



Preliminary analysis of the preparation of Polish water utilities to implement mandatory risk management in accordance with the Drinking Water Directive 2020/2184

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Received: 6 April 2021 / Accepted: 30 May 2022 / Published online: 22 June 2022
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Abstract

The new Directive 2020/2184 of the European Parliament and the Council on the quality of water intended for human consumption (EU, Official J EU 23.12.2020.435, 2020) is to be transposed into the local law of all Member States by 2023 and its implementation will start thereafter. Therefore, it is important to identify what are the water utilities' greatest concerns. The Chamber of Commerce "Polish Waterworks" conducted two surveys among its members, aimed at understanding the needs of the water supply sector in the context of the new requirements of the directive. The surveys were conducted one year apart. The first in January 2019, the second in January 2020, when the new directive has not yet been adopted; however, its content was known to a close approximation. The article focuses on the issues of risk-based management, presents the responses of water companies, and indicates their needs. The research results indicate not only financial needs. A major challenge is the development of knowledge and competencies in the field of risk management in the water supply system. Enterprises need substantive support and their situation, despite the Chamber's actions, does not improve significantly. Surveys indicate the need for expert training and support in assessing and managing risks in water systems. It is necessary to reach the smallest entities with knowledge and support.

Keywords Drinking water directive · DWD · Risk management · Value of water

Introduction

The ability to drink water supplied to households without fear of falling ill may be one of the key features that define developed countries (Hrudey et al. 2006). Hence the provisions in European Union (EU) law that are intended to pay attention to safety issues, as water pollution has a significant impact on public health around the world.

In 1998 Directive 98/83/EC on water intended for human consumption (EU 1998) was adopted in the European Union. In the meantime, changes were introduced to it, but they were not significant for water utilities. The biggest burden on waterworks was caused by a change in 2015 based on Directive 2013/51/Euratom (EU 2013) imposing the obligation to test water radioactivity. According to the European

Commission the directive 98/83/EC fulfilled its task (European Commission 2015a, 2015b), however, technical progress and knowledge of civilization threats mobilized EU institutions to evaluate and revise it. Finally, on February 1, 2018, the European Commission (2018) published a proposal for a major amendment to the Directive on the quality of water intended for human consumption, proposing its new text. The debate on the final legal act ended with an informal political agreement reached in February 2020. The new Drinking Water Directive (DWD) has been published and entered into force in January 2021 (EU 2020). The evolution of the provisions between the Commission's proposal from 2018 and the final version adopted by the European Parliament was significant.

The new DWD introduces changes that are important for the operation of water utilities. It requires many changes to local law and many new measures from water companies. There are less than 2 years left to transpose the new requirements into local (Member States) law. In addition to quality control, the directive is becoming a tool to improve European citizens' access to safe water. The responsibility

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to manage risk across the entire supply system, from the catchment area to the tap, is a major challenge. There are also new substances for mandatory analysis or monitoring. The system for controlling materials and products in contact with water was also rebuilt. The consumer has become even more important, he needs more information and an absolute right to water.

Directive 98/83/EC encouraged Member States to introduce some risk management solutions, but the new DWD requires mandatory risk-based management. Article 7 introduces mandatory risk assessment and risk management throughout the supply chain, emphasizing a clear division of responsibilities between stakeholders. Article 9 introduces risk assessment and risk management in water treatment and distribution. The requirements described in the directive are very general, therefore only local regulations define the details.

Risk assessment in water supply systems is not a new idea and is considered a very effective way of managing water quality risks. A preventative risk-based approach for the whole drinking water supply system has been introduced worldwide (Van der Berg et al. 2019). Moreover, it is also used for other waters, e.g., bathing water profile.

There are already many risk-based guidelines and tools that water utilities use, such as Hazard Analysis and Critical Control Point (HACCP). It is a procedure aimed at ensuring food safety by identifying and estimating the scale of threats from the point of view of health requirements and the risk of hazards occurring during all stages of food production and circulation. The use of HACCP in drinking water supply systems has been developing since the 1980s (Havelaar 1994). The international standard ISO 9001: 2015 “Quality management systems—Requirements” is also quite popular; defines the requirements for quality management in the entity. However, the most popular source of basic knowledge turned out to be the Drinking Water Quality Guidelines, published by World Health Organization (WHO) in 2004. They recommend the use of preventive risk management methods to manage water quality risks (WHO 2004). The third edition of the WHO Guidelines contained a ‘Framework for Safe Drinking-water’, which includes the setting health-based targets in risk management. This approach to risk management has been called a Water Safety Plan (WSP). The Guidelines are updated on an ongoing basis, and WHO draws suppliers’ attention to the essence of people’s access to safe water (WHO 2015). Various WHO publications such as the WSP manual (WHO 2009), WSP for small communities (WHO 2012), and the updated Guidelines (WHO 2011a, b, 2017), provide further support in implementing Water Safety Plans. WSPs are proven to be an effective tool for water supplies increasing awareness, knowledge and understanding among staff, improving communication and collaboration with other stakeholders and within water supply companies

