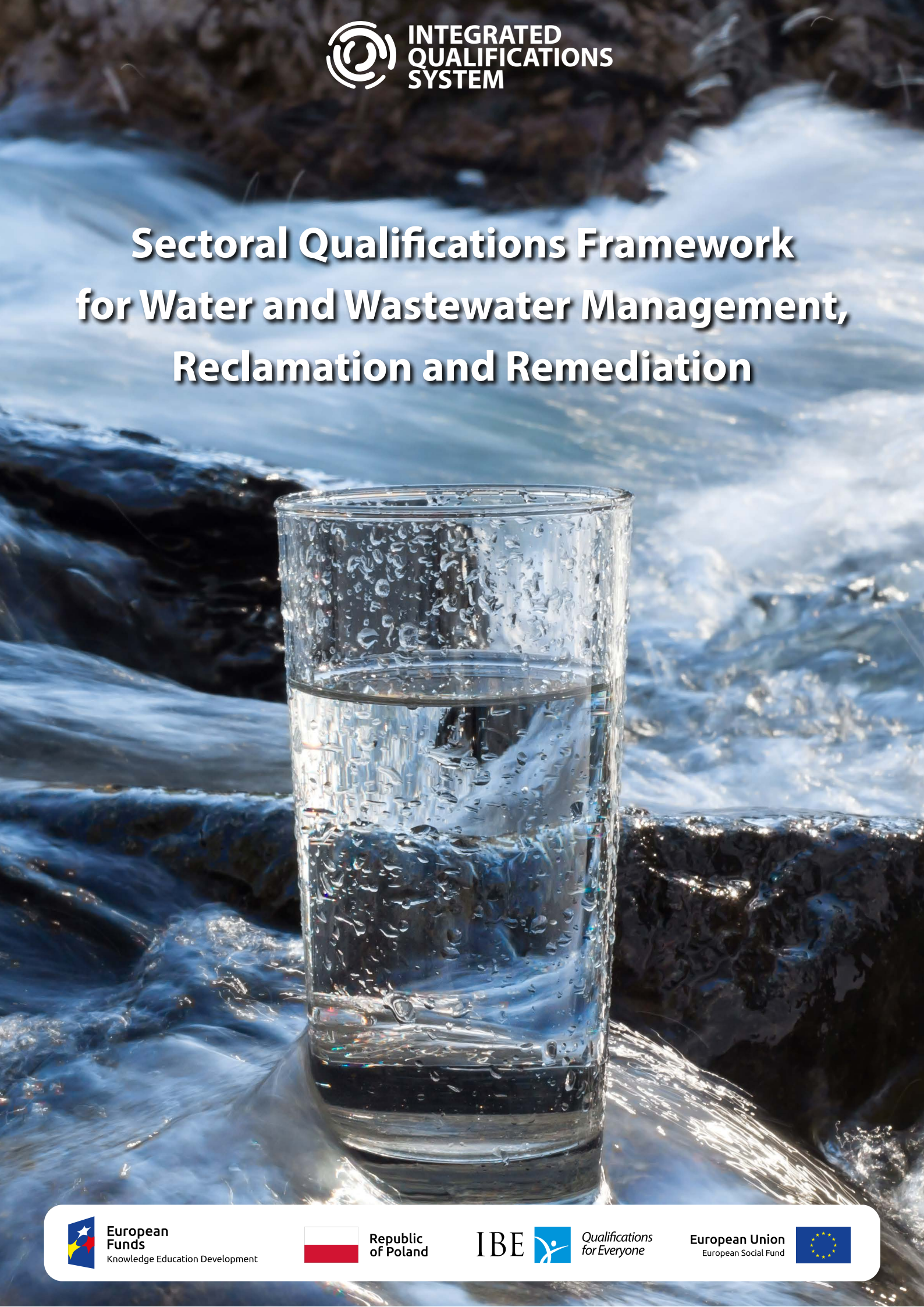
INTEGRATED QUALIFICATIONS SYSTEM

Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation



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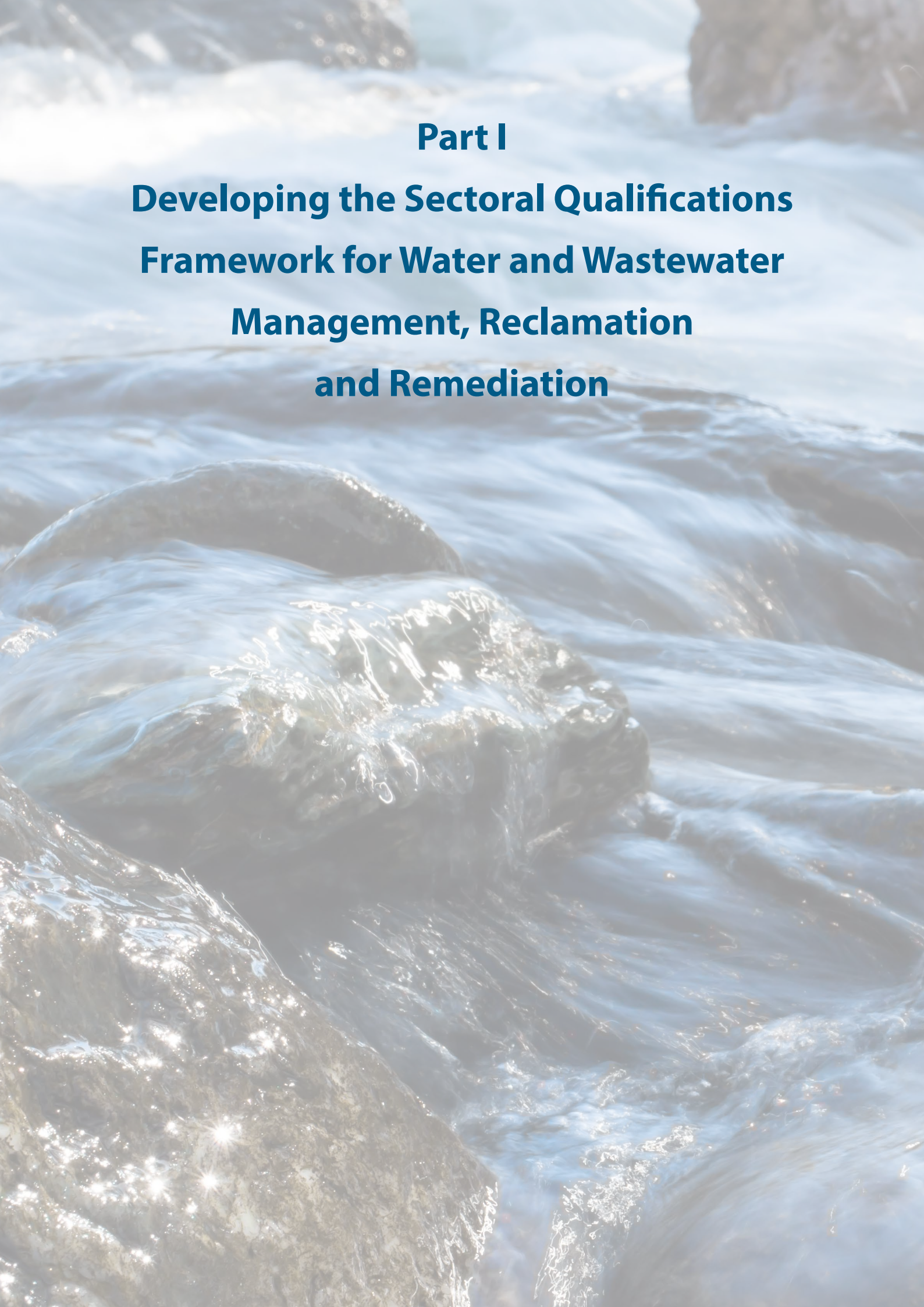


Part I

Developing the Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation

Introduction

We forget that the water cycle and the life cycle are one.[1]
Jacques-Yves Cousteau

The Water-Wastewater Management and Reclamation (WWMR)[2] Sector is closely linked to engineering and environmental protection – it involves services performed for the general interest of society. Working in the sector is a special mission that involves looking after the well-being of people and the environment. Although most of the issues and tasks of the sector closely relate to technology and engineering, the spectrum of competences required of its employees is very broad: they include knowledge of issues in the biological sciences, chemical sciences and humanities. In the almost three years of work on the framework by the Sector Skills Council for the Water-Wastewater Management and Reclamation Sector, many opinions and ideas have been generated about building the competences of the sector's employees, the cooperation of educational institutions with the sector's enterprises, and the involvement of various stakeholders to improve the sector's functioning. All of these ideas have to some extent been included in the entries of the Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation. This is the first framework created for the sector and dozens of experts and members of the Sector Skills Council have been involved in its development.

Environmental services, including water and reclamation services, are not just about providing safe and healthy water or collecting and treating wastewater. They are also about caring for natural resources, the safety of people and the environment, and mitigating the negative effects of civilisational development. These services have an important material value due to their extensive infrastructure. They are a strategic part of the circular economy – they involve reducing water and energy consumption as well as restoring health to areas degraded by people.

Of great importance is the intangible value of water services, which relates to the security of life, citizens' sense of well-being, social well-being, etc. The same is true of reclamation

[1] The original in French: *Nous oublions que le cycle de l'eau et le cycle de vie ne font qu'un*.
[2] The official name of the sector does not include the word "remediation" – unlike the name of the framework developed for the sector. The abbreviation of the sector's name is WWMR, the abbreviation of its sectoral qualifications framework is WWMRR.

services, where what matters is to nullify the negative environmental effects of human activity. The value of this work performed for society as a whole is generated by people. The employees of the water and sewerage systems and reclamation services are an invaluable resource comprising the WWMR sector. They have various education levels and experiences, and thus form a strong and effective team.

According to Statistics Poland, there are more than 1,800 stage II sectoral vocational schools in the country. In 2021, more than 25,000 graduates of these schools completed their education in engineering-technical fields. In turn, engineering-technical stage I sectoral vocational schools graduated over 16,000 students. Some of these people are likely to have found jobs in the WWMR sector.[3]

A significant influence on the future of the sector is the development of technology, with the scientists and engineers behind it. They are the ones who are modernising the sector and implementing innovative solutions. In 2004, scientists and engineers accounted for 2.7% of Poland's working population, and in 2021 they are already accounting for 8% – a figure close to the EU average. The leader in this respect is Sweden, where the percentage of scientists and engineers among the working population is 13%. 14% of working age people in Poland completed tertiary education in 2004; currently the percentage is 36% – 1 percentage point above the EU average. Luxembourg has the highest proportion of an EU country's population with tertiary education – 52%.

Approximately 30 Polish universities offer degrees in environmental engineering, but there are, after all, many more faculties which can prepare future employees for WWMR sector companies. Subjects relating to the sector include environmental protection, geology, chemistry, physics, environmental engineering and construction.

The results of a sector-related education study commissioned by the Sector Skills Council (PARP, 2021) pointed to a number of challenges for the development of the sector. There is a need to better prepare graduates from stage I and II sectoral vocational schools, higher education institutions, with more emphasis being placed on practical training. There is also a need to improve communication about the WWMR sector to encourage people to work in it. The sector still has low recognition, while offering many attractive jobs for people with various skills. The Council has called for the creation of an environmental engineering sector in vocational education. In addition, it recommends increasing practical classes and intensifying cooperation between schools and businesses.

[3] See https://bdl.stat.gov.pl/

The past few decades have seen huge investments in the sector, particularly in urban infrastructure – water treatment plants, wastewater treatment plants, water and sewerage networks have been built or modernised. There has been an increase in the efficiency of wastewater and sludge management. Unfortunately, the situation is more difficult in rural areas, which is, among others, due to the lack of employees with the competences required to work in the sector. In contrast, the focus in recent years in the reclamation sub-sector has been on implementing new technologies and solving problems in degraded areas.

What will the next decade be like for the sector? Regardless of political and financial issues, there will still be plenty of opportunities for industry professionals to demonstrate their ingenuity. Infrastructure needs to be well managed, properly operated and renovated so that it can continue to serve future generations. Indeed, innovation is key to ensuring the affordability of safe, sustainable and effective environmental services for decades to come. Many of these require specific innovation efforts to achieve the objectives of the European Green Deal strategy (see European Commission, 2019), which is based on driving a sustainable economy in the European Union.

It is important to emphasise that innovation in the WWMR sector must not be limited to technological development. In fact, innovation also encompasses other aspects, such as governance, communication, public policy and customer communication. The implementation of innovative solutions must be accompanied by the wise management of human resources. To achieve this, it is extremely important to identify the competences of the employees needed by the sector: defining the knowledge and skills and establishing their level of advancement required to perform relevant professional tasks.

This is why Sector Skills Council representatives welcome the Sectoral Qualifications Framework for the Water and Wastewater Management, Reclamation and Remediation Sector with satisfaction and believe that it will be used to develop curricula and training, recruitment activities and job definitions. On the basis of SQF WWMRR, the competences of the future can be described and linked to the digitalisation of the sector, adaptation to climate change, and reduction of negative human impacts on the environment. The development of a sectoral framework was one of the key recommendations of the Council.

Sector Skills Council

for the Water-Wastewater Management and Reclamation Sector

Definitions of some of the terms used in this publication are provided below (based on Sławiński, 2017; Żurawski, 2020):

SQF level descriptors – a set of general statements describing the knowledge, skills and social competence required for qualifications at a given SQF level.

Learning outcomes – the knowledge, skills and social competence acquired in the learning process. This concept can be explained as follows: learning outcomes consist of what a person knows and understands, is able to do, as well as the responsibilities a person is prepared to fulfil. Individual learning outcomes can be specific to a given qualification or universal; they can, for example, refer to what are known as key competences or to general professional competences.

Qualification – a set of learning outcomes meeting the requirements determined for a given qualification, which encompass knowledge, skills and social competence acquired in formal and non-formal education as well as informal learning. Attainment of the required learning outcomes for a given qualification is assessed through validation and formally confirmed by an awarding body.

Polish Qualifications Framework (PQF) – descriptions of the eight levels of qualifications distinguished in Poland, which correspond to the levels of the European Qualifications Framework. The descriptions present the general characteristics (known as "descriptors") of the learning outcomes assigned to each level, which are categorised in the areas of knowledge, skills and social competence.

Polish Qualifications Framework level – the scope and complexity of the learning outcomes required for a qualification assigned to a given PQF level. Each level is described by the general characteristics (known as "descriptors") of the required learning outcomes.

Sectoral qualifications framework – description of the levels of qualifications functioning in a given sector or industry; sectoral qualifications framework levels correspond to the same levels of the Polish Qualifications Framework.

Competence series – a group of descriptors from different SQF levels that relate to the same determinant and are in the same category of learning outcomes (e.g., knowledge).

Sectoral determinants – key competence areas in a given sector.

Integrated Qualifications System (IQS) – a national system of required standards and principles defined in the IQS Act on: describing qualifications, assigning Polish

Qualifications Framework levels to qualifications, the process of including qualifications in the IQS, making information about qualifications available in the Integrated Qualifications Register (IQR), as well as the principles and standards of awarding qualifications and their quality assurance.

1. The context of developing SQF WWMRR

1.1. Premises and aim of SQF WWMRR

The aim of developing the Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation was to create a simple tool that presents sector-specific competences in a structured way. The SQF WWMRR is a tool designed to facilitate the referencing of sector-specific qualifications to particular levels of the Polish Qualifications Framework. Descriptions of competences included in the framework can be used to compare qualifications, formulate criteria when contracting services, or develop requirements for employee recruitment. The framework can be useful for all those working in the sector to take a more conscious and individualised approach to their career development.

The SQF WWMRR meets the requirements set forth in the IQS Act – it is in line with the premises of the Polish Qualifications Framework and the assumptions of the Integrated Qualifications System (IQS), namely:

- SQF WWMRR descriptors are a further elaboration of the stage 2 level descriptors typical of vocational qualifications. They are formulated in the language of learning outcomes and organised in the categories of knowledge, skills and social competence.
- SQF WWMRR descriptors describe the progression of requirements in knowledge, skills and social competence that are key and characteristic of the sector.
- Individual components of the level descriptors are constructed in such a way as to define the minimum level of competence, only contain descriptions of those competences that can be confirmed, and are necessary for performing essential sector-relevant tasks at a defined degree of difficulty.

1.2. Characteristics of the water-wastewater management and reclamation sector

1.2.1. The organisational structure of water-wastewater management and conducting reclamation and remediation in Poland

In Poland, water and wastewater management is performed by public entities in a municipality-voivodeship-central state arrangement.

Municipality

One of the responsibilities of a municipality is to ensure water and wastewater management. This is defined in detail by three legal acts. The first of these is the Act of 8 March 1990 on Municipal Government (Journal of Laws of 1990, No. 16, item 95, Article 7, as amended), which indicates that "the tasks (of the municipal government unit) include all matters relating to water supply, the sewerage system, the removal and treatment of municipal wastewater". In order to fulfil these tasks, the municipality may create organisational units, conclude agreements with other entities as well as conclude inter-municipal agreements.

The second important legal act is the Act of 7 June 2001 on Collective Water Supply and Collective Wastewater Disposal (Journal of Laws of 2001, No. 72, item 747, Chapter 3, Articles 16–19, as amended). Pursuant to this act, the village head/mayor/city president issues, by way of a decision, the authority to perform collective water supply or collective wastewater disposal. The local government head is also responsible for approving long-term plans for developing and modernising sewerage facilities and the tariffs for collective water supply and collective wastewater disposal set by water and sewerage companies. The municipal/city council adopts a resolution to approve them. The final piece of legislation on the obligations of a municipality with regard to water and wastewater management is the Act of 13 September 1996 on Maintaining Cleanliness and Order in Municipalities (Journal of Laws of 1996, No. 132, item 622, Articles 5–6, as amended). According to its provisions, a municipality is obliged to:

- ensure cleanliness and tidiness within its area and develop the conditions for maintaining this in the event that connecting all properties to the sewerage network is impossible or would cause excessive costs; to ensure the construction, maintenance and operation of the wastewater disposal plants it owns or shares with other municipalities;

- maintain records of septic tanks and household wastewater treatment plants in order to control the frequency of emptying them and to draw up a plan for the sewerage network;
- adopt rules and regulations for maintaining cleanliness and tidiness in the municipality;
- exercise supervision over the real estate owner's obligations;
- determine the upper rates of charges for emptying septic tanks and the transport of liquid waste;
- organise alternative septic tank emptying services;
- issue permits to entrepreneurs for providing septic tank emptying services and transporting liquid waste;
- oversee compliance with and application of the Act.

Voivodeship (region)

At the regional level, responsibilities for water and wastewater management, reclamation and remediation are defined by the Act of 5 June 1998 on Voivodeship Government (Journal of Laws of 1998, No. 91, item 576, art. 11 par. 2, as amended). The law indicates the activities of the voivodeship government in the areas of environmental protection and water management. Among others, the voivodeship development strategy is required to take into account the preservation of the natural environment and the needs of future generations. The voivodeship development policy should include "the rational use of natural resources and the shaping of the environment in accordance with the principle of sustainable development". As of 2018 (Water Law, Journal of Laws 2017, item 1566 art. 135–138, as amended), voivodeship governors (called marshals) have been given a number of powers to issue local laws, including establishing protective zones for water intakes, establishing protective areas for inland water reservoirs or adopting water maintenance plans.

Central level

At the national level, the minister responsible for water and wastewater management, reclamation and remediation is the minister responsible for water management (currently the minister of infrastructure). As of 2018, water resources management in Poland has been centralised, establishing the "Polish Waters" State Water Management Holding [*Państwowe*

Gospodarstwo Wodne "Wody Polskie"] as the responsible entity. It consists of the following institutions:

- National Water Management Authority – an auxiliary institution of the Holding; its statutory tasks consist of, among others, developing proposals of a number of documents, including a proposed set of environmental objectives for marine waters, a proposed programme of protection of marine waters, a proposed preliminary flood risk assessment, a proposed plan to counteract the effects of drought.
- Regional Water Management Authorities – these units perform tasks relating to the maintenance of water sources and their infrastructure, for example, they issue water permits, plan projects to restore ecosystems degraded by the exploitation of water resources, plan the maintenance of inland waterways, etc. At present, there are 11 such units in Poland, whose catchment areas have been designated in accordance with river basins and water regions.
- Water Catchment Authorities – are responsible for matters relating to the planning and management of water investments and the issuance of fees; they cooperate with water users and water infrastructure construction companies. There are currently 50 Water Catchment Authorities in the current organisational structure of the Holding.
- Water Supervisory Authorities – are responsible for, among others, maintaining and operating the water facilities belonging to the State Treasury, providing danger signalling in situations of extreme hydrological phenomena and marking navigable routes on inland waterways. Currently, there are 330 Water Supervisory Authorities in Poland.

