

Fishy business

**Monitoring of the situation and water
consumption data in the coal industry**



instrat

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Key numbers and conclusions

5,68 km³

is how much water is used annually by the energy industry in Poland (data from Statistics Poland (Główny Urząd Statystyczny GUS) for 2022). This is more than eight times the volume of Lake Śniardwy - the largest lake in Poland in terms of surface area. As much as 96% of this water is not reused. Coal-fired power plants with open cooling circuits abstract the vast majority.

**1.4 mln
tonnes**

of sulphates and chlorides were discharged into surface waters by coal mines in 2022 (data from the Industrial Development Agency (Agencja Rozwoju Przemysłu w Katowicach). The sum of permitted discharges under water and integrated permits is significantly higher. Even legal levels of salt discharges can cause ecosystem limits to be exceeded many times in some rivers (NIK, 2023).

- **Data on water consumption in the Polish industry (including coal mining) is inconsistent, incomplete, and often mutually exclusive.** There is a lack of access to crucial information on the environmental aspects of the sector's operations, which, combined with inaccurate records in environmental permits, results in a lack of accurate control over the environmental impact of the coal industry's activities.
- **The available data sets are split between governmental agencies and their regional branches.** Challenging procedures for obtaining the permits and their presentation make it difficult to analyse and monitor the water management situation. The data can be obtained as scans of paper versions of documents, which can take up to several months. In addition, processing information obtained in this form is time-consuming. An example is the data contained in the water abstraction database and wastewater discharge permits for power plants and mines in Poland, published as an annex to this report (link in editorial footer).
- **Data analysis and monitoring within environmental institutions and the government is also ineffective** due to the low level of digitalisation of information and data flows, staff overload, and lack of access to complete details.
- **We recommend that the government develops a complete and publicly available water use database for environmental monitoring,** which will report on water use by individual industries. The data should be comprehensive, easily accessible, free of charge, and published in a readable format (e.g., CSV) on the dane.gov.pl platform.

1. Introduction

1.1. Use of water by Industry

Polish regulations on water abstraction and wastewater management are scattered in many laws and subordinate legislation. **In most cases, the competent authority that issues permits for water use is Wody Polskie** (*eng.* Polish Waters). This is the overarching organisation responsible for water policy. These decisions are subject to appeal at a higher instance¹.

Environmental Protection Law² and other legal acts list facilities and installations that may significantly impact the environment. Their operation related to the use of the environment and the discharge of pollutants is regulated by the relevant authorities, such as the aforementioned Wody Polskie.

Establishments with a significant impact on the environment include:

- Thermal power stations and other solid fuel combustion installations with a thermal capacity greater than 10 MW and installations burning other fuels with a capacity greater than 25 MW.
- Large mines and mining facilities, including but not limited to quarries, gas and oil wells.
- Other extensive industrial facilities, larger cultural, entertainment, agricultural, or commercial buildings, and large structures of almost any type³.

The list of institutions that significantly impact the environment thus includes virtually every significant economic activity. This implies an obligation for these entities to report both their environmental impact and methods of reducing it. In theory, this should allow the relevant governmental agencies to strictly regulate most sectors of the Polish economy and limit the adverse effects of environmental exploitation.

However, the devil lies in the details. Environmental permitting regulations can be surprisingly unrestrictive. There are also several provisions and exceptions that make it possible, in practice, to circumvent the obligation to report activities to the relevant government agencies. For example:

- In many economic sectors, such as industrial animal husbandry, regulation is commonly avoided by dividing large farms into several smaller ones, each operating below the threshold of more stringent environmental requirements.
- Old industrial facilities (including boilers in power plants and combined heat and power plants) benefited until a few years ago from derogations allowing emissions above limits for a limited period (e.g., 17 500 hours of total operation until the boiler is permanently shut down)⁴. Higher air pollutant emissions are also permitted during the start-up and shut-down.

¹ Act of 14 June 1960 Code of Administrative Procedure (Journal of Laws of the Republic of Poland 2023, item 775).

² Act of 27 April 2001. Environmental Protection Law (Journal of Laws of the Republic of Poland 2022, item 2556, amended).

³ Regulation of the Council of Ministers of 10 September 2019 on projects likely to have a significant impact on the environment (Journal of Laws of the Republic of Poland 2019, item 1839).