(Gunnarsdottir et al. 2012). The way WSPs are applied varies according to the level of development of the water supply infrastructure and the resources available. They are becoming more and more popular all over the world, as well as in Europe (Mälzer et al. 2010; Pereira Vieira 2005, 2011; Roeger and Tavares 2018; Schmoll et al. 2011; Setty et al. 2017; Solini et al. 2017). Their advantage is the fact that it is a comprehensive management process that puts emphasis on prevention, not reacting to dangerous events. They are often combined with other solutions, such as HACCP (Dewettinck et al. 2001; Metge et al. 2003; Mullenger et al. 2002; Tsitsifli and Tsoukalas 2016, 2018; United States Environmental Protection Agency 2006; Yokoi et al. 2006).

The International Water Association (IWA) also stressed the importance of risk control in water supply systems. The Bonn Charter for Safe Drinking Water (IWA 2004) was the response of many international organizations to the WHO’s call to create WSPs. IWA provides a framework describing the operational and institutional arrangements that are fundamental for risk management. Together with WHO, it runs a dedicated portal <https://wsportal.org>.

In 2015, the United Nations Economic Commission for Europe (UNECE) and WHO organized a meeting on the Protocol of Water and Health, which was adopted in 1999 by many countries. The objectives of the meeting were to introduce key elements of risk-based surveillance (WHO, UNECE 2015).

In 2013, a European Standard EN 15975-2 “Security of drinking water supply—Guidelines for risk and crisis management—Part 2: Risk management”, based on WHO guidelines was published; this is a general guideline for the development of a risk management system.

In addition to general guidelines and standards various tools based on risk management appear (Gruiz et al. 2017; Lindhe 2008; Pollard et al. 2004; Summerscales and McBean 2011). They include multi-criteria decision (Ghandi and Roozbahani 2020), multiple failure models (Haider et al. 2021), solutions based on belief functions (Démotier et al. 2003). An important aspect of water safety is microbiological safety (Dufour et al. 2003; Odonkor and Mahami 2020). Part of risk management is controlling the proper maintenance of the infrastructure, so there are decision support tools that combine Water Safety Plans with asset management (Large et al. 2014).

Many water utilities rely on these existing tools, guidelines, and standards.

Drinking water supply sector in Poland

According to art. 7 of the Act on municipal self-government (PI 1990), the municipality’s own tasks include, inter alia, water supply, and sewage services. Municipalities fulfill this

obligation using their own resources or delegating it to other entities. There are over 2 700 entities in Poland providing collective water supply and sewage services. The most popular model is delegated public management. According to data from the Polish governmental entity—The State Water Holding Polish Waters, the most common organizational form of a water supply and sewage companies are limited liability companies (45.78% of the number of all Polish entities providing the services), local government units (22.05%) and budgetary units (21.58%); other forms of organization are joint stock companies, water cooperatives, individual economic activities, and others. The Municipalities are the majority or sole shareholders of the companies (limited liability companies, joint stock companies).

The directive 98/83/WE has been transposed to the Polish law mainly in the Act on collective water supply and collective sewage disposal (PI 2001) and the Regulation of the Minister of Health on the quality of water intended for human consumption (PI 2017a).

In Poland, groundwater is the basic source of water supply for the population. Large intakes of surface water function only in the largest cities receiving water from rivers or lakes. In southern Poland, intakes in mountain streams are mainly exploited, which are characterized by high seasonal dynamics of quality changes. Surface water accounts for 18.5% of the total water consumed to supply the population.

The number of people using the water supply network in cities is not growing significantly anymore. According to data from the Central Statistical Office of Poland (GUS), in 2000 it was 21 885 207 people connected to the municipal drinking water network and in 2019—22 261 111 (an increase of 1.7%). However, the overall growth dynamic is more pronounced. In 2000, the total number of people using the water supply system (urban and rural areas) was 32 413 260, and in 2019—35 387 128 (an increase by 8.4%). This is the result of the development of a collective water supply network in villages and the connection of new consumers to the already existing infrastructure. However, the increase in the length of the water supply network is still noticeable both in the countryside and in cities, although it is not as dynamic as it was 30 years ago. There are more long sections without connections in rural areas, which means that their operation requires greater financial outlays in relation to the number of recipients served. In 2019, 92.2% of the Polish population had access to the water supply network. Household water consumption is declining due to infrastructure improvements however in the last decade, water utilities no longer record a significant decline in consumption as they did at the end of the twentieth century. The slight increase results rather from new connections and changing weather conditions in summer, forcing residents to use tap water also to irrigate green areas.