Reclamation and remediation

Reclamation and remediation processes in Poland are the responsibility of persons and entities who, by their actions, contribute to the degradation or devastation of the land on which they implement their activities.

1.2.2. Structure of the enterprises in the sector

At the end of 2020, there were 5,534 business entities operating in the field of water and wastewater management, reclamation and remediation in Poland (Statistics Poland, 2020). More than half of them (2,846) were active in the area of wastewater collection and treatment. Another 1,927 entities were involved in water abstraction, treatment and supply, and less than 800 conducted reclamation and remediation activities. The growth

of the sector is evident over the past years, and in the last decade alone, the number of its entities has increased by more than a thousand. The highest increase of 458 entities was recorded in the reclamation and remediation sub-sector. A further 323 entities were established in the wastewater collection and treatment sub-sector. The smallest growth over the past 10 years can be observed in the area of water abstraction, treatment and supply, where the number of entities increased by 219 new units.

In 2019, 86,595 employees were working in the sector, and their number increased by 937 compared to the previous year; 86.4% of the sector's employees were employed by public entities. According to Statistics Poland, 43,100 people worked in the sub-sector of water collection, treatment and supply, 39,820 people in the sub-sector responsible for wastewater collection and treatment, and 3,675 people in the reclamation sub-sector (PARP, 2020b).

1.2.3. Development opportunities in the sector

The water and wastewater management, reclamation and remediation sector is one of the most dynamically changing industries in Poland. This is mainly due to legislative changes at the international and national levels. Limited water resources in Poland, among others, as well as excessive water consumption and the emission of large volumes of wastewater across the European Union resulted in a European Commission decision of prioritising the development of water and wastewater management in current EU social policies. One of its elements is the implementation of a circular economy by Member States, which is to be based on the premise that "products, materials and raw materials should remain in the economy for as long as possible" and waste generation should be minimised as much as possible (PARP, 2020a, p. 9).

The European Green Deal strategy currently being implemented in Member States also emphasises the importance of the WWMR sector. It aims to "build a climate-neutral, equitable and prosperous society with a modern, resource-efficient and competitive economy".[4] This objective is to be achieved by 2050 through the realisation of the individual Green Deal points, such as climate neutrality, a circular economy, a pollution-free environment or the ecosystem and biodiversity strategy. These are linked to successive EU initiatives, such as "The EU Biodiversity Strategy 2030: Bringing nature

[4] From https://www.gov.pl/web/rolnictwo/neutralnosc-klimatyczna; see also https://www.consilium.europa.eu/media/41787/12-euco-final-conclusions-pl.pdf [accessed 07.09.2021]

back into our lives" [5] and the "New EU plan for a circular economy for a cleaner and more competitive Europe".[6]

The strategic assumptions indicated above are determining the development of the sector and setting its directions in the medium and long term. At present, the most important development trends visible in the sector are those relating to new technologies and optimisation processes, particularly in terms of "the better use of resources, reduction of environmental nuisances and greater efficiency of operation" (PARP, 2020b, p. 9). These include the areas of: "the use of water and the management of water resources for consumption and economic purposes, the management of surface and groundwater, the treatment of wastewater, the recovery of water, energy and other raw materials from wastewater, and the reclamation of degraded and devastated land and waters" (PARP, 2020b, p. 10). At the same time, two opposing trends are emerging among the sector's actors, which are increasing specialisation and expansion beyond core business activities (PARP, 2020b). All these processes are generating the need for increased employment in companies and the creation of "green jobs". At the same time, the water and wastewater sector faces the problems of an insufficient number of qualified staff and increasing average age of employees (PARP, 2020b).

1.3. Identifying competences and qualifications for SQF WWMRR

The water-wastewater management and reclamation sector needs a variety of workforce competences at different levels of complexity. The skills and knowledge required must enable employees to perform the key processes of the sector, such as water abstraction from sources, water treatment and distribution, wastewater collection and treatment, discharge of the treated water into the environment, as well as reclamation and remediation. The training and education offer in Poland is good and largely meets the needs of the sector. At the same time, however, industry representatives stress that formal education does not fully prepare employees to perform their duties. They need to develop their competences as well as acquire new ones in the workplace itself – while putting acquired theoretical knowledge into practice. The educational offer of post-primary schools is varied. The Regulation of the Minister of National Education of 16 May 2019 on the core curricula for education in the occupations of vocational training and additional vocational skills for selected occupations of vocational training (Journal

[5] See https://eur-lex.europa.eu/legal-content/PL/TXT/?uri=CELEX:52020DC0380
[6] See https://kproblen.pan.pl/images/stories/pliki/pdf/dyskusja/GOZ_03_2020.pdf

of Laws of 2019, item 991) defines the occupations used in the water and wastewater management, reclamation and remediation sector taught in formal education. The core curricula for education in the occupations of sectoral vocational education have been assigned to 32 industries. Occupations relating to water and wastewater management, reclamation and remediation were assigned to other industries: construction, chemical industry, horticulture, water transport, mining and quarrying, electrical energy, mechanical engineering and precision mechanics. The identified professions often indirectly relate to the WWMR sector, i.e., they are professions and faculties where only part of the educational outcomes or subjects strictly relate to water-wastewater management and reclamation.

The availability of educational offerings from stage I and II sectoral vocational schools varies. Six specialisations relating to the sector have been identified and are offered by schools in all voivodeships. These are: fitter of sanitary networks and installations (574 schools in the country), mechanic technician (550), landscape architecture technician (350), mechanic-fitter of machinery and equipment (263), renewable energy equipment and systems technician (231) and environmental protection technician (188). Other sector-related professions are only available in certain regions of the country. This is due, among others, to the level of interest in these professions, the demand for them and the availability of teaching staff. The least number of training opportunities are for the professions of water construction fitter, driller – 7 schools in each of 4 voivodeships – and water construction technician – 5 schools in 5 voivodeships (IBE, 2022). The educational offer of Polish universities for professions in the sector is quite broad and relatively accessible. Sector-related majors can be studied in every voivodeship. At present, universities offer 92 courses relating to the water-wastewater and reclamation sector. For the most part, these are courses of a general academic profile, with only a small proportion of them having a practical nature. Universities also offer postgraduate studies, making it possible to acquire the knowledge and skills used in the industry. Competences in fields relating to the sector can also be supplemented through courses, training workshops and conferences provided as part of non-formal education. The offer in this respect is relatively good. In addition, regulated qualifications, i.e., qualifications specifically defined in legal acts, exist that indirectly relate to the sector. These include a qualification for performing, supervising and directing categories IV-VI geological works (Journal of Laws of 2017, item 2126), and construction qualifications in the following specialisations: hydro-technical engineering and installation of networks,

facilities and equipment, including heating, ventilation, gas, water and sewerage (Journal of Laws of 2017, item 2126).

1.4. Entities and people involved in developing SQF WWMRR

A consortium consisting of EPRD Policy & Development Ltd. (leader), "Polish Waterworks" Chamber of Commerce (partner) and MABEA Ltd. (partner) worked on developing SQF WWMRR.

1.4.1. EPRD Policy & Development Ltd.

EPRD Policy & Development Ltd. [*EPRD Biuro Polityki Gospodarczej i Rozwoju Regionalnego Sp. z o.o.*] is a consulting company, working for over 25 years with experts from various industries, providing advisory and training services to the public sector, international corporations, small and medium-sized enterprises as well as non-governmental organisations. It works on the development of broadly-understood entrepreneurship in Poland and abroad. EPRD led the development of five sectoral qualifications frameworks: for agriculture, the chemical industry, energy, waste management and the real estate sector. It also participated in preparing the descriptions of ten market qualifications for the chemical industry.

1.4.2. "Polish Waterworks" Chamber of Commerce

"Polish Waterworks" Chamber of Commerce [Izba Gospodarcza "Wodociągi Polskie"] is a self-governing business organisation for the water and sewerage industry in Poland, bringing together more than 500 companies that are responsible for serving more than 80% of the water and sewerage market in Poland. It has been active in the sector since 1992. It is a member of the National Chamber of Commerce in Warsaw, as well as the European Union of National Associations of Suppliers of Water and Sewerage Services EurEau, based in Brussels. It conducts conferences, training activities and organises events, for example, the conferences: Water. Sewage. Sludge, Environmental Forum, Congress of Polish Waterworks; training workshop: "How to build a multi-utility enterprise"; professional courses: "Operator of a sewage treatment plant", "Water and sewerage network installer".

1.4.3. MABEA Ltd.

MABEA Ltd. is involved in various activities relating to the development of the qualifications system. MABEA's team has experience in conducting sectoral competence analyses as well as in developing sectoral qualifications frameworks for the fashion industry, agriculture, the chemical industry, energy sector, waste management and real estate. It also prepared descriptions of market qualifications, e.g., in the fields

of environmental protection, the chemical industry, sales and customer service, administration and management.

1.4.4. Expert team members

The proposed SQF WWMRR was developed by experts with specialist knowledge, among others, of the water-wastewater management and reclamation sector, the entities operating in it and the relationships between them, as well as the competences and most important qualifications awarded in the sector. Team members also possessed appropriate knowledge about developing qualifications, education and training programmes for the water-wastewater management and reclamation sector at home and abroad, as well as basic knowledge about the Polish Qualifications Framework and the premises of the Integrated Qualifications System in Poland.

The team of experts was selected in a way to ensure the representation of water and sewerage companies from cities of different sizes: very large (based in Kraków), large (Białystok), medium (Kościerzyna) and small (Drawsko Pomorskie). These entities have different abilities to develop employee competences due to their size, applied management tools, as well as geographical location. The team also included representatives of industry organisations, including associations of water and sewerage companies (Lower Silesian Waterworks Forum Foundation), as well as suppliers of solutions for the sector (Association of Manufacturers of Plastic Pipes and Fittings). Some of the experts involved have worked both in companies and in industry organisations, which also enriched the competence and knowledge base of the entire team. The consortium partner, "Polish Waterworks" Chamber of Commerce, was represented by the manager of substantive issues and three members, which made it possible not only to use the knowledge of the experts themselves, but also to conduct ongoing consultations with companies in the sector. People representing the sector in various ways were invited to join the expert team: individuals involved in personnel management, recruitment or the development of organisational charts.

The expert team also included members of the Sector Skills Council for the Water-Wastewater and Reclamation Sector: Prof. Marian Kwietniewski – Vice-Chair of the Research and Analysis Council, Dr. Klara Ramm – animator of the Council, acting as the manager of substantive issues during the development of the sectoral framework; and Robert Fennig – member of the Council as well as the Integrated Qualifications System Committee. This allowed the results of the Council's work to

date to be taken into account during the development of SQF WWMRR. The work on the framework was also supported by Dr. Jan Bondaruk from the University of Silesia.

Methodology experts Magdalena Słocińska and Anna Araminowicz, specialising in the implementation of the Integrated Qualifications System in Poland and with extensive experience in developing proposed sectoral qualifications frameworks for other sectors, also worked on the SQF WWMRR.

Table 1. Members of the expert team developing the SQF for Water and Wastewater Management, Reclamation and Remediation

Representing:	No.	Name
Companies providing water and sewerage services and independent suppliers of water	1.	Robert Fennig Miejskie Przedsiębiorstwo Infrastruktury „KOS-EKO" Sp. z o.o. („KOS-EKO" Municipal Infrastructure Enterprise Ltd.)
	2.	Beata Wiśniewska Wodociągi Białostockie Sp. z o.o. (Białystok Waterworks Ltd.)
	3.	Piotr Matusiak Zakład Wodociągów i Kanalizacji Sp. z o.o. w Drawsku Pomorskim (Waterworks and Sewerage Department Ltd. in Drawsko Pomorskie)
	4.	Edward Żołądkowicz Przedsiębiorstwo Wodociągów i Kanalizacji Sp. z o.o. w Morągu (Waterworks and Sewerage Enterprise Ltd. in Morąg)
Companies whose main business activities involve reclamation, remediation and other wastewater service activities	5.	Dr. Andrzej Staniszewski Ecol-Group Sp. z o.o. (Ecol-Group Ltd.)
	6.	Bartosz Łuszczek Wodociągi Miasta Krakowa S.A. (City of Kraków Waterworks, Inc.)
	7.	Zbigniew Gieleciak Regionalne Centrum Gospodarki Wodno-Ściekowej S.A. w Tychach (Regional Centre of Water and Wastewater Management, Inc. in Tychy)
	8.	Mirosław Milak Arcadis Sp. z o.o. (Arcadis Ltd.)

Representing:	No.	Name
Companies in the sector offering specialised services (e.g., provision of technology and specialised equipment, maintenance, repair, laboratory services)	9.	Justyna Król Eurofins OBiKŚ Sp. z o.o. (Eurofins OBiKŚ Ltd.)
	10.	Radosław Szeinig Fabryka Armatury Hawle Sp. z o.o. (Hawle Fittings Factory Ltd.)
	11.	Edyta Zalewska Uponor Infra Sp. z o.o. (Uponor Infra Ltd.)
	12.	Łukasz Dumas Endress+Hauser Polska Sp. z o.o. (Endress+Hauser Poland Ltd.)
Organisations operating in related fields and for the benefit of the water and wastewater management, reclamation and remediation sector (associations, chambers of commerce, foundations, etc.).	13.	Jakub Kucharski Izba Gospodarcza „Wodociągi Polskie" ("Polish Waterworks" Chamber of Commerce)
	14.	Andrzej Gołąb Stowarzyszenie Eksploatatorów Obiektów Gospodarki Wodościekowej (Association of Water and Wastewater Works Operators)
	15.	Marek Kornatowski Fundacja Dolnośląskie Forum Wodociągowe (Lower Silesia Waterworks Forum)
		Paulina Kopeć Izba Gospodarcza „Wodociągi Polskie" ("Polish Waterworks" Chamber of Commerce)
Institutions involved in formal education relating to water and wastewater management, reclamation and remediation	17.	Prof. Marian Kwietniewski Zakład Zaopatrzenia w Wodę i Odprowadzania Ścieków Wydziału Instalacji Budowlanych, Hydrotechniki i Inżynierii Środowiska Politechniki Warszawskiej (Department of Water Supply and Wastewater Disposal, Faculty of Building Services, Hydro and Environmental Engineering of Warsaw University of Technology)
	18.	Tomasz Boniecki Zespół Szkół Centrum Kształcenia Rolniczego w Nadrożu (Agricultural Training Centre School Complex in Nadroży)

Representing:	No.	Name
Non-formal education provider in water and wastewater management, reclamation and remediation	19.	Iwona Włodarek Izba Gospodarcza „Wodociągi Polskie" ("Polish Waterworks" Chamber of Commerce)
Experts with knowledge and experience in implementing the IQS	20.	Magdalena Słocińska MABEA Ltd.
	21.	Anna Araminowicz MABEA Ltd.

Source: own work based on Araminowicz, Misztal, Słocińska (2022).

2. The course of the work on developing SQF WWMRR

2.1. The scope of SQF WWMRR

The Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation (SQF WWMRR) contains descriptions of the competences necessary to plan, organise, implement and supervise the processes of water and wastewater management, reclamation and remediation, specifically in the following areas:

- water abstraction, treatment and supply;
- wastewater collection, transportation and treatment, including discharging wastewater into water and the ground;
- assessment of the condition of ecosystems and the design and implementation of corrective measures in reclamation and remediation processes;
- design, construction and operation of water and sewerage infrastructure;
- performing measurements, observations, laboratory and field tests for water and wastewater management, reclamation and remediation processes;
- water resources management, including the minimisation of water consumption, water reuse and the management of rainwater and snowmelt;
- management of waste, including sludge, generated by the processes of water and wastewater management, reclamation and remediation, in accordance with the concept of sustainable development and the principles of a circular economy.

SQF WWMRR also includes descriptions of the competences needed to conduct educational, informational and awareness-raising activities for the public, entrepreneurs, sector employees and representatives of state and local government institutions on consciously managing water resources, using ecosystems and acting in accordance with the concept of sustainable development and the principles of a circular economy.

2.2. Definition of the sector

In the preparatory process, after consultations with industry representatives, it was decided that the name of the sectoral framework would be the same as that of the Sector Skills Council for the Water-Wastewater and Reclamation Sector. At the same

time, for the purposes of the planned work, the Educational Research Institute prepared the "Analysis of Competences and Qualifications in the Water-Wastewater Management and Reclamation Sector" report. The research conducted for this publication and its preparation allowed, among other things, a definition of the sector and its boundaries to be determined, that is, to decide which processes and activities fall within its scope, and which are characteristic of other sectors, even though it may seem that they also apply to the water-wastewater management and reclamation sector.

Based on the above work, the following definition of the water-wastewater management and reclamation sector was adopted for the purposes of working on the sectoral framework:

The water-wastewater management and reclamation sector consists of the following processes and activities:

- enabling the use of water by people, regardless of the purpose and type of recipient (individual, collective and industrial), taking into account the return of the used water to the environment in a safe state (i.e., sequentially: water abstraction from the source, its treatment, distribution, and then collection of wastewater, its treatment and discharge into the environment),
- ensuring the quality and purity of water in the environment (i.e., remediation of ground and surface waters as well as the soil that affects water quality),
- designing, coordinating and supervising the aforementioned processes and activities.

The above definition has three components. The first is a description of the processes and activities relating to people's use of water, taking into account its various sources – the environment and wastewater. The second refers to ensuring the quality of this water and directly addresses water treatment and wastewater treatment. In turn, the last component addresses the organisation of the activities described above.

2.3. Stages of work on SQF WWMRR

2.3.1. Stage I – Preparatory activities

The Educational Research Institute, in cooperation with a research firm, prepared the "Analysis of Competences and Qualifications in the Water-Wastewater and Reclamation Sector" report. Its purpose was to identify a list of competences and qualifications specific to the sector. The research results and prepared report formed

the basis for the subsequent work of the expert team on the sectoral determinants and SQF level descriptors of the framework.

As part of the preparatory activities, a public procurement was announced to select a contractor for developing the sectoral framework. The contractor presented a substantive concept for developing a proposed SQF WWMR, along with a detailed schedule for the execution of the contract. The concept included, in particular, a proposal to modify the scope of the sector indicated in the bidding documentation as well as detailed substantive assumptions for developing the framework's sectoral determinants and level descriptors. It took into account the use of the results of IBE's research and analysis from its report and other materials, helpful in developing the SQF level descriptors. In addition, at this stage of the work, special materials were prepared and sent to the expert team members.

2.3.2. Developing the draft SQF WWMR by the expert team

An inaugural seminar launched the second phase of work on the framework. Experts were introduced to issues relating to the IQS, PQF and SQF, and presented the planned course and organisation of the team's work. During the seminar, substantive work on developing a draft SQF WWMR was also begun. During the debate held in the expert group, issues were raised concerning the main processes performed in the sector, the scope of the sector, as well as the needs and expectations of the industry community with regard to the SQF WWMR.