⁴ Regulation of the Minister of the Environment of 21 July 2015 on the requirements relevant to the implementation of the Interim National Plan (Journal of Laws of the Republic of Poland 2019, item 1877, amended).

- Pollutant limits are often expressed as an annual average rather than an hourly value. This approach means that during periods of low river flows and high production at the same time, water or air pollution can reach environmentally dangerous concentrations.

In addition, environmental regulations may be diluted by other legislation. For example, they may completely exempt "key investments" from the rigour of assessing their environmental impact (the so-called "Specustawy")⁵ (Bąkowski et al., 2020; Krupa-Dąbrowska, 2021) or set arbitrary limits on pollutants that are above safe levels⁶.

The coal mining and conventional energy sectors significantly impact the water environment. This can take place in several ways. One is the discharge of large quantities of salt or highly heated water into surface waters. Wastewater with a chloride and sulphate content of more than 1.5 g/l can be discharged into rivers almost without restriction, provided that the final concentration in the river does not exceed 1 g/l. In the case of large rivers such as the Vistula and Oder, this theoretically allows millions of tonnes of chlorides and sulphates to be discharged into Polish rivers annually. According to the Act, even this final concentration is not required, as it is permissible to "increase the total concentration of chlorides and sulphates to a value greater than 1,000 mg/l, below the point of discharge of wastewater or waters referred to in paragraph 1, provided that this does not cause damage to the aquatic environment and does not impede the use of the waters by other users."⁷.

Cooling water can be discharged into lakes and rivers as long as its temperature does not exceed 35°C. This temperature exceeds the survival limit for virtually all native freshwater multicellular species. Therefore, environmental permits usually include a maximum permissible temperature for the entire river or lake. This criterion still does not eliminate the negative environmental impacts of discharging warm water into water bodies (Pracownia na Rzecz Wszystkich Istot, 2020). This is also particularly relevant in the context of rising global temperatures and accelerated rates of land warming at higher latitudes.

For this publication, as the coal industry, we consider all entities that mine hard coal and lignite and, among those that produce electricity, those whose installations belong to Centrally Dispatched Generation Units (JWCD) and are fired by solid coal fuels (PKD codes: 05.10.Z, 05.11.Z and 35.11.Z).

The Instrat Foundation's contribution to opening up environmental data is creating and publishing a database of water abstraction and wastewater discharge permits for power plants and mines in Poland, an annexe to this report. It is available at the address indicated in the editorial footer and contains information on the conditions of environmental use in the water and integrated permits we obtained.

1.2. Water abstraction and pollution emission permits

Water-intensive industries have historically been required to obtain permits from the government administration for water abstraction and wastewater emissions. With the

⁵Act of 10 April 2003 on special rules for the preparation and implementation of investments in the field of public roads (Journal of Laws of the Republic of Poland 2023, item 162, amended).

⁶Regulation of the Minister of Maritime Affairs and Inland Navigation of 12 July 2019 on substances particularly harmful to the aquatic environment and conditions to be met when discharging waste water into waters or into the ground, and when discharging rainwater or snowmelt into waters or into water facilities (Journal of Laws of the Republic of Poland 2019, item 1311).

⁷Ibid.

establishment of Wody Polskie in 2018, this agency took over the responsibility of granting permits and overseeing data archives. Water permits may contain the following information:

- type and scale of economic activity,
- the technology and performance characteristics of the installations concerned,
- the environmental protection measures applied,
- data on the expected use of environmental resources, the hazardous substances used and the way they are used and disposed of,
- the permitted level of harmful emissions and waste production,
- data on water abstraction and wastewater discharge,
- environmental exemptions and restrictions,
- mechanisms for controlling and reporting environmental impacts and everything related to environmental impacts,
- risk analysis of all significant events with a potentially harmful effect on the environment,
- expiry date (if applicable),
- justification,
- information on the procedure for appealing the decision.

2. Data governance model

The industry is not required to publish data on its environmental impact except in strictly defined cases. This data is sent to the relevant governmental agencies responsible for environmental protection, such as Wody Polskie, which processes them internally but does not publish it. This information can be made available under the Act on the Provision of Information on the Environment and its Protection⁸.