The equalization of water consumption in the countryside and the city results from changes in consumer behavior, growing awareness of resource savings, but the strongest factor is the price of water as well as equipping households with new, water-saving devices (washing machines, dishwashers, taps with perlaters, economical flushing toilets, etc.). An important factor is also building trust based on facts. It is an important aspect of risk mitigation. Trust in tap water is growing mainly in cities, as shown by satisfaction surveys conducted by water utilities (Krakow Water 2021; Warsaw Water Utility 2021).

An important aspect of safety that DWD points out to is the condition of the water supply system. Currently, the most used material for network construction in Poland is polyvinyl chloride, followed by steel and polyethylene. There are still pipes made of asbestos-cement and of lead decades ago. Most networks were created in the 90 s of the twentieth century. Therefore, it should be stated that the infrastructure is new in most communes. However, the biggest problems are generated not only by the oldest pipes but also those built in the 1980s and 1990s, when the technical culture was very poor. A significant increase in the water supply network was achieved thanks to the EU pre-accession funds (ISPA, PHARE), and the Cohesion Fund.

According to the Chief Sanitary Inspectorate, in 2020 99.6% of the population connected to the water supply network used good quality water. This also applies to water conditionally released for consumption or based on temporary derogations issued by the bodies of the State Sanitary Inspection (Chief Sanitary Inspectorate 2021). The remaining 0.4% of the population had access to water, which temporarily showed non-compliance with the requirements of quality standards. In such situations, steps have been taken to provide residents with water of adequate quality from alternative water sources.

Systematic risk management throughout the water supply system is still not well developed in Poland. Of course, enterprises have their own risk mitigation methods. They consist in carrying out appropriate water monitoring, going beyond the minimum legal requirements. Monitoring plans must be approved by the Chief Sanitary Inspectorate. There are also infrastructure renewal plans, and in some utilities also maintenance plans.

Big cities implement ISO, they have more resources to implement a risk management system.

Some cities have already started implementing Water Safety Plans on a voluntary basis. The leader is Słupsk, which applied the WHO methodology (Mikulska and Czerwczak 2017). Currently, other cities are working on the implementation of risk management based on the 15,795 standard and WHO documents. It is still a voluntary task, carried out only by larger utilities.

Risk management is an essential part of ensuring water safety. The most popular tools in the water sector in Europe seem to be based on Water Safety Plans considered by the WHO as the most effective means of maintaining a safe supply of drinking water to the public. This method is developing slowly in Poland, although there are some publications in Polish. For example, the WHO (2011a, b) guidelines are available in 9 languages, including Polish (WHO 2011a). The manual was published by IGWP under WHO copyrights. There are few other Polish guidelines and manuals (Michalski et al. 2019; Rybka and Pietrucha 2011; Zimoch 2019). However, most studies and manuals are in English which consists of a significant obstacle for the Polish utilities.

Survey on the readiness of Polish water utilities to implement risk management

Methodology for collecting data on DWD implementation readiness

The Chamber of Commerce "Polish Waterworks" is the only economic self-government organization in the water and sewage sector in Poland. It was established on September 14, 1992, and today it associates 507 companies representing more than 85% of the water supply services market. The Chamber strives to create favorable conditions for the functioning of the water and sewage sector. Its representatives and experts interpret and evaluate the applicable regulations on an ongoing basis, monitor proposed changes, participate in the creation of law, and introduce solutions to improve the functioning of the sector. Conducting surveys is therefore one of the tools for acquiring knowledge about water services. The survey results are the basis for articles, presentations, and consultations with policy makers.

The Chamber conducted two surveys among its members to gain basic knowledge about the needs of Polish water utilities in the context of the requirements of the new DWD. The surveys contained questions about many aspects related to the new DWD, but a part of the questions related to risk-based management. The questionnaires were prepared in Google Forms, water suppliers were asked to fill them online. Most of the questions were open-ended. The first survey was sent in January 2019 by email to 495 members, 106 of them completed the questionnaire. The second survey was sent in January 2020 to 499 members of the Chamber and 148 responses were received. Members of the Chamber serve about 85% of the inhabitants connected to the water supply network.

For the first survey in 2019 answers were given by persons responsible for drinking water supply, working in lower management positions or specialists working in units

responsible for the operation of the water supply infrastructure. Although the final content of the directive was not known at that time, it was certain that risk management in water supply would become the responsibility of companies. IGWP received 106 answers, 90% of them came from commercial law companies (joint stock companies, limited liability companies with 100% of municipal capital). Entities that took part in the survey serve from 1 119 to 2.2 million inhabitants. 60% of them use groundwater, most often with simple treatment (aeration, filtration). Most of the respondents were medium and small suppliers. For example, 27 respondents are entities employing from 5 to 20 people, supplying drinking water to less than 20 000 inhabitants. This is the largest group of respondents, being at the same time in the most difficult organizational and financial situation.