Next, workshops were held for the experts on specific areas of the sector: issues relating to water supply, wastewater management, sludge management, reclamation and remediation. During each session, the principles of conducting work on developing the SQF, including the formulation of level descriptors, were explained in detail. Sector competence research was also launched in small groups of experts to identify the key competences for the sector. In the course of a moderated discussion, the processes and tasks of the sector were identified, together with the competences needed to perform them. After all the workshops were held, the lists of competences identified by the sectoral experts were edited. In this way, the first, working, preliminary version of SQF WWMR was developed. This material was sent to all experts, which they subsequently supplemented and revised. Descriptions of the competences identified in the sector (resulting from the conducted desk research, group work during the workshops and independent expert work) were arranged into competence series and grouped by the adopted sectoral determinants. At this stage, the level of detail in the descriptions of competences was systematised and

the chosen sectoral determinants were verified. The completed, subsequent version of SQF WWMR was sent to all expert team members to verify the completeness of the level descriptors and substantive correctness of the entries. At each stage of the formulation of the SQF WWMR level descriptors, methodology experts analysed the compliance of SQF WWMR with the premises of the PQF and the IQS Act, especially the correspondence of SQF WWMR's level descriptors with those at the same PQF level. This analysis consisted primarily of comparing each entry with the corresponding descriptors of second stage PQF level descriptors typical of vocational qualifications and assigning the corresponding descriptors. These activities were consulted on an ongoing basis with IBE experts to ensure that the entire process was being undertaken correctly. The result of the expert team's work at this stage was a draft Sectoral Qualifications Framework for Water-Wastewater Management and Reclamation.

2.3.3. Stage III – Consulting the draft SQF WWMR with the sector and its verification

The contractor developed a concept for verifying the draft Sectoral Qualifications Framework for the Water-Wastewater and Reclamation Sector. The concept included the main assumptions of the verification process, a description of the planned methods and the method of selecting participants for the consultations. In the end, consultations were conducted with 104 representatives of the sector from all over the country.

Table 2. Schedule of the consultations with the sector on the draft SQF WWMR

Type of Consultation	Date	Number of Participants
Individual interviews (10)	21.04–13.05.2022	10
Focus group interviews (4)	22.04–12.05.2022	24
Consultation seminars (4)	14.12.2021	70

Source: own work based on Araminowicz, Misztal, Słocińska (2022, p. 55).

As a result of comments made during the consultations, the SQF's level descriptors were further modified. Changes made at this stage included:

- **renaming the sectoral qualifications framework – expanding the name to include remediation**, which is consistent with the scope of the framework and the terminology it contains;

- distinguishing a determinant for infrastructure – descriptions of competences relating to infrastructure design and construction were separated from those relating to operations; this was due to the differences between the two groups of competences and the fact that they often occur separately, involving different individuals or teams;
- supplementing the draft framework with additional issues and competence descriptions – including issues relating to water retention, the impact of retention on water resource management, counteracting floods, water shortages, droughts, calculating rainwater volumes and retention, evaporative water losses, and preparing water balances. A frequently raised issue was also the need to more strongly emphasise rational water management, water reuse, including, for example, grey water, competences relating to water losses, such as detection, analysis of causes and prevention. The draft SQF was also supplemented with knowledge of basic concepts about water management, knowledge of the water cycle in nature, the ways in which water resources are formed, as well as descriptions of competences needed to cooperate with institutions, such as sanitary inspections, water supervision inspectorates, environmental inspectorates, higher education institutions or on cooperation between science and industry. Issues on financial and economic issues, knowledge of statistical methods and mathematical models used in the sector were also added;
- clearly separating installations/systems into collective and individual ones;
- supplementing the framework with the issue of using waste in reclamation and remediation processes, knowledge of the possibilities and conditions for their use;
- supplementing the entries for social competence with the readiness to work under difficult conditions, such as in the presence of unpleasant odours, noise or harmful factors, as well as the readiness to work under specific organisational conditions (work during non-standard hours, shift work, on-call work);
- making the provisions having an analogous character more consistent in water supply, wastewater disposal, reclamation and remediation – among the added elements were: a description of competences relating to identifying stakeholders' needs in water and wastewater management (analogous to those included in the case of reclamation and remediation processes), provisions for wastewater disposal systems (analogous to the series on water supply systems), issues relating to the infrastructure used in reclamation and remediation processes (these were not included in the entries for infrastructure design);

- amending the structure of the SQF, names of series, names and descriptions of sectoral determinants – among others, selected series were separated or merged, entries were transferred between series and entire series were transferred between determinants, some of the names were modified to make them more understandable and clearly indicate the content of a given series/determinant;
- making the terminology in all entries of the framework more consistent and modifying the glossary.

After conducting the consultations, analysing and introducing the proposed changes, a draft SQF for Water and Wastewater Management, Reclamation and Remediation was developed and reviewed by the industry community.

2.3.4. Stage IV – Preparing the final version of the framework as well as guidelines for the implementation and use of SQF WWMRR for various stakeholder groups

Stage four involved the development of a final report summarising the work on SQF WWMRR and additional information. At this stage, the final versions were developed of:

- SQF WWMRR level descriptors and sectoral determinants in Polish;
- SQF WWMRR level descriptors and sectoral determinants in English;
- a correspondence table between the SQF entries for Water and Wastewater Management, Reclamation and Remediation and second stage PQF level descriptors typical for vocational qualifications;
- instructions on reading the level descriptors for users of the SQF WWMRR – a description of how to use the SQF WWMRR, a glossary of terms used in the framework, a description of possible ways the SQF WWMRR can be utilised;
- a detailed description of the work done in developing the level descriptors;
- recommendations on implementing and using SQF WWMRR in Poland, as well as the future development of its entries;
- a multimedia presentation summarising the work on the SQF for Water and Wastewater Management, Reclamation and Remediation.

3. The structure of SQF WWMRR

3.1. Level descriptors

The Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation contains descriptions of competences at six levels of the Polish Qualifications Framework – from PQF level 3 to 8. SQF WWMRR level descriptors are divided into competences for knowledge and skills, grouped by sectoral determinants and then by series within the determinants. Social competences have a more universal nature and relate to abilities other than those listed in the sectoral determinants; these descriptors are presented at the end of the framework. In developing the framework, special care was taken to ensure that the entries do not duplicate each other, but are complementary and present the entire spectrum of competences specific and essential to the sector.

3.2. Sectoral determinants

Sectoral determinants provide coherence to the structure of the framework, identifying the key areas of the sector. They were distinguished in accordance with the assumption that the structure of the framework should be based on grouping the sector's key competences by:

- the key work processes performed in the sector;
- the objects that are affected by a person performing tasks within a given process, e.g., people, products, raw materials, phenomena, costs;
- the tools, methods and organisation of work;
- the standards, rules and laws pertaining to selected processes, end-user requirements (Szymczak, Trochymiak, Żurawski, 2015).

The sectoral determinants were developed on the basis of analysing the sector's implemented processes and required competences. In addition, the results were used of the first edition of the Industry Human Capital Balance survey (Urbanowicz, Kania, Kornecki, Krukowski, Jelec, 2021), the results of the work of the Sector Skills Council for the Water-Wastewater and Reclamation Sector, as well as other studies on competences in the sector. Subsequently, the developed determinants were discussed with representatives of the consortium's industry partner involved in developing the sectoral framework – the "Polish Waterworks" Chamber of Commerce. In the course of the work

on the framework, the determinants were further modified by taking into account the proposals made during the public consultations.

The final list of the sectoral determinants within the categories of knowledge and skills is:

- ecosystems and water resources,
- stakeholders,
- testing, measurements, data acquisition and analysis,
- infrastructure design and construction,
- operating the infrastructure,
- water abstraction, treatment and supply,
- wastewater collection, transport and treatment,
- planning and implementing reclamation and remediation processes,
- safety.

Due to the cross-cutting and universal nature of social competences for all areas of the sector, descriptions of these competences have been separated in the framework. They are grouped into the following determinants:

- communication and cooperation,
- responsibility for the environment,
- work standards

The sectoral determinants designated for SQF WWMRR are defined as follows:

Ecosystems and water resources

This determinant includes **knowledge** relating to:

- the properties of ecosystems, the phenomena, reactions and processes of ecosystems and the factors affecting their functioning;
- the types of pollutants found in ecosystems, their properties and effects on ecosystems;
- the impact of implemented processes on the functioning of the ecosystem and the course of phenomena in it, including the risks associated with conducting reclamation and remediation processes in the ecosystem;
- the retention and the management of water resources, the quality and availability of water resources, as well as the technologies supporting the rational management of water resources;
- legal regulations on ecosystem functioning and water resources management.

The **skills** it includes relate to:

- analysing land and water conditions, the socioeconomic environment, and the history of ecosystems to assess their pollution status and the availability and quality of water resources;
- analysing water resources;
- promoting activities for the conscious management of water resources.

Stakeholders

This determinant includes **knowledge** relating to:

- stakeholder groups and their needs;
- the principles of cooperation with stakeholders, including the legal regulations defining these principles;
- the principles for establishing cooperation and including specialists from other fields in activities conducted in the processes of water and wastewater management, reclamation and remediation.

The **skills** it includes relate to:

- identifying the needs of the various stakeholder groups in the processes of water and wastewater management, rehabilitation and remediation;
- establishing and implementing cooperation in water and wastewater management, rehabilitation and remediation, including with specialists from other fields;
- informing and educating stakeholders on environmental protection, water and wastewater management, reclamation and remediation.

Testing, measurements, data acquisition and analysis

This determinant includes **knowledge** relating to:

- the types, principles and methods of observation, field measurements for water and wastewater management, reclamation and remediation;
- the types of laboratory tests and the principles for taking, storing and transporting samples for laboratory tests in the processes of water and wastewater management, reclamation and remediation;
- the principles of operating testing apparatus and measuring equipment;
- the legal regulations on the performance of field and laboratory tests;
- the mathematical models used to perform analyses for water and wastewater management, reclamation and remediation;
- data sources and the principles of data acquisition and use.

The **skills** it includes relate to:

- planning surveys, measurements and observations for water and wastewater management, reclamation and remediation;
- taking measurements and samples for laboratory tests for water and wastewater management, reclamation and remediation;
- obtaining and analysing existing data for water and wastewater management, reclamation and remediation;
- operating measuring equipment;
- analysing test results, observations and measurements.

Infrastructure design and construction

This determinant includes **knowledge** relating to:

- the types, construction and design principles of water supply and wastewater disposal systems;
- the principles of the operation, functioning, design, construction, and conditions of use of devices and fittings used in water supply and wastewater disposal systems;
- the types, functions, principles of operation, intended use and design of facilities and installations used in reclamation and remediation processes;
- the standards and regulations on the design and construction of facilities, plants and networks for water supply and wastewater disposal systems and for use in reclamation and remediation processes.

The skills it includes relate to:

- designing the infrastructure for collective water supply and wastewater disposal;
- designing individual water supply and wastewater disposal systems;
- designing the infrastructure used in reclamation and remediation processes;
- designing and constructing connections for water and sewerage networks;
- using documentation in the design and construction of facilities, installations and networks forming part of the water supply and wastewater disposal systems and used in reclamation and remediation processes.

Operating the infrastructure

This determinant includes **knowledge** relating to:

- the principles for the operation, maintenance and use of infrastructures for water supply and wastewater disposal systems;
- the types, operation and maintenance principles, operating parameters and performance of specialist auxiliary equipment;

- the standards and regulations on infrastructure maintenance.

The **skills** it includes relate to:

- operating, assessing the correctness of operation and diagnosing the causes of malfunctions of equipment, installations and networks used in water supply and wastewater disposal systems;
- operating specialised auxiliary equipment;
- the ongoing maintenance, planning and execution of repairs and renovations of devices, installations, facilities and networks;
- using documentation in the operation of the facilities, equipment, installations and networks used in water supply and wastewater disposal systems.

Water abstraction, treatment and supply

This determinant includes **knowledge** relating to:

- the principles of operating and protecting water intakes;
- water parameters at different stages of the water supply process;
- the methods, technologies and products used in water treatment processes;
- the possibility of using sludge, washings and other waste materials generated by water treatment processes;
- the effectiveness and correctness of processes as well as the costs of activities in water abstraction, treatment and supply;
- the methods and procedures of preparing water balances in networks as well as the detection, prevention and reduction of water losses in water supply systems;
- the legal conditions of the processes of water abstraction, treatment and supply, including issues relating to the critical infrastructure.

The **skills** it includes relate to:

- estimating water demand, monitoring water distribution and ensuring the security of the water supply;
- planning and implementing the processes of water abstraction, treatment and supply;
- selecting technologies and applying products in the water treatment process;
- the abstraction of water from intakes, management of water intakes, and risk analysis of water intakes and water supply systems;
- analysing the effectiveness and efficiency of water abstraction, treatment and supply processes and optimising the costs of implementing these processes.

Wastewater collection, transport and treatment

This determinant includes **knowledge** relating to:

- the methods, technologies and products used in wastewater treatment processes;
- the formal and legal considerations of wastewater collection, transport and treatment and sludge disposal;
- wastewater parameters and the principles of wastewater treatment;
- the efficiency and correctness of wastewater collection and transport, wastewater treatment and sludge treatment processes, and the costs of the activities of these processes;
- the methods and procedures for performing wastewater and sludge balances in wastewater collection systems;
- the possibilities of using and technologies for treating sludge and other waste generated by wastewater treatment processes;
- the technologies for generating biogas in wastewater treatment processes.

The **skills** it includes relate to:

- planning and implementing the processes of the collection, transport and treatment of wastewater, management of sludge and other waste generated in the wastewater treatment process;
- designing technologies and applying products in the wastewater treatment process;
- designing processes for treating sludge and other waste materials generated by the wastewater treatment process;
- analysing the effectiveness and efficiency of the processes of the collection, transport and treatment of wastewater, management of sludge and other waste generated by the wastewater treatment process and optimising the costs of these processes.

Planning and implementing reclamation and remediation processes

This determinant includes **knowledge** relating to:

- the methods and technologies used in reclamation and remediation processes, and the conditions of their use;
- the products used in reclamation and remediation processes;
- the costs of implementing reclamation and remediation as well as the factors influencing the efficiency and effectiveness of reclamation and remediation processes;
- the formal and legal conditions of implementing reclamation and remediation processes;

- the irregularities occurring during reclamation and remediation processes, and the methods of preventing irregularities and taking remedial actions;
- the potential of effectively managing the waste generated by reclamation and remediation processes, and the possibility of using waste from other industries in reclamation and remediation processes.

The **skills** it includes relate to:

- developing reclamation and remediation projects, including setting objectives, land-use planning, selection of methods and technologies;
- analysing the effectiveness of reclamation and remediation processes, as well as assessing the risks in reclamation and remediation processes;
- analysing the impact of reclamation and remediation on ecosystems;
- organising reclamation and remediation processes, including planning logistics and managing waste;
- monitoring the execution of reclamation and remediation processes, including assessing the correctness of the processes, identifying irregularities in the processes and monitoring the sustainability of the results;
- obtaining administrative decisions and maintaining the documentation on reclamation and remediation processes.

Safety

This determinant includes **knowledge** relating to:

- the risks to the ecosystem, people and property associated with the implementation of reclamation and remediation processes;
- the risks associated with implementing water and wastewater management processes;
- the methods of identifying and minimising the risks associated with the processes of reclamation and remediation, water and wastewater management;
- the principles of safety when implementing work associated with water and wastewater management, reclamation and remediation;
- the principles for handling products and samples of pollutants.

The **skills** it includes relate to:

- assessing the risks of the occurrence of threats;
- implementing solutions to minimise the risks and consequences of threats;
- applying and designing procedures to ensure safety.

Social competence

The expert panel determined that social competences are generally universal in nature and refer to several determinants at the same time. It was therefore decided that the social competence determinants would be presented at the end of the sectoral framework.

Communication and cooperation

This determinant includes social competences relating to:

- a readiness to communicate, establish and maintain relationships with ecosystem stakeholders, users of water and wastewater networks, investors, principals, representatives of environmental organisations, administrators and legislators, service providers, and professionals from other sectors.

Responsibility for the environment

This determinant includes social competences relating to:

- taking into account the environmental impact of undertaken activities, prioritising environmental aspects when making decisions;
- taking action to support the functioning of ecosystems, including the maintenance of the proper state of soil and water;
- promoting attitudes and raising awareness about caring for ecosystems and the sustainable management of water resources.

Work standards

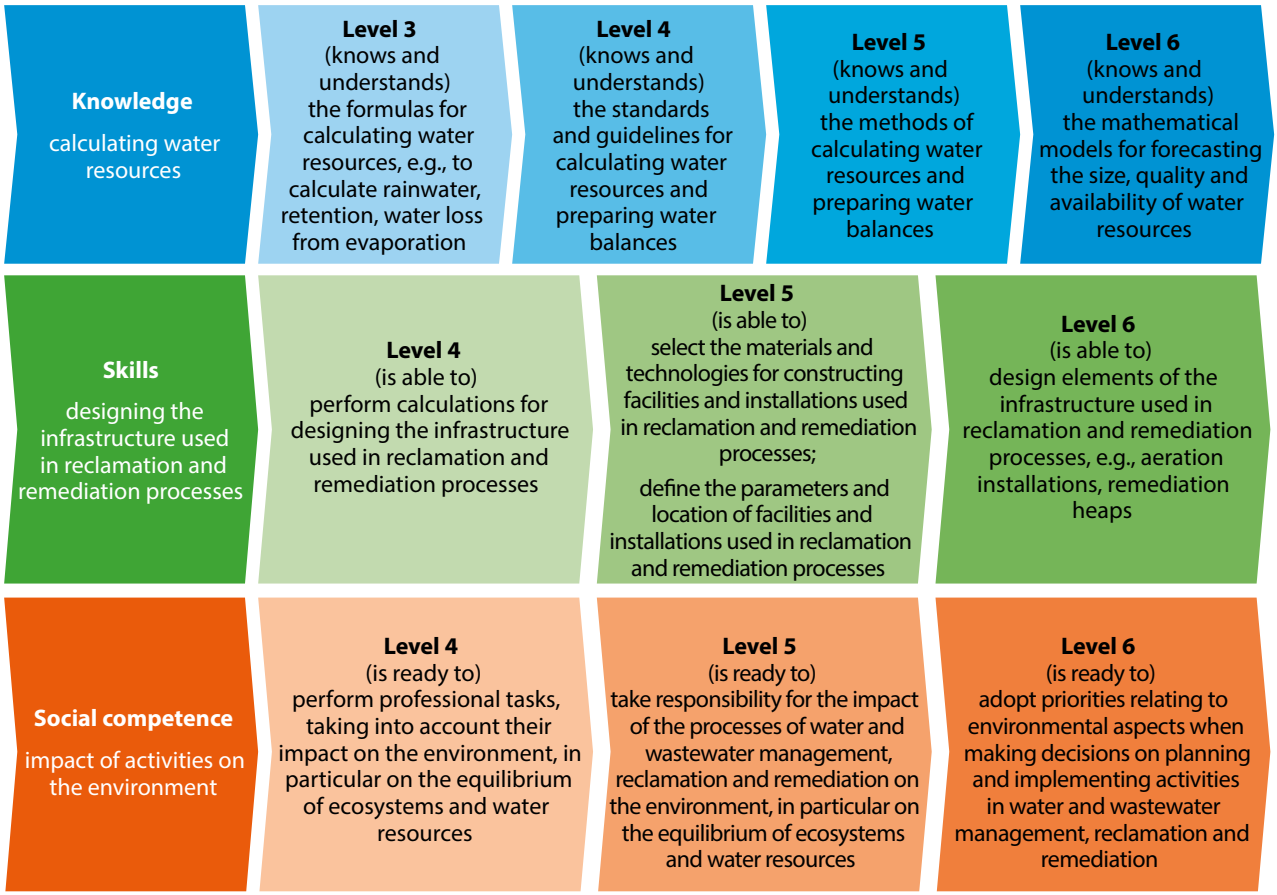
This determinant includes social competences exhibiting a readiness to:

- take into account the long-term consequences of undertaken activities;
- make decisions under changing conditions, time pressure and situations that may pose a threat;
- take responsibility for the safety of people and property in connection with the processes being implemented;
- take responsibility for the safety of the water supply and the operation of critical infrastructure;
- undertake work in non-routine or onerous conditions.

3.3. Competence series

The descriptions of competences within the sectoral determinants of SQF WWMRR are grouped into series. A series is a set of thematically-related competence descriptions forming a logical sequence of entries of increasing complexity and difficulty. The competences of one series are always in the same row, making it possible to trace the progression of the requirements. Examples of competence series for knowledge, skills and social competence are presented below.