As pointed out by the Supreme Audit Office, environmental protection authorities, including the issuing of water permits and integrated permits, have allowed water to be used in a way that does not ensure the safety of the ecosystem. Even legally discharged pollutant amounts can affect aquatic organisms in extremely adverse ways. The lack of complete data (gaps in the data governance strategy) in Wody Polskie meant that other state institutions could also not obtain this data (NIK, 2023). This constitutes, in the opinion of the Supreme Audit Office (Najwyższa Izba Kontroli - NIK), a failure to fulfil both the Water Act⁹, as well as the Act on Informatisation of the Activities of Entities Performing Public Tasks¹⁰ (NIK, 2023):

PGW WP did not have complete and up-to-date information on entities/units using the waters, including water rights and integrated permits, the water use

⁸ Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws of the Republic of Poland 2023, item 1094, amended).

⁹ Act of 20 July 2017. Water Law (Journal of Laws of the Republic of Poland 2023, item 1478, amended).

¹⁰ Act of 17 February 2005 on the computerisation of the activities of entities performing public tasks (Journal of Laws of the Republic of Poland 2023, item 57, amended).

conditions set out therein, the number and location of wastewater discharges, and their quantity and quality. The lack of reliable data prevented effective water management, including water conservation (it was not possible to make a reliable assessment of pressures as well as a reliable preparation of planning documents). (...) Thus, the data sets were not maintained in a manner that ensured interoperability at the organisational, semantic, and technological level within the meaning of the Act of 17 February 2005 on the computerisation of the activities of entities performing public tasks, thus failing to meet the requirement set out in Article 330(3) of the Water Law Act.

2.1. Industrial Development Agency Katowice Branch

The Katowice Branch of the Industrial Development Agency (Agencja Rozwoju Przemysłu, Oddział w Katowicach) publishes annual and quarterly reports on the environmental impact of hard coal mining in Poland, based on the Act on the functioning of hard coal mining¹¹. This includes the following information:

- The extraction and use of rock masses and tailings taken directly from mines or coal preparation plants. Most of these end up in landfills (heaps) or are used for construction and earthworks.
- Emissions of gases and dust into the atmosphere.
- Water abstraction and wastewater discharge.
- Fees and financial penalties paid by companies in the sector for environmental impacts.

The data published by ARP Katowice presents the resulting statistical information, i.e., the total, aggregated environmental impact of the entire hard coal mining sector. The publicly available data only goes as far as 2021; some information for 2020 is also available. Until 2021, ARP Katowice publications produced under the Public Statistics Research Programme - financed from the state budget - were available for a fee on the online shop's website run by this state-owned institution (www.polskirynekwegla.pl).

To this day, additional information on the sector's functioning can be purchased on this website for a fee of up to several thousand PLN. This makes it significantly more difficult to access information regarding the sector's state and monitor its negative environmental, economic, and social impact.

2.2. State Water Management Authority Wody Polskie

State Water Management Authority Wody Polskie (Państwowe Gospodarstwo Wodne Wody Polskie - PGW WP) is an agency that combines all water management issues into a single entity. Wody Polskie are responsible for water resources management, flood and drought mitigation, and water quality. The institution also issues water permits and integrated permits for industry and controls water tariffs for households.

As part of the study, data was obtained through an environmental information request form (under the Act on the Provision of Information on the Environment and its Protection) from

¹¹Act of 7 September 2007 on the functioning of the coal mining industry (Journal of Laws of the Republic of Poland 2022, item 1309, amended).

11 Regional Water Management Authorities (Regionalny Zarząd Gospodarki Wodnej - RZGW) responsible for issuing permits. The statutory deadline for responding is 30 days, but the data arrived late in several cases.

As the original documents the Regional Board keeps are in various forms, including hard copies, they must be found in the archives and later scanned into a PDF file. A small fee (depending on the number of pages to be scanned) must be paid to obtain the documents at each Regional Board.

The entire process of obtaining data - from sending the request to obtaining documentation - can take up to several months.

As part of the project, requests for environmental information and information collected in the Water Management Information System were sent. The scope of the inquiry covered all coal mines in the country (regardless of their size, location, and type of coal mined) and all thermal power plants included in the Centrally Dispatched Generating Units (Jednostki Wytwórcze Centralnie Dysponowane - JWCD). Our inquiries included the name, operator, and location of each facility.