The 2018 and 2019 were years of debate on the details of the new DWD and many controversial issues have been clarified and in January 2020, the Council of the European Union has already identified very detailed changes (Ramm 2019). Then (January 2020), IGWP conducted the second survey, which was based on knowledge of the final content of the directive and its requirements. The questions focused not only on risk management issues but also the requirements related to new water quality analyzes and necessary investments.

The second survey was also sent by email to 499 IGWP members. It was filled by people in the same positions as in the first survey, (although they were not always the same employees). One hundred and forty-eight responses were received, mostly from companies with limited liability from small and medium cities.

It is important to pay attention to the profile of respondents, which reflects the position of the IGWP members, but is not a picture of the entire Polish sector. This is reflected in the analysis of the set of entities that are subject to the Act on collective water supply and submit tariff applications. The applications are submitted every 3 years by approximately 2,700 entities. The 506 largest companies belong to IGWP. They serve over 85% of the population, the remaining over 2,000 entities do not belong to the Chamber. This means that most of the entities are very small, supplying several dozen or several hundred people. According to data on tariff applications submitted to the State Water Holding Polish Waters about 80 entities serve less than 50 people. According to Art.3 of the new DWD (Exemptions) these suppliers may be excluded from the directive. More than 200 entities supply water to groups of 50 to 500 people. Article 9 of the directive (Risk assessment and risk management of the supply system) allows them to be exempted from carrying out a risk assessment. The remaining entities—approximately 2500—will have to implement risk management. However, the majority of IGWP members are larger entities, which means that the smallest suppliers did

not complete the survey and knowledge about their readiness to implement risk management is unknown. However, it can be assumed that they are not ready for such a challenge. They are mostly small businesses or private intake owners. The obligation to supply water often results from historical conditions. In the twentieth century, many cities in Poland developed around one, usually state-owned factory that provided jobs, built housing estates for workers, and provided them with the media. After the political change, fragments of the infrastructure went to different owners. They are obliged to continue serving the residents. Some factories have been privatized and their owners continue to supply water to consumers.

During the two surveys, respondents indicated certain aspects which give rise to the particular concern. The main challenge indicated was risk management. Other issues that need support are the new list of parametric values (new tests), reducing leakage, and ensuring access to water for all. These 4 new obligations were indicated as the main challenging.

Surveys' results related to risk management

Respondents were asked whether they carry out a risk assessment related to the water supply infrastructure. The results of both questionnaires were similar: 45% of respondents answered that they work on it, although admitted that they do it fragmentarily introducing solutions such as ISO or risk analysis for establishing protection zones under Article 133 of the Water Law (PI 2017b). This article obliges all groundwater intake operators to carry out a risk analysis and if needed (depending on the risk analysis result), to define indirect protection zones. 55% of respondents stated that they did not carry out a risk assessment and did not implement any risk management systems (such as water safety plans). Moreover, only 32% of respondents assumed that they have enough internal resources to start carrying out a risk assessment.

According to the surveys, the implementation of risk management will be a significant obstacle for most, mainly small, utilities. The smallest suppliers expect support in providing knowledge and guidelines on how to manage risk. Moreover, water utilities will have to closely cooperate with the central administration responsible for monitoring the environment and with the administrators of selected buildings, especially priority premises (as indicated in Art. 10 of the new DWD). Risk management is not only about developing an action plan but especially about its implementation, systematic modification, and execution, which will involve the necessary costs, including investment. Each of the 2477 Polish municipalities together with the central entity responsible for coordinating this process will have to be engaged;

leaving water utilities without support may cause many problems with the implementation of the directive.

In the second survey, respondents who admitted that they had implemented a part or full risk management system were asked about the cost of this implementation. Knowing the number of people served by them, an approximate cost of implementing risk management tools was obtained, amounting to PLN 1 per capita. The entities will have 6 years for the first implementation, but risk management is a continuous process, so a part of this cost will be repeatable. Obviously, this is a rough estimate of an order of magnitude, not the exact budget needed by every utility. Moreover, it is an average value. Detailed analysis shows that economies of scale are important here: the larger the enterprise, the lower the cost per capita. This shows that relatively higher costs of implementing risk management systems will be incurred by the smallest entities. Moreover, IGWP did not reach most of the smallest suppliers because they are not members of the organization.

Respondents were also asked what competency or staff shortages prevented them from making a reliable risk assessment. Ignorance of the subject turned out to be the biggest problem (Fig. 1). The respondents had a choice of the indicated answers and the possibility to mark the ones they considered the most accurate.

The largest companies—serving over 100 000 consumers—did not identify any problems that would make risk management impossible; they have enough internal resources. They have knowledge of future obligations and are already implementing or developing risk management. However, it is the large utilities that are most exposed to the risk of losing service continuity due to sudden, unexpected cases (Mrozik et al. 2015; Rak and Tchórzewska-Cieślak 2019).