Figure 1. Examples of competence series in SQF WWMRR



Source: own work.

Arranging the competence descriptions comprising the SQF WWMRR level descriptors into series and determinants makes the framework easier to use and ensures its utility and functionality.

3.4. Glossary of terms used in the Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation (SQF WWMRR)

Term	Definition
stakeholders (relating to water and wastewater management processes)	persons, communities, companies, organisations, institutions, universities and research units that have an impact on water and wastewater management processes, e.g., contractors, representatives of local authorities, decision-makers, regulators, investors, sub-contractors and landowners, as well as individuals, communities, companies, organisations and institutions that are customers and users of water supply systems and wastewater collection and treatment systems
stakeholders (relating to reclamation and remediation processes)	persons, communities, companies, organisations, institutions, universities and research units that have an impact on reclamation and remediation processes, e.g., investors, clients, site owners, decision-makers, regulators, participants or contractors in reclamation and remediation processes, as well as individuals, communities, companies, organisations and institutions that use or benefit from sites subject to reclamation and remediation processes
products	chemical and biological substances, solutions, mixtures used in water and wastewater management, reclamation and remediation processes, e.g., coagulants, reagents
industrial symbiosis	cooperation between companies and other organisations for the purpose of improving the use of raw materials and rationally managing waste, with a particular focus on material and energy exchange
in-situ reclamation and in-situ remediation	implementing reclamation and remediation work at a polluted site
ex-situ reclamation and ex-situ remediation	implementing reclamation and remediation work away from a polluted site, involving the excavation of contaminated soil, its relocation and treatment outside the ecosystem
water supply system	a system of interacting engineering elements and facilities for supplying water to consumers; the system includes, among others, water intakes, pumping stations, water treatment plants, water reservoirs, e.g., equalisation tanks, retention tanks, water supply networks; the term used in SQF WWMRR refers to both collective and individual water supply systems (e.g., wells, micro-retention systems)

Term	Definition
wastewater disposal system	a system of interacting engineering elements and facilities for the collection, removal, transport and treatment of wastewater as well as rainwater and snowmelt; the system includes, among others, sewerage networks, sewers, pumping stations, septic tanks, treatment plants; the term used in SQF WWMRR refers to both collective and individual wastewater collection and treatment

4. Recommendations for using SQF WWMRR

The sectoral qualifications framework for the water and wastewater management, reclamation and remediation sector is intended to be a useful tool for representatives of the sector, helping, among others, to identify and structure the competences expected by employers, to express the sector's needs to representatives of the school, higher education and non-formal education systems, as well as to raise public awareness about the importance of the sector for the economy and to build its positive image. At the same time, during the work of the expert team on the framework, as well as during the consultations, discussions were held on how to implement it and how it could be used in the future. The discussions resulted in the following recommendations for implementing, developing, updating and using SQF WWMRR. These recommendations are addressed to a wide range of stakeholders, including entrepreneurs (employers), educational institutions, professional organisations, and government representatives at the central and local levels.

The benefits that using the SQF WWMRR can bring to employers in their work are:

- assistance in determining the desired employment structure of the company, assessing existing staff resources, and identifying the resources needed for the planned development of the company,
- making it easier to describe the requirements for particular job positions,
- providing support in recruitment and selection processes,
- supporting internal employee evaluation processes,
- supporting employee development planning,
- facilitating the development of job assessments and salary grids,
- facilitating the development of a system of employee promotion and remuneration, as well as helping to plan the career path of employees.

Employers can use the framework to determine the desired structure of their workforce and assess their human resources. The SQF entries can help to effectively manage human resources and create teams of employees adapted to the level of complexity of the tasks to be performed, which improves not only the effectiveness of the company itself, but also increases the level of employee satisfaction, as they are performing tasks at their right competence level.

The opportunities offered by SQF WWMRR to employees and jobseekers in the sector are:

- gaining a better idea of what is involved in working in the sector;
- assistance in making an informed choice about one's career path – the SQF entries make it easier to identify the competences a person has already achieved and to identify those which still need to be obtained;
- the possibility for the employer to develop a clear remuneration system and thus make it easier for an employee to obtain a higher salary;
- a shorter transition period of employment or apprenticeship due to more effective management of human resources by employers.

SQF WWMRR can be used by public administration representatives to:

- increase the transparency of conducting public procurement procedures by facilitating the formulation of the requirements for the contractor based on the competences used in the sector, as described in the framework;
- more precisely define the services being contracted in the scope of, for example, the servicing and maintenance of equipment, designing or programming, with the use of the descriptions in SQF WWMRR of the processes, phenomena or technologies characteristic of the sector;
- enable the relevant minister to define the desired competences for the experts to be engaged in consulting legal regulations, administrative procedures or to define the competences of officials working on issues in the WWMR sector.

In the area of education, SQF WWMRR can be used in the following ways, among others:

- SQF entries can be helpful, for example, in setting the curriculum/profile or designing training courses. During the work on the framework, it was pointed out that while courses and training programmes are already mostly tailored to market needs, school and higher education curricula still need to be systematically modified;
- in the organisation of apprenticeships and work placements – in order to develop an education programme that is as effective as possible and tailored to employers' expectations; as a tool to facilitate the development of new, more specialised and WWMR-dedicated curricula.

In addition, the provisions of the framework can be helpful in developing market qualifications for the sector.

Industry representatives pointed to the strong role which could be played by the Sector Skills Council in implementing SQF WWMRR. The Council should encourage the industry community to make the widest possible use of SQF WWMRR in education or recruitment processes. It should also be responsible for ensuring that the framework entries are updated on a cyclical basis in line with the needs of the sector. It was also pointed out that the implementation and further development of SQF WWMRR should also involve, among others, education and training entities (higher education institutions, schools, training institutions), industry organisations ("Polish Waterworks" Chamber of Commerce, associations and business organisations), public administration (e.g., Ministry of Education and Science, Ministry of Family and Social Policy, Ministry of Infrastructure, Ministry of Climate and Environment). Industry representatives also suggested that the SQF provides the opportunity to develop short courses on industry knowledge, aimed, for example, at people with basic technical competences. Such courses could facilitate retraining and preparation for work in the sector. On a similar basis, courses could be developed for tertiary graduates who have acquired more general knowledge and need to complement it with competences in a narrower field, to better meet the requirements of a job. Courses of this type could be available, for example, through an e-learning platform. Another suggestion is to analyse SQF WWMRR in terms of its benefits for different stakeholder groups and to conduct a pilot implementation for them.

In addition, attention was drawn to the need for central administration representatives to become involved in promoting and implementing SQF WWMRR (it was suggested, for example, that the SQF be placed under the patronage of the relevant minister). Industry representatives stated that reviewing SQF WWMRR on a cyclical basis together with stakeholders and industry-related persons and to publish the conclusions of such review would also be important. It was also pointed out that a prerequisite for the effective use of SQF WWMRR in the future is the periodic updating of its entries. In doing so, a period of 1 to 5 years was indicated, suggesting, for example, that SQF WWMRR should be reviewed more frequently, with the document being modified more extensively after longer intervals.

5. Instructions for using SQF WWMRR

The Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation is a structured description of sector-specific and key competences categorised by knowledge, skills and social competence. The competence descriptions have been grouped thematically and arranged by the increasing complexity and difficulty of the requirements.

Searching for competences in SQF WWMRR

Step 1. Check the scope of SQF WWMRR

The scope of SQF WWMRR is defined by the key processes and tasks performed in the sector, requiring the possession of the sector-specific competences described in the framework. When the competence being sought is not found in SQF WWMRR, it is worth looking at other sector-specific SQFs published so far, in which competences relating to water and wastewater management, reclamation and remediation may have been described.

These include the following SQFs:

- Sectoral Qualifications Framework for the Energy Industry (SQFE) – contains descriptions of competences relating to energy production, see https://kwalifikacje.edu.pl/sektorowa-rama-kwalifikacji-dla-energetyki-srke/.
- Sectoral Qualifications Framework for the Chemical Industry (SQF Chem) – contains competences relating, among others, to knowledge of chemical substances, designing and conducting chemical processes, performing laboratory tests, see https://kwalifikacje.edu.pl/sektorowa-rama-kwalifikacji-dla-przemyslu-chemicznego-srk-chem/.
- Sectoral Qualifications Framework for the Construction Industry (SQF Con) – includes competences required for designing and constructing buildings, see https://kwalifikacje.edu.pl/sektorowa-rama-kwalifikacji-w-budownictwie-srk-bud/.
- Sectoral Qualifications Framework for the Waste Management Sector (SQF WM) – presents competences relating to waste treatment https://kwalifikacje.edu.pl/sektorowa-rama-kwalifikacji-dla-gospodarki-odpadami/.

- SQF Sectoral Qualifications Framework for Agriculture (SQF AG) – contains descriptions of competences relating to planning and planting vegetation, see https://kwalifikacje.edu.pl/sektorowa-rama-kwalifikacji-dla-rolnictwa-srk-rol/.
- Sectoral Qualifications Framework for the Fashion Industry (SQF FI) – among others, this framework describes competences relating to the management of wastewater from the leather (tanning) and textile industries, see https://kwalifikacje.edu.pl/sektorowa-rama-kwalifikacji-dla-przemyslu-mody-srk-pm/.

Step 2. Determine the category of the competence

Competences in SQF WWMRR are divided into three categories: **knowledge** (knows and understands – coded in blue), **skills** (is able to – coded in green) and **social competence** (is ready to – coded in orange). The category to which the competence being searched for belongs needs to be determined.

Step 3. Choose the sectoral determinant

The sectoral determinants divide the competences included in SQF WWMRR into thematic areas and identify key aspects of the sector's work. The framework has separate determinants, e.g., planning and conducting reclamation and remediation processes, in which descriptions of competences from the knowledge and skills categories are grouped together. The determinants organising the descriptions of social competence are at the end of the framework. The sectoral determinants with their descriptions can be found in Chapter 3.

Step 4. Select the competence series

Competences within the sectoral determinants are grouped into series. A competence series is a thematically linked set of competence descriptions (descriptors) that form a logical sequence of entries of increasing complexity. Competences belonging to one series in the SQF WWMRR are always in the same row, making it possible to trace the progression of requirements. The name of each series identifies the thematic scope of the competences it contains, which is intended to make it easier to find the needed description, e.g., reclamation and remediation methods, or performing water abstraction, treatment and supply processes.

Step 5. Finding the competence

The competence series consist of descriptions of competences organised by individual PQF levels. In SQF WWMRR, competences have been described at levels corresponding to Polish Qualifications Framework levels 3–8, although individual series do not always

contain competences at all these levels. If this is the case, it means that no sector-specific competences have been identified corresponding to that level.

Step 6. Further specifying the competence

SQF WWMRR level descriptors are described in a generic way allowing the competence requirements for the whole sector to be reflected. This means that in order to use SQF WWMRR descriptors to formulate requirements for specific jobs, in training programmes, qualification descriptions, etc., they may need to be described more precisely. The following are examples of ways to improve the precision of SQF WWMRR descriptors.

Table 3. Examples of how selected SQF WWMRR descriptors from the categories of knowledge and skills may be further specified

SQF WWMRR competence description	Example of making it more precise
(knows and understands) the principles and procedures of cooperating with institutions supervising activities in water and wastewater management as well as reclamation and remediation	(knows and understands) the procedures of cooperating with State Sanitary Inspection authorities in supervising the quality of water intended for human consumption
(is able to) conduct observations, measurements and tests to determine the parameters of water, soil, wastewater, sludge and pollutants present in ecosystems	(is able to) take pH measurements of soil

Source: Araminowicz, Misztal, Słocińska, 2022, p. 22.

In order to produce a complete set of competences, the above steps should be repeated until one is obtained. Importantly, one set of competences can include descriptors from different determinants and series, competences not included in the framework and even those corresponding to different levels of the SQF and PQF. The glossary of terms used in the Sectoral Qualifications Framework for Water and Wastewater, Reclamation and Remediation, which clarifies terms that may be ambiguous (e.g., stakeholders) or interpreted in different ways (e.g., water supply system, wastewater disposal system) can also be helpful in developing such a set.

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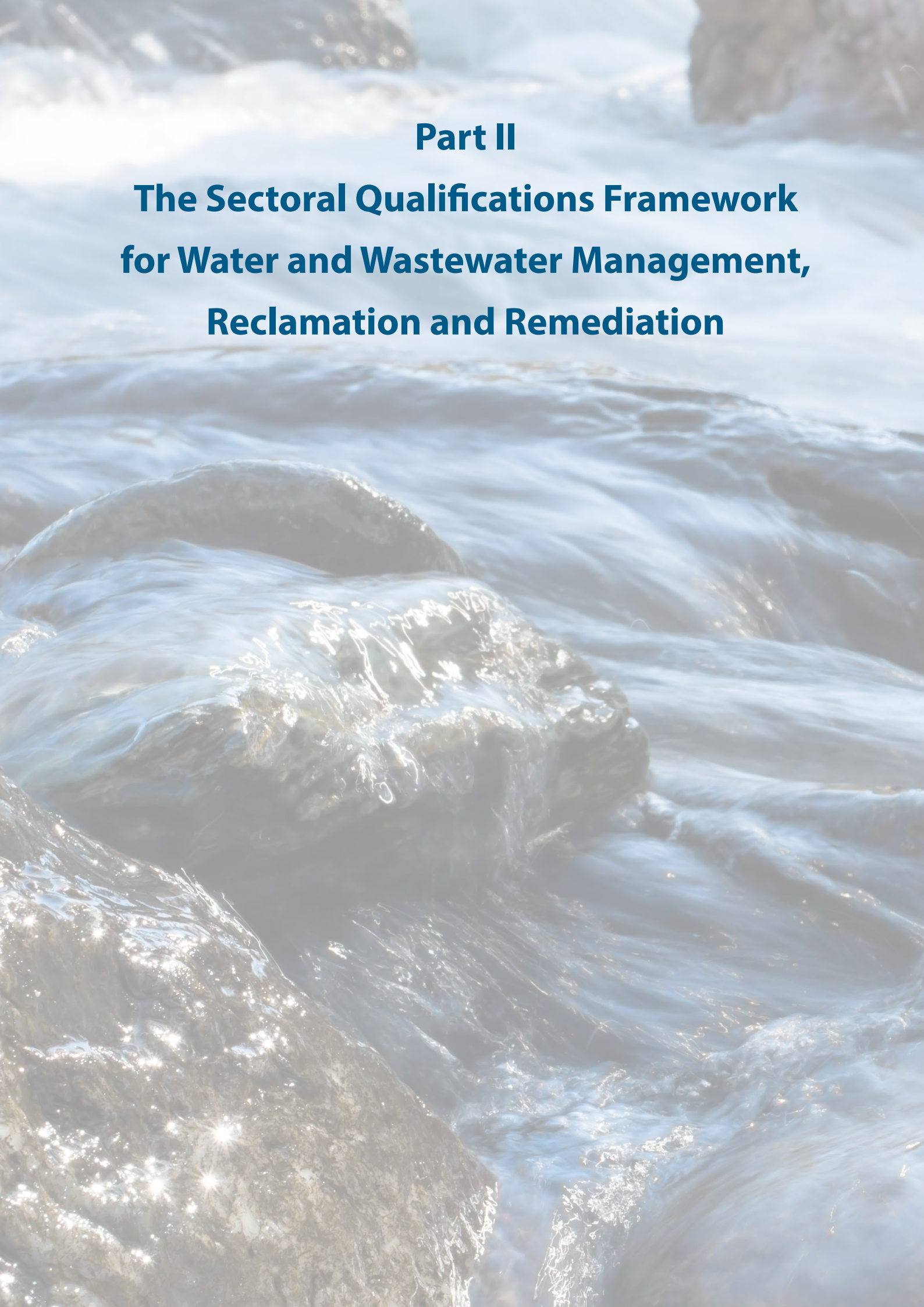

Part II
The Sectoral Qualifications Framework for Water and Wastewater Management, Reclamation and Remediation

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
ECOSYSTEMS AND WATER RESOURCES	KNOWLEDGE: knows and understands	properties of ecosystems	the types and genesis of ecosystems; the types and availability of water resources in nature; the basic concepts and terminology relating to ecosystems, including hydrology, geology, hydrogeology, biology, ecology, sozology, etc.	the structure and functioning of ecosystems	the linkages and relationships between ecosystems	the properties of ecosystems affecting the size, quality and availability of water resources, determining the way pollutants spread, and affecting the potential of performing reclamation and remediation processes	the predicted effects of changes in the structure and functioning of ecosystems	
		legal requirements pertaining to ecosystems		the parameters defining the requirements for different ecosystems or their elements, e.g., permissible concentrations of substances	the legal regulations specifying the requirements for a given type of ecosystem	the scientific, legal, social and economic conditions for determining the regulatory requirements for ecosystems	the trends in national, European and global policies on the exploitation and conservation of ecosystems	
		anthropogenic factors affecting ecosystems	the types of anthropogenic factors influencing ecosystems	the relationship between the type and scale of human activity and the scope, type and scale of ecosystem pollution	the impact of anthropogenic factors on ecosystems, including natural phenomena occurring in ecosystems and the size, quality and availability of water resources; the impact of anthropogenic factors on the behaviour of pollutants in the ecosystem, including the manner and rate of their spread	the long-term effects of human impact on ecosystems, including on the size, quality and availability of water resources	the directions of change in the manifestations of human activities that may affect ecosystems	
		physical, chemical and biological reactions and processes occurring in ecosystems		the physical, chemical and biological reactions and processes in a given ecosystem	the factors influencing the course of physical, chemical and biological reactions and processes in a given ecosystem	the course of physical, chemical and biological reactions and processes taking place in ecosystems	predicted changes in the physical, chemical and biological reactions and processes occurring in ecosystems	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
ECOSYSTEMS AND WATER RESOURCES	KNOWLEDGE: knows and understands	pollutants occurring in ecosystems	the types and forms of pollution occurring in ecosystems	the properties of pollutants affecting their behaviour in an ecosystem, including the manner and rate of entering and spreading in an ecosystem; the ways pollutants enter and spread in ecosystems	the impact of pollutants on the equilibrium of an ecosystem	the long-term effects of pollution on an ecosystem		
		chemical pollutants of ecosystems	the chemicals that pollute ecosystems, including persistent organic pollutants	the properties of chemical pollutants, including persistent organic pollutants; the concentration standards and thresholds of chemicals present in ecosystems	the chemical composition of pollutants in ecosystems	the mechanisms and consequences of the decomposition of chemical substances in the environment; the natural and induced mechanisms determining the persistence of chemicals		
		the risk to the ecosystem associated with implementing reclamation and remediation processes		the types of threats to an ecosystem and dependent ecosystems relating to reclamation and remediation processes	the risk to an ecosystem and dependent ecosystems relating to the implementation of reclamation and remediation processes using ex-situ methods, including the effects of changes in the structure of the ecosystem and the earth's surface, changes in the properties of the ecosystem, changes in water relations and imbalances in dependent ecosystems	the risk to an ecosystem and dependent ecosystems relating to the implementation of reclamation and remediation processes using in-situ methods, including the effects of changes in the structure of the ecosystem and the earth's surface, changes in the properties of the ecosystem, changes in water relations and imbalances in dependent ecosystems	the mechanisms of the formation of ecological, natural or construction disasters in an ecosystem or dependent ecosystems as a result of implementing reclamation and remediation processes	
		availability of water resources	data on the quality, volume and availability of water resources at the national or regional level; the criteria and standards for the abundance of available water from water abstraction recharge areas	data on the quality, volume and availability of global water resources	local problems and threats relating to the size, quality and availability of water resources; a broad scope of the methods of searching for water sources	global problems and threats relating to the size, quality and availability of water resources; the conditions, factors and processes influencing the formation of local and national water resources	the conditions, factors and processes influencing the formation of global water resources	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
ECOSYSTEMS AND WATER RESOURCES	KNOWLEDGE: knows and understands	calculating water resources	the formulas for calculating water resources, e.g., to calculate rainwater, retention, water loss from evaporation	the standards and guidelines for calculating water resources and preparing water balances	the methods of calculating water resources and preparing water balances	the mathematical models for forecasting the size, quality and availability of water resources		
		retention	the importance of water in the ecosystem, its circulation cycle in nature, and the ways of shaping water resources; the principles of storing rainwater and meltwater within the framework of micro-retention	natural retention factors; the principles of water storage to counteract floods, water scarcity and droughts	the impact of retention on the management of water resources, including the prevention of floods, water shortages and droughts			
		managing water resources	the basic concepts and terminology relating to water management; the principles of minimising household water consumption as well as of its reuse	the principles of minimising water consumption in a region, e.g., on the scale of a local community, county, voivodeship; the principles of managing and reusing water, e.g., water from technological processes, treated wastewater, rainwater; the principles, benefits and difficulties of managing water catchments	the technologies supporting rational water resource management, e.g., minimising water consumption, supporting water reuse; the legal regulations on the reuse of water, e.g., water from technological processes, treated wastewater, rainwater	the principles of designing technological processes in a way that reduces water consumption in accordance with the principles of the circular economy; the principles of designing technological processes in a way that takes into account the reuse of water	the trends in the technologies and organisational solutions supporting rational water resource management	the latest achievements in the technologies supporting rational water resource management