The documents received included sequences of successive water and integrated institutional permits (in some cases going back as far as 20 years) and information on extensions and updates resulting from plant upgrades. The results and conclusions obtained from these data are discussed in the following sections of this analysis.

2.3. Statistics Poland

The resulting statistical information on the environmental impact of the Polish industry can also be found in publications of Statistics Poland (Główny Urząd Statystyczny - GUS). The most critical data on this subject is published by the Spatial and Environmental Research Department in two annual publications:

- *Environmental protection* – the publication contains general data on water consumption and wastewater discharge. We have included the most relevant data for this publication in Figure 2 (GUS, 2023a).
- *Economic aspects of environmental protection* – the publication contains data on environmental charges and financial penalties at an economy-wide level. The publication also contains information on the environmental funding framework (GUS, 2023b).

The Statistics Poland's data is valuable for their holistic view of the problem, easy access, and interdisciplinary subject matter. However, they are not assigned to specific companies or facilities but relate to entire sectors of the economy. This significantly reduces their usefulness in analysing locally affecting environmental risks, such as chloride discharges into the catchment area of a specific river.

The value of water abstraction by heat and power plants is almost double that of all other economic sectors combined. According to the Statistics Poland, the energy industry entities are "Electricity, gas, steam, and hot water production and supply" (almost 99% of water abstraction) and "Mining and quarrying" (approximately 1.2% of water abstraction).

3. Conclusions from the data analysis

3.1. Water abstraction by power plants

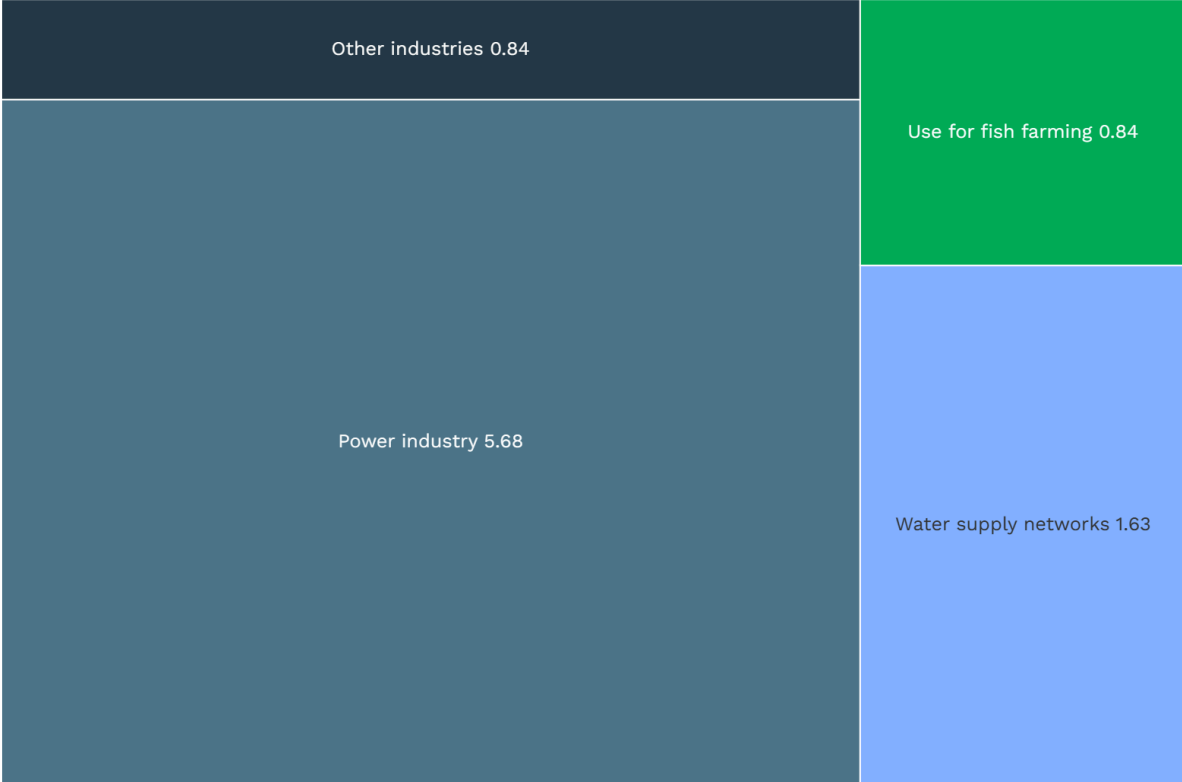
The energy industry is the sector of the Polish economy that draws the most water from the environment. Unlike agriculture, which relies heavily on atmospheric precipitation (supported at most by groundwater abstraction from local intakes), only a few coal-fired power plants with open cooling circuits are responsible for the majority of water abstraction by the industry.

