendations for modification or define new ambitious goals of climate and environmental transformation, including a list of indicative projects. This type of support will also help to build the city's administrative capacity and prepare it to finance key investments under the new EU financial perspective, funds from the National Reconstruction Plan and priority programs of the National Fund for Environmental Protection and Water Management. The strategic consulting process will be summarized in the final report, individually for each city [7].

4. Conclusion

The problem of poor retention seems to be especially severe in urbanized areas. In cities, there have always been natural disasters that generate social, economic and environmental losses; there are related to the climate, natural conditions and human activity in a given area. Currently, they become more frequent and their extreme intensity have been observed both in Poland and all over the world. The main cause of such events is progressive warming of the climate, which is associated with intensification of extreme atmospheric phenomena, including natural disasters [10,11].

We are surrounded by more and more urbanized areas from which water drains quickly. One of the most important problems related to operation of modern rainwater sewage systems is their hydraulic overload as well as hydraulic overloading of receiving water (city rivers). Therefore, safe and rational drainage should be oriented towards reduction of volume and velocity of water drained from paved surfaces and subjecting it to pretreatment. As a resource, rainwater should be protected from pollution, managed and used onsite. Spatial policy of the cities and their investments should promote rainwater retention.

A financial mechanism, similar to the rain fee, should mobilize local governments to more efficient retention, and significantly contribute to the effective and efficient management of water resources; the funds should be spend on activities that ensure the availability of sufficient amount of good quality water.

From August 17, 2020, the draft Act on investments related to preventing the effects of drought undergoes public consultations; the last documents in the legislative process were disclosed in the Government Legislation Center on March 17, 2021.

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