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
ECOSYSTEMS AND WATER RESOURCES	SKILLS: is able to	analysing the purpose and manner of using the ecosystem	based on source data, determine the purpose and manner of using an ecosystem	identify the actual use of an ecosystem; identify the limitations of the way an ecosystem is used	formulate recommendations for the protection and use of an ecosystem, including for areas that have undergone reclamation and remediation processes			
		analysing hydrological, geological and hydrogeological conditions		determine hydrological, geological and hydrogeological conditions, e.g., define the topography, supply and drainage areas, catchments, type, size, quality and availability of water resources	assess the hydrological, geological and hydrogeological conditions in terms of the possibility of the occurrence and spread of pollutants, the feasibility and effectiveness of reclamation and remediation processes, and the conditions for conducting water and wastewater management	analyse hydrological, geological and hydrogeological conditions with the use of mathematical models	forecast changes in hydrological, geological and hydrogeological conditions, including those resulting from conducted water and wastewater management as well as reclamation and remediation processes	
		researching the history and socio-economic environment of an ecosystem		based on source data, determine the history and characteristics of the socio-economic environment of an ecosystem that affects the assessment of the state of its pollution as well as the size, quality and availability of water resources	analyse the historical and current socio-economic environment of an ecosystem and the history of the phenomena occurring in it in terms of the possibility of it being polluted and its potential for reclamation and remediation			
		determining the state of ecosystem pollution	indicate possible pollutants in a given ecosystem	on the basis of source data, determine existing and potential ecosystem pollutants, their age and possible causes	assess the pollution existing in an ecosystem (e.g., determine where it occurs, sources, how it is spreading)	analyse the pollution existing in an ecosystem using mathematical models; prepare an assessment of ecosystem pollution	forecast the state of ecosystem pollution on the basis of hydrogeological conditions, the type of pollutants present, forecasts for the management of the ecosystem; identify possible scenarios for ecosystem degradation	develop complex mathematical models to analyse pollutants, e.g., their occurrence, movement

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
ECOSYSTEMS AND WATER RESOURCES	SKILLS: is able to	determining the impact of pollutants on ecosystems		identify the way a given type of pollution affects human health and life, the state of the environment, the equilibrium and aesthetic values of the ecosystem; identify threats relating to the presence of a given type of pollution in the ecosystem	identify how a given pollutant interacts with other pollutants and substances in the ecosystem	analyse the impact of ecosystem pollution on human health and life, the state of the environment, the equilibrium and aesthetic values of the ecosystem; prepare an assessment of significant risk	forecast the long-term effects of pollution	
		analysing water resources		perform the calculations necessary to develop a water balance	analyse data on water resources, e.g., rainfall, evaporation losses, drainage from the catchment area, retention; prepare a water balance	analyse the size, quality and availability of water resources	forecast changes and analyse the factors affecting the size, quality and availability of water resources	develop mathematical models to predict the size, quality and availability of water resources
		supporting activities for rational water resource management		explain the principles of rational water resource management, including the principles of conserving and reusing water	select the methods and technologies supporting rational water resource management, including methods of minimising water consumption, using grey water, managing rainwater and meltwater	prepare information and communications on the principles of rational water resource management, including conserving water, using grey water, managing rainwater and meltwater	conduct activities to introduce technological, organisational and legislative changes supporting rational water resource management	develop technologies and organisational solutions supporting rational water resource management
STAKEHOLDERS	KNOWLEDGE: knows and understands	stakeholders of reclamation and remediation processes	the groups of stakeholders of reclamation and remediation processes; the principles of cooperation with stakeholders during reclamation and remediation processes	the scope of responsibility, tasks and expectations of stakeholders during reclamation and remediation processes	the legal regulations defining the scope of responsibility and principles of cooperation with stakeholders during reclamation and remediation processes			
		water consumers	the groups of water consumers	the requirements of various consumer groups in terms of the parameters of supplied water, resulting, e.g., from the type of activity they conduct	the legal regulations on the quantity and quality parameters of water supplied to various consumer groups			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
STAKEHOLDERS	KNOWLEDGE: knows and understands	entities producing wastewater	the types of entities producing wastewater	the factors affecting the amount and parameters of wastewater produced by various entities, e.g., households, businesses	the relationship between the type and scale of activity conducted by businesses and the amount and type of wastewater they produce	the socio-economic mechanisms shaping the structure of generated wastewater		
		recipients of products resulting from the treatment of waste generated by the processes of water and wastewater management, reclamation and remediation	the groups of recipients of products resulting from the processing of sludge, washings and other waste generated by water and wastewater management, reclamation and remediation	the requirements of various groups of recipients in terms of the parameters of products resulting from the processing of sludge, washings and other waste generated by water and wastewater management, reclamation and remediation	the legal regulations on the use of products resulting from the processing of sludge, washings and other waste generated by water and wastewater management, reclamation and remediation			
		supervisory institutions and bodies	the tasks and responsibilities of institutions and bodies supervising and monitoring the processes of reclamation and remediation as well as water and wastewater management, e.g., environmental protection inspections, sanitary inspections, water oversight institutions	the principles and procedures of cooperating with institutions supervising activities in water and wastewater management as well as reclamation and remediation	the legal regulations on overseeing the processes of reclamation and remediation as well as water and wastewater management by designated authorities and institutions; the legal regulations on the reporting requirements for water and wastewater management as well as reclamation and remediation			
		specialists from other fields	the areas of activity of specialists from other fields participating in the processes of reclamation and remediation as well as water and wastewater management	the activities requiring the involvement of specialists from other fields in the processes of reclamation and remediation as well as water and wastewater management; the benefits of involving specialists from other fields in work relating to reclamation and remediation as well as water and wastewater management	the legal regulations specifying the participation of specialists from other fields in the processes of reclamation and remediation as well as water and wastewater management			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
STAKEHOLDERS	SKILLS: is able to	researching the needs of stakeholders of reclamation and remediation processes	search for information on the needs of stakeholders in reports, statements, research results, etc.	conduct interviews with stakeholders, including those aimed at examining the needs of stakeholders and identifying the state of the ecosystem; identify the needs and possibilities of investors relating to reclamation and remediation processes, e.g., setting goals for reclamation and remediation, the scope of research, budget, deadline	compare the needs and expectations of various stakeholder groups in relation to a given ecosystem	analyse the relevance and prioritise the needs and expectations of various stakeholder groups in relation to a given ecosystem		
		researching the needs of stakeholders of water and wastewater management processes	identify the needs of water consumers and entities producing wastewater in terms of the conditions and standards for implementing water supply and wastewater collection services	identify the needs of stakeholders in developing water supply and wastewater disposal systems, e.g., expanding and modernising infrastructure, changing network efficiency	analyse data on the socio-economic development of a region in terms of the need to provide water and wastewater management services	design standards for the implementation of water supply and wastewater disposal services		
		cooperating with entities producing wastewater	identify entities generating wastewater in the service area of the wastewater treatment plant	determine the terms of cooperation with entities producing wastewater in the service area of the wastewater treatment plant, including the principles of the delivery, preparation method and parameters of the wastewater	negotiate non-standard terms of cooperation for wastewater collection, including non-standard wastewater parameters, preparation methods and delivery	establish and maintain relationships with customers and cooperants, including as part of industrial symbiosis, and also cooperate with other sectors of the economy	develop strategies of cooperation with entities from other industries to increase the efficiency of water and wastewater management processes, including the processes of producing energy from biomass	
		cooperating with stakeholders of reclamation and remediation processes	identify the stakeholders of a given reclamation and remediation process	establish the terms of cooperation with entities involved in reclamation and remediation processes, e.g., investors, suppliers, subcontractors, government representatives	reach agreement with the investor on a strategy for implementing reclamation and remediation activities, taking into account the needs and expectations of various groups of stakeholders	resolve disputes relating to the needs and expectations of the stakeholders of implemented reclamation and remediation processes	conduct multilateral negotiations with stakeholders on implemented reclamation and remediation processes	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
STAKEHOLDERS	SKILLS: is able to	cooperating with specialists from other fields		define the issues and areas requiring the participation of specialists from other fields in the processes of reclamation and remediation as well as water and wastewater management	select specialists from other fields needed in the ongoing processes of reclamation and remediation as well as water and wastewater management	establish and maintain relationships with specialists from other fields participating in reclamation and remediation processes as well as water and wastewater management		
		providing information to stakeholders	provide information to stakeholders on current reclamation and remediation processes, as well as communicate and explain necessary changes; provide information on the principles of water and wastewater management in the region, e.g., the guidelines of connecting to the network, accounting for the costs of water supply and wastewater collection	explain the principles of water and wastewater management in a given region; explain the principles of the performance, course and methods used in reclamation and remediation processes; reach agreement with the investor on the scope and manner of providing information to stakeholders during reclamation and remediation processes	provide investors and other stakeholders with explanations and arguments relating to issues in the processes of water and wastewater management, reclamation and remediation, e.g., the need to expand water and sewerage infrastructure, perform reclamation and remediation, the legitimacy of using specific methods, the costs and benefits of the activities	prepare information and communications, including marketing and media communications, directed, among others, to the local community, decision makers, business partners, on the water and wastewater management in a given region, reclamation and remediation processes, as well as to raise awareness of the processes of water supply, wastewater collection and the protection of ecosystems	plan marketing and media activities to raise awareness on water and wastewater management, reclamation, remediation and ecosystem protection, as well as to build a positive image of the sector and the people and entities operating in it	
		educating stakeholders		conduct information and educational activities on water and wastewater management as well as reclamation and remediation, e.g., conduct study visits, show groups around infrastructure facilities	design information and educational activities on water and wastewater management as well as reclamation and remediation, e.g., by developing nature trails, organising open days, planning study visits	conduct training on water and wastewater management processes, the need to protect the environment, using a reclaimed ecosystem and ways of preventing ecosystem degradation	develop and implement educational and training programmes to increase awareness about water and wastewater management, performing remedial actions in the environment, using a reclaimed ecosystem and preventing ecosystem degradation	develop and implement educational and training programmes to increase awareness about water and wastewater management, performing remedial actions in the environment, using a reclaimed ecosystem and preventing ecosystem degradation

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
TESTING, MEASUREMENTS, DATA ACQUISITION AND ANALYSIS	KNOWLEDGE: knows and understands	measurements, laboratory and field tests required for water and wastewater management as well as reclamation and remediation	the types of measurements, field and laboratory tests used to determine ecosystem parameters and the presence of pollutants as well as the quality parameters of water, wastewater, sludge and gases	the principles and methods of collecting, labelling, securing, storing and transporting samples of water, wastewater, sludge and gases for laboratory tests; the factors affecting reliable and accurate measurements, e.g., water temperature or turbidity, season of the year, contamination of samples	the principles and methods of collecting, labelling, securing, storing and transporting samples for the laboratory tests of ecosystem parameters and the presence of pollutants, needed for reclamation and remediation; the principles and methods of measuring the quality parameters of water, wastewater, sediments and gases, including microscopy analyses, needed for water and wastewater management processes	the principles and methods of making field observations and measurements of ecosystem parameters and pollutants needed for reclamation and remediation	the directions of development of the methods and technologies for testing, taking measurements and analysing data needed for water and wastewater management, reclamation and remediation	the latest solutions in the methods and technologies for testing, taking measurements and analysing data needed for water and wastewater management, reclamation and remediation
		principles of operating testing apparatus, measuring tools and devices	the principles of using measuring tools and devices as well as those used to take samples, e.g., of soil, water, wastewater, sludge and gases	the principles of operating the testing apparatus and laboratory equipment used to determine the parameters of water, soil, wastewater, sludge, gases and pollutants occurring in ecosystems	the principles of operating and maintaining automated systems used for, e.g., monitoring the water level in the catchment area supplying the water intake, controlling the parameters of treated wastewater			
		the calibration and legalisation of measuring devices	the principles of the calibration and legalisation of measuring devices; data on the accuracy of measurements made by measuring devices	the guidelines for the calibration and legalisation of measuring devices used to determine the parameters of the water, soil, wastewater, sludge and pollutants occurring in ecosystems	the legal regulations on the calibration and legalisation of measuring devices used in the processes of reclamation and remediation as well as water and wastewater management			
		regulations on field and laboratory testing		the principles of submitting samples for laboratory testing, including the requirements of laboratories performing tests for the processes of reclamation and remediation as well as water and wastewater management	the standards and legal regulations on commissioning and performing field and laboratory tests for the processes of reclamation and remediation as well as water and wastewater management			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
TESTING, MEASUREMENTS, DATA ACQUISITION AND ANALYSIS	KNOWLEDGE: knows and understands	mathematical models for conducting analyses	simple mathematical models used in the data analysis needed for water and wastewater management, reclamation and remediation	the statistical methods used in the data analysis needed for water and wastewater management, reclamation and remediation	the principles of developing and validating mathematical and statistical models for researching, assessing, simulating and forecasting the phenomena and processes of water and wastewater management, reclamation and remediation	the mathematical models used to analyse water resources, the condition of the ecosystem and its pollutants, the operation of water supply systems and wastewater disposal systems	the models using artificial intelligence supporting the analysis of water resources, the state of the ecosystem and its pollutants, the operation of water supply systems and wastewater disposal systems, e.g., to forecast the state of ecosystem pollution, the abundance of available resources in the water intake catchment area	
		data on ecosystems and water resources	the types and sources of current and historical data on water resources, ecosystems and their pollutants	the principles of using maps, databases, geographic information systems and spatial information systems	the principles of developing dedicated databases on water resources, ecosystems and their pollutants	property rights and the principles of using data, test results, reports, studies, etc. obtained to assess the condition of ecosystems and the size, quality and availability of water resources		
	SKILLS: is able to	planning tests and measurements		estimate the costs of measurements, laboratory and field tests	plan measurements as well as laboratory and field tests, including developing the schedule of measurements and tests, selecting the types of measurements and tests, defining how and where to take samples and their number, and selecting the testing methods and techniques	define the goals and scope of tests and measurements in relation to the adopted aims of reclamation and remediation or the premises of water and wastewater management; analyse the justification for taking measurements as well as performing tests and analyses, taking into account the expected costs and benefits		
		performing tests and measurements	collect, label, secure, prepare for storage and transport samples, e.g., of soil, water, wastewater and sludge; read, including remotely, data from measuring devices and systems	conduct observations, measurements and tests to determine the parameters of water, soil, wastewater, sludge and pollutants present in ecosystems	formulate guidelines on the techniques and methods of observation, measurement, sampling and laboratory tests needed for the processes of reclamation and remediation as well as water and wastewater management			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
TESTING, MEASUREMENTS, DATA ACQUISITION AND ANALYSIS	SKILLS: is able to	analysing measurement and test results		assess the accuracy of measurements and the reliability of the results of observations, measurements and tests; identify irregularities in measurements and test results	interpret the readings of measuring devices and systems as well as the results of observations, laboratory and field tests; identify the possible causes of the incorrect or abnormal results of measurements and laboratory tests	analyse data sets for water and wastewater management, reclamation and remediation		
		obtaining secondary data on ecosystems and water resources	identify sources of historical and current data; acquire, collect and verify the reliability of data on water resources, ecosystems and their pollutants	determine the scope and method of obtaining data on the history and current situation of the ecosystem, useful for analysing water resources, assessing the ecosystem and the pollutants present in them				
		operating measuring devices	perform activities to operate simple measuring devices, e.g., manual meters, testers, oxygen meters (calibration, maintenance, adjusting settings in accordance with the manual, performing measurements)	perform activities to operate precise measuring devices, e.g., analysers, spectrophotometers, spectral probes (calibration, maintenance, adjusting settings in accordance with the manual, performing measurements)	perform tasks to operate measurement systems used in the processes of reclamation and remediation as well as water and wastewater management, including applications controlling measuring devices, transmitting and collecting data from measuring devices; supervise the operation of measuring devices	design measurement systems for the processes of reclamation and remediation as well as water and wastewater management		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
INFRASTRUCTURE DESIGN AND CONSTRUCTION	KNOWLEDGE: knows and understands	water supply systems and wastewater disposal systems	the types of water supply systems and wastewater disposal systems (e.g., by design, operation, service area); the types of elements included in water supply systems and wastewater disposal systems	the functions and principles of operating the elements of a water supply system and a wastewater disposal system, e.g., water intake, treatment plant, pumping station, water supply system, sewage treatment plant	the principles of selecting devices and installations for equipping the facilities of a water supply system and a wastewater disposal system; the principles of constructing and assembling the elements of a water supply systems and a wastewater disposal system	the principles of designing and constructing water supply systems and wastewater disposal systems	the trends in designing and constructing water supply systems and wastewater disposal systems	the latest solutions in designing water supply systems and wastewater disposal systems
		devices, fittings and pipelines	the types of devices, fittings and pipeline elements used in water supply systems and wastewater disposal systems	the principles of operating the devices and fittings used in water supply systems and wastewater disposal systems; the properties of pipeline elements affecting their durability, reliability and the parameters of the transported medium	the purpose and construction of devices, fittings and pipeline elements used in water supply systems and wastewater disposal systems; the conditions and restrictions on the use of the equipment, fittings and pipeline elements in water supply systems and wastewater disposal systems; the legal regulations on the use of devices and fittings in water supply systems and wastewater disposal systems	the principles of configuring and programming computer-controlled devices and fittings used in water supply systems and wastewater disposal systems	the trends in the equipment, fittings and pipelines used in water supply systems and wastewater disposal systems	the latest achievements in the equipment, fittings and pipelines used in water supply systems and wastewater disposal systems
		hydraulic phenomena	the basic concepts of hydraulics and fluid mechanics (flow, pressure)	the hydraulic phenomena of water supply and wastewater disposal systems that may have a negative impact on infrastructure	the methods of securing water supply systems and wastewater disposal systems against the effects of unfavourable hydraulic and atmospheric phenomena; the methods of assessing the effects of unfavourable hydraulic and atmospheric phenomena			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
INFRASTRUCTURE DESIGN AND CONSTRUCTION	KNOWLEDGE: knows and understands	infrastructure used in reclamation and remediation processes	the types of facilities and installations used in reclamation and remediation processes	the functions and principles of operating the facilities and installations used in reclamation and remediation processes	the purpose and construction of the facilities and installations used in reclamation and remediation processes; the principles of designing and constructing the facilities and installations used in reclamation and remediation processes			
		legal regulations on infrastructure design and construction	the terms and definitions resulting from the legal regulations on designing and constructing water and wastewater infrastructure as well as the infrastructure used in reclamation and remediation processes	the procedures of securing agreements for projects, site plans and the issuance of technical conditions, permits, authorisations and other administrative decisions relating to designing and constructing water supply and wastewater disposal infrastructure and the infrastructure used in reclamation and remediation processes	the standards and legal regulations on designing and constructing the facilities, installations and networks included in water supply systems and wastewater disposal systems and those used in reclamation and remediation processes; the legal regulations on connecting users to water and sewerage networks	European legal regulations, guidelines and norms defining the standards and models of water supply and wastewater disposal		
	SKILLS: is able to	designing infrastructure for collective water supply and wastewater disposal		perform calculations, including hydraulic ones, for designing water supply systems and wastewater disposal systems	select the devices, fittings and other elements included in the installations, networks and facilities of water supply systems and wastewater disposal systems; define the type and parameters of the devices, fittings and other elements included in the installations, networks and facilities of water supply systems and wastewater disposal systems	design individual installations that are elements of water supply systems and wastewater disposal systems	design water supply systems and wastewater disposal systems and their elements with the use of innovative devices and technological solutions; plan the location of facilities for water supply systems and wastewater disposal systems; plan water supply catchment areas and wastewater disposal zones as well as the method of supplying the water network	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
INFRASTRUCTURE DESIGN AND CONSTRUCTION	SKILLS: is able to	designing individual water and sewerage installations	perform calculations for designing individual water and sewerage installations, e.g., household wastewater treatment plants, wells, micro-retention systems	select devices, fittings, tanks and other elements included in individual water and sewerage installations	define the type, parameters and location of devices, fittings, tanks and other elements included in individual water and sewerage installations	design individual water and sewerage installations, e.g., household wastewater treatment plants, wells, micro-retention systems		
		designing the infrastructure used in reclamation and remediation processes		perform calculations for designing the infrastructure used in reclamation and remediation processes	select the materials and technologies for constructing facilities and installations used in reclamation and remediation processes; define the parameters and location of facilities and installations used in reclamation and remediation processes	design elements of the infrastructure used in reclamation and remediation processes, e.g., aeration installations, remediation heaps		
		analysing the efficiency and reliability of water supply systems and wastewater disposal systems		calculate the efficiency of water supply systems and wastewater disposal systems or their components taking into account the population density of the given area and the activities conducted there; calculate the values of the readings indicating the reliability of water supply systems and wastewater disposal systems or their components	analyse the efficiency and reliability of water supply systems and wastewater disposal systems or their components; identify opportunities and constraints on the expansion of water supply systems and wastewater disposal systems or their components	design solutions optimising the parameters of water supply systems and wastewater disposal systems or their components, including those that increase their efficiency and reliability (e.g., air-venting valves, pressure regulators)	model the work of water supply systems and wastewater disposal systems using advanced systems and IT tools	develop simulation models for water supply systems and wastewater disposal systems