The vast majority (63%) of measured and monitored water use in GUS statistics is attributable to the sector supplying electricity, steam, hot water and gas to other consumers. Only 4% of this water is reused (GUS, 2023a).

Chart 1. Statistics Poland resulting information on water abstraction

The power industry is responsible for the majority of water abstraction in Poland

Total volume of water intake by power plants and combined-heat-and-power plants for year 2022 is almost twice as large as all other economy sectors combined. All values in cubic kilometres per year.



Source: Instrat Foundation own work based on data from Statistics Poland ("Environment 2022")
"Power industry" on this chart consists of entities listed by Statistics Poland in categories "Electricity, gas, steam and air conditioning supply" (almost 99% of the volume in this chart) and "Mining and quarrying" (roughly 1.2% of the volume in this chart).



The impact of water consumption on the ecosystem and the Polish economy is unequal. Power plants do not release a considerable amount of harmful substances into rivers. Their massive water abstraction is due to treating the river or lake ecosystem as a heat sink. The flux of water withdrawn is high due to their low thermal efficiency (30-42% for coal-fired power plants cooled by river water) and the required low-temperature difference between the condenser and the surroundings.

The most significant environmental impact is the heating of water, which negatively affects river and lake ecosystems:

- Warmer water creates conditions unfavourable for cold-tolerant species but favourable for warm-loving organisms, disrupting natural ecosystems.
- Decomposition of organic matter occurs faster in warmer water, leading to algal blooms and periodically reduced oxygen levels.
- The larvae and juvenile fish usually do not survive being sucked along with the water into the cooling circuit of the power plant and heating this water to 35°C. It is estimated that hundreds of millions of juvenile fish die this way every year in just a few power plants (Pracownia na Rzecz Wszystkich Istot, 2020).

Acquired water abstraction data from the mining and power industry do not present the whole picture. For several power plants with open cooling circuits, the permitted water abstraction in the permits obtained is several orders of magnitude higher or lower than the permitted effluent emissions. The difference is almost 5 km³ per year for the Dolna Odra Power Plant. For Połaniec and Kozienice Power Plant, the differences are 2 km³ and 11 km³ per year, respectively.

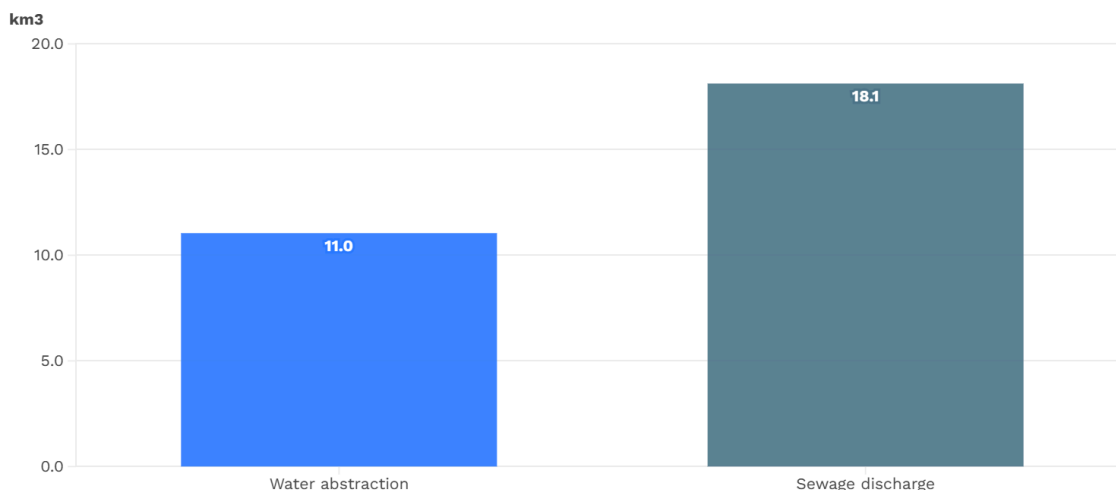
These figures reveal an apparent contradiction. Power plants do not produce or evaporate several km³ of water per year. One km³ is much more than the volume of Lake Śniardwy. Hypothetically, evaporating this amount of water requires an amount of heat equivalent to 79 GW of thermal power supplied continuously for a year.