The analysis of the size of the companies' combined with the replies showed that smaller water utilities do not have sufficient knowledge to start smoothly implementing the requirements of the new Drinking Water Directive. Among the reasons for not implementing risk management, respondents first give organizational and financial constraints as well as lack of time (employees have their tasks and it is difficult for them to do more). There is a lack of competence among staff, especially in smaller entities.

Respondents were asked to indicate what they need most to start or complete the process of implementing risk management. The greatest needs of the Polish water utilities concern the demand for competencies and knowledge (Fig. 2). Small companies have the biggest problems with understanding the essence of risk management. The entities serving difficult rural or urban–rural areas are in a particularly difficult situation. They require extensive substantive support.

Fig. 1 Distribution of responses to the question about the most problematic issue that enables the respondent to develop risk management. Multiple choice question. (1st survey January 2019)

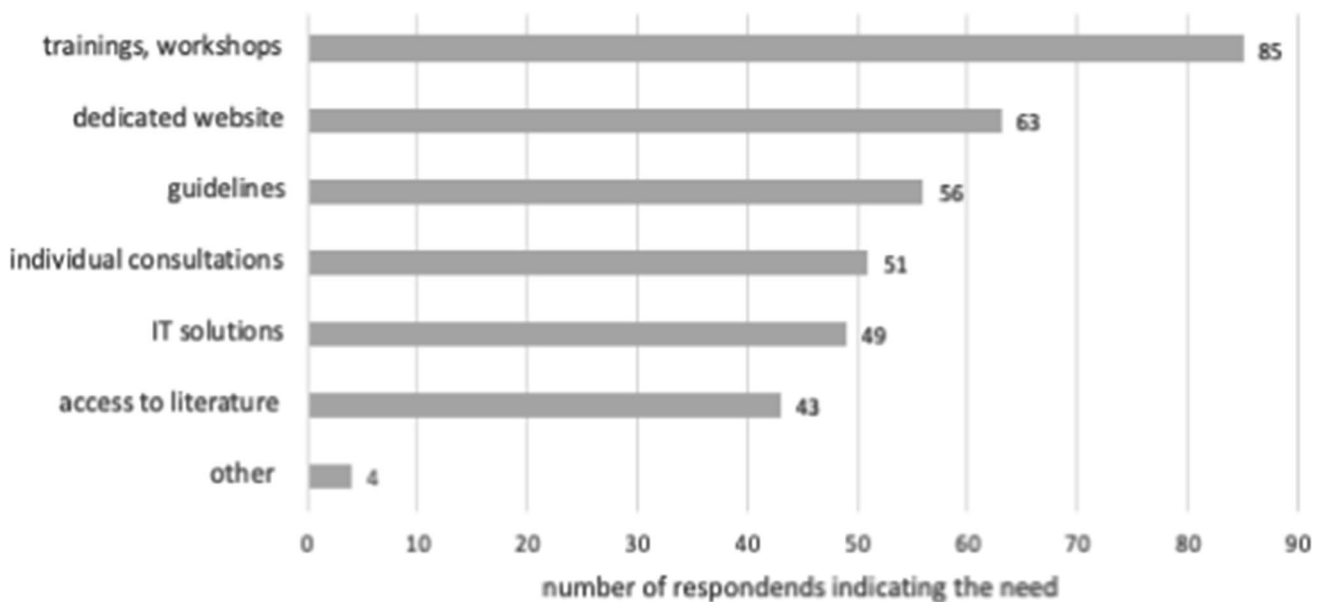
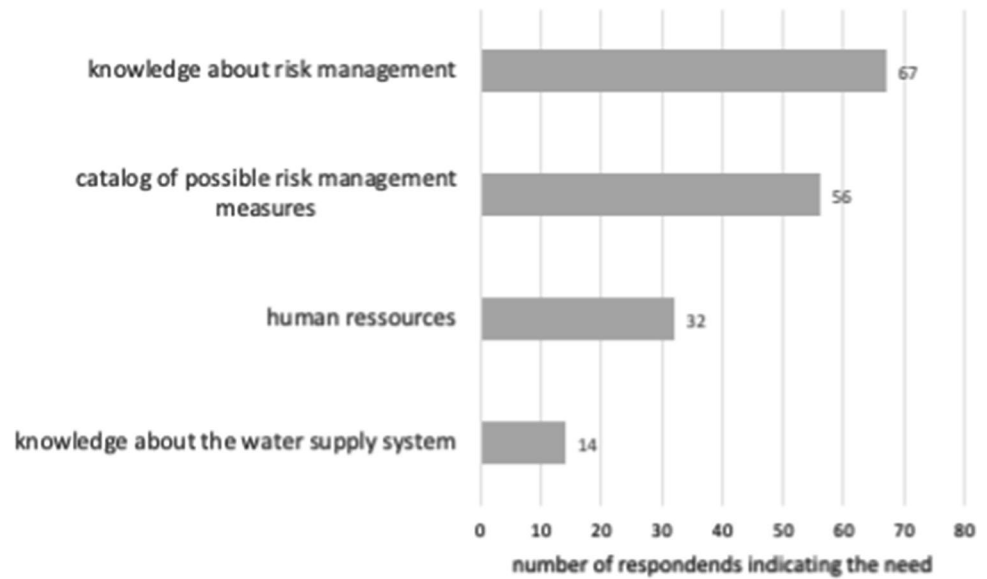