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
INFRASTRUCTURE DESIGN AND CONSTRUCTION	SKILLS: is able to	making connections	make connections to water and sewerage networks	perform the calculations needed for designing water and sewerage connections; define the technical conditions for connecting a user to the water and sewerage network	select the devices and fittings needed to connect to the water and sewerage network	design connections for water and sewerage networks		
		using documentation	use the designs of water and sewerage installations and networks as well as the technical documentation of devices and fittings used in water supply systems and wastewater disposal systems	update the data in geographic information and spatial information systems on the facilities, installations and networks included in water supply systems and wastewater disposal systems and used in reclamation and remediation processes	maintain documentation on designing and constructing facilities, installations and networks included in water supply systems and wastewater disposal systems and used in reclamation and remediation processes			
OPERATING THE INFRASTRUCTURE	KNOWLEDGE: knows and understands	principles of the operation, maintenance and utilisation of devices, fittings and pipelines	the principles of operating, maintaining and utilising simple fittings used in water supply systems and wastewater disposal systems, e.g., gate valves, valves, check valves, internal and external hydrants, water meters; the principles of maintaining and operating pipelines	the principles of operating, maintaining and utilising devices and complex fittings used in water supply systems and wastewater disposal systems	the legal regulations on maintaining water and wastewater infrastructure, including the performance of technical inspections; the operating parameters and mode of operation of devices and fittings used in water supply systems and wastewater disposal systems	the mechanisms and criteria for the technical and economic optimisation of the operation of devices, fittings and pipelines used in water supply systems and wastewater disposal systems		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
OPERATING THE INFRASTRUCTURE	KNOWLEDGE: knows and understands	specialised auxiliary equipment	the types of tools, devices and specialised vehicles for the diagnostics, cleaning and unblocking of devices, installations and networks included in water supply systems and wastewater disposal systems; the principles of the operation and ongoing maintenance of tools, simple devices and specialised vehicles for the diagnostics, cleaning and unblocking of devices, installations and networks included in water supply systems and wastewater disposal systems, e.g., locators, washers, pumps, vacuum trucks	the principles of the operation and ongoing maintenance of moderately complex devices for the diagnostics, cleaning and unblocking of devices, installations and networks included in water supply systems and wastewater disposal systems, e.g., correlators, geophones, loggers, flow meters	the operating parameters and method of operation of specialised devices and vehicles used for the diagnostics, cleaning and unblocking of devices, installations and networks included in water supply systems and wastewater disposal systems	the principles of designing and programming complex diagnostic systems	the development directions of devices and vehicles for the diagnostics, cleaning and unblocking of devices, installations and networks included in water supply systems and wastewater disposal systems	the latest achievements of devices and vehicles for the diagnostics, cleaning and unblocking of devices, installations and networks included in water supply systems and wastewater disposal systems
		legal regulations on infrastructure maintenance	the concepts and definitions in the legal regulations on the maintenance of water and wastewater infrastructure	the principles of the maintenance, repair management and operation of facilities, devices, installations and networks included in water supply systems and wastewater disposal systems	the standards and legal regulations on the maintenance of water supply systems and wastewater disposal systems			
	SKILLS: is able to	operating devices and fittings	perform simple activities relating to the operation of individual devices and fittings used in water supply systems and wastewater disposal systems (prepare for operation, start-up, make adjustments, set parameters in accordance with the manual, take readings, shut down, secure after work)	perform tasks relating to the operation of equipment assemblies used in water supply and wastewater disposal systems (prepare for operation, start-up, make adjustments, set parameters in accordance with the manual, monitor parameters, shut down, perform maintenance and secure after work)	perform tasks relating to the operation of devices and their assemblies under variable and not fully predictable conditions resulting, for example, from changes in water quality parameters, the amount of water or wastewater (monitor the operation of devices, adjust parameters depending on the course of the process)	program computer-controlled devices and assemblies of devices; analyse the operation of devices and assemblies of devices with the use of mathematical models and SCADA information systems	modify and optimise the software controlling the operation of devices and their assemblies; simulate the operation of water supply systems and wastewater disposal systems using mathematical models	develop simulation models for water supply and wastewater disposal systems

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
OPERATING THE INFRASTRUCTURE	SKILLS: is able to	operating specialised auxiliary equipment	perform activities relating to the operation of tools, simple devices and specialised vehicles for diagnostics, cleaning and unblocking devices, installations and networks included in water supply systems and wastewater disposal systems, e.g., locators, washers, pumps, vacuum trucks (calibrate, maintain, adjust settings in accordance with instructions, perform work)	perform activities relating to the operation of moderately complex devices for diagnostics, cleaning and unblocking devices, installations and networks included in water supply systems and wastewater disposal systems, e.g., correlators, geophones, loggers, flow meters (calibrate, maintain, adjust settings in accordance with instructions, perform work)	select tools and devices for diagnostics, cleaning and unblocking devices, installations and networks included in water supply systems and wastewater disposal systems; perform tasks relating to the operation of complex diagnostic systems, including the operation of applications controlling diagnostic devices, transmitting and collecting data from devices; supervise the operation of diagnostic devices and systems			
		diagnosing failures	perform an organoleptic assessment of the correct functioning of devices, installations and networks included in water supply systems and wastewater disposal systems; read data from measuring devices and systems monitoring the operation of devices, installations and networks included in water supply systems and wastewater disposal systems	locate failures and disruptions in the operation of devices, installations and networks included in water supply systems and wastewater disposal systems; detect and locate unauthorised connections to the water and sewerage network	analyse data from measuring devices and monitoring systems; analyse the typical causes of malfunctions, failures and disturbances in the operation of devices, installations and networks included in water supply systems and wastewater disposal systems	analyse the non-routine causes of malfunctions, failures and disruptions in the operation of devices, installations and networks included in water supply systems and wastewater disposal systems		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
OPERATING THE INFRASTRUCTURE	SKILLS: is able to	planning inspections, overhauls, repairs and modernisation		plan work relating to inspections, overhauls, repairs and modernisation of devices and water and sewerage installations; estimate the costs of inspections, overhauls, repairs and modernisation	plan work relating to inspections, overhauls and the routine repairs of facilities and networks included in water supply systems and wastewater disposal systems, including the method of their implementation, scheduling, necessary resources and the scope of the network shutdown; identify the needs for reconstructing water and wastewater infrastructure	plan the method of making repairs under non-routine conditions or posing a particular threat to the property, life or health of people; plan the modernisation of devices and installations included in water supply systems and wastewater disposal systems as well as the expansion of water and sewerage networks	develop long-term development plans for water supply systems and wastewater disposal systems	
		maintenance, overhauls, repairs, modernisation	perform activities relating to the current and periodic maintenance of devices and fittings (washing, cleaning, unblocking), conduct technical inspections, perform simple repairs and overhauls of devices, installations and networks included in water supply systems and wastewater disposal systems	modernise, perform complex repairs and overhaul devices and installations included in water supply systems and wastewater disposal systems as well as overhaul water and sewerage networks under routine conditions	repair and overhaul devices, installations and networks included in water supply systems and wastewater disposal systems under non-routine or special risk conditions; assess the correctness of performed repairs and overhauls of devices, installations and networks included in water supply systems and wastewater disposal systems			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
OPERATING THE INFRASTRUCTURE	SKILLS: is able to	utilising documentation	use the operating instructions and technical documentation of devices and fittings used in water supply systems and wastewater disposal systems, as well as the operating instructions and technical documentation of specialised auxiliary equipment; read data from geographic information and spatial information systems, including the use of mobile devices, on the facilities, installations and networks included in water supply systems and wastewater disposal systems	maintain the documentation relating to the operation of facilities, equipment, installations and networks included in water supply systems and wastewater disposal systems				
WATER ABSTRACTION, TREATMENT AND SUPPLY	KNOWLEDGE: knows and understands	operating water intakes	the types of water intakes	the principles of operating various types of water intakes; the natural phenomena and anthropogenic factors affecting the method of utilising water intakes	the legal regulations on the utilisation of water intakes			
		protecting water intakes	the prohibitions, restrictions and orders in force for the direct and indirect protection of water intake protection zones; the types of entities authorised to perform control activities and responsible for monitoring violations in water intake protection zones	the methods of protecting water supply areas; the procedures for controlling and reporting violations in water intake protection zones	the standards and legal regulations on protecting water supply areas	the methods and models for delineating water intake protection zones		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	KNOWLEDGE: knows and understands	water quality parameters	the parameters characterising water quality at the individual stages of its abstraction, treatment and supply processes	the factors influencing the quality parameters of water at the individual stages of its abstraction, treatment and supply processes	the legal regulations on the quality parameters of water at the individual stages of its intake, treatment and supply processes	the scientific, legal, social and economic conditions for determining the requirements pertaining to water quality parameters for the development of legal regulations	the directions of change in the scope of national, European and global legal regulations on water quality parameters at the individual stages of its intake, treatment and delivery processes	
		water treatment technology		the methods and technologies used in water treatment processes	the principles of selecting methods and technologies used in water treatment processes depending on, e.g., the source of the water, parameters of abstracted water, and intended use of the water	the principles for adapting water treatment methods and technologies in non-routine and unpredictable situations, e.g., sudden changes in water quality, contamination in a water intake protection zone, flooding	the trends in technologies used in water treatment processes	the latest technological solutions used in water treatment processes
		chemical reactions and biological processes occurring in water treatment processes	the basic concepts of the chemical reactions and biological processes occurring in water treatment processes	the types of chemical reactions and biological processes occurring in water treatment processes	the factors affecting the course of the chemical reactions and biological processes in water treatment processes	the course of chemical reactions and biological processes occurring in water treatment processes		
		unit processes used in water treatment	the unit processes used in water treatment; the parameters characterising the unit processes used in water treatment	the principles of conducting the unit processes used in water treatment, its stages and course, e.g., ozonation, coagulation, filtration, disinfection	the principles of selecting the parameters of the unit processes used in water treatment; the dependencies between the individual unit processes used in water treatment and their parameters	the effect of individual unit processes on water quality parameters		
		products used in water treatment processes	the types of products used in water treatment processes, including trade names, types of packaging, labels	the action, conditions of use, side effects and risks of the products used in water treatment processes	the chemical composition of the products used in water treatment processes; the reactions of the products used in water treatment processes with other chemicals	the effect of the products used in water treatment processes on human health, the welfare of plants and animals, and the course of the technological processes using the supplied water	the trends relating to the products used in water treatment processes	the latest solutions relating to the products used in water treatment processes

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	KNOWLEDGE: knows and understands	managing sludge, washings and other waste generated by water treatment processes	the principles of handling sludge, washings and other waste generated by water treatment processes and the substances recovered from them in other industries	the possibility of using the sludge, washings and other waste generated by water treatment processes and the substances recovered from them in other industries	the chemical composition of the sludge, washings and other waste generated by water treatment processes; the technological possibilities of recovering substances from the sludge, washings and other waste generated by water treatment processes; the economic, organisational and legal conditions for the use of substances recovered from the sludge, washings and other waste generated by water treatment processes	the economic and environmental benefits resulting from the management of the sludge, washings and other waste generated by water treatment processes, in accordance with the principles of sustainable development	the directions of development in the technologies for the recovery and reuse of substances from the sludge, washings and other waste generated by water treatment processes	the innovations in the technologies for the recovery and reuse of substances from the sludge, washings and other waste generated by water treatment processes
		efficiency of water abstraction, treatment and supply processes		the types of factors affecting the efficiency of water abstraction, treatment and supply processes, including financial and energy efficiency	the methods, organisational and technological solutions increasing the efficiency of water abstraction, treatment and supply processes, including financial and energy efficiency			
		costs of water abstraction, treatment and supply activities	the types of costs involved in water abstraction, treatment and supply processes	the cost components of water abstraction, treatment and supply activities; the principles for calculating the costs of activities relating to water abstraction, treatment and supply	the principles of the financial optimisation of activities relating to water abstraction, treatment and supply			
		irregularities in water abstraction, treatment and supply processes	the types of irregularities in water abstraction, treatment and supply processes	the causes of irregularities in water abstraction, treatment and supply processes	the effect of irregularities in water abstraction, treatment and supply processes on the course and efficiency of these processes as well as on water quality parameters			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	KNOWLEDGE: knows and understands	critical infrastructure	the facilities and systems included in the critical infrastructure	the principles of operation and obligations of critical water supply infrastructure operators; the principles of protecting the facilities of the critical water supply infrastructure	the legal regulations on the critical water supply infrastructure			
		formal and legal requirements for water abstraction, treatment and supply	the obligations of the water network operator relating to the processes of water abstraction, treatment and supply	the principles of conducting water abstraction, treatment and supply activities, including fees, required permits and authorisations; the procedures for obtaining permits, authorisations and other administrative decisions for water abstraction, treatment and supply processes	the legal regulations on water abstraction, treatment and supply; the legal regulations on obtaining permits, authorisations and other administrative decisions required for water abstraction, treatment and supply processes			
		performing water balances in the water supply system	the types and causes of water losses in water supply systems	the factors influencing water loss; the coefficients used to calculate the magnitude of water losses in water supply systems; the allowable amounts of water loss in water supply systems	the methods and procedures of performing water balances in water supply systems; the methods of detecting and analysing water losses and calculating their amount; the methods of preventing and reducing water losses	the principles of managing the water supply system in the region covered by the water network operator	the principles of the strategic planning of the functioning of the water supply system, the management of water resources and the development of water reserves	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	SKILLS: is able to	ensuring the security of the water supply	perform activities resulting from the procedures that ensure business continuity in water abstraction, treatment and supply processes	implement plans to ensure the continuity of the water supply in the event of planned inspections, repairs, maintenance and modernisation of the devices, installations and networks included in water supply systems	implement plans to ensure the continuity of the water supply in the event of emergency situations, unplanned changes in the quantity or quality parameters of water and other emergencies causing disruptions in the processes of water abstraction, treatment and supply, e.g., contamination of an intake, failure of the water supply system; assess business continuity plans for water abstraction, treatment and supply processes	develop plans and procedures for ensuring the continuity of the water supply in the event of planned inspections, repairs, maintenance and modernisation of devices, installations and networks included in water supply systems	develop plans and procedures for ensuring the continuity of the water supply in emergency situations, unplanned changes in the quantity or quality parameters of water and other emergencies causing disruptions in the processes of water abstraction, treatment and supply, e.g., contamination of an intake, failure of the water supply system	develop multi-year strategies and plans to ensure the security of the water supply
		determining the demand for water	perform the calculations for estimating water demand	estimate the water demand of households	estimate the water demand in the region covered by the water network operator's activities	estimate the long-term perspective of the demand for water, taking into account anticipated changes in consumer habits	forecast changes in water demand in the region covered by the water network operator's activities, resulting from non-routine socio-economic situations, natural phenomena, natural disasters, and other situations	
		performing water abstraction, treatment and supply processes		monitor the course of water abstraction, treatment and supply processes; identify irregularities and disturbances affecting the course of water abstraction, treatment and supply processes	select the parameters of water abstraction, treatment and supply processes; identify the possible causes of irregularities and disturbances affecting the course of water abstraction, treatment and supply processes	make recommendations for the optimisation of water abstraction, treatment and supply processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	SKILLS: is able to	analysing the effectiveness and efficiency of water abstraction, treatment and supply processes		identify anomalies and disturbances affecting the effectiveness and efficiency of water abstraction, treatment and supply processes	analyse the effectiveness and efficiency of the technological processes of water abstraction, treatment and supply; identify possible causes of irregularities and disturbances affecting the effectiveness and efficiency of water abstraction, treatment and supply processes	adapt and implement solutions and technologies increasing the effectiveness and efficiency of water abstraction, treatment and supply processes	modify technological processes to increase the efficiency and effectiveness of water abstraction, treatment and supply processes	develop solutions and technologies to increase the efficiency and effectiveness of water abstraction, treatment and supply processes
		analysing the abundance of water from water intakes		calculate the abundance of water and efficiency of water intakes	analyse the possibilities of building water intakes	analyse the abundance of water and efficiency of water intakes in terms of the possibility of meeting existing and anticipated demand	develop long-term forecasts and plans for the operation of water intakes	develop mathematical models to simulate the utilisation of water intakes
		analysing the water quality of intake areas		assess the quality of water in terms of the possibility of its treatment and delivery to recipients	analyse the fluctuations in water parameters in the areas supplying water intakes; analyse the factors affecting water quality parameters in the areas supplying water intakes	assess the effect of natural phenomena and anthropogenic factors on water quality parameters	forecast the water quality parameters of intakes	
		controlling the area supplying the water intake	perform activities relating to the regulation of water flow in the area supplying the water intake	assess water flow parameters in the area supplying the water intake in relation to undertaking water abstraction	select water flow parameters in the area supplying the water intake under routine conditions	select the water flow parameters of a river in the area supplying the water intake in emergency and non-routine situations, e.g., hypoxia, waste discharge		
		water abstraction		monitor and regulate water abstraction from a single water intake	supervise and regulate the operating parameters of a water abstraction system utilising many water intakes	develop water abstraction plans, including determining the amount of water extracted, the amount of raw water reserve		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	SKILLS: is able to	analysing the risks to water intakes and water supply systems		identify threats in the water intake protection zone and water supply system affecting the quality and quantity of water; perform activities preventing the occurrence and limiting the effects of the occurrence of threats in the water intake protection zone and water supply system	assess the risk of threats affecting water quality and quantity in the water intake protection zone and water supply system; prepare a risk assessment for the water intake and water supply system; design protective zones for water intakes	plan and supervise the implementation of activities to prevent the occurrence and limit the effects of the occurrence of threats in the water intake protection zone and water supply system; analyse the impact of the occurrence of threats in the water intake protection zone or water supply system on the quality and quantity of supplied water	design solutions to minimise the probability and consequences of the occurrence of threats in the water intake protection zone and water supply system	
		monitoring the distribution of water		compile data on the distribution of water; identify anomalies in the distribution of water; calculate water losses in water supply systems	analyse the causes of fluctuations in the distribution of water; analyse the indicators of water loss in the water supply system; prepare a water balance for water supply systems	adapt and implement solutions and technologies limiting water losses in water supply systems		
		optimising the financial aspects of water abstraction, treatment and supply processes	identify the components of costs relating to water abstraction, treatment and supply processes	estimate the costs of activities relating to water abstraction, treatment and supply, including the cost of water losses in the water supply system	analyse the financial effectiveness of activities relating to water abstraction, treatment and supply	analyse the possibilities of increasing the financial effectiveness of activities relating to water abstraction, treatment and supply; adapt and implement technologies and organisational solutions increasing the financial efficiency of water abstraction, treatment and supply processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WATER ABSTRACTION, TREATMENT AND SUPPLY	SKILLS: is able to	designing water treatment technologies			select individual water treatment processes and plan their course depending on the quality of the raw water; select the parameters of the technological processes of water treatment	modify the parameters of the technological processes of water treatment in non-routine and unpredictable situations, e.g., sudden changes in water quality, intake contamination, flood	modify water treatment methods and technologies	develop innovations in water treatment
		using products in water treatment processes	calculate product doses and apply them in water treatment processes; supervise dosing devices to ensure that the correct amounts of product are being used in water treatment processes	define the conditions for the use of products in water treatment processes	select the type, amount and concentration of the products used in water treatment processes depending on the method used and the quality of the raw water			
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	KNOWLEDGE: knows and understands	wastewater treatment technology		the methods and technologies used in municipal wastewater treatment processes	the methods and technologies used in industrial wastewater treatment processes not posing a threat to the environment; the principles of selecting the methods and technologies used in wastewater treatment processes depending on, e.g., the source, wastewater quality parameters	the methods and technologies used in the treatment of highly loaded wastewater containing substances particularly harmful to the environment; the principles of adapting the methods and technologies of wastewater treatment in non-routine and unpredictable situations, e.g., sudden changes in raw wastewater parameters, increased amount of wastewater	the trends in technologies used in wastewater treatment processes	the latest technological solutions used in wastewater treatment processes