Figure 2: Sum of permitted water abstraction and discharge values by permit obtained

Data discrepancy for water use in power plants

Gross allowed water abstraction and sewage release from power plants in Poland

Obtained environmental permits show a large difference between the volume of allowed water intake and sewage discharge for several power plants. This has no physical basis - power plants with open cooling circuits (responsible for the majority of water use) will have almost identical water intake and release. It is very likely, that the data is incomplete.



Source: Instrat Foundation own work based on data from environmental permits obtained from Wody Polskie. The numbers include only Centrally Dispatched Power Units (JWCD), for which data could be obtained.



3.2. Discharge of saline wastewater from coal mines

Data from environmental permits shows a very high permissible amount of salt that coal mines can discharge into the environment. This amount is not surprising, as in many Polish mines, coal is mined from around 1 000 - 1 300 m below the earth's surface. Water at such depths has high mineralisation, including high concentrations of chlorides and sulphates (often exceeding those in seawater). The highest permitted emissions are at the Piast-Ziemowit mine near Oświęcim. The water permit allows this mine to discharge 96 million tonnes of wastewater per year (3 m³/s) with a total chloride content equivalent to 6 million tonnes of table salt.

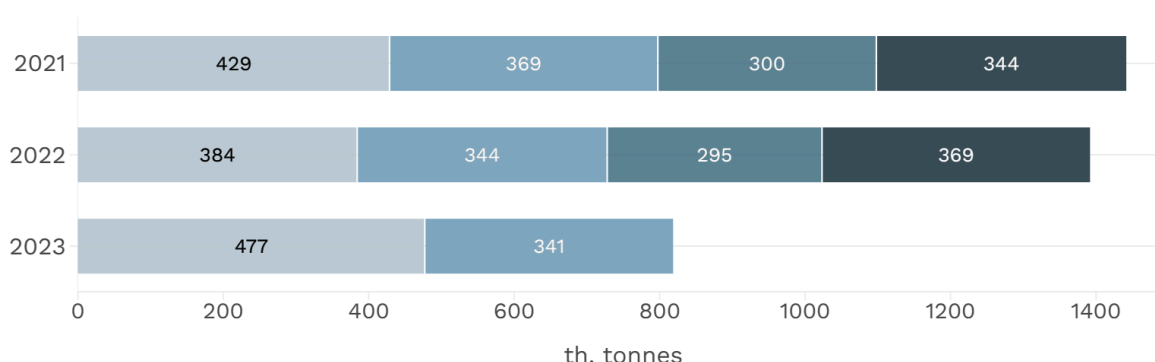
There is a lack of annualised unit data on the amount of chlorides and sulphates discharged by each Polish coal mine. Nevertheless, data for the sector as a whole suggest significantly lower sulphate and chloride emissions than the maximum ceilings from the permits. According to data from ARP Katowice, total chloride and sulphate emissions from the energy sector amounted to more than 1.4 million tonnes in 2022. The volume of wastewater discharged is approximately 200 million m³ per year - twice the maximum ceiling in the permit for just one coal mine, Piast-Ziemowit.

Chart 3. ARP Katowice statistical results on chloride and sulphate discharges by coal mines in Poland

Chlorides and sulphates release from the hard coal mining sector

Cumulative Cl+SO₄ mass discharged to surface waters (quarterly data in thousand tonnes)

■ I quarter ■ II quarter ■ III quarter ■ IV quarter



Source: Instrat Foundation own work based on Industrial Development Agency, Katowice Branch (ARP Katowice) data



4. Recommendations

The data governance model in Polish water management institutions needs further reforms in the context of increasing environmental demands and the risk of further natural disasters.

Key documents defining the environmental impact of water users are often archived and processed in hard copies. This limits access to these documents, as many are missing (NIK,

2023). This hinders environmental monitoring in regular situations and prevents dynamic responses in emergencies.