Fig. 2 Distribution of answers to the question about the most needed external support. Multiple choice question. The respondents had a choice of the indicated answers and the possibility to mark the ones they considered the most accurate (1st survey January 2020)

Simultaneously with the first questionnaire, IGWP organized trainings and a conference on risk management in the supply system. The members of the Chamber who already undertook certain activities related to risk assessment and management shared their experiences. They presented how they fulfill the obligations resulting from the WHO guidelines and the PN-EN 15975-2 standard. It should be added that companies already have some experience in analyzing health risks related to the creation of protection zones for water intakes (Łyp 2019). This is due to the obligation to carry out a risk analysis for

catchment areas, resulting from Article 133 of the Water Law. The deadline for the implementation of this obligation is December 2023. This risk analysis complies with the requirement of Art. 8 DWD (Risk assessment and risk management of the catchment areas for abstraction points of water). Entities usually outsource this service on the market. This is because a variety of competences (e.g., knowledge of local hydrogeological conditions) and time are required to conduct a risk analysis for catchment areas. Entities that have already commissioned this service were asked about the costs incurred.

The cost of such an analysis on average does not exceed PLN 1 per capita. However, there were exceptions up to PLN 15/inhabitant (service cost incurred divided by the number of people served). This analysis is performed every 10 or even 20 years, so the cost should not be too burdensome. However, it should be noted that it is again the smallest entities that may be the most heavily burdened. Water utilities in villages usually have many small intakes, for each of them they must carry out a risk analysis.

After the information campaign, workshops, and conferences, a second study was carried out (January 2020). One of the objectives of the survey was to find out about the actions already taken by the water suppliers. According to the WHO methodology, the first step in building a Water Safety Plan is to appoint an interdisciplinary team. So, in 2020, respondents were asked if they had already formed such a team. Figure 3 reflects the responses of respondents. 47% of utilities did not establish a team which is recommended by the World Health Organization. 25% of them wait for the new obligation which will be transposed to the Polish law. Only 16% have already formed teams, but their effectiveness in action varies. During meetings and workshops organized by IGWP, team leaders admitted that many of them were not active i.e., teams were formed, but there was no progress in implementing risk assessment tools.

The respondents were also asked whether implementation of risk management (e.g., Water Safety Plan) would be problematic for them within the next 6 years as it is indicated in the new DWD (Art. 7). Respondents are divided into three parts (Fig. 4). Only 34% answered that it will not be problematic. Others are aware of their ignorance or are even not aware of it (they replied “I don’t know”), which

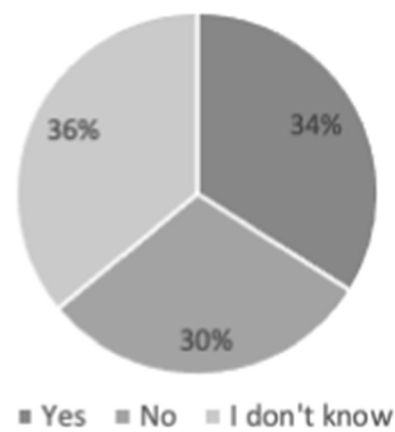


Fig. 4 Distribution of answers to the question whether implementing risk management would be problematic (2nd survey January 2020)

seems to be an even worse situation. Such a statement suggests that the entities did not acquire minimal knowledge about risk management, they do not know their needs and limitations. The survey therefore shows that 66% of water companies are not ready to implement risk management.

The respondents justified the lack of readiness with the reasons presented in Fig. 5. The causes and problems identified by the water utilities are like those reported in the first study. Relatively, the situation has not changed. In the first study, 67 (63%) out of 106 respondents indicated a lack of knowledge, and in the second, out of 148 respondents, 95 (64%) indicated it. 30% of the respondents to the first questionnaire indicated a lack of adequate human resources. In the second survey, they were already 46%.