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	KNOWLEDGE: knows and understands	formal and legal requirements for wastewater collection, transport and treatment	wastewater collection and transport procedures; the obligations of a sewerage network operator relating to wastewater disposal processes	the principles of conducting activities relating to wastewater collection, transport and treatment, including fees, required permits and authorisations; the procedures for obtaining permits, authorisations and other administrative decisions relating to wastewater collection, transport and treatment	the legal regulations on wastewater collection, transport and treatment and on the requirements for vehicles used to transport wastewater; the legal regulations on obtaining permits, authorisations and other administrative decisions required for wastewater collection, transport and treatment			
		principles of handling wastewater	the types and parameters of generated wastewater	the procedures for discharging sewage and industrial wastewater as well as rainfall and snowmelt into the sewerage system; the procedures for handling wastewater not released to the sewerage system; the principles of discharging treated wastewater into the water and ground	the legal regulations specifying the principles of discharging wastewater into the sewerage system, handling wastewater not discharged into the sewerage system and the principles for discharging treated wastewater into the water and ground			
		treated wastewater	the parameters characterising treated wastewater discharged into the water and ground	the types of substances found in treated wastewater discharged into the water and ground	the standards and legal regulations defining the principles of discharging wastewater into the water and ground, including the requirements for wastewater parameters; the way treated wastewater affects the ecosystem	the relationship between the degree of wastewater treatment and its parameters, and the properties and functioning of the ecosystem		
		chemical reactions occurring in wastewater treatment processes	the basic concepts of the chemical reactions taking place in wastewater treatment processes	the types of chemical reactions taking place in wastewater treatment processes	the factors influencing the course of the chemical reactions taking place in wastewater treatment processes	the course of the chemical reactions taking place in wastewater treatment processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	KNOWLEDGE: knows and understands	biological processes occurring in wastewater treatment processes	the basic concepts of the biological processes taking place in wastewater treatment processes	the types of biological processes occurring in wastewater treatment processes, including the processes occurring in wastewater treatment using activated sludge	the factors affecting the course of the biological processes taking place in wastewater treatment processes; the factors affecting the quality of the activated sludge used in biological wastewater treatment	the course of the biological processes taking place in wastewater treatment processes		
		unit processes used in wastewater treatment	the unit processes used in wastewater treatment; the parameters characterising the unit processes used in wastewater treatment	the principles of conducting unit processes, their stages and course used in wastewater treatment, e.g., filtration, sedimentation, coagulation, neutralisation	the principles of selecting the parameters of the unit processes used in wastewater treatment; the dependencies between the individual unit processes used in wastewater treatment and wastewater parameters	the effect of individual unit processes on the parameters of treated wastewater		
		products used in wastewater treatment processes	the types of products used in wastewater treatment processes, including trade names, types of packaging, labelling	the action, conditions of use, side effects and hazards of the products used in wastewater treatment processes	the chemical composition of the products used in wastewater treatment processes; the manner in which wastewater treatment products react with other chemicals	the effects of the products used in wastewater treatment processes on the environment	the directions of development of the products used in wastewater treatment processes	the latest solutions relating to the products used in wastewater treatment processes
		efficiency of wastewater treatment processes		the factors influencing the efficiency of wastewater treatment processes, including financial and energy efficiency	the organisational and technological methods and solutions increasing the efficiency of wastewater treatment processes, including financial and energy efficiency			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	KNOWLEDGE: knows and understands	costs of wastewater collection, transport and treatment as well as sludge processing activities	the types of costs in wastewater collection, transport and treatment processes as well as in processing sludge and other waste generated by the wastewater treatment process	the cost components of activities relating to wastewater collection, transport and treatment as well as to treating sludge and other waste generated by the wastewater treatment process; the principles of calculating the costs of activities relating to wastewater collection, transport and treatment as well as processing sludge and other waste generated by the wastewater treatment process	the principles of the financial optimisation of activities relating to wastewater collection, transport and treatment as well as the processing of sludge and other waste generated by the wastewater treatment process			
		the balance of wastewater and sewage sludge in wastewater disposal systems		the factors influencing the amount of wastewater in the wastewater disposal system	the methods and procedures of preparing a wastewater and sewage sludge balance	the principles of managing the wastewater disposal system	the principles of the strategic planning of the functioning of the wastewater disposal system	
		irregularities in wastewater treatment processes	the types of irregularities in wastewater treatment processes	the causes of irregularities in wastewater treatment processes	the impact of the irregularities occurring during wastewater treatment processes on their course and effectiveness and the quality parameters of the treated wastewater			
		sludge and other waste from wastewater treatment processes	the types of waste generated by wastewater treatment processes; the parameters characterising sludge and other waste generated by wastewater treatment processes	the factors influencing the possibilities of processing sludge and other waste generated by wastewater treatment processes	the chemical composition of sludge and other waste generated by wastewater treatment processes	the dependencies between the type and parameters of wastewater and the properties of the sludge and other waste generated by wastewater treatment processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	KNOWLEDGE: knows and understands	biogas generated by wastewater treatment processes	the parameters of the biogas generated by wastewater treatment processes	the possibility of using biogas generated by wastewater treatment processes; the factors influencing the efficiency of producing biogas generated by wastewater treatment processes	the methods of extracting, processing and treating biogas generated by wastewater treatment processes	the course of the reactions and physical, chemical and biological processes taking place during biomass processing as well as during the processing and treatment of biogas generated by wastewater treatment processes; the dependencies between the parameters of wastewater and sludge and the efficiency of the biogas production process and its parameters	the directions of development in the methods and technologies of extracting, processing and treating biogas generated by wastewater treatment processes	the innovations in the methods and technologies of extracting, processing and treating biogas generated by wastewater treatment processes
		managing sludge and other waste generated by wastewater treatment processes	the principles of handling sludge and other waste generated by wastewater treatment processes	the possibilities of using the products from the treatment of sludge and other waste generated by wastewater treatment processes and the substances recovered from them in other industries; the possibilities of efficiently using sludge and other waste generated by wastewater treatment processes, including the potential for energy production, biogas extraction and processing, and bio-components	the economic, organisational and legal conditions for the use of substances recovered from sludge and other waste generated by wastewater treatment processes; the technological possibilities of processing sludge and other waste generated by wastewater treatment processes	the economic and environmental benefits of managing sludge and other waste generated by wastewater treatment processes, in accordance with the principles of sustainable development	the directions of development in utilising the products from the treatment processes of sludge and other waste generated by wastewater treatment processes	the innovations in utilising the products from the treatment processes of sludge and other waste generated by wastewater treatment processes

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	KNOWLEDGE: knows and understands	methods and technologies used in the management processes of sludge and other waste		the types of physical, chemical and biological processes involved in sludge treatment	the methods and technologies for processing sludge and other waste generated by wastewater treatment processes, including methods of obtaining energy from sludge; the principles of selecting the methods and technologies for processing sludge and other waste generated by wastewater treatment, depending on the parameters of the sludge, the purpose of their processing and the required parameters of the products	the course of the reactions and physical, chemical and biological processes occurring in the management of sludge and other waste generated by wastewater treatment processes	the directions of development in the technologies of processing sludge and other waste generated by wastewater treatment processes, including methods of obtaining energy from these substances	the innovations in the technologies of processing sludge and other waste generated by wastewater treatment processes, including methods of obtaining energy from these substances
	SKILLS: is able to	ensuring business continuity in wastewater collection, transport and treatment processes	implement activities within the framework of procedures ensuring business continuity in wastewater collection, transport and treatment processes	implement plans to ensure business continuity in wastewater collection, transport and treatment processes in the event of planned inspections, repairs, maintenance and the modernisation of devices, installations and networks included in wastewater disposal systems	implement plans to ensure business continuity in the event of failures, unplanned changes in the quantity or quality parameters of wastewater and other emergencies disrupting wastewater collection, transport and treatment processes, e.g., sewerage network failures; assess business continuity plans for the collection, transport and treatment of wastewater	develop plans and procedures to ensure business continuity in wastewater collection, transport and treatment processes, in the event of planned inspections, repairs, maintenance and the modernisation of devices, installations and networks included in wastewater disposal systems	develop plans and procedures to ensure business continuity in wastewater collection, transport and treatment processes in the event of failures, unplanned changes in the quantity or quality parameters of wastewater and other emergency situations disrupting the collection and treatment processes, such as, e.g., sewerage network failures	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	SKILLS: is able to	conducting wastewater collection, transport and treatment processes		monitor the course of wastewater collection, transport and treatment processes; identify irregularities and disturbances influencing the course of wastewater collection, transport and treatment processes	plan the course and select the parameters of wastewater collection, transport and treatment processes; identify possible causes of irregularities and disturbances affecting the course of wastewater collection, transport and treatment processes	make recommendations for the optimisation of wastewater collection, transport and treatment processes		
		analysing the effectiveness and efficiency of wastewater treatment processes		identify irregularities and disturbances affecting the effectiveness and efficiency of wastewater treatment processes	analyse the effectiveness and efficiency of the technological processes in wastewater treatment; identify possible causes of irregularities and disturbances affecting the effectiveness and efficiency of wastewater treatment processes	select solutions and technologies which increase the effectiveness and efficiency of wastewater treatment processes	modify technological processes in order to increase the efficiency and effectiveness of wastewater treatment processes	develop solutions and technologies that increase the efficiency and effectiveness of wastewater treatment processes
		optimising the financial aspects of wastewater collection, transport and treatment processes and sludge management	identify the cost components of wastewater collection, transport, treatment and the management of sludge and other waste generated by the wastewater treatment process	estimate the costs of activities in wastewater collection, transport, treatment and the management of sludge and other waste generated by the wastewater treatment process	analyse the financial efficiency of the activities of wastewater collection, transport and treatment and the management of sludge and other waste generated by the wastewater treatment process	analyse the possibilities of increasing the financial efficiency of the activities of wastewater collection, transport and treatment and the management of sludge and other waste generated by the wastewater treatment process; adapt and implement technologies and organisational solutions increasing the financial efficiency of wastewater collection, transport and treatment processes as well as the management of sludge and other waste generated by the wastewater treatment process		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	SKILLS: is able to	analysing the structure and parameters of wastewater		monitor the amount and parameters of raw sewage discharged into the sewerage system; identify the factors changing the amount and parameters of raw sewage; assess the quality of treated wastewater in terms of the possibility of its discharge into the water and ground	define the structure and quality parameters of the wastewater produced in a given region; estimate the amount of raw sewage discharged into the sewerage network; prepare a wastewater and sludge balance in the wastewater disposal system	analyse the type, morphology and quality parameters of wastewater produced in a given region	forecast changes in the amount and parameters of wastewater resulting from the occurrence of natural phenomena and socio-economic factors; develop and implement activities aimed at modifying the quality parameters of the raw sewage collected	
		designing wastewater treatment technologies			select wastewater treatment unit processes and plan their course depending on the quality of raw sewage and the desired parameters of the treated wastewater; select the parameters of wastewater treatment technological processes	modify the parameters of wastewater treatment technological processes in non-routine and unpredictable situations, e.g., sudden changes in raw sewage parameters, increased amount of wastewater	modify the methods and technologies of wastewater treatment	develop innovative methods and technologies in the field of wastewater treatment
		using products in wastewater treatment processes	calculate product doses and apply them in wastewater treatment processes; supervise dosing devices to ensure that the correct amounts of product are being used in wastewater treatment processes	define the conditions for using products in wastewater treatment processes	select the type, amount and concentration of products used in wastewater treatment processes depending on the method used, raw sewage parameters and desired parameters of treated wastewater			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WASTEWATER COLLECTION, TRANSPORT AND TREATMENT	SKILLS: is able to	planning the management of sludge and other waste generated by wastewater treatment processes		choose the method of managing sludge and other waste generated by wastewater treatment processes	identify opportunities and plan the use of sludge and other waste generated by wastewater treatment processes, taking into account the principles of the circular economy; analyse the rationality of use and assess the environmental impact of individual methods of managing sludge and other waste generated by wastewater treatment processes	establish cooperation with cooperants, including representatives of other industries, in the use of sludge and other waste generated by wastewater treatment processes	analyse the possibility of applying innovations in managing sludge and other waste generated by wastewater treatment processes, in particular those aimed at increasing the efficiency of obtaining energy from sludge, recovering raw materials, including critical raw materials	develop multi-variant strategic scenarios and directions of change in the processing of sludge and other waste generated by wastewater treatment processes, in particular regarding energy generation from sludge
		designing the sludge treatment process			select the methods and technologies of processing sludge and other waste generated by wastewater treatment processes, depending on the purpose of the processing and the desired parameters of the final products	adapt technologies and organisational solutions for processing sludge and other waste generated by wastewater treatment processes in order to implement the premises of the circular economy	modify the methods and technologies of processing sludge and other waste generated by wastewater treatment processes in order to increase the efficiency of obtaining energy from sludge, recovering raw materials and reducing the negative impact on the environment	develop new methods and technologies for the treatment of sludge and other waste generated by wastewater treatment processes, enabling the implementation of a sustainable development policy in the field of water and wastewater management
		designing and analysing biogas extraction processes		identify factors influencing the efficiency and effectiveness of biogas extraction in wastewater treatment processes	analyse biomass parameters in terms of the efficiency and effectiveness of the biogas extraction process in wastewater treatment processes; select methods and technologies for the extraction, processing and treatment of biogas generated by wastewater treatment processes	analyse the efficiency of the processes of extracting, processing and treating biogas generated by wastewater treatment processes; adapt and implement technologies and organisational solutions increasing the efficiency and effectiveness of the processes of extracting, processing and treating biogas generated by wastewater treatment processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION AND REMEDIATION PROCESSES	KNOWLEDGE: knows and understands	reclamation and remediation methods	the types of methods used in reclamation and remediation processes	the methods and technologies used in reclamation and remediation processes, including pollution removal and containment techniques; the course of the technological processes used in reclamation and remediation	the criteria for selecting reclamation and remediation methods	the benefits and consequences of using particular reclamation and remediation methods on the functioning of the ecosystem and dependent ecosystems, including their impact on the natural phenomena occurring in ecosystems	the directions of development in the methods and technologies used in reclamation and remediation processes	the latest methods and technologies used in reclamation and remediation processes
		products used in reclamation and remediation	the types of products used in reclamation and remediation processes, including trade names, types of packaging, labelling	the action, conditions of use, side effects and risks associated with the products used in reclamation and remediation processes	the chemical composition of the products used in reclamation and remediation processes; the way the products used in reclamation and remediation processes affect the ecosystem, including the way they react with other substances	the long-term benefits and consequences of the influence of a given product on the ecosystem	the directions of development of the products used in reclamation and remediation processes	the latest solutions in the products used in reclamation and remediation processes
		the determinants of using reclamation and remediation methods		the principles of conducting reclamation and remediation processes resulting from the specificity of the ecosystem	the conditions for using a given method for reclamation and remediation, including technical possibilities and limitations, the limitations resulting from local conditions and the specificity of the ecosystem	the principles of adapting reclamation and remediation methods to specific conditions, including local conditions, the specificity of the ecosystem, and available technical solutions		
		formal and legal requirements for reclamation and remediation		the principles of conducting reclamation and remediation processes pursuant to permits, authorisations, other administrative decisions and agreements in place	the legal regulations defining the conditions for the implementation and course of reclamation and remediation processes; legal regulations on the use of products in reclamation and remediation processes	the current conditions of national, European and global environmental policies relating to reclamation and remediation processes	the directions of change in national, European and global environmental policies relating to the implementation of reclamation and remediation processes	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION AND REMEDIATION PROCESSES	KNOWLEDGE: knows and understands	managing the waste generated by reclamation and remediation processes	the principles of handling waste generated by reclamation and remediation processes not posing a threat to the environment and human life and health; the application of the by-products of reclamation and remediation processes in other industries	the principles of handling waste generated by reclamation and remediation processes containing pollutants that may pose a threat to the environment and human life and health; the application of the by-products of reclamation and remediation processes in other industries	the legal regulations specifying the rules for handling waste generated by reclamation and remediation processes; the possibilities and conditions, including the technical, economic, organisational and legal ones, for using waste generated by reclamation and remediation processes	the benefits and consequences of particular methods of managing waste generated by reclamation and remediation processes	the directions of development of reusing waste generated by reclamation and remediation processes	innovations in the technologies of processing and reusing waste generated by reclamation and remediation processes
		using waste generated by other industries		the use of waste generated by other industries in reclamation and remediation processes	the possibilities and conditions, including the technical, economic, organisational and legal ones, for the use of waste generated by other industries in reclamation and remediation processes; the legal regulations specifying the conditions for using waste in reclamation and remediation processes	the benefits and consequences of using waste generated by other industries in reclamation and remediation processes	the directions of development in using waste generated by other industries in reclamation and remediation processes	innovations in using waste generated by other industries in reclamation and remediation processes
		the principles of obtaining permits, authorisations and other administrative decisions	the types of permits, authorisations and other administrative decisions required for reclamation and remediation processes	the procedures for obtaining permits, authorisations and other administrative decisions for reclamation and remediation processes; the course of the administrative proceedings relating to activities implemented in reclamation and remediation	the legal regulations on obtaining permits, authorisations and other administrative decisions required for reclamation and remediation processes			