The Regulation on the National Interoperability Framework¹² describes the minimum requirements for public registers and procedures for exchanging information. Although it has been in force since 2012, it is still not fully implemented in many institutions.

In contrast, in 2018, the Ministry of Digitalisation developed standards for data openness as part of the Openness of Public Data Programme (Ministerswto Cyfryzacji, 2018). They are intended to ensure that a higher quality of data is made available by the administration and include, among other things, technical requirements for such data.

¹² *Regulation of the Council of Ministers of 12 April 2012 on the National Interoperability Framework, minimum requirements for public registers and the exchange of information in electronic form and minimum requirements for ICT systems* (Journal of Laws of the Republic of Poland 2017, item 2247).

The Role of Technology in Internal Data Governance

We recommend the use of efficient data storage technologies. The first step should be to complete and improve the Water Management Information System. Ultimately, data from this register should be made publicly available.

Access to documents should be universal for all interested parties. Meanwhile, currently, it is even problematic for the very staff of the institutions collecting and archiving this data. Monitoring the environmental situation and conducting data-driven policies are impossible if access to information is difficult, even for the institution responsible for these policies. We recommend digitising the data management process when it is technically and organisationally justified.

Strong institutions are essential for properly managing any area subject to government oversight. However, building institutional capacity is a lengthy, unspectacular process and requires adequate funding (for salaries, among other things). It is also necessary to build staff competencies from scratch and draw on the knowledge of experienced staff and experts in the field.

Only strong institutions with developed standards for data management, quality, and data use can ensure that the government's environmental guidelines are implemented at an acceptable level and that responses to potential emergencies can be made quickly enough. This also applies to the oversight of the mining and energy sector and the issue of finding a compromise between its needs and environmental protection.

Water abstraction and wastewater discharge data are essential for scientists and civil society, including environmental organisations, citizens, local governments, and international organisations. Therefore, data should be publicly available and free of charge, e.g., on the data.gov.pl portal, and not made available only upon written request and for a fee. This is required under the *European Commission's Implementing Regulation (EU) 2023/138 of 21 December 2022, establishing a list of specific high-value datasets and rules for publication and re-use*¹³.

Data quality is another crucial issue. They should be:

- complete,
- easily searchable and processable (including by machine),
- published in a readable format (e.g., CSV),
- available with an open licence on the data.gov.pl platform.

A review of water quality environmental policies and practices was carried out by a team of NGOs questioning the effectiveness of the current approach (ClientEarth et al., 2023). However, the harshest criticism comes from a recent briefing from the Supreme Audit Office (NIK, 2023):

The lack of reliable data on water users, also resulting from the failure of regional water management boards to complete formal and legal verification of active and inactive water facilities used for discharging sewage or rainwater and snowmelt into rivers by units of the State Water Management Authority Wody Polskie, prevents effective water management, including water conservation.

¹³ EUR-Lex 2023, 19/43.

The process of issuing water permits did not reduce the risk of an environmental crisis. As part of the carried-out investigations, the regulations in force did not require balancing the limits of pollutants discharged into rivers established in the permits in the context of changing hydrological conditions to exclude excessive pollution pressure on the environment. At the same time, the lack of reliable data on the permits in force, including those issued by other authorities, makes it impossible to carry out such analyses.

We recommend that steps be taken to ensure that the relevant State authorities have the necessary data and tools to implement policies to protect aquatic ecosystems. The State must have reliable and effective data-based policies and make environmental data available to the public.

We further recommend that measures be taken to contribute to an actual reduction of coal mining impacts and conventional power generation on aquatic ecosystems, including through financial tools that will provide a real incentive to reduce this pressure.

Explanations and abbreviations

ARP Katowice	Industrial Development Agency, Katowice Branch (Agencja Rozwoju Przemysłu, Oddział w Katowicach)
JWCD	Centrally Dispatched Generating Units (Jednostki Wytwórcze Centralnie Dysponowane)
GUS	Statistics Poland (Główny Urząd Statystyczny)
NIK	Supreme Audit Office (Najwyższa Izba Kontroli)
PGW WP	State Water Management Authority Wody Polskie (Państwowe Gospodarstwo Wodne Wody Polskie)
RZGW	Regional Water Management Authority (Regionalny Zarząd Gospodarki Wodnej)

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