Fig. 3 Distribution of answers to the question whether a company has already established a risk assessment team. Single choice question (2nd survey January 2020)

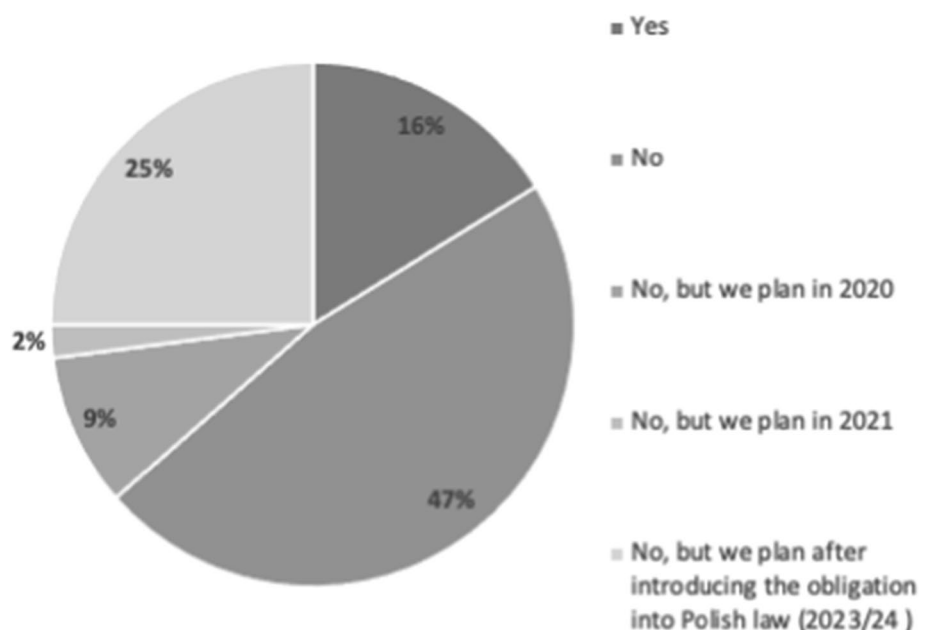
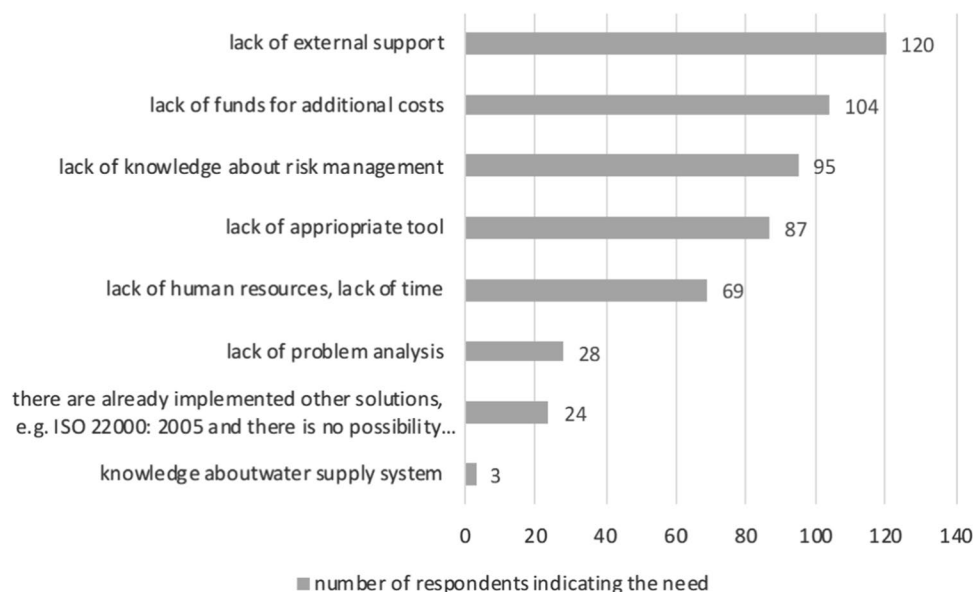


Fig. 5 Distribution of responses to the question about the most problematic issue that enables the respondent to develop risk management. Multiple choice question (2nd survey January 2020)



The first questionnaire did not ask about funds needed to implement a risk-based management. It turns out that this is a very serious problem indicated by as many as 81% of respondents. The results indicate that most utilities analyzed the need to implement risk management which is a positive trend. 30% of respondents commented that because there are no formal requirements (transposition of the directive) yet, there is no justification for implementing risk management systems.

Water utilities pay attention to the costs related to risk management, e.g., costs of introducing new systems (e.g., Geographic Information System) or data archiving procedures for risk assessment and management (e.g., failure database, priority premises database, complaints, leaks, incident registration). Digital systems require constant updating and improvement. However, most water utilities are aware that they will need to carry out a risk assessment. Of course, a lot depends on the quality of this process and on the maintenance of the system at the appropriate level.