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION AND REMEDIATION PROCESSES	KNOWLEDGE: knows and understands	costs of reclamation and remediation activities	the types of costs in implementing reclamation and remediation, including the costs of monitoring the results of reclamation and remediation	the cost components of reclamation and remediation activities, e.g., to conduct field studies and laboratory tests, apply specific methods, monitor results; the principles of calculating the costs of reclamation and remediation activities, e.g., testing, in-situ and ex-situ remediation and others, monitoring results	the principles of financially optimising reclamation and remediation activities, e.g., testing, in-situ and ex-situ remediation and others, monitoring results	the financial mechanisms supporting reclamation and remediation activities, e.g., subsidies, funds, discounts		
		effectiveness of reclamation and remediation processes		the types of factors influencing the effectiveness of reclamation and remediation processes	the impact of external factors, including anthropogenic ones, on the effectiveness of reclamation and remediation processes	the methods of measuring the effectiveness of remediation and reclamation, criteria for assessing the effectiveness of reclamation and remediation processes	the directions of development of the methods increasing the effectiveness of reclamation and remediation processes	
		irregularities in reclamation and remediation processes		the types and causes of irregularities in reclamation and remediation processes; the types of measures preventing irregularities in reclamation and remediation processes; the types of remedial actions in the event of irregularities in reclamation and remediation processes	the impact of irregularities occurring during reclamation and remediation processes on their course and effectiveness			
	SKILLS: is able to	setting and assessing the achievement of reclamation and remediation objectives		monitor the achievement of the stated objectives of reclamation and remediation processes, including the interim objectives of the individual stages of reclamation and remediation	assess the degree of achievement of the stated objectives of reclamation and remediation processes, including the risk of non-performance and selection of corrective actions	define the objectives of reclamation and remediation processes, including the interim objectives of the individual stages of reclamation and remediation; define the indicators and achievement criteria for the objectives of reclamation and remediation		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION AND REMEDIATION PROCESSES	SKILLS: is able to	implementing reclamation and remediation processes		monitor the tasks implemented by employee teams, external entities, services, etc. in reclamation and remediation processes	analyse and assess the course of reclamation and remediation processes	coordinate the activities of employee teams, external entities, services, etc. implementing tasks in reclamation and remediation processes or conducting other activities in the sites undergoing reclamation and remediation		
		planning the use of polluted and degraded sites			analyse the possibilities of managing polluted or degraded ecosystems	develop a concept for the management and use of a polluted or degraded ecosystem, including in situations when reclamation and remediation are abandoned		
		feasibility assessment of reclamation and remediation processes		reach agreement on the organisational, technological and financial conditions for implementing reclamation and remediation processes	analyse the potential of reclamation and remediation, including determining the possibility of using a given method; assess the formal and legal conditions, including those relating to the terrain and legal status, in terms of the possibility of implementing reclamation and remediation	develop technical and economic analyses for reclamation and remediation processes	develop a feasibility study for reclamation and remediation processes	
		analysing the effectiveness of reclamation and remediation processes	identify the types of costs of the activities implemented in reclamation and remediation processes	estimate the costs of the activities implemented in reclamation and remediation processes	analyse the factors influencing the effectiveness of reclamation and remediation processes, including cost-benefit analyses; analyse and assess the effectiveness of various methods used in reclamation and remediation processes, including economic and environmental effectiveness	select and analyse effectiveness indicators for various methods used in reclamation and remediation processes; determine the possibilities and criteria for optimising the effectiveness of reclamation and remediation processes, including economic and environmental criteria	forecast the effectiveness of reclamation and remediation processes, taking into account scenarios of technological and organisational development	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION AND REMEDIATION PROCESSES	SKILLS: is able to	analysing the risk in reclamation and remediation processes	identify the factors influencing the effectiveness and feasibility of the reclamation and remediation process, e.g., difficulties resulting from geological conditions, weather changes	assess the risk factors limiting the feasibility and effectiveness of ex-situ reclamation and remediation processes, resulting, among others, from ecosystem characteristics, land management practices, weather phenomena	assess the risk factors limiting the feasibility and effectiveness of in-situ reclamation and remediation processes, resulting, among others, from ecosystem characteristics, land management practices, weather phenomena	plan activities to minimise the risk factors limiting the feasibility and effectiveness of reclamation and remediation processes, including the planning of alternative solutions		
		analysing the impact of remediation and reclamation processes on the ecosystem			assess the impact of reclamation and remediation processes on a given ecosystem and dependent ecosystems (e.g., outflow of surface water, the impact of pollutants on a reservoir)	diagnose the course of natural processes taking place in the ecosystem after reclamation and remediation activities; analyse the consequences of not implementing reclamation and remediation processes	forecast the long-term effects of implementing or not implementing reclamation and remediation processes, including forecasting the course of natural processes, forecasting changes in the ecosystem	
		selecting technologies		select the devices and equipment for reclamation and remediation processes; select the products required to perform reclamation and remediation	select reclamation and remediation methods (based on testing, diagnosis, established reclamation and remediation objectives)	adapt reclamation and remediation methods in accordance with the objectives of reclamation, remediation, soil and water conditions, type of pollution as well as organisational, financial and social conditions	modify the methods and technologies required for reclamation and remediation processes and implement solutions from other fields	develop new methods of reclamation and remediation
		logistics in reclamation and remediation processes		plan activities for the provision, transport, handling and storage of equipment, products and other resources needed for typical reclamation and remediation processes	plan activities for the provision, transport, movement and storage of equipment, products and other resources needed for non-routine reclamation and remediation processes or performed under particularly difficult conditions	establish a schedule of activities to be implemented in reclamation and remediation processes, taking into account variable and not fully predictable conditions resulting from the characteristics of ecosystems, the variability of weather phenomena and the dynamics of natural phenomena; modify schedules in the event of irregularities and disruptions in reclamation and remediation processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION AND REMEDIATION PROCESSES	SKILLS: is able to	planning waste management		choose the method of managing the waste generated by reclamation and remediation processes	plan the management of waste generated by reclamation and remediation processes, taking into account the principles of the circular economy; analyse the rationality of using particular waste management methods and assess their impact on the environment	establish cooperation with cooperants, including representatives of other industries, for the reuse of waste generated by reclamation and remediation processes	analyse the possibility of applying innovations in managing the waste generated by reclamation and remediation processes in accordance with the concept of sustainable development	
		planning the use of waste generated by other industries		identify the possibilities of obtaining and using waste from other industries in reclamation and remediation processes	analyse the benefits and effects as well as assess the rationality of using waste generated by other industries in reclamation and remediation processes	establish cooperation with cooperants, including representatives of other industries, for the reuse of waste generated by reclamation and remediation processes	analyse the possibility of applying innovations in managing the waste generated by reclamation and remediation processes in accordance with the concept of sustainable development	
		monitoring the results of reclamation and remediation		plan control activities to monitor the results of reclamation and remediation processes; estimate the costs of monitoring the results of reclamation and remediation	assess the level of the duration of the results of reclamation and remediation processes; identify the causes of deterioration in the durability of the results of reclamation and remediation processes and formulate recommendations for remedial actions	establish indicators of the durability of the results of reclamation and remediation processes and the criteria for their achievement		
		identifying irregularities in the course of reclamation and remediation processes		identify irregularities in performed reclamation and remediation processes; implement measures to minimise the effects of irregularities in reclamation and remediation processes	analyse the types and causes of irregularities in reclamation and remediation processes; assess the risk of irregularities occurring in the reclamation and remediation process	plan activities to minimise the effects of irregularities in reclamation and remediation processes	solve the complex, non-routine problems occurring in reclamation and remediation processes	

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
PLANNING AND IMPLEMENTING RECLAMATION...	SKILLS: is able to	obtaining administrative decisions required for reclamation and remediation processes	identify the required permits, authorisations and other administrative decisions required for reclamation and remediation processes, including those relating to waste management	process and develop the data required to obtain permits, authorisations and other administrative decisions for reclamation and remediation processes	prepare the documentation required to obtain permits, authorisations and other administrative decisions for reclamation and remediation processes	negotiate and reach agreement on issues not regulated by law with administrative authorities for the implementation of reclamation and remediation		
		documenting tasks in reclamation and remediation	read and understand the information in instructions, plans and schedules necessary to perform tasks in reclamation and remediation processes	document the tasks performed in reclamation and remediation processes, including observations, measurements, analyses; use the documentation of the reclamation and remediation processes in progress, including projects, technical documentation, results of assessments and analyses, e.g., the assessment of significant risks	prepare and verify the documentation of conducted reclamation and remediation processes, including debriefings, reports, analyses, specifications			
SAFETY	KNOWLEDGE: knows and understands	threats to people, property and the environment from implementing reclamation and remediation processes	the threats resulting from the implemented technological processes occurring at the work station and site of reclamation and remediation activities	the types and causes of threats to the safety of people, property and the environment occurring during reclamation and remediation processes	the impact of implementing or not implementing reclamation and remediation processes on human health and life as well as the safety of property and the environment	the long-term effects on the environment and human life and health resulting from implementing or not implementing reclamation and remediation processes		
		threats resulting from the implemented technological processes in water and wastewater management	the threats resulting from the implemented technological processes occurring at the work station and the site of the plant implementing water and wastewater management operations	the types and causes of threats to the safety of people, property and the environment occurring in water and wastewater management operations	the impact of the occurrence of threats in water and wastewater management operations, e.g., water supply system failures, sewage treatment plant failures, on the course of the technological process, the surroundings or the environment	the long-term effects on the surroundings or the environment of the threats in water and wastewater management processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SAFETY	KNOWLEDGE: knows and understands	the dangers of contact with pollutants and other harmful substances		the risks resulting from contact with pollutants and other harmful substances found in water, soil, sewage and waste from the processes of water and wastewater management, reclamation and remediation, e.g., poisoning, contamination	the direct effects on health or life resulting from contact with pollutants and other harmful substances found in water, soil, sewage and waste from the processes of water and wastewater management, reclamation and remediation	the long-term effects on health or life resulting from contact with pollutants and other harmful substances found in water, soil, sewage and waste from the processes of water and wastewater management, reclamation and remediation		
		measures ensuring the safety of the processes of water and wastewater management, reclamation and remediation	the principles and procedures of applying measures to ensure safety during the performance of professional tasks and to reduce threats during the processes of water and wastewater management, reclamation and remediation; the principles and procedures of handling the threats occurring in the processes of water and wastewater management, reclamation and remediation	the principles and procedures of selecting measures to reduce the risk of threats and emergency situations occurring during the processes of water and wastewater management, reclamation and remediation	the methods of identifying, analysing and minimising the risk of threats and emergency situations occurring in the processes of water and wastewater management, reclamation and remediation, including those resulting from the technologies used	the principles of designing methods, organisational solutions and other measures to reduce the risk of threats and emergencies occurring, including the principle of developing safety plans		
		the principles of safety in performing work in water and wastewater management, reclamation and remediation	the safety principles and procedures in performing the tasks of water and wastewater management, reclamation and remediation, e.g., performing work in sewerage systems, in explosion hazard zones, near water reservoirs, settling tanks, in a road lane; the procedures to be followed in case of an accident at work or a situation posing a threat to the health and life of persons performing tasks or bystanders, property or the environment	the legal regulations on safety rules for performing work in water and wastewater management, reclamation and remediation				

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SAFETY	KNOWLEDGE: knows and understands	the principles of handling products and samples of pollutants	the symbols placed on labels relating to the safety of applying the products used in the processes of water and wastewater management, reclamation and remediation; the safety principles and procedures of handling the products used in the processes of water and wastewater management, reclamation and remediation	the principles of using, warehousing, storing and transporting the products used in the processes of water and wastewater management, reclamation and remediation; the principles of handling typical pollutants, including pollutant samples or contaminated waste	environmental quality standards and other legal regulations specifying the methods of handling products and pollutants	the principles of handling non-routine, rarely encountered, new types of pollution		
	SKILLS: is able to	assessing the risk of threats occurring in the processes of water and wastewater management, reclamation and remediation		identify possible threats to the safety of people and property relating to the processes of water and wastewater management, reclamation and remediation, e.g., methane micro-explosions, release of harmful aerosols, outflow of harmful substances, accumulation of hydrogen sulphide	assess the risk of threats to human health and life and property in the processes of water and wastewater management, reclamation and remediation activities	plan solutions to minimise the occurrence of threats to human health and life, property or the environment in the processes of water and wastewater management, reclamation and remediation activities		
		minimising the threats in reclamation and remediation processes		secure the site where reclamation and remediation processes are being performed and perform activities ensuring the safety of employees, bystanders and property	select the methods of securing the site and other solutions ensuring the safety of employees, bystanders and property during the processes of reclamation and remediation, under routine conditions not posing any threats	select and adapt the methods of securing a site and other solutions ensuring the safety of employees, bystanders and property during the processes of reclamation and remediation under non-routine conditions, particularly difficult ones, or those posing a particular threat to human health or life		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SAFETY	SKILLS: is able to	applying procedures to ensure safety in the processes of water and wastewater management, reclamation and remediation	implement procedures and use personal protective equipment while performing tasks relating to water and wastewater management, reclamation and remediation	supervise the application of procedures and measures ensuring the safety of employees, bystanders and property while performing tasks relating to the processes of water and wastewater management, reclamation and remediation	implement procedures and use personal and collective protection measures in emergency and unpredictable situations posing a threat to health, life or property, e.g., landslide, water supply system failure, discovering explosives	develop procedures and other measures to ensure safety while performing the processes of water and wastewater management, reclamation and remediation, including in the event of emergencies and unpredictable situations posing a threat to health, life or property		
SOCIAL COMPETENCE								
COMMUNICATION AND COOPERATION	SOCIAL COMPETENCE: is ready to	communicating with ecosystem stakeholders		communicate with residents, local communities, representatives of organisations associating ecosystem stakeholders	maintain relationships with residents, local communities, representatives of ecosystem stakeholder organisations with regard to activities aimed at restoring and maintaining proper soil and water conditions in a given area			
		communicating with users of water and sewerage networks	inform about the principles of using water and sewerage networks properly, the parameters of supplied water and the ability to consume tap water	communicate with users of water and sewerage networks	maintain proper relationships with users of water and sewerage networks, including in difficult situations caused by, e.g., failures, interruptions in water supply or sewage collection and other disruptions in the provision of services	maintain relationships, including within the framework of industrial symbiosis, with entities producing wastewater	establish and shape the conditions for cooperation with persons and entities operating in the water and wastewater management sector, including the establishment and development of cooperation within the framework of industrial symbiosis	
		communicating with investors and principals, representatives of environmental protection organisations, public administration and legislators		communicate with investors and principals, including explanations of the short- and long-term benefits and consequences of conducting or not conducting specific activities in water and wastewater management, reclamation and remediation	maintain relations with investors and principals regarding the implementation of activities to restore and maintain proper soil and water conditions in a given area as well as in water and wastewater management	maintain relations with public administration representatives and legislators as well as environmental protection organisations regarding the implementation of activities to protect natural resources and conduct sustainable water and wastewater management	establish and shape conditions for the cooperation of investors, principals, representatives of public administration, legislators and environmental protection organisations to protect natural resources and maintain appropriate soil and water conditions, as well as to conduct sustainable water and wastewater management	establish and shape the conditions for establishing international cooperation to protect natural resources and maintain proper soil and water conditions as well as to conduct sustainable water and wastewater management

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
COMMUNICATION...	SOCIAL COMPETENCE is ready to	cooperation with external entities, services and specialists from other industries		communicate with suppliers, subcontractors, specialists from other industries, public services, public administration and representatives of the world of science	maintain relationships with suppliers, subcontractors, representatives of public services and administration, specialists from other industries, representatives of the world of science	work together in the community to promote good practices and implement innovative solutions in planning, performing and assessing reclamation and remediation processes as well as planning and conducting sustainable water and wastewater management	support the cooperation and integration of the community of entities involved in planning, performing and assessing reclamation and remediation processes as well as planning and conducting sustainable water and wastewater management	initiate and develop cooperation in the community on a national and international scale, for the transfer of innovative solutions in reclamation and remediation as well as water and wastewater management
RESPONSIBILITY FOR THE ENVIRONMENT		care for ecosystems		transfer knowledge on the causes and effects of soil and water pollution and on how pollution may be prevented	promote the principles and methods of ecosystem use that support the functioning of the ecosystem, maintain the effects of reclamation and remediation, and prevent soil and water pollution	take actions and promote solutions to support the functioning of ecosystems, including the maintenance of proper soil and water conditions and preventing the pollution of ecosystems	take actions to increase stakeholder awareness of the causes and effects of soil and water pollution, how pollution may be prevented, the importance of reclamation and remediation processes, and the advantages of using methods supporting the functioning of ecosystems	shape attitudes on the sustainable use of ecosystems
		care for water resources		apply the principles that reduce water consumption	promote the principles and methods that help reduce water consumption and promote its reuse	promote attitudes of responsibility towards water resources, including attitudes and ideas supporting the sustainable management of water resources	promote the importance of sustainable water resource management	shape the conditions to conduct international initiatives for sustainable water resource management, including the protection of global water resources
		impact of activities on the environment		perform professional tasks, taking into account their impact on the environment, in particular on the equilibrium of ecosystems and water resources	take responsibility for the impact of the processes of water and wastewater management, reclamation and remediation on the environment, in particular on the equilibrium of ecosystems and water resources	adopt priorities relating to environmental aspects when making decisions on planning and implementing activities in water and wastewater management, reclamation and remediation		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
RESPONSIBILITY...	SOCIAL COMPETENCE: is ready to	effective waste management			undertake activities for the effective use of sludge, washings and other waste generated by the processes of water and wastewater management, reclamation and remediation, including the search for new opportunities and technological-organisational solutions	establish and shape the conditions for cooperation in the development and implementation of solutions in the sector for the effective use of sludge, washings and other waste generated by the processes of water and wastewater management, reclamation and remediation	initiate and take actions to popularise solutions for the effective use of sludge, washings and other waste generated by the processes of water and wastewater management, reclamation and remediation	establish and shape the conditions for cooperation in the development and implementation of solutions in the sector for the effective use of sludge, washings and other waste generated by the processes of water and wastewater management, reclamation and remediation
WORK STANDARDS		attentiveness to the quality of performed work	take into account the impact of how tasks are performed on the course of the processes of water and wastewater management, reclamation and remediation	take into account the impact of how activities are performed and decisions made by oneself and a subordinate team on the correctness of the course and outcome of the processes of water and wastewater management, reclamation and remediation	take into account the long-term benefits and consequences for the environment as well as the safety and quality of life of people resulting from the accurate and reliable implementation of activities in the processes of water and wastewater management, reclamation and remediation	perform activities to disseminate the principles of reliability and accuracy in performing tasks in the processes of water and wastewater management, reclamation and remediation		
		performing tasks and making decisions under non-routine conditions	undertake activities under difficult conditions, e.g., in the presence of unpleasant odours, noise, harmful biological and chemical factors, enclosed spaces	undertake activities under variable circumstances relating to the instability of natural conditions, including hydrogeological and atmospheric conditions, as well as the dynamics of chemical and biological processes; undertake activities under variable, non-routine conditions resulting from the organisation of work, e.g., work during non-standard hours, shift work, remote work, work in virtual teams, on-call duty	take responsibility for the course of the processes taking place under variable circumstances resulting from the instability of natural conditions, including hydrogeological and atmospheric conditions, and the dynamics of chemical and biological processes	make decisions under variable circumstances resulting from the instability of natural conditions, including hydrogeological and atmospheric conditions, and the dynamics of chemical and biological processes		

SECTORAL DETERMINANTS		SERIES	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
WORK STANDARDS	SOCIAL COMPETENCE: is ready to	openness to change			adapt to changes in the work environment resulting from technological progress, including automation and digitalisation; adapt to changes in the work environment relating to the occurrence of exceptional situations in the socio-economic environment, e.g., pandemic, war	perform activities to better adapt subordinates and co-workers to changes in the work environment	undertake activities to increase the openness of the industry community to changes relating to the implementation of new technical and organisational solutions	
		responsibility for safety	take into account the impact of the activities conducted on one's own safety and that of one's co-workers	take responsibility for one's own safety in the performance of professional tasks	take responsibility for the safety of people, property and the environment in planning and supervising the activities conducted in the processes of water and wastewater management, reclamation and remediation	make decisions under time pressure and in situations threatening the safety of people, property and the environment in the processes of water and wastewater management, reclamation and remediation	make decisions in high-risk situations relating to a direct threat to human life and health or the possibility of environmental contamination, an ecological, natural or construction disaster	
		responsibility for the safety of the water supply and wastewater disposal systems			take responsibility for the proper functioning of the facilities included in the critical infrastructure	make decisions under time pressure and in difficult situations relating to the occurrence of disruptions in the processes of water abstraction, treatment and supply as well as the collection, transport and treatment of wastewater	make decisions in situations posing a threat to the continuity of the water supply, e.g., failures, contamination of water supply networks, natural disasters, cyber attacks	