Conclusion

The new Drinking Water Directive responds to the increasing pollution of water resources and the need to increase consumer safety. Its four articles (7–10) focus on risk assessment and risk-based management, which shows how significant this challenge is. The two surveys results indicate that the Polish water services sector is not well prepared to implement risk-based management.

Comparing the responses from both surveys conducted by IGWP, the situation in enterprises, despite several years of public debate on the Directive, has not changed significantly.

The water sector is facing a serious, costly, long-term challenge. The survey results reflect the situation of the IGWP members only, it is not a picture of the entire sector, which is very fragmented. On the other hand, the results of the surveys reflect the situation of entities serving almost half of the population of Poland, as the utilities that responded to the second questionnaire serve 17 million people, which is about 44% of the country's population. The problems indicated in the first questionnaire are indicated with the same force in the second. In 2019, 84% of enterprises did not establish a risk management team (Fig. 3), of which 25% intend to wait for the Polish authorities to introduce a formal legal requirement. This means that, unfortunately, the annual IGWP information campaign did not bring any clear results. Moreover, entities in both surveys indicated the need for external support. In the first survey, 80% of entities (out of 106 respondents) emphasized the need for workshops and trainings (Fig. 2). In the second survey, 81% (out of 148 respondents) indicated lack of external support (Fig. 5). The Chamber is planning to conduct workshops, but also to launch a website with useful data and case studies.

This lack of significant progress in the development of knowledge and competences may be because both studies were carried out when the Directive was not yet finalized and published in the Journal of the European Union. Currently, its content is known, and transposition into Polish law must be completed by January 2023. Water companies should therefore increase their interest. Therefore, the Chamber developed the third questionnaire that was sent to IGWP members at the beginning of November 2021. It focuses again on questions about risk management readiness. In addition, it focuses on new water quality parameters. The Council of the European Union highlights

growing health and environmental concerns related to highly persistent chemicals, mainly increasing evidence of the adverse effects of exposure to highly fluorinated compounds (PFAS). The ubiquitous presence of PFAS in water, soil, products, and waste is emphasized, and the threat it may pose to our drinking water resources. Moreover, according to the Chemical Strategy for Sustainable Development (European Commission 2020), per- and polyfluoroalkyl substances (PFAS) require special attention given the high number of soil and water pollution—including drinking water—in the EU and worldwide, the number of people affected by the full spectrum of diseases and related social and economic costs. More and more studies prove the harmfulness of PFAS (OECD 2013; Ramm 2018), as indicated by the EU institutions (European Commission 2020a, b; European Environment Agency 2021). Unfortunately, knowledge on preventing their release into the environment, their control and detection is insufficient in the (EurEau 2020). Therefore, in the third survey, the PFAS problem was linked to questions about risk-based management. Article 13 of the Directive requires the Commission to establish by January 2024 technical guidelines on methods of analysis for the monitoring of per- and polyfluoroalkyl substances under the parameters 'Total PFAS' and 'Sum of PFAS', including detection limits, parametric values, and frequency sampling.

The new challenges complicate the already difficult situation of water utilities. This is evidenced by the answers to the question whether the implementation of risk management will be problematic for enterprises. As many as 36% of them are not able to answer this question (Fig. 4) choosing the answer "I don't know". The key to success is recognizing your own weaknesses and eliminating them, which is why this result is so disturbing. Only 30% of respondents say that implementing risk management will not be a problem for them. Therefore, apart from financial needs, educational needs are the greatest. Substantive support, training, and access to basic knowledge, especially in the field of risk assessment and management, are essential. Language is an important barrier for employees. Therefore, it will be advisable to translate books and guidelines into Polish and conduct a broad, long-term educational campaign, addressed mainly to small entities. The WHO and Water Safety Plans guidelines are becoming more and more popular in the world (Baum and Bartram 2018) and it will probably be so in Poland.

Unfortunately, the survey did not reach the smallest utilities that do not belong to IGWP. However, the problem of small waterworks is not specific to Poland (Amjad 2003), it requires action, especially in terms of providing appropriate tools, to meet new challenges. Therefore, educational campaigns should be conducted not only at the local level, but also at the EU level.

The implementation of risk management, according to the respondents, is a serious challenge. In practice, it is associated with other challenges indicated in the new DWD, i.e., ensuring access to water for all residents, limiting leakages, and the need to test new parameters.

The directive leaves many unknowns to be resolved while the EU institutions are working on detailed regulations. Therefore, IGWP plans to continue monitoring of the knowledge and needs of members of the organization regarding the implementation of DWD.

Authors' contributions Not applicable.

Funding No funds, grants, or other support was received.

Code availability Not applicable.

Declarations

Conflict of interest The author has no conflicts of interest to declare that are relevant to the content of this article.

Ethics approval Not applicable.

Consent to participate Not applicable.

Consent for publication Not applicable